

## **INNOVATING LIABILITY: THE VIRTUOUS CYCLE OF TORTS, TECHNOLOGY AND LIABILITY INSURANCE**

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25 YALE J.L. & TECH. 448 (2023)

*Emerging technologies, such as artificial intelligence and quantum computing, are predicted to grow exponentially over the next decade. This growth should lead to a substantial economic impact on various commercial markets, but it will also lead to different types of harms. These may include physical harms, such as a chess robot breaking a child's finger, or non-physical harms, such as excessive privacy breaches and cyberattacks enabled by quantum computing. While considering the safe integration of emerging technologies into our commercial stream, stakeholders often overlook the vital role of insurance. So far, scholars have identified different roles insurance hold, such as spreading and reducing risk. This Article identifies a new role insurance has in the context of emerging technologies—enabling safe and productive innovation.*

*The novelty of emerging technologies leads to difficulties in premium estimations and setting the terms of a liability policy to genuinely reflect the risks associated with an emerging technology. Despite this difficulty, insurance possesses the ability to enhance the integration of emerging technologies into daily commercial routines while mitigating the harms that may arise from this process. Throughout history, from the industrial revolution to outer space exploration, insurance has allowed innovative manufacturers to pursue breakthrough technologies while hedging their risks.*

*The intersection of torts, technology and liability insurance is perpetually developing as each field continuously fuels the others. Emerging technologies lead to new types of risks and losses, creating new liability rules, which in turn drive the purchase of liability insurance. Other times, tort law reacts slowly to harms caused by emerging technology leading to the purchasing of liability insurance and only then to the formation of liability rules, which are influenced by the existence of these policies. Yet in other instances, the existence of liability rules and insurance helps facilitate the safe dissemination of emerging technologies into our commerce stream. This virtuous cycle is a dominant one in the realm of liability law. However, to date, little has been discussed on the interplay between these three fields.*

*This Article challenges the notion that insurance is inadequate to cover emerging technologies given their novelty. It argues that insurance holds a vital underexplored role in advancing safe and*

*healthy innovation and that, as a result, regulators should actively ensure its availability to both manufacturers and consumers. It aims to flesh out the influence torts, liability insurance and emerging technologies have on each other. Liability insurance allows consumers and manufacturers of emerging technologies to innovate while hedging their risks, thus acting as a catalyzing force of innovation itself.*

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## INTRODUCTION

Emerging technologies hold an imperative part in today's commercial market across the world. Innovation has become an inseparable part of our day-to-day lives improving it in new and innovative ways. These improvements, however, come with a cost when these new technologies alter the current threat landscape and lead to different scopes and types of losses and damages.<sup>1</sup> The insurance industry has had, and continues to have today, a significant role in managing these threats and losses. Despite this, there seems to be a profound disconnect between scholars focusing on insurance law, especially liability insurance, and those focusing on law and technology.<sup>2</sup> This disconnect is a peculiar anomaly. Liability insurance is deeply entrenched and effected by the technologies of the past as well as today's variety of emerging technologies, such as biological and chemical engineering, gene editing, quantum computing, AI, and information communication.

This Article aims to shed light on the inevitable "virtuous innovation cycle" which includes the fields of liability insurance, liability law and emerging technologies. It explores the ways these three fields have mutually influenced each other throughout history. It recommends ensuring greater availability of liability insurance policies to cover the future emerging technologies that are about to enter our commercial market.

This Article provides a theoretical framework about the virtuous innovation cycle and offers three main contributions to current literature: First, it aims to delve into the underexplored role insurance has had as a facilitator of healthy innovation. Insurance has enabled the integration of emerging technologies in a safe manner into our commercial stream. Scholars have thus far focused

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<sup>1</sup> See, e.g., Jon Henley, *Chess Robot Grabs and Breaks Finger of Seven-Year-Old Opponent*, GUARDIAN (July 24, 2022), <https://www.theguardian.com/sport/2022/jul/24/chess-robot-grabs-and-breaks-finger-of-seven-year-old-opponent-moscow> [<https://perma.cc/F69B-BBPA>]; Vivek Wadhwa & Mauritz Kop, *Why Quantum Computing Is Even More Dangerous Than Artificial Intelligence*, FOREIGN POLICY (Aug. 21, 2022), <https://foreignpolicy.com/2022/08/21/quantum-computing-artificial-intelligence-ai-technology-regulation> [<https://perma.cc/4JGY-S8ZS>].

<sup>2</sup> Asaf Lubin, *Insuring Evolving Technology*, 28 CONN. INS. L.J. 130 (2021).

on the roles of insurance as a means to reduce and distribute risks. This Article shines a new spotlight on the role insurance has as a supporting force of technologies. Second, the Article provides three parameters to help stakeholders, such as insurance brokers and carriers, policyholders, and the regulator, predict when insurance coverage will be offered. These parameters are (1) the ability of the insurance carriers to make a profit; (2) current and expected regulatory intervention; and (3) the possibility of widespread impact leading to multiple policies being triggered at once. Lastly, the Article emphasizes the important role the regulator has in ensuring insurance availability. It calls for the regulator to guarantee policies covering innovative technologies will be available and accessible to those who wish to purchase them.

A good example for the important role insurance has had with regards to emerging technologies is the vital part fire insurance had played during the Industrial Revolution.<sup>3</sup> The product of fire insurance policies underwent an extensive evolution process in response to the challenges the insurance industry faced in the last quarter of the eighteenth century. Fire insurance has been well established during the years preceding to the First Industrial Revolution, but the complexity of industrial property and the risks associated with it were foreign to the information and calculations insurers used before.<sup>4</sup> The emergence of factories, unlike previous domestic workshops, created a far more excessive concentrated risk which was not in line with previous information upon which premiums were calculated. Despite these difficulties, the insurance industry continued to act as a risk-hedging mechanism supporting the advance of machinery into our commercial markets.<sup>5</sup> Insurance carriers collected new information and rapidly adjusted their premiums without changing their underlying policy, hence, enabling extensive protection as factories grew and machines became an integral part of mass production. Insurers indeed suffered losses in the beginning of this process, given the discrepancy between the premiums they charged and the losses which they were obligated to

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<sup>3</sup> ROBIN PEARSON, *INSURING THE INDUSTRIAL REVOLUTION: FIRE INSURANCE IN GREAT BRITAIN, 1700-1850* (2017).

<sup>4</sup> M.W. Beresford, *Prometheus Insured: The Sun Fire Agency in Leeds During Urbanization, 1716–1826*, 35 *ECON. HIST. REV.* 373 (1982); S.D. Chapman, *The Devon Cloth Industry in the Eighteenth Century: Sun Fire Office Inventories of Merchants' and Manufacturers' Property, 1726-1770*, 23 *DEVON AND CORNWALL RECORD SOCIETY* (1978).

<sup>5</sup> *Rowell v. Railroad*, 57 N.H. 132, 139 (1876) (“There is no doubt that one of the objects of insurance against fire is to guard against the negligence of servants and others; and therefore the simple fact of negligence has never been held to constitute a defence.”).

pay or indemnify.<sup>6</sup> Considering the new information insurance carriers accumulated along with their incentive to generate profit by minimizing losses, their underwriting practice nudged their insureds to create safer infrastructures, for instance by determining “the material and design of a mill, warehouse or workshop construction.”<sup>7</sup> Thus, insurers had a great impact on the safeness of emerging industries, from their infrastructure to their actual day-to-day practice.<sup>8</sup> This is also true today.

This process of new technologies integrating into society and the insurance industry reacting to them while enabling their safe growth had occurred many times since the Industrial Revolution. This process is bound to repeat itself once insurers cover new types of technologies. The most intuitive example is that of the automobile industry. The innovative technology of the automobile led to high volumes of injuries with little adequate compensation.<sup>9</sup> In 1932, the Columbia Plan offered to mandate the purchase of automobile liability insurance by all car owners.<sup>10</sup> In 1965, Keeton and O’Connell proposed a no-fault insurance policy for automobile accident claims.<sup>11</sup> Today, auto liability insurance is mandatory in 49 states and the District of Columbia.<sup>12</sup>

Insurance has the power to handle damages inflicted by emerging technologies, serving both a preventive and a compensatory function. Insurance carriers possess the unique capability to promote accident prevention via liability insurance premiums, which are varied considering different levels of risk

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<sup>6</sup> Robin Pearson, *Fire Insurance and the British Textile Industries During the Industrial Revolution*, 34 BUS. HIST. 1, 4 (1992) (“From the 1790s textiles proved increasingly troublesome for the metropolitan insurers. Frequent mill and warehouse fires meant that often premiums failed to cover losses. The extension of some manufacturing activities into cotton warehouses, the increasing size and density of industrial plant in urban locations, and the expansion of multiple occupation, all complicated the underwriting of textile risks.”).

<sup>7</sup> *Id.* at 2.

<sup>8</sup> Such was the case with regards to the then-booming textile industry during the Industrial Revolution. *Id.* at 8.

<sup>9</sup> Robert E. Keeton & Jeffrey O’Connell, *Basic Protection for the Traffic*, 24 WASH. & LEE L. REV. 170 (1967).

<sup>10</sup> JAMES M. ANDERSON, PAUL HEATON & STEPHEN J. CARROLL, THE U.S. EXPERIENCE WITH NO-FAULT AUTOMOBILE INSURANCE: A RETROSPECTIVE 30 (2010).

<sup>11</sup> ROBERT E. KEETON & JEFFREY O’CONNELL, BASIC PROTECTION FOR THE TRAFFIC VICTIM: A BLUEPRINT FOR REFORMING AUTOMOBILE INSURANCE (1965).

<sup>12</sup> Ava Lynch, *Why is Car Insurance Mandatory?*, ZEBRA (July 6, 2022), <https://www.thezebra.com/auto-insurance/policies/why-is-car-insurance-mandatory>. For more on automobile liability insurance history, *see infra*, Section III.A.

posed by policyholders.<sup>13</sup> The policyholder thus have an incentive to promote safety and proactively prevent accidents in order to lower its premium and the overall level of risk associated with its activities. Furthermore, the existence of insurance ensures victims of new technologies will be compensated promptly when no clear liability rules have been established yet, which is usually the case with emerging technologies. Thus, early adopters are encouraged to complete their part in the dissemination of a new technology into our commerce stream.<sup>14</sup> These inherent features of insurance positions this industry at a unique place to act as a facilitator of innovation into the market.

Emerging technologies create new types of risks and damages, which are inflicted upon individuals, as well as upon societies, in new and ubiquitous ways. One may choose to avoid these risks by abandoning the process of investing in new technologies. However, this may also lead to the creation of risks due to the lack of innovation, which is detrimental to us all in the aggregate. Imagine a world without cars, nuclear power, or vaccines. A world with them is far from being safe, but a world without them is unimaginable nor desirable.<sup>15</sup> Under this assumption, managing any risk, and especially technological associated risks, should focus on the reduction of risks-related costs, rather than the elimination of risks as a whole. These risk-related costs include costs of risk-reduction methods as well as risks associated with the loss of technological benefits. Insurance can help reduce those risks and enable individuals, companies, and society to avoid selective aversion from innovation. Insurance provides a risk management tool capable of hedging a wide scope of risks associated with the innovation of new technologies.<sup>16</sup>

When damages are anticipated, insurance steps to the fore and aims to provide a layer of protection to those behaving in a way that may cause damages to themselves (first-party policies) or their surroundings (third-party policies). Insurance has always been in the background when new technologies entered our commercial market

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<sup>13</sup> Kenneth S. Abraham, *Liability Insurance and Accident Prevention: The Evolution of an Idea*, 64 MD. L. REV. 573, 603 (2005); GUIDO CALABRESI, THE COSTS OF ACCIDENTS 46-54 (1970).

<sup>14</sup> *Early Adopter*, CFI, <https://corporatefinanceinstitute.com/resources/knowledge/other/early-adopter> [<https://perma.cc/G3UZ-MRFF>] (“They provide feedback to the vendor and help them to refine the product features, design, distribution, and support.”).

<sup>15</sup> Clayton P. Gillette & James E. Krier, *Risk, Courts, and Agencies*, 138 U. PA. L. REV. 1027, 1028 (1990) (“... though risk by definition is costly, avoiding risk is costly as well.”).

<sup>16</sup> Assuming innovation is a high priority. For a different view in the context of information privacy regulation ‘stifling’ innovation, see Yafit Lev-Aretz & Kathy J. Strandberg, *Privacy Regulation and Innovation Policy*, 22 YALE J.L. & TECH. 256 (2020).

and were offered to consumers. It is thus surprising these two disciplines have been kept relatively separate throughout the years. This changed slightly with the emergent of the cyber-insurance market, which created a clear link between the insurance and technology spheres that has since drawn wide scholarly debate.<sup>17</sup> But there is much more to discuss about the role of insurance in facilitating innovative technology, in the past, present, and future. This Article aims to flush out these intersection points and highlight the mutual influence liability insurance and innovation have on each other. In doing so, it hopes to open a discussion connecting the reciprocal disciplines of insurance and technology.

Insurance as a whole seems to have acquired a bad reputation in the eyes of the average American consumer.<sup>18</sup> Much of this can be attributed to its intuitive association with the health insurance market and the bad experience some policyholders have had while dealing with them.<sup>19</sup> It seems that this bad experience is rather unique to the American context whereas in other countries a social health system provides basic health services to the population at large.<sup>20</sup> This has tainted consumers' perception with regards to the potential benefits insurance as a system can offer them.<sup>21</sup> However, in the context of liability insurance, it is important to emphasize the value of the insurance system in protecting consumers from the risks of emerging technologies while enabling the latter's growth. In this sense, this Article aspires to readjust the way consumers perceive the merits of the insurance industry, outside of the rigid framework of American health system.

This Article delves into the role insurance had played in the past, and is bound to play in the future, to help the safe assimilation of emerging technologies into our commerce stream, despite their risks. From the creation of the steam engine and the airplane to space exploration and satellites, until today's widespread use of the Internet. Liability insurance has had an underappreciated role in the

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<sup>17</sup> See *infra*, Section III.B.

<sup>18</sup> L. S. Howard, *Insurance Flipsides: Countering the Industry's Negative Perception Problem*, *INS. J.* (May 10, 2018), <https://www.insurancejournal.com/blogs/insurance-flipsides/2018/05/10/488857.htm> [https://perma.cc/53T3-VMZD]; James Eardley, *Bad Reputation: Changing the Perception of Insurance*, *THE FUTURE OF CUSTOMER ENGAGEMENT AND EXPERIENCE*, <https://www.the-future-of-commerce.com/2021/01/28/perception-of-insurance> [https://perma.cc/ZLR9-DUMC].

<sup>19</sup> See, e.g., Amy Monahan & Daniel Schwarcz, *Rules of Medical Necessity*, 107 *IOWA L. REV.* 423 (2022) (discussing the challenging structure of the health care insurance system and how they can affect policyholders' ability to receive coverage).

<sup>20</sup> Olga Khazan, *What's Actually Wrong with the U.S. Health System*, *ATLANTIC* (July 14, 2017).

<sup>21</sup> Andy Rooney, *Why We Hate Insurance Companies*, *CHI. TRIB.* (Nov. 26, 1985), <https://www.chicagotribune.com/news/ct-xpm-1985-11-26-8503210894-story.html> [https://perma.cc/V4YW-UG9A].



development of technologies since 1752, when it was formed in reaction to the new risks of modern life, such as steam boilers, railroads, streetcar lines and automobiles. A great deal of credit has been given to tort law as an important safety adjuster mechanism capable of accommodating and encouraging technological innovation,<sup>22</sup> but insurance's ability to do the same has been undeservedly ignored. This Article aims to remedy this gap by building upon the evolution of insurance and its influence on the adoption of emerging technologies. Insurance has always been an ally to business and users, alongside the tort system, in facilitating innovation and providing an *ex ante* and *ex post* platform which enables compensation to victims when other legal institutions fail them. Here we will grant insurance the recognition it deserves and discuss its importance as a risk-management instrument enabling new innovations.

This Article focuses on insurance covering both *disruptive* and *sustaining* innovation. Christensen offered a distinction between the two.<sup>23</sup> He stated that disruptive innovation presents a fundamental change in a given trajectory which reflect “a rethinking of the basic premises of important areas of mainstream technology.”<sup>24</sup> These emerging types of technologies are viewed as disruptive because they create a paradigm-shift and strive to change the existing circumstances. Prominent examples are the invention of the train as a mean of transportation, and the internet as a mean of communication. On the other hand, sustaining innovation doesn't fight the status quo but rather strives to maintain it. It does so by “incrementally improving areas of mainstream technology.”<sup>25</sup> Unlike disruptive innovation, sustaining innovation doesn't challenge existing technologies, but rather wishes to extend its grasp in the current market. Uber, Airbnb, and even autonomous vehicles (AVs) are examples for sustaining innovation as they build upon existing mainstream infrastructure, taxis, hotels, and cars,

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<sup>22</sup> James A. Henderson Jr., *Tort vs. Technology: Accommodating Disruptive Innovation*, 47 ARIZ. ST. L.J. 1145, 1146 (2015) (arguing that tort law can be viewed as a set of rules which embrace “risk-taking in order to promote individual and social values that the system considers appropriate,” *id.*, and that the American tort law system “is designed to allow innovators to avoid crushing liability,” *id.* at 1148). *See also* Mary L. Lyndon, *Tort Law and Technology*, 12 YALE J. ON REG. 137 (1995); Gregory N. Mandel, *Regulating Emerging Technologies*, 2019 L., INNOVATION & TECH. 75, 77; Donald G. Gifford, *Technological Triggers to Tort Revolutions: Steam Locomotives, Autonomous Vehicles, and Accident Compensation*, 11 J. TORT L. 71 (2018).

<sup>23</sup> CLAYTON M. CHRISTENSEN, *THE INNOVATOR'S DILEMMA*, at xviii–xix (1997).

<sup>24</sup> *Id.*

<sup>25</sup> Henderson, *supra* note 22, at 1151.

attempting to expand and improve them rather than challenge their foundations.<sup>26</sup>

This Article aims to analyze the way insurance has supported, and still supports, the growth of disruptive and sustaining innovation. In both scenarios insurers face an informational challenge—they lack data about disruptive innovations given their novelty, and they lack nuanced information about sustaining innovation given their ‘incremental’ technological improvement that may diverge significantly from insurers’ datasets. Both types of innovation put the insurance industry in a difficult position—offering coverage despite of the profound lack of knowledge surrounding the scope and probability of risks associated with a new or improved technology. By choosing to offer policies covering these technologies, the insurance industry plays an active role in incentivizing innovation and hedging the many risks associated with them.<sup>27</sup>

The Article continues as follows. Part II presents the virtuous cycle of torts, insurance, and technology, while highlighting the issue of long-tail liability. Part III discuss the interplay of insurance and technology. It starts by presenting a brief history of tech liability insurance. It then presents the major challenges innovation poses to actuarial science and issuance of policies. Part IV provides an overview of the current status of insurance in the fields of AI and cyber space. Part V reviews three prominent disadvantages (moral hazards, stifling innovation, and adverse selection) associated with insurance to offset the insurance-optimistic tune presented in the Article. Nonetheless, this Part still maintains the notion that despite the shortages of the insurance industry, it should still play a part in facilitating the safer implementation of emerging technologies into the commercial market. Part VI discusses future implications of offering insurance to emerging technologies. It presents the issue of ‘known unknowns’ and its implications of the feasibility of offering insurance. It also provides an overview of the future roles of government, reinsurance, and securitization in the context of insuring emerging tech, as well as a discussion about the identity of the policyholders (first- or third-party). Part VII then offers three parameters—profitability, regulatory intervention, and widespread impact—to help stakeholders predict when the insurance industry will offer coverage for innovation (‘fight’), and when it will prefer

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<sup>26</sup> Clayton M. Christensen, Michael E. Raynor & Rory McDonald, *What Is Disruptive Innovation?*, HARV. BUS. REV. (Dec. 2015), <https://hbr.org/2015/12/what-is-disruptive-innovation> (“Uber’s financial and strategic achievements do not qualify the company as genuinely disruptive—although the company is almost always described that way.”).

<sup>27</sup> This distinction has important implications in the model-business context, but it might be misleading when discussing the risks these types of innovations present to consumers.

to deny it ('flight'). It calls for regulatory intervention to ensure the ongoing availability of liability policies to both users and manufacturers in an effort to support future innovations.

## I. THE VIRTUOUS CYCLE OF TORTS, INSURANCE AND TECHNOLOGY

In his book, *THE LIABILITY CENTURY*, Abraham emphasizes the important connection between tort law and insurance law: "They interact and influence each other's development, shape, and scope. The tort system, not only as it exists on paper but also how it works in practice, is a product of the insurance system, just as the insurance system is a product of the tort system."<sup>28</sup> These two systems grow side-by-side along with the movement toward greater social welfare in the US throughout the previous century: "Insurance was a principal mechanism by which tort law spread risk. And so new forms of insurance developed along with the expansion of tort liability, sometimes before and sometimes after a new form of tort liability was created."<sup>29</sup>

The interplay between insurance law and tort law is undeniable. Their mutual interactive impact has resulted in a "decades-long arms race."<sup>30</sup> At times, the tort system makes the first move by expanding the current scope of liability, leading to the creation of insurance against these new types of liabilities. At other times, the insurance system acts first by offering liability insurance, which in turn leads to a counterreaction from the tort system to create new types of liabilities.<sup>31</sup> Because tort and insurance law have become so "inextricably and unavoidably intertwined,"<sup>32</sup> it seems as though insurance law has lost its identity in the process, at least in the aspect of academic studies and research. Unlike tort law, insurance is not a mandatory course in law schools and many law schools do not offer it to their students.<sup>33</sup> This is also true in the context of technology law, where much has been written about the mutual influence that tort law and technology law have had on each other, with little regard to the vast influence that insurance law has had on that field.<sup>34</sup>

As a result, though current literature discusses the interplay between insurance law and tort law,<sup>35</sup> as well as the interplay

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<sup>28</sup> KENNETH S. ABRAHAM, *THE LIABILITY CENTURY: INSURANCE AND TORT LAW FROM THE PROGRESSIVE ERA TO 9/11*, at 1 (2008).

<sup>29</sup> *Id.* at 2.

<sup>30</sup> *Id.* at 4.

<sup>31</sup> *Id.*

<sup>32</sup> *Id.* at 5.

<sup>33</sup> *Id.* at 7.

<sup>34</sup> Excluding the debate about the automobile insurance industry. *See, e.g., supra* notes 9-12 and accompanying text.

<sup>35</sup> Mostly the work of ABRAHAM, *supra* note 28.

between tort law and technology law,<sup>36</sup> the intersection points of technology and insurance law, as well as the broader influence these three fields has had upon each other, is underexplored.<sup>37</sup> Current literature discusses the usage of insurance in specific technological instances, such as Autonomous Vehicles,<sup>38</sup> IoT devices,<sup>39</sup> and commercial aerial robots.<sup>40</sup>

Garba and Saint discussed an insurance system unique for IoT devices which aims at addressing “technical and market failures in the IoT ecosystem, propose a method of distrusting risk more equitable, and examine ways to funds necessary response to large scale incidents.”<sup>41</sup> They state that “an insurance model has not been widely adopted in the traditional Internet, but the increasing number and reach of IoT devices increases the risk and consequences of a network failure and suggests the need for a risk management solution.”<sup>42</sup> This notion also applies to other emerging technologies that are expanding their grasp in the market, thus amplifying the harms that might occur and highlighting the need for a risk management strategy.

Beyer et al. offered an insurance solution in the context of commercial aerial robots. Their article analyzes the different components that must appear in a policy covering aerial robots (drones) focusing on safety, privacy, and cyber security.<sup>43</sup> Aerial robots’ coverage also manifests the challenges presented by the underwriting process of a ‘drone insurance’ policy, similar to challenges presented in the context of offering insurance for other

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<sup>36</sup> See, e.g., Kyle Graham, *Of Frightened Horses and Autonomous Vehicles: Tort Law and Its Assimilation of Innovations*, 52 SANTA CLARA L. REV. 101 (2012); Lyndon, *supra* note 22; Gifford, *supra* note 22.

<sup>37</sup> The main exception to this statement is the discussion about boiler explosion safety. See *infra* Part III.

<sup>38</sup> This discussion is rather intuitive given the current insurance infrastructure that regulated the uses of non-autonomous vehicles and the way it should be changed once AVs dominate the road. For a deeper discussion about this debate, see Anat Lior, *Insuring AI: The Role of Insurance in Artificial Intelligence Regulation*, 35 HARV. J.L. & TECH. 467, 489-498 (2022). See also *infra* Chapter V.A.

<sup>39</sup> Aminata Garba & Martin Saint, *Mitigating Risk: Insurance for the Internet of Unexpected Things* (Mar. 31, 2017) (unpublished manuscript) ([https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2944323](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2944323)).

<sup>40</sup> David K. Beyer, Donna A. Dulo, Gale A. Townsley & Stephen S. Wu, *Risk, Product Liability Trends, Triggers, and Insurance in Commercial Aerial Robots*, (Apr. 4-5, 2014), [https://robots.law.miami.edu/2014/wp-content/uploads/2013/06/Beyer-Dulo-Townsley-and-Wu\\_Unmanned-Systems-Liability-and-Insurance-Trends\\_WE-ROBOT-2014-Conference.pdf](https://robots.law.miami.edu/2014/wp-content/uploads/2013/06/Beyer-Dulo-Townsley-and-Wu_Unmanned-Systems-Liability-and-Insurance-Trends_WE-ROBOT-2014-Conference.pdf) [<https://perma.cc/PNW9-C6U2>].

<sup>41</sup> Garba & Saint, *supra* note 39, at 1.

<sup>42</sup> *Id.* at 2.

<sup>43</sup> Beyer et al., *supra* note 40, at 15.

emerging technologies where the historical data needed for an actuarial approach is lacking at first.<sup>44</sup>

Lubin has started a broader discussion about ‘insuring evolving technology,’ while focusing on the growing market of cyber-insurance.<sup>45</sup> In his article Lubin aims to expose an insurance audience to the burgeoning law and technology literature. Briefly focusing on the intersection of torts, insurance and technological evolution, Lubin reviews the stages of new technologies and its influence on liability assignment in torts and insurance, which presents a salient challenge, especially at the inception of a technology.<sup>46</sup> Building on the example of cyber insurance, Lubin tries to connect law-and-technology scholars and insurance scholars. He concludes by stating that “if we each step outside of our own silo and explore what the folks on the other side are writing and thinking about, we might be able to develop deeper and more nuanced insights.”<sup>47</sup> This Article aims to do that by delving into the ongoing influence torts, insurance and emerging technologies have upon each other and deepening the current discussion about this virtuous innovation cycle.

We must have a good understanding of the reciprocal relationship between tort and insurance and their influence on technology if we wish to propose any type of regulation that can genuinely influence the intersection of these three fields, such as the currently highly debated topic of AI governance.<sup>48</sup> Otherwise, these regulation attempts may be counterproductive and unable to offer solutions that address the problems they were designed to solve.<sup>49</sup> Abraham observed that:

Over time, liability insurers’ presence in tort suits would come very nearly to be constitutive of the system’s character. Not only would the insurers’ involvement affect the procedure and operation of the system; the availability of insurance as a source of compensation would influence the substantive evolution of tort law. Much of the scope of modern tort liability eventually would be justified in at least some quarters as a method of gaining access to

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<sup>44</sup> *Id.*

<sup>45</sup> Lubin, *supra* note 2.

<sup>46</sup> *Id.* at 139.

<sup>47</sup> *Id.* at 164.

<sup>48</sup> See, e.g., *National AI Policies & Strategies*, OECD.AI, <https://oecd.ai/en/dashboards>; Margit E. Kaminski, *Regulating the Risks of AI*, 103 B.U. L. REV. (forthcoming, 2023).

<sup>49</sup> ABRAHAM, *supra* note 28, at 5.

defendant's liability insurance. *In a very real sense, tort would become insurance.*<sup>50</sup>

In many aspects, tort and insurance are one, and ignoring one while discussing the other may lead to problematic policy decisions and inadequate legal regimes. A good example of this notion is the fact that courts often take into consideration the availability and existence of liability insurance while they establish new liability rules,<sup>51</sup> including those governing damages inflicted by novel technologies.

The way in which insurance, tort and emerging technologies have significantly shaped each other over the last century is demonstrated in the case of 'long-tail' liability claims. 'Long-tail' liability claims exemplify the types of challenges that insurance and tort face in light of emerging technologies.<sup>52</sup> 'Long-tail' liability claims occur due to tortious behavior that results in "latent bodily injury or property damage that then manifests itself only many years after the harm-causing conduct occurred."<sup>53</sup> For instance, exposure to asbestos or other hazardous components that cause visible harms only years after the initial exposure.

Technology had a substantive part in the development of long-tail liability. The booming industrial activities occurring at the beginning of the twentieth century, combined with the chemical and pharmaceutical revolutions arriving later that century, led to bodily injuries and property damages which involved long-latent harms.<sup>54</sup> Long-tail litigation demonstrates how innovative technologies were the driving force behind developing tort and insurance law. Moreover, it was technological and scientific developments themselves which enabled these long-tail claims to be brought to court, as they assisted in identifying the causes of the latent harm.

Both tort and insurance law were transformed as a result of long-tail claims litigation. Common law developed new doctrines in light of the legal challenges brought on by long-tail liability claims.<sup>55</sup> Long-tail claims led to unprecedented volumes of insurance litigation "entirely remaking the field."<sup>56</sup> New doctrines aimed specifically at resolving the 'long-tail coverage' issue were

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<sup>50</sup> *Id.* at 38 (emphasis added).

<sup>51</sup> *Id.* at 12. This is also notable from a defendant's obligation to disclose any insurance that might cover all or part of the judgment as an initial required disclosure in the beginning of discovery. *See* FED. R. CIV. P. 26.

<sup>52</sup> ABRAHAM, *supra* note 28, at 152.

<sup>53</sup> Kenneth S. Abraham, *The Long-Tail Liability Revolution: Creating the New World of Tort and Insurance Law*, 6 U. PA. J.L. & PUB. AFF. 347, 347 (2021).

<sup>54</sup> *Id.* at 350.

<sup>55</sup> Such as the indeterminate defendant and plaintiff problems. *Id.* at 362-65.

<sup>56</sup> *Id.* at 367.

created by the courts.<sup>57</sup> Long-tail litigation also led to new and generally applicable doctrines, such as the interpretation of “damages” and “expected” losses<sup>58</sup> as they were phrased in Commercial General Liability (CGL) policies.<sup>59</sup>

Emerging technologies of this century, as well as the centuries to come, will further develop the need to ensure collaboration between tort and insurance law. These technologies will bring new types of risks and harms that might only be discovered years after their implementation into our commerce stream. Abraham gives the examples of gene therapy and cyber harms for potential emerging technologies that might create long-latent harms.<sup>60</sup> He states that this will present a challenge to both insurers and the tort system as “the lesson of decades of long-tail litigation is that the liability rules, and the insurance mechanisms that may cushion against these new forms of potential and actual liability, are not necessarily going to be adequate to meet the challenges that the new technologies pose.”<sup>61</sup>

It remains unclear whether the current long-tail doctrines will suffice for the future long-tail harms,<sup>62</sup> but insurance carriers will nonetheless continue to have an important role in accommodating their practices to these new harms, as they did in the past. They will have to take into consideration potential latent damages emerging technologies may inflict and embody these concerns in calculating their premiums rates, as well as setting exclusions and limitations when offering coverage. Long-tail claims have had an enormous impact on the development of liability rules, as well as insurance mechanisms reacting to it. When new technologies enter the market, this long history should assist insurance carriers in providing efficient and accurate policies, while considering the possibility of long-latent harms.<sup>63</sup>

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<sup>57</sup> These include the definition of a “trigger” event springing the policy into action, *id.* at 376, and qualified and absolute pollution exclusions, *id.* at 380.

<sup>58</sup> *Id.* at 382-83.

<sup>59</sup> These are policies purchased by business in the US to protect themselves against different forms of civil liability. For more on CGL, see KENNETH S. ABRAHAM & DANIEL SCHWARCZ, *INSURANCE LAW & REGULATION* 463 (7th ed. 2020).

<sup>60</sup> Abraham, *The Long-Tail Liability Revolution*, *supra* note 53, at 410.

<sup>61</sup> *Id.* at 352-53.

<sup>62</sup> *Id.* at 410 (“ . . . if long-tail harms do eventually materialize, it is impossible to say for certain whether the new legal doctrines that were created to deal with twentieth-century long-tail harms will be adequate for dealing with the kinds of harms that occur as a result of twenty-first century activities.”).

<sup>63</sup> For more on this issue and the doctrinal developments it led to see Kenneth S. Abraham & Tom Baker, *What History Can Tell Us about the Future of Insurance and Litigation after COVID-19*, 71 *DEPAUL L. REV.* 169, 184 (2022). Another example is the invention of the computer, which will be discussed in Section III.B.

## II. THE INTERSECTION OF CONSUMER INSURANCE AND TECHNOLOGY LAW

The steam engine, a machine using steam power to perform mechanical work via the use of heat, was an essential part of the first industrial revolution in the eighteenth century.<sup>64</sup> It enabled faster manufacturing practices. Unsurprisingly, the new usage of steam power to operate machineries led to a sharp increase in injuries and deaths due to frequent steam boiler explosions.<sup>65</sup> For example, in New York, “the Hague Street Disaster of 1850 claimed the lives of sixty-seven workers.”<sup>66</sup> Shortly after in 1853 a statute was enacted by the legislature of New York authorizing the formation of companies to issue policies “upon steam-boilers, against explosion, and against loss or damage to life or property resulting therefrom.”<sup>67</sup> In Philadelphia, “an 1867 explosion killed another twenty-eight people.”<sup>68</sup> Insurance firms offering coverage for boiler accidents “estimated that over seven thousand people were killed in boiler explosions in the United States between 1833 and 1907.”<sup>69</sup>

On June 30, 1866, The Hartford Steam Boiler Inspection and Insurance Company (HSB) was founded, considering itself “the first company in America devoted primarily to industrial safety.”<sup>70</sup> HBS estimated that between 1880 to 1886 about one thousand boiler explosions occurred in the US leading to damages in property in the amount of three million dollars, and around 1,500 deaths and injuries.<sup>71</sup> HBS provided safety information about the steam engine to its policyholders as a loss prevention tool—information aimed to minimize the occurrence of accidents and maximize available safety

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<sup>64</sup> For the history of the steam engine, see Britannica, steam engine (Apr. 7, 2023), <https://www.britannica.com/technology/steam-engine> [<https://perma.cc/9RWE-FDSV>].

<sup>65</sup> HSB Group, *The History of HSB*, <https://www.munichre.com/hsb/en/about-hsb/hsb-group/history.html> [<https://perma.cc/KH5G-87KW>] (“With thousands of boilers in operation throughout the country, there was also widespread ignorance about the properties of steam and the causes of boiler explosions. During the 1850’s, explosions were occurring at the rate of almost one every four days.”). See also ALAN MCEWEN, *HISTORIC STEAM BOILER EXPLOSIONS* (2009).

<sup>66</sup> John Fabian Witt, *Speedy Fred Taylor and the Ironies of Enterprise Liability*, 103 COLUM. L. REV. 1, 31 (2003).

<sup>67</sup> *Chicago Sugar Ref. Co. v. American Steam-Boiler Co.*, 1891 U.S. App. LEXIS 1569.

<sup>68</sup> Witt, *supra* note 66, at 31.

<sup>69</sup> *Id.* “A growing number of establishments turned to steam power, and as boilers became more and more powerful, boiler explosions wreaked havoc in early American manufacturing. Fatal boiler explosions were reported as early as 1838, and in the 1850s and 1860s disastrous boiler catastrophes made headlines.” *Id.* at 30-31.

<sup>70</sup> HSB Group, *The History of HSB*, *supra* note 65. The UK equivalent were the Vulcan Boiler & General Insurance Company (1859) and British Engine Insurance (1878). MCEWEN, *supra* note 65.

<sup>71</sup> Witt, *supra* note 66, at 31.



instruments.<sup>72</sup> Insurance companies offering coverage for boiler damages, such as HSB, “collected comprehensive statistics on boiler accidents, which made it possible for the first time to make scientific investigations into the relative merits of alternate boiler design.”<sup>73</sup> As a result, the safety measures taken by insurance carriers, including inspections conducted by engineers, “sharply reduced the incidence of boiler explosions.”<sup>74</sup> HSB still provides insurance for technology related products today.<sup>75</sup>

A modern example can be found in outer space exploration and satellites. Different insurance carriers are offering space and satellite insurance which “has evolved from simple launch coverage to a complex discipline combining contract analysis and advice, risk evaluation, alternative risk transfer concepts, insurance program design and implementation, and claims negotiation.”<sup>76</sup> These types of policies cover a variety of aspects regarding space missions including “assembly, integration and test (AIT) risk, pre-launch risk, facility damage, in-orbit life insurance, third party liability”<sup>77</sup> etc. Space travel tourism, which has been growing in recent years, has created new avenues for insurance companies to offer coverage.<sup>78</sup> Insurance companies have enabled, and enabling still, further endeavors and innovation when it comes to outer space exploration and development.<sup>79</sup>

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<sup>72</sup> For more on steam boiler insurance, see Richard J. Martin & Ali Reza, *What is an Explosion? A Case History of an Investigation for the Insurance Industry*, 14 J. LOSS PREVENTION PROCESS INDUS. 491 (2000); DAVID JOHN DENAULT, AN ECONOMIC ANALYSIS OF STEAM BOILER EXPLOSIONS IN THE NINETEENTH-CENTURY UNITED STATES (1993).

<sup>73</sup> Witt, *supra* note 66, at 32.

<sup>74</sup> *Id.*

<sup>75</sup> See HSB Group, *Products*, <https://www.munichre.com/hsb/en/products.html> [<https://perma.cc/BL2S-DU5M>].

<sup>76</sup> Aviation Insurance, ALLIANZ GLOBAL CORPORATE & SPECIALTY, <https://www.agcs.allianz.com/solutions/aviation-insurance/space-insurance.html> [<https://perma.cc/Y47R-YXEN>].

<sup>77</sup> *Id.* See also *Covers for Satellites in Commercial Space Flight*, MUNICH RE, <https://www.munichre.com/en/solutions/for-industry-clients/space-and-satellite-insurance-solutions.html> [<https://perma.cc/ZS4H-HRCR>]; *Space Insurance and the New Era of Space Exploration*, GLOBAL AEROSPACE (June 29, 2020), <https://www.global-aero.com/space-insurance-and-the-new-era-of-space-exploration> [<https://perma.cc/AM6U-34L2>].

<sup>78</sup> See, e.g., Newsdesk, *Battleface Launches Travel Insurance For Space Tourism*, LUXURY TRAVEL ADVISOR (Sept. 3, 2021), <https://www.luxurytraveladvisor.com/tours/battleface-launches-travel-insurance-space-tourism> [<https://perma.cc/EJ4D-QBR7>]; Richard C. Frese, *Will Space Travel Insurance Become As Common As Auto Insurance?*, MILLIMAN (Aug. 2, 2021), <https://us.milliman.com/en/insight/will-space-travel-insurance-become-as-common-as-auto-insurance> [<https://perma.cc/9WND-6CES>].

<sup>79</sup> Hubert Fabre, *Insurance Strategies for Covering Risks in Outer Space: a French Perspective*, 18 SPACE POL'Y 281 (2002); Jeanne Suchodolski, *An Overview and Comparison of Aviation and Space Insurance*, 14 J. BUS. & TECH.

Steam engine and satellites are good examples of emerging technologies that simultaneously present an opportunity and a challenge to the insurance industry. On the one hand, emerging technologies are booming and are in high demand. They are a major part of our economy.<sup>80</sup> Thus, they present a lucrative opportunity for insurers to offer coverage to both consumers and manufacturers. On the other hand, at the inception of a new technology, little is known about its threat landscape. The risks associated with these technologies remain outside the scope of current actuarial calculations and the traditional underwriting process of insurance carriers.<sup>81</sup> This leads the insurance industry to fear the potential damages, risks and uncertainties associated with these technologies. Underestimating these risks may even leave insurance carriers bankrupted if they fail to price their policies accurately.

This Part first provides a short survey of the history of tech liability insurance. It then delves into the above dilemma while focusing on consumers and their decision to purchase innovative technology. Lastly, it describes the ways in which insurance can act as an enabler of emerging technologies.

#### A. A BRIEF HISTORY OF TECH LIABILITY INSURANCE

Kranzberg's fifth law of technology states that "all history is relevant, but the history of technology is the most relevant."<sup>82</sup> The history of technology is deeply intertwined with the history of liability insurance. Liability insurance policies were first offered towards the end of the nineteenth century. The Fidelity and Casualty Company of New York established a liability department in 1888 and started to issue employer's liability policies,<sup>83</sup> and Travelers quickly followed in 1889.<sup>84</sup> In 1902 Aetna began writing liability

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L. 469 (2018-2019); Andrea Harrington, *Insurance as Governance for Outer Space Activities*, 18 *ASTROPOLITICS* 99 (2020) (stating that to maintain important space activities, their risk must be managed, and insurers are uniquely situated to successfully do that).

<sup>80</sup> Zia Qureshi, *Technology and the future of growth: Challenges of change*, BROOKINGS (Feb. 25, 2020), <https://www.brookings.edu/blog/up-front/2020/02/25/technology-and-the-future-of-growth-challenges-of-change> [<https://perma.cc/3NG3-JKLZ>].

<sup>81</sup> In the nanotechnology context, see CRO Forum, *Nanotechnology CRO Briefing: Emerging Risks Initiative – Position Paper*, 7 (2010) <https://www.nanowerk.com/nanotechnology/reports/reportpdf/report138.pdf> [<https://perma.cc/CS7K-ZP7E>]. See also Jaime Bonín Roca, Parth Vaishnav, M. Granger Morgan, Joana Mendonça & Erica Fuchs, *When Risks Cannot Be Seen: Regulating Uncertainty in Emerging Technologies*, 46 *RSCH. POL'Y* 1215 (2017).

<sup>82</sup> See L.M. Sacasas, *Kranzberg's Six Laws of Technology, a Metaphor, and a Story*, <https://www.thefrailestthing.com/2011/08/25/kranzbergs-six-laws-of-technology-a-metaphor-and-a-story> [<https://perma.cc/H7HJ-E49X>].

<sup>83</sup> ANN M. KELCHBURG, *A HISTORY OF THE CONTINENTAL INSURANCE COMPANY: 1853-1978*, at 103 (1979).

<sup>84</sup> ABRAHAM, *supra* note 28, at 32.

insurance leading to the development of a broader market of liability insurance. This was driven in large part by the fast development of new technologies, which led to extensive harms of a different type and scope than previously seen.

The First Industrial Revolution, between around 1760 until the late 1840s,<sup>85</sup> was the first meaningful harmful interaction between society and machinery.<sup>86</sup> Technology forever changed the way commerce and manufacturing was carried out, and in return, created new types and scopes of harms that needed to be addressed. It was the period in which first-party liability insurance was invented and introduced in America.<sup>87</sup>

Fire, health, and liability insurance, among others,<sup>88</sup> had to be rapidly developed due to the pervasive nature of these then-new technologies to better facilitate their adoption into commerce as well as adjust consumers activities.<sup>89</sup> Insurance of personal injury did not manifest itself until the end of the nineteenth century. It was first introduced in the form of first-party policies, and later in the form of third-party policies as employers sought out ways to protect themselves when their employees were injured on the job.<sup>90</sup>

Prior to the Industrial Revolution, the dominant forms of insurance were marine and fire.<sup>91</sup> Life insurance also started to gain recognition during that time and those three policies offered “first-party” coverage to the insured purchasing the policy. Liability insurance, which is regarded to be a “third-policy” type of insurance when a party other than the insured suffers a loss and sues the policyholder, took more time to appear as it is more difficult to combat moral hazard in this context.<sup>92</sup> Unlike a first-party policy, the insured has no personal underlying self-interest in the covered subject matter when it comes to causing damages to a third-party. Therefore, liability insurance was considered against public policy and tort law operated alone without liability insurance. However,

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<sup>85</sup> PHYLLIS DEANE, *THE FIRST INDUSTRIAL REVOLUTION* (2d ed. 1979).

<sup>86</sup> JOHN FABIAN WITT, *THE ACCIDENTAL REPUBLIC: CRIPPLES WORKINGMEN, DESTITUTE WIDOWS, AND THE REMAKING OF AMERICAN LAW* (2004); Rebecca Crootof, *The Internet of Torts*, 69 *DUKE L.J.* 583, 642 (2019).

<sup>87</sup> Abraham, *supra* note 13, at 580.

<sup>88</sup> *See, e.g.*, 1 *THE HISTORY OF INSURANCE*, (David Jenkins & Takau Yoneyama eds., 2000). For a prehistorical discussion about the origin of insurance and its role in ancient Rome, *see* C. F. TRENERRY, *THE ORIGIN AND EARLY HISTORY OF INSURANCE: INCLUDING THE CONTRACT OF BOTTOMRY* (1926).

<sup>89</sup> *THE HISTORY OF INSURANCE*, *supra* note 88 at xi (“Its role was essential in providing the means by which the individual could avoid some of the risks in industry, commerce and life.”).

<sup>90</sup> Abraham, *supra* note 13, at 580; WITT, *supra* note 86, at 76. This was later replaced by the enactment of the workers’ compensation statues. *See* PRICE V. FISHBACK & SHAWN EVERETT KANTOR, *A PRELUDE TO THE WELFARE STATE: THE ORIGINS OF WORKERS’ COMPENSATION* (2000).

<sup>91</sup> ABRAHAM, *supra* note 28, at 15.

<sup>92</sup> *Id.* At 17. For a discussion about moral hazards, *see* Section V.A.

unlike today, substantial limits were placed on the scope of liability that individuals and businesses could face. These limitations were slowly lifted throughout the twentieth century as liability was expanded and applied whenever a defendant did not exercise reasonable care under the circumstances. As liability expanded, the need for liability insurance grew.

In the years before the Industrial Revolution there was no need for third-party liability insurance. This is because a general negligence tort was not yet in existence, and most accidents were sporadic and did not lead to severe damages, as locomotives were not invented yet.<sup>93</sup> The need for liability insurance, separate from marine and fire insurance, slowly arose throughout the nineteenth century as American society transformed from a rural one to an urban-industrial one involving accidental injury as a cause of “milldams, horses and the carriages they pulled, farm and residential fires, and in the classic case, a dogfight.”<sup>94</sup>

It was the deployment of the railroads systems that finally brought insurance liability to main concussions. The “common carries” rule was applied to the activities conducted by trains. They owed a higher duty of care towards their costumers that led to a higher degree of exposure to liability.<sup>95</sup> Towards the end of the century, railroads accumulated massive economic power and essentially possessed the power to dictate the price and terms on “which they will transport passengers and carry goods.”<sup>96</sup> As a result, the railroad company created liability waivers and indemnity agreements to mitigate its liability exposure. Railroad companies used contract law to circumvent the burdensome common carrier rule set at common law.<sup>97</sup> This contracting-out of a common law high duty of care was considered invalid as it created a moral hazard risk with regards to the behavior of railroads towards their customers.

A turning point in the law’s attitude toward the concept of moral hazard and its implications to insurance law was the 1886 *Phoenix* Supreme Court case.<sup>98</sup> In this case, a marine insurer paid a policy holder for loss of its goods while in transit. It then sued the common carrier of the goods for reimbursement. The common carrier’s defense was that the insurer has no direct cause of action against it because the shipping agreement, made between it and the passenger, gave the carrier the benefit of the shipper’s insurance.<sup>99</sup>

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<sup>93</sup> *Id.* at 20.

<sup>94</sup> *Id.* at 22.

<sup>95</sup> *Id.* at 23.

<sup>96</sup> *Id.*

<sup>97</sup> *Id.*

<sup>98</sup> *Phoenix Ins. Co. of Brooklyn v. Erie & Western Transportation Co.*, 117 U.S. 312 (1886).

<sup>99</sup> ABRAHAM, *supra* note 28, at 25.

The insurer responded that this type of provision in shipping agreements is against public policy as it “amounted to insuring the carrier against liability for its own negligence.”<sup>100</sup> The court concluded for the carrier and stated that the carrier can contract with the passenger “to be allowed the benefit of insurance voluntarily obtained” by him.<sup>101</sup> However, this result leads to moral hazard risks on the side of the carrier who essentially has no incentive to proactively protect its consumers knowing it is granted the benefit of a policy insurance purchased by the latter.

Abraham attempted to explain this decision, which essentially permitted this form of insurance despite its embedded moral hazard, while other liability waivers and indemnity agreements were not. He stated that the court rationales derived from the fact that “an increase of moral hazard could be tolerated if the result was to help ensure that injured parties were compensated.”<sup>102</sup> The practice permitted in this case by the court did not deprive anyone of compensation but simply *shifted* the risk of loss to an insurer. The court has explicitly stated that “ensuring the compensation of victims by making insurance available to parties responsible for negligently caused loss was a positive value that could overcome the law’s concern about moral hazard.”<sup>103</sup> This was the first major step permitting liability insurance despite fears of moral hazards, which were of considerable weight during the nineteenth century. A significant part of this groundbreaking development can be attributed to the advancement of technology, along with the court’s strong desire to protect patrons from harms inflicted by these then-new technologies.

More generally, the rise of insurance liability could be attributed to several factors, most of them are directly connected to the development of new and dangerous technologies. These factors included the quick pace of industrialization and growth of railroads and streetcar lines, which led to a dispersal of population across greater distance. These increased the opportunities of accidents and injuries between strangers, mostly between business enterprises that created conditions for injuries to happen, and individuals. Raising incidents of accidents strained the existing tort system which was not equipped to handle the growing number of accidents industrialization has caused.<sup>104</sup> Other notions were also beginning to change regarding the fundamental causes and responsibility of accidents. Prior to the industrial revolution, accidents were considered a product of bad luck on the part of the injured party. Technological developments during the industrial revolution and the

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<sup>100</sup> *Id.*

<sup>101</sup> *Phoenix*, 117 U.S. at 325.

<sup>102</sup> ABRAHAM, *supra* note 28, at 26.

<sup>103</sup> *Id.*

<sup>104</sup> *Id.* at 27.

creation of large business enterprises started to change this notion. It was no longer a matter of poor luck, someone can and should be held liable for causing these damages. Thus, a normative process of validating liability insurance emerged, and it became an inseparable part of tort law.<sup>105</sup>

At the beginning of the twentieth century, a new component of “public liability” was added to policies. This incorporated third-party liability into insurance liability policies aimed at protecting other parties, who were injured as a result of a covered activity.<sup>106</sup> This new feature was a result of the increase in third-party liability suits by members of the public against individuals and business corporations. This increase was especially prominent in urban areas where new technologies were adopted quicker than rural areas.<sup>107</sup> For example, railroad accidents were pervasive at the end of nineteenth century and those were quickly regarded as repeat defendants in urban areas.<sup>108</sup> An even more persuasive example is that of the electric streetcar system, which was introduced in Boston in 1900. This rapidly led to over 1,400 suits alleging negligent operation.<sup>109</sup> Similarly, in New York City streetcar accidents accounted for 25% of personal injury suits in 1890.<sup>110</sup> New technologies of transportation were a major force of injuries, and vastly contributed to the growth and development of liability insurance.<sup>111</sup>

The collision of technology, liability rules and liability insurance has brought to life a comprehensive system aimed at hedging one’s risks and providing compensation to those harmed while preserving and encouraging innovation. Each of these fields has had an important reciprocal role in the evolution and shaping of our current liability system. This is also evident from other technologies that were formed since the industrial revolution, such as the invention of the automobile. The automobile has stimulated

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<sup>105</sup> The first major aspect to change was employer liability, as many workers injured in their new work in an industrialized and mechanized environment. *Id.* at 27-32.

<sup>106</sup> *Id.* at 33.

<sup>107</sup> *Id.* at 34.

<sup>108</sup> *Id.* at 35.

<sup>109</sup> ROBERT A. SILVERMAN, *LAW AND URBAN GROWTH: CIVIL LITIGATION IN THE BOSTON TRIAL COURTS, 1880-1900*, at 105 (2014).

<sup>110</sup> RANDOLPH EMIL BERGSTROM, *COURTING DANGER: INJURY AND LAW IN NEW YORK CITY, 1860-1910*, at 21 (1992).

<sup>111</sup> The inception of liability insurance can be viewed as a predictor of the future. The development of liability insurance heavily relied on and was aided by the development of new technologies that strained the then existing tort system. It presents a chicken-and-egg conundrum—which came first, liability or insurance. ABRAHAM, *supra* note 28, at 171. Though history clearly shows that in the first instance, it was tort liability that came first, further legal developments may suggest the contrary. Though this question is fascinating, it lies beyond the scope of this Article.

the insurance marketplace and generated a new form of insurance policy aimed at protecting against the new risks created by this development.<sup>112</sup> The invention of the automobile has forever changed consumers lives around the world.<sup>113</sup> Along with its many benefits, this invention has brought with it volumes of causalities and damages. This is true even today over a century after its invention but was far worst in the 1930s.<sup>114</sup> Liability insurance in the automobile context provides protection for both drivers and victims in case of insolvency on the driver's part.

In 1927, Massachusetts was the first to enact a mandatory auto liability insurance.<sup>115</sup> However, this was met with strong opposition on the part of insurers, who worried this regulation will compel them to provide insurance to all at insufficient premium rates.<sup>116</sup> It was not until the 1960s that other states enacted mandatory insurance laws. Today these laws exist in the majority of states, and in most countries around the world.<sup>117</sup> This mandatory insurance scheme further exhibits the important role the invention of the automobile has had on the development of the insurance industry.<sup>118</sup> This development continues today when the insurance market offers policies covering new emerging technologies. Nonetheless, insurance carriers still face significant challenges when they decide to offer coverage for these types of new technologies. We turn to discuss these challenges below.

## B. THE CHALLENGES OF INSURING EMERGING TECHNOLOGIES

Due to emerging technologies' innovative and novel nature, actuarial science requires more information to offer accurate premiums to both manufactures and consumers who wish to hedge their risks associated with these new technologies. Put another way,

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<sup>112</sup> Abraham & Baker, *supra* note 63. Another example is the invention of the computer, which will be discussed in Section III.B.

<sup>113</sup> ABRAHAM, *supra* note 28, at 70.

<sup>114</sup> Back then there were twenty times more deaths per mile than there are today. *See id.* at 71.

<sup>115</sup> *Id.* at 73; Ralph H. Blanchard, *Compulsory Motor Vehicle Liability Insurance in Massachusetts*, 3 LAW AND CONTEMPORARY PROBLEMS 538, 539 (1936).

<sup>116</sup> ABRAHAM, *supra* note 28, at 73.

<sup>117</sup> *What is Auto Insurance Like in Other Countries?*, FARM BUREAU INSURANCE, <https://www.lafarmbureau.com/2020/05/20/foreign-car-insurance> [<https://perma.cc/X3CR-V3XX>].

<sup>118</sup> Abraham & Baker, *supra* note 63, at 177 (“ . . . the availability of auto liability insurance fueled the growth of tort liability. And that growth was enormous.”). Furthermore, the litigation surrounding automobile accidents created much of today's tort law doctrine, as well as common settlements practices. *See* Nora Freeman Engstrom, *When Cars Crash: The Automobile's Tort Law Legacy*, 53 WAKE FOREST L. REV. 293 (2018); Nora Freeman Engstrom, *Sunlight and Settlement Mills*, 86 N.Y.U. L. REV. 805 (2011). For more on the history of automobile insurance, *see* ABRAHAM, *supra* note 28 at Chapter 4.

the current pool of information is too shallow in depth and narrow in scope. This puts a significant dent in insurers' ability to offer coverage for damages caused by emerging technologies. This section delves into this challenge while focusing on the consumers side and their approach to purchasing innovative commodity.<sup>119</sup>

The public is worried about the integration of new technologies into their social and commercial lives and the risks associated with them. When individuals assess novel risks, they mostly rely on mental models based on previous experience. This may not be applicable to new technologies and is sometimes based on misleading preconceptions and bias.<sup>120</sup>

Experts' ability to assess risks depends on the strength of the science standing behind an emerging technology. Mature technologies, such as nuclear power and GMOs, have strong science backing them up, so experts have a better understanding of the risks associated with them and can clearly communicate these risks to the public at large.<sup>121</sup> This is less true with regards to new technologies such as autonomous vehicles (AVs) and gene editing.<sup>122</sup> Once scientific understanding is lacking, "risk analysis shifts from reliance on established facts to expert judgment." This judgment is usually well grounded, but only when enough feedback has been collected. When it comes to emerging technologies, however, this feedback is missing. Until the scientific community will be able to receive good feedback, experts and the public will be clouded with uncertainty with regards to the accuracy of their risk estimation. This uncertainty and lack of information directly impacts insurers' ability to offer coverage for risks associated with emerging technologies.

From a consumer perspective, perceived risk refers to "the uncertainty that consumers face when they cannot foresee the consequences of their purchase decisions."<sup>123</sup> The actual risks of new technologies are rarely known, so consumer behavior research focuses on consumers' cognitive calculations as well as perception

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<sup>119</sup> Current literature focuses on consumers' behavior rather than that of manufacturers. Furthermore, the supply side of the transaction and the decision of manufacturers to research and develop innovative technology highly depends on costumers' decisions to adopt these technologies, as well as external circumstances which lie beyond the scope of this Article (such as, R&D governmental funds, personal and national agendas, etc.).

<sup>120</sup> Baruch Fischhoff, *When Assessing Novel Risks, Facts are not Enough*, SCL. AM. (Sept. 1, 2019), <https://www.scientificamerican.com/article/when-assessing-novel-risks-facts-are-not-enough> [https://perma.cc/5VKC-9YAV]

<sup>121</sup> Paul Slovic, Baruch Fischhoff & Sarah Lichtenstein, *Facts and Fears: Understanding Perceived Risk*, in SOCIETAL RISK ASSESSMENT: HOW SAFE IS SAFE ENOUGH? 181, 183 (1980).

<sup>122</sup> Fischhoff, *supra* note 120.

<sup>123</sup> LEON G. SCHIFFMAN & LAZAR LESLIE KANUK, CONSUMER BEHAVIOR 153 (2014).



of risk.<sup>124</sup> Consumers decide which products to purchase based on their evaluation of the risks of negative outcomes associated with that product. Perception of risks is derived from both an emotional perception as well as a cognitive one.<sup>125</sup> Risk-averse consumers will likely attempt to gather information about a given product prior to making their decision in order to reduce the uncertainty of future outcomes. However, as mentioned, this type of information is constantly lacking in the context of emerging technologies, especially given personal bias that highly effects this risk assessment process.<sup>126</sup>

In their article, Featherman et al. analyze consumers' decision process to purchase an electric car (EV). They describe several dimensions of perceived risk, which are generally applicable to the decision-making process of purchasing any type of emerging technology. These include performance risk, financial risk, privacy risk, time risk,<sup>127</sup> psychological risk,<sup>128</sup> social risk (perceived loss of social status) and physical safety risk.<sup>129</sup> All of these are entrenched in a consumer decision to purchase innovative technology, and in most cases, it will tilt the pendula towards the decision not to purchase. Unless some assurance can be made, and consumers are able to hedge these risks. This is where insurance has provided, and provides still, a lifeline to the integration of emerging technologies into our commerce stream, whether it is a first-party policy purchased by the consumer, or a third-party policy, which is usually purchased by the manufacturer. Both can provide the assurance consumers need when considering purchasing innovative technology.

When it comes to offering insurance to new technologies, it seems that the lack of information about damages emerging technologies can cause present a salient reason to worry about providing insurance to cover these activities. This lack of information is an inherent feature of these technologies as they are new and not frequently used. A recent report published by the second largest reinsurance company in the world, Swiss Re,<sup>130</sup> demonstrated this challenge and the insurance industry's concern.

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<sup>124</sup> Mauricio Featherman et al., *The Impact of New Technologies on Consumers Beliefs: Reducing the Perceived Risks of Electric Vehicle Adoption*, TECH. FORECASTING & SOC. CHANGE 169, 172 (2021).

<sup>125</sup> *Id.*

<sup>126</sup> *Id.* at 173.

<sup>127</sup> Time-consuming activities to maintain the technology, such as, performing EV maintenance and unplanned EV charging. *Id.*

<sup>128</sup> *Id.* (“Some consumers may avoid innovations that require learning, changes to lifestyle, and perceived dangers causing avoidance behavior.”).

<sup>129</sup> *Id.* tbl. 1.

<sup>130</sup> SWISS RE SONAR: NEW EMERGING RISK INSIGHT (June 2022), <https://www.swissre.com/dam/jcr:2ff3e4a6-2da9-43b0-937e-bc3a336d9572/2022-june-16-sonar2022.pdf> [<https://perma.cc/F8TW-3TYJ>].

The report surveys different technologies, such as AI, Machine Learning and Quantum Computing, that “could reshape the industries and societies, hence transforming the overall risk landscape.”<sup>131</sup> Delving into quantum computing, the report states that along with the fast development of quantum computing “comes new threats to data security which from the insurer’s perspective, will likely outpace any benefits for the foreseeable future.”<sup>132</sup> Particularly the report flags the concern that quantum computing will be able to effortlessly “hack standard encryption keys used in online communication and data transfer.”<sup>133</sup> The report concludes that given the risks and threats presented by quantum computing, especially the rise of “state-backed cyber-attacks,” there is a significant peril that insurance carriers, as well as other industries, will be hacked thus “becoming victims of QC [quantum computing] before they profit from it.”<sup>134</sup>

As has happened in the past, this issue should be mitigated over time as new information is gathered about new technologies, their uses and the probability and type of damages they can cause. The lack of current usage of these novel technologies means there is no substantial data about the way and manner they can inflict damages. This lack of knowledge “challenges the very risk assessment method insurance companies employ in order to determine the premium for their products.”<sup>135</sup> This lack of information is a problem that will abate over time as new tech will be more widely deployed. The very operation of new technologies will generate data that insurers can then use to establish more accurate risk-adjusted premiums for those activities.<sup>136</sup> Increased use leads to increased data, which enables better risk assessment and premium determination. This ongoing cycle of information gathering eventually posits the insurance industry in a good position to offer risk-management tools in the form of liability policies. This process enables insurance carriers to perform the very essence of insurance—shift risks from their policyholders and spread them upon a large pool of policyholders, for the right price.

While new technologies undoubtedly present challenges to insurers, the insurance industry has a long history of helping

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<sup>131</sup> *Id.* at 12.

<sup>132</sup> *Id.* at 44.

<sup>133</sup> *Id.*

<sup>134</sup> *Id.* at 45.

<sup>135</sup> Andrea Bertolini, *Insurance and Risk Management for Robotic Devices: Identifying the Problems*, 16 GLOB. JURIST 291, 293 (2016).

<sup>136</sup> Geistfeld discussed this in the context of autonomous vehicles. See Mark A. Geistfeld, *A Roadmap for Autonomous Vehicles: State Tort Liability, Automobile Insurance, and Federal Safety Regulation*, 105 CAL. L. REV. 1611, 1659 (2017). Geistfeld discusses the ability of this disclosed “risk-adjusted annual premium” as a measurement to satisfy the manufacturers’ obligation to warn about the inherent risk of crash. *Id.* at 1623.

facilitate the entrance of new technologies into our society. Insurance companies are uniquely suited to adapt to challenges presented by emerging technologies and provide a much-needed layer of protection to consumers and manufactures during the new technology's initial deployment. In doing so, insurance acts as a catalyzing force that encourages innovation and hedges its associated risks.

### C. SAFER ASSIMILATING OF NEW TECHNOLOGIES THROUGH INSURANCE

Emerging technologies have had a strong influence on the development of tort law, and this is evident from the development and assimilation of tort law in the context of our behavior as consumers. Graham discussed this inherent connection between innovations and tort law,<sup>137</sup> and his observations are relevant to the relationship between innovation and insurance. Exploring this connection will allow us to better understand the pivotal role insurance has, along with the tort system, in facilitating innovation and accommodating new technologies as they enter the commercial market.

First, *atypical early claims* refer to situations in which the initial cases of accidents caused by a new emerging technology may be very different from latter cases after the technology has matured and stabilized itself in the consumer market.<sup>138</sup> In the tort context, common law rules made by courts as a result of these early atypical cases may persist to future cases, even if these rules are no longer relevant or applicable given the development process of a given technology.<sup>139</sup> Unlike the tort system, the insurance industry possesses a more nuanced ability to adjust itself based on the development of technologies. It is more flexible in changing its policies in reaction to these improvements in real time, rather than in retrospective. It is inevitable that first atypical early claims will be treated differently by insurers, and higher premiums will be set to promise their indemnification. Such was the case with cyber-insurance when it first emerged.<sup>140</sup> However, the risk of these premature and harmful decisions persisting, even when they are no longer relevant, is significantly lower in the insurance context than in the tort context. This is true given the different institutions which

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<sup>137</sup> Kyle Graham, *Of Frightened Horses and Autonomous Vehicles: Tort Law and Its Assimilation of Innovations*, 52 SANTA CLARA L. REV. 101 (2012).

<sup>138</sup> *Id.* at 103.

<sup>139</sup> Graham provides the example of automobile liability and the first cases it brought—frightened horses. *Id.*, at 103-12.

<sup>140</sup> Ram Shankar Siva Kumar & Frank Nagle, *The Case for AI Insurance*, HARV. BUS. REV. (Apr. 29, 2020), <https://hbr.org/2020/04/the-case-for-ai-insurance> [<https://perma.cc/FU5X-ZSMG>]; Asaf Lubin, *Public Policy and the Insurability of Cyber Risk*, 5 J. OF L. & TECH. TEX. 45, 63 (2021).

address this issue—the judicial system in contrast to the insurance market. The latter’s capabilities vary from the former. The inherent activities carried out by insurers enable them to proactively react to technology changes via the amendment of their premium rates *ex ante* much more efficiently and immediately than the judicial system, which can only act *ex post* after a claim has been brought to it and the damage has already occurred. Thus, insurance adjusts its policies in a speedy manner to ensure those reflect the genuine risks associated with a certain technology and in this way enables its safer growth.

Second, “the public can exaggerate the harms associated with an innovation.”<sup>141</sup> While some claim that this is the case with regards to emerging technologies, such as AI,<sup>142</sup> others may underestimate the harms technologies may inflict and will have difficulties in identifying unreasonable risks. Graham refers to this interplay between tort law and technology as ‘*separating the good from the bad*’ where suits are filed, and regulations are created long after the innovation has been integrated into the market.<sup>143</sup> Insurance can help identify these unreasonable risks sooner using its actuarial data and the process of underwriting policies. This may enable insurers to embody these ‘unreasonable risks’ in their premiums, and by doing so provide an incentivizing mechanism for insureds to take protective measures sooner than would have been incentivized via the tort system.

Third, *early adopters* of a new technology are treated differently from a tort and an insurance perspective.<sup>144</sup> From a tort perspective, “the law often regards early adopters as taking their chances with a technology.” As a result, early adopters will not be compensated for any damages that ensue from this early technology, based on the decision they made to assume that risk upon themselves.<sup>145</sup> From an insurance perspective, insurance can deny coverage for early adopters of a new technology or charge them excessively high premiums given the lack of sufficient information to calculate accurate premiums, which will truly embody the risks

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<sup>141</sup> Graham, *supra* note 137, at 118.

<sup>142</sup> See, e.g., Adam Lashinsky, *Why At Least One AI Expert Isn’t Worried About AI Taking Over*, FORTUNE (Oct. 18, 2017), <https://fortune.com/2017/10/18/why-at-least-one-ai-expert-isnt-worried-about-ai-taking-over> [<https://perma.cc/2Z5X-LR3X>].

<sup>143</sup> Graham discusses hybrid vehicles and tasers as examples for this. See Graham, *supra* note 137, at 117-20.

<sup>144</sup> For more on early adopters in the context of AI and tort law see Amy L. Stein, *Assuming the Risks of Artificial Intelligence*, 102 B.U. L. REV. 979, 979 (2022) (claiming that the defense of assumption of risk “may prove vital to shaping the likelihood of success for these prospective plaintiffs injured by AI, first-adopters who are often eager to ‘voluntarily’ use the new technology but simultaneously often lacking in ‘knowledge’ about AI’s risks”).

<sup>145</sup> *Id.* at 120. Such as automobile and passenger air travel. *Id.* at 120-26.

of these new activities. Nonetheless, it seems that insurance has an advantage in providing remedy in case of damages caused by new technologies, more rapidly than the tort system. This is in light of insurers' ability and flexibility to shift the blame from the users themselves, instead providing them coverage based on collected and analyzed data, which is constantly updated as the innovation develops. This constant update depends on the term of the policy, which is usually renewed annually. The renewal allows insurers to change and adapt their policy terms based on new developments, such as updates and safety mechanisms implemented into the new technology given previous accidents. It also provides new insureds with policies reflecting an accurate assessment of the current technological status.

This should facilitate the adoption of new technologies faster than if tort law was acting alone given the different incentives these institutions have in changing their current approach towards the new technology along with its growth. Two intertwined differences should be given more thought. First, the tort system has to wait until a lawsuit is brought in front of it *ex post* in order for it to make a decision and set instructions on how one should behave to prevent accidents. The insurance industry, in contrast, has an incentive to proactively prevent accidents *ex ante* and thus minimize damage, reduce indemnification claims and, as a result, increase profit. Second, liability insurance adjusters can convert complex tort standards set by courts into simpler and more easily administered rules.<sup>146</sup> Thus, insurers provide insureds with much-needed guidance as to how they should behave in order to be eligible for indemnification in case damages occur. Moreover, insurers do not have to necessarily wait for courts to set standards as they possess the ability to produce "bright-line rules, thereby providing regulated parties (insureds) with concrete instruction regarding the choice of appropriate care levels."<sup>147</sup> This is especially true if a new form of technology has yet to be adjudicated by courts, but a demand exists for liability insurance policies to cover its potential risks and perils. These bright-line rules can be based on aggregated data insurers have collected, data the courts simply do not possess nor have the ability or expertise to collect and analyze.

Fourth, putting together all of the above principles, it seems that new technologies receive a 'grace' period when they first enter

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<sup>146</sup> Tom Baker, *Liability Insurance as Tort Regulation: Six Ways that Liability Insurance Shapes Tort Law in Action*, 12 CONN. INS. L. J. 1, 11 (2005); Omri Ben-Shahar & Kyle D. Logue, *Outsourcing Regulation: How Insurance Reduces Moral Hazard*, 111 MICH. L. REV. 197, 234 (2012).

<sup>147</sup> Ben-Shahar & Logue, *supra* note 146.

the commercial market.<sup>148</sup> This is due to the regulator's inclination to value innovation and the progress of technology over maintaining the safety of emerging technologies.<sup>149</sup> This can be seen as what Citron referred to as the 'hyper-vigilant' stage of law's reaction to new technologies: "[A]fter the technology's benefits become apparent, the law abruptly reverses course, seeing its earlier awards of liability as threats to technological progress and granting sweeping protection to the firms in the new industry."<sup>150</sup> During this grace period, tort law will probably not hold any party accountable for damages. Here insurance can act as an important supplementary instrument during this grace period and the regulatory vacuum left by it. It is true it does not hold the liable entity accountable for her tortious behavior, but it at least provides the victim a remedy in the form of compensation and warrants victims are not left abandoned.

A good example for this principle in the context of AI can be found in the case of autonomous vehicles (AVs). Because of lenient regulation from different states in the US, AV companies were granted a *de-facto* grace period from liability. This allowed these manufacturers to experiment with new technologies with little to no legal consequences since 2011.<sup>151</sup> Thus, throughout this unofficial grace period, insurance was the primary instrument which could ensure that the negative consequences were not borne solely by the victims.

Moreover, the insurance industry uses two nontraditional tools in the context of emerging technologies to ensure safer assimilation of new technologies—research and education, and engagement with public regulation.<sup>152</sup> These tools are important because emerging technologies will require assistance from the academic and public sectors in order to safely grow.

Insurance company investment in research and education can eventually lead to regulatory techniques that are essential to the commercial field of emerging technologies. "Engagement with

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<sup>148</sup> *Id.* at 126-27. For a different approach of how "tort law routinely penalizes innovation, while rewarding manufactures who adhere to the status quo," see *id.* at 127; Peter Huber, *Safety and the Second Best: The Hazards of Public Risk Management in the Courts*, 85 COLUM. L. REV. 277 (1985).

<sup>149</sup> Jeffery L. Vagle, *Cybersecurity and Moral Hazard*, 23 STAN. TECH. L. REV. 71, 101 (2020).

<sup>150</sup> Danielle Keats Citron, *Cyber Civil Rights*, 89 B.U. L. REV. 61, 115 (2009).

<sup>151</sup> Nevada, California and Florida were the first to permit the operation and testing of autonomous vehicles. Nevada was the first to do so in 2011. They left future standards to be developed, and licensing requirements are rather flexible. See Sheela Jayabala et al., *Artificial Intelligence Governance: A Heads up from Driverless Cars*, 34 WORLD APPL. SCI. J. 376, 378 (2016); Ugo Pagallo et al., *The Rise of Robotics & AI: Technological Advances & Normative Dilemmas*, in ROBOTICS, AI AND THE FUTURE OF LAW 1, 4 (Marcelo Corrales et al. eds., 2018).

<sup>152</sup> Tom Baker & Rick Swedloff, *Regulation by Liability Insurance: From Auto to Lawyers Professional Liability*, 60 UCLA L. REV. 1412, 1422-23 (2013); Ben-Shahar & Logue, *supra* note 146, at 212-13.

public regulation” refers to a trickle effect from the private sector of insurance companies to the public sector of regulators.<sup>153</sup> Insurers have considerable power to persuade regulators that a loss prevention mechanism is effective enough to be obligatory.<sup>154</sup> Airbag and seatbelt regulations in the automobile industry are a clear example of this—both these tools originated with insurance companies and were later adopted into written law.<sup>155</sup> These tools provide the insurance industry with much-needed expertise about a new technology, and this knowledge base can provide social benefits in the early and late stages of distributing an emerging technology as insurance nudges its policyholders to maintain better safety standards.

Emerging technologies, such as biotechnology, nanotechnology synthetic biology,<sup>156</sup> and AI, are inherently embedded with scientific uncertainty. This uncertainty may create “fear and concern among members of the public and public interest groups . . . and produces a problematic environment for industry plans for investment and development.”<sup>157</sup> This phenomenon is rather common in the context of emerging technologies and their implementation into our commerce stream. To a certain degree, insurance can help alleviate and mitigate this uncertainty by providing an actuarial instrument to hedge the risks associated with emerging technologies. An example of this can be found in Marchant's proposal for soft regulation of nanotechnology via insurance.<sup>158</sup> Marchant suggested that insurance coverage be used as a mechanism to incentivize nanotechnology companies “to opt into voluntary nanotechnology risk management initiatives,”<sup>159</sup> while ensuring their compliance with these initiatives as an inherent part of their policy coverage. An example of such voluntary risk-management initiatives could be found in the form of obtaining *ex ante* approval from safety certification companies, such as UL (Underwriters Laboratories),<sup>160</sup> prior to underwriting a liability policy. UL provides “testing, inspection and certification, advisory and risk management services” with regards to technologies

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<sup>153</sup> Baker & Swedloff, *supra* note 152, at 1423.

<sup>154</sup> See Ben-Shahar & Logue, *supra* note 146, at 212-13.

<sup>155</sup> *Id.* at 231.

<sup>156</sup> Mandel, *supra* note 22, at 77.

<sup>157</sup> *Id.* at 80.

<sup>158</sup> Gary E. Marchant, ‘Soft Law’ Mechanisms for Nanotechnology: Liability and Insurance Drivers, 17 J. RISK RSCH. 709 (2014). For issues arising from insuring nanotechnology see Amy Fink, *Potential Insurance Coverage Issues Arising from Nanotechnology: Big Risks Could Come in Small Packages*, NSTI-Nanotech 2010, <https://briefs.techconnect.org/wp-content/volumes/Nanotech2010v3/pdf/130.pdf> [<https://perma.cc/J6XD-V2ZR>].

<sup>159</sup> *Id.* at 718.

<sup>160</sup> See *UL Solutions*, <https://www.ul.com> [<https://perma.cc/CZ8N-T2M2>].

innovated throughout the twentieth century,<sup>161</sup> and they continue to offer these services today.<sup>162</sup> This ‘soft law’ approach can assist insurance carriers in guaranteeing the safe entrance of new technologies into our commercial market.

Insurance has the capability to enable the faster and safer assimilation of innovations into the fabric of our commercial market. The next Part further examines this notion by reviewing current insurance schemes covering damages caused by AI and cyber harms.

### III. CURRENT DEVELOPMENTS IN INSURING EMERGING TECHNOLOGIES

The introduction of new technologies into our commercial market presents new challenges for our legal system.<sup>163</sup> Time is necessary for any innovation “to become fully assimilated within everyday tort law,”<sup>164</sup> and the same holds true for the intersection of innovation and insurance.<sup>165</sup> The latter helps the technological advancement of society by providing a safety net to new innovators in the shape of risks hedging.

Today, insurance carriers are proactively offering coverage via traditional policies, and technology-specific policies, to cover emerging technologies. An example of the latter is that of a nanotechnology specific policy called LexNanoShield offered by Lexington Insurance Company.<sup>166</sup> This policy provides risk management tools and loss prevention services to assist policyholders in managing risks associated with nanotechnology.<sup>167</sup>

Other emerging technologies, led by AVs and the raising concerns of cybersecurity, have created a demand for new insurance

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<sup>161</sup> See *UL, LLC*, MONITORING ASS’N, <https://tma.us/MemberDirectory/ul-llc> [https://perma.cc/J2KX-VUWU].

<sup>162</sup> See, e.g., Heather Hall, *Igus Becomes World’s First Manufacturer to Receive UL Approval for Halogen-Free TPE Cables*, DESIGN WORLD (Mar. 9, 2022), <https://www.designworldonline.com/igus-becomes-worlds-first-manufacturer-to-receive-ul-approval-for-halogen-free-tpe-cables> [https://perma.cc/8X5P-YNU8].

<sup>163</sup> Tania Leiman, *Law and Tech Collide: Foreseeability, Reasonableness and Advanced Driver Assistance Systems*, 40 POL’Y & SOC’Y 250 (2020) (discussing the interplay of tort law and technological change).

<sup>164</sup> Graham, *supra* note 137, at 102. See also Henderson, *supra* note 22 (claiming that tort law platforms actually promote innovation).

<sup>165</sup> In the context of the Industrial Revolution, see John Fabian Witt, *Toward a New History of American Accident Law: Classical Tort Law and the Cooperative First-Party Insurance Movement*, 114 HARV. L. REV. 690, 777 (2001).

<sup>166</sup> Porter Wright, *First Nano-Specific Insurance: Lexington Insurance Company Introduces LexNanoShield*, TECH. L SOURCE (Mar. 31, 2010), <https://www.technologylawsources.com/2010/03/articles/nanotechnology/first-nanospecific-insurance-lexington-insurance-company-introduces-lexnanoshield> [https://perma.cc/DUV9-3YPS].

<sup>167</sup> Marchant, *supra* note 158, at 717.



policies. This Part provides a brief of the current developments and scholarly discussion about insuring today’s emerging technologies. It seeks to show the high potential insurance holds as a facilitator of innovation in the context of AI and cyber activities, even if that potential is yet unrealized. It will first descriptively present the current discussion in the context of AI, focusing on AVs, and will then descriptively and normatively explore the fast-growing market of cyber insurance.

#### A. ARTIFICIAL INTELLIGENCE

The current discussion of offering insurance to cover risks associated with AI is still mainly theoretical.<sup>168</sup> Nonetheless, the suggestions described below present insurance’s capacity to ensure AI’s current and future integration into our commercial market will be done safely.

Some of the current suggestions focusing on AI rely on the existing insurance infrastructure,<sup>169</sup> while other suggest that the new risks presented by AI require the creation of a new policy or creation of new insurance infrastructures. None of these suggestions have received wide approval from the insurance community, and it seems that the structure of policies covering this technology is still an ongoing process.

In 1996, Curtis Karnow suggested one of the earliest proposals for AI insurance, what he called his “Turing Registry.”<sup>170</sup> Karnow argued that an AI entity’s behavior, although stochastic, is similar to risks that are underwritten by insurance agencies every day, so the risks associated with AI entity’s usage can also be predicted and insured by insurance companies.<sup>171</sup> According to Karnow’s suggestion, only registered AI entities would be covered by insurance. Programmers would be required to obtain a “Turing certification,” pay the premium and secure protection for the deployment of their AI entity before they were allowed to disperse and sell it.<sup>172</sup> This is an *ex ante* scheme which obligates the

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<sup>168</sup> Anat Lior, *Insuring AI: The Role of Insurance in Artificial Intelligence Regulation*, 35 HARV. J.L. & TECH. 467 (2022); Gary E. Marchant & Carlos Ignacio Gutierrez, *Soft Law 2.0: An Agile and Effective Governance Approach for Artificial Intelligence*, 24 MINN. J.L. SCI. & TECH. 375, 419 (2023). In the medical malpractice context, see, e.g., Benedict See, *Paging Doctor Robot: Medical Artificial Intelligence, Tort Liability, and Why Personhood May Be the Answer*, 87 BROOK. L. REV. 417, 439 (2021).

<sup>169</sup> Lior, *supra* note 168.

<sup>170</sup> Curtis E.A. Karnow, *Liability for Distributed Artificial Intelligences*, 11 BERKELEY TECH. L. J. 147, 193 (1996).

<sup>171</sup> *Id.*

<sup>172</sup> *Id.* at 194. For a similar suggestion in the context of nanotechnology see Gary E. Marchant et al., *A New Soft Law Approach to Nanotechnology Oversight: A Voluntary Product Certification Scheme*, 28 UCLA J. ENV’T. L. & POL’Y 123 (2010).

manufacturers, but not the end-users, to purchase a liability insurance policy to cover third-party damages caused by their AI entities.<sup>173</sup>

There have also been proposals to regulate AI in more narrow contexts. In the context of AI-based products used in health care services, a recent article proposes to use liability insurance to promote the responsible adoption of AI,<sup>174</sup> based mostly on existing policies.<sup>175</sup> The article states that “well-designed AI liability insurance has the potential to mitigate liability risks and uncertainties for stakeholders, and to do so in a way that is aligned with patient, physician, and health care organization leadership interests.”<sup>176</sup>

Other more specific insurance suggestions have been much deliberated in the context of autonomous vehicles.<sup>177</sup> For example, in August 2018, Volvo’s CEO declared that the company will take full responsibility for all accidents caused by its AVs, freeing the car owner/operator from liability.<sup>178</sup> Alternatively, AVs manufacturers could act as insurers, meaning that they would offer in-house insurance schemes attached to each AV they sell. Tesla, for example, is already offering an in-house insurance program for its vehicles and aims to expand this program across the US.<sup>179</sup> In this

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<sup>173</sup> A different proposal about applying an insurance scheme to all AI entities was published by the European Parliament in its *Report with Recommendations to the Commission on Civil Law Rules on Robotics* (European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL))).

<sup>174</sup> Ariel Dora Stern, Avi Goldfarb, Timo Minssen & W. Nicholson Price II, *AI Insurance: How Liability Insurance Can Drive the Responsible Adoption of Artificial Intelligence in Health Care*, 3 INNOVATIONS CARE DELIVERY (2022).

<sup>175</sup> *Id.* at 6.

<sup>176</sup> *Id.* at 2.

<sup>177</sup> Zoe Sagalow, *Self-Driving Cars Raise Liability Questions for Insurers*, GOV’T TECH. (May 26, 2021), <https://www.govtech.com/fs/self-driving-cars-raise-liability-questions-for-insurers> [<https://perma.cc/SNK9-CTJ3>]. Some even claim AVs can reduce the need for insurance, see *Tesla: Autonomous Cars May Be The Solution To Louisiana's Insurance Cost Issues*, MKT. SCREENER (June 4, 2020), <https://www.marketscreener.com/TESLA-INC-6344549/news/Tesla-Autonomous-Cars-May-Be-The-Solution-To-Louisiana-s-Insurance-Cost-Issues-30719636> [<https://perma.cc/9YBR-KDBS>] (“autonomous cars could deliver a massive reduction in insurance premiums, and perhaps even one day, an elimination of the need for liability insurance altogether”). Cf. *Self-Driving Vehicles Could Struggle to Eliminate Most Crashes*, IIHS (June 4, 2020), <https://www.iihs.org/news/detail/self-driving-vehicles-could-struggle-to-eliminate-most-crashes> [<https://perma.cc/8XXE-DU8B>].

<sup>178</sup> Kirsten Korosec, *Volvo CEO: We Will Accept All Liability When our Cars are in Autonomous Mode*, FORTUNE (Oct. 7, 2015), <https://www.fortune.com/2015/10/07/volvo-liability-self-driving-cars> [<https://perma.cc/RFU6-EDPG>].

<sup>179</sup> Fred Lambert, *Tesla (TSLA) is About to Launch its In-House Insurance Program in More States*, ELECTREK (Mar. 22, 2021), <https://www.electrek.co/2021/03/22/tesla-tsla-launch-in-house-insurance-program-more-states> [<https://>

option, customers will purchase the AV with a built-in insurance policy.

Another example comes from the UK, where regulators have opted for a different liability scheme. Enacted in 2018, the Automated and Electric Vehicles Act<sup>180</sup> “extends the compulsory insurance scheme for normal road vehicles in the UK to cover automated ones.”<sup>181</sup> “If an accident is caused by an AV and it is insured, the insurer is liable for that damage. If the AV is not insured, the owner of the AV will be liable for the damage.”<sup>182</sup> Because this is a coercive insurance scheme, it ensures that everyone who drives on UK roads purchases an auto-insurance policy.<sup>183</sup>

Alongside legislation and industry statements, the topic of hedging the risk of AVs has been vastly discussed in the academic literature.<sup>184</sup> Abraham and Rabin suggested one prominent proposal entitled “Manufacturer Enterprise Responsibility” (“MER”). According to this suggestion, once 25% of all registered vehicles<sup>185</sup> on the road are autonomous vehicles,<sup>186</sup> auto manufacturers should

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perma.cc/ED7Z-ZSY4]. Specifically in California, Tesla is working on offering insurance for their AVs in preparation for the liability shift from driver to the autonomous system and its manufacturer.

<sup>180</sup> For the full text of the Act see *Automated and Electric Vehicles Act 2018*, <https://www.legislation.gov.uk/ukpga/2018/18/contents/enacted> [https://perma.cc/SK47-C385].

<sup>181</sup> JACOB TURNER, *ROBOT RULES: REGULATING ARTIFICIAL INTELLIGENCE IN THE 21ST CENTURY* 114 (2018).

<sup>182</sup> Anat Lior, *Insurability of Artificial Intelligence Algorithms and Robots – A Different Version of the Same Policy*, THE FEDERMANN CYBER SECURITY CENTER – CYBER LAW PROGRAM (Aug. 5, 2019), <https://csrcl.huji.ac.il/blog/anat-lior-Insurability-AI> [https://perma.cc/HGG2-DSFZ].

<sup>183</sup> For a critical view see James Davey, *By Insurers, For Insurers: The UK’s Liability Regime for Autonomous Vehicles*, 13 J. TORT L. 163 (2020). Another interesting example is a German law amending the “Road Traffic Act and the Compulsory Insurance Act – Act on Autonomous Driving”. See Drucksache 19/27439, <https://www.dip21.bundestag.de/dip21/btd/19/274/1927439.pdf> [https://perma.cc/F6NC-85E4].

<sup>184</sup> See, e.g., Kenneth S. Abraham & Robert L. Rabin, *Automated Vehicles and Manufacturer Responsibility for Accidents: A New Legal Regime for a New Era*, 105 VA. L. REV. 127 (2019); Carrie Schroll, *Splitting the Bill: Creating a National Car Insurance Fund to Pay for Accidents in Autonomous Vehicles*, 109 NW. U. L. REV. 803 (2015); Anthony Paolino III, *The Ultimate Insurance Policy: Autonomous Vehicles and Artificial Intelligence, A Statutory Proposal for a Complicated Product*, 3 ARIZ. L.J. EMERGING TECH. 1 (2018), available at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3275823](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3275823)

[https://perma.cc/5UEY-9DPF]; Jin Yoshikawa, *Sharing the Costs of Artificial Intelligence: Universal No-Fault Social Insurance for Personal Injuries*, 21 VAND. J. ENT. & TECH. L. 1155 (2019); Geistfeld, *supra* note 136.

<sup>185</sup> Abraham & Rabin, *supra* note 184, at 132.

<sup>186</sup> *Id.* at 139. They define these AVs based on the five-tiered levels of automation developed by the Society of Automotive Engineers (SAE) International, as SAE level 4 or 5. For more on this ranking system, see *SAE International Releases Updated Visual Chart for Its “Levels of Driving*

become responsible “for all injuries arising out of the operation of”<sup>187</sup> AVs. Abraham and Rabin describe their MER proposal as “manufacturer-financed, strict responsibility bodily-injury compensation system, administered by a fund created through assessments levied on HAV [high autonomous vehicles] manufacturers.”<sup>188</sup> In other words, the MER will provide compensation automatically, up to a specific benefit limit, for bodily injuries<sup>189</sup> which arise out of the operation of autonomous vehicles, excluding injuries caused by the owner’s own negligence.<sup>190</sup> This regime would be the exclusive remedy for the victims and no other tort cause of action would be available.<sup>191</sup>

Another suggestion proposes to eliminate liability resulting from autonomous vehicles accidents and substituting it for a national insurance fund.<sup>192</sup> This proposal is based on a federal fund paid for by taxes on riders, car-sharing companies, and manufacturers. These taxes would be collected from these players “in proportion to how much they benefit from the use of” these autonomous vehicles.<sup>193</sup>

The current discussion focusing on insurance policies which cover AI is relatively in its infancy. There exists a general agreement that insurance as a risk-hedging mechanism is a valuable tool in the safe integration and development of AI, but the details are yet to be flushed out.<sup>194</sup> Unlike insurance for AI, the market for cyber insurance has been growing fast in the last couple of years.

## B. CYBER INSURANCE

Cyber insurance presents a unique case study in which the insurance industry clearly strives to provide a product that can support the safe growth and development of cyber space, but thus far in practice its ability to achieve this goal has been limited. Nonetheless, there is place for optimism with regards to future

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*Automation” Standard for Self-Driving Vehicles*, SAE (Nov. 12, 2018), <https://www.sae.org/news/press-room/2018/12/sae-international-releases-updated-visual-chart-for-its-%E2%80%9Clevels-of-driving-automation%E2%80%9D-standard-for-self-driving-vehicles> [https://perma.cc/6FC8-88MJ].

<sup>187</sup> Abraham & Rabin, *supra* note 184, at 132.

<sup>188</sup> *Id.* at 147.

<sup>189</sup> Property injuries will still be covered by “conventional” insurance policies and will be excluded from the MER. *Id.* at 152.

<sup>190</sup> *Id.* at 150.

<sup>191</sup> *Id.* at 156. This scheme can simply be viewed as manufacturer liability for AI harm separate from concepts of insurance.

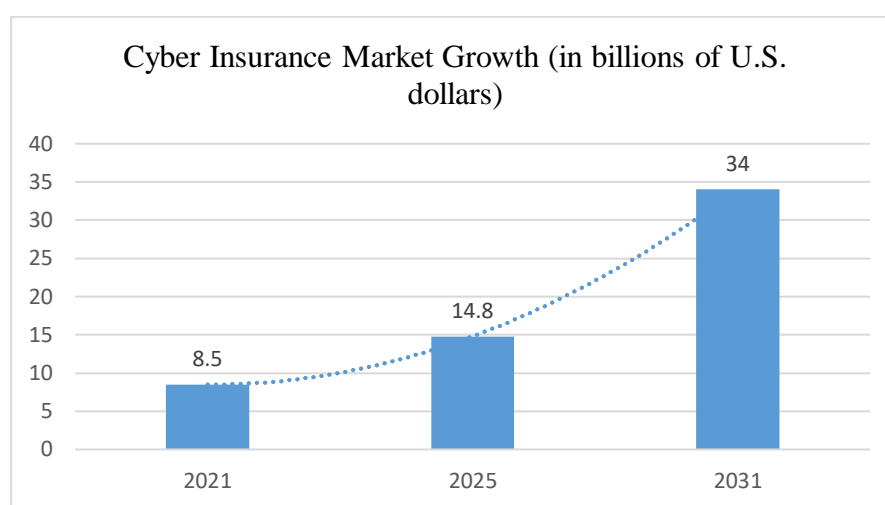
<sup>192</sup> Schroll, *supra* note 184, at 822.

<sup>193</sup> *Id.* at 823.

<sup>194</sup> For a more critical analysis of these proposals see Lior, *supra* note 168. *See also infra*, Section V.C.

developments of this product that will enable the insurance market to successfully fulfil its role as a facilitator of innovation.

The fast-growing market of cyber insurance is predicted to continue growing at an annual growth rate of about 24.9% during 2022-2028 reaching \$34 billion by 2031.<sup>195</sup> This constant growth prediction can be viewed as evidence that insurance has a vital role in supporting emerging technologies and offering coverage for the risks associated with them. Cyber insurance represents an excellent example to the strong connection between emerging technologies and insurance as this product is a direct result of “the way that the world has been revolutionized by the advent of computers and connected digital devices.”<sup>196</sup>



Cyberattacks, commonly referred to as ‘hacking’, have become a common and almost mundane risk of our current digital age given the ubiquity of online space. Cyberattacks refer to situations in which a malicious third-party breaches datasets stored on online servers. These usually lead to economic loss and invasion of privacy for both companies and individuals.<sup>197</sup> Since the Morris

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<sup>195</sup> David Braue, *Cyberinsurance Market to Reach \$34 Billion By 2031*, CYBERCRIME MAGAZINE (Nov. 23, 2021), <https://www.cybersecurityventures.com/cyberinsurance-market-to-reach-34-billion-by-2031> [https://perma.cc/TJZ7-L9CQ]; Vantage Market Research, *\$28+ Billion Global Cyber Insurance Market is Expected to Grow at a CAGR of over 24.90% During 2022-2028*, GLOBENEWSWIRE (Apr. 18, 2022), <https://www.globenewswire.com/news-release/2022/04/18/2423505/0/en/28-Billion-Global-Cyber-Insurance-Market-is-Expected-to-Grow-at-a-CAGR-of-over-24-90-During-2022-2028-Vantage-Market-Research.html> [https://perma.cc/PZ45-N4PU].

<sup>196</sup> Abraham & Baker, *supra* note 63, at 180.

<sup>197</sup> See, e.g., Lubin, *supra* note 140, at 47.

Worm cyberattack in 1988 targeting computers at MIT,<sup>198</sup> large scale cyberattacks have drawn the attention of the media and the world.<sup>199</sup> Others, especially those involving ransom demands, are kept private.<sup>200</sup> Regardless of their publication, the continuous and repetitive nature of these attacks have created the new and fast-growing market of cyber insurance.<sup>201</sup> The constant risks and inherent vulnerabilities, which are omnipresent in the online space, have created an increased economic risk due to cyberattacks and data breaches. These led companies, especially small to medium businesses, to turn to the insurance market as part of their risk management strategy in an attempt to protect themselves against potential cyber loss.<sup>202</sup>

A cyber insurance policy covers “information security and privacy liability, and business interruption,”<sup>203</sup> these include breaches and data leakage of private information as well as ransomware and denial of service attacks.<sup>204</sup> A couple of well-known examples include the NotPetya malware attack in June 2017, which according to the White House estimations led to damages of more than \$10 billion;<sup>205</sup> the WannaCry ransomware attack in May

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<sup>198</sup> *The Morris Worm: 30 Years Since First Major Attack on the Internet*, FBI (Nov. 2, 2018), <https://www.fbi.gov/news/stories/morris-worm-30-years-since-first-major-attack-on-internet-110218> [<https://perma.cc/3LXG-CYH2>] (“At around 8:30 p.m. on November 2, 1988, a maliciously clever program was unleashed on the Internet from a computer at the Massachusetts Institute of Technology (MIT)”); *United States v. Morris*, 928 F.2d 504 (2d Cir. 1991).

<sup>199</sup> See, e.g., *Significant Cyber Incidents*, CSIS, <https://www.csis.org/programs/strategic-technologies-program/significant-cyber-incidents> [<https://perma.cc/BJ88-YDXR>].

<sup>200</sup> Kenneth S. Abraham & Daniel Schwarcz, *Courting Disaster: The Underappreciated Risk of a Cyber-Insurance Catastrophe*, 27 CONN. INS. L.J. 1, 2 (2021).

<sup>201</sup> Conner Forrest, *Why Cybersecurity is the Fastest-Growing Insurance Market for SMBs*, TECHREPUBLIC (Oct. 12, 2018), <https://www.techrepublic.com/article/why-cybersecurity-is-the-fastest-growing-insurance-market-for-smbs> [<https://perma.cc/C9ED-SWHJ>].

<sup>202</sup> See generally, ANDREW COBURN ET. AL., SOLVING CYBER RISK: PROTECTING YOUR COMPANY AND SOCIETY 235 (2019).

<sup>203</sup> Kumar & Nagle, *supra* note 140.

<sup>204</sup> Sue Poremba, *How Cyber Insurance Changed Cybersecurity*, SEC. INTEL. (Apr. 24, 2023), <https://securityintelligence.com/articles/how-cyber-insurance-changed-cybersecurity> [<https://perma.cc/BE3Y-MADS>]. For more on ransomware and DoS attacks see Pascal Geenens, *Ransomware & Ransom DoS, Why they are Similar but Different*, RADWARE BLOG (Nov. 30, 2021), <https://blog.radware.com/security/2021/11/ransomware-ransom-dos-why-they-are-similar-but-different> [<https://perma.cc/XRX3-KRD7>].

<sup>205</sup> Lubin, *supra* note 140, at 45; Andy Greenberg, *The Untold Story of NotPetya, The Most Devastating Cyberattack in History*, WIRED (Aug. 22, 2018), <https://www.wired.com/story/notpetya-cyberattack-ukraine-russia-code-crashed-the-world> [<https://perma.cc/K3UN-A6LH>].

2017 which led to approximately \$4 billion damages;<sup>206</sup> as well as more recent cyberattacks resulting from the Russia-Ukraine confrontation starting March 2022,<sup>207</sup> leading to damages to businesses around the world.<sup>208</sup> These examples present the potential vast harms that accompany these types of cyber-attacks, whether they originated from warfare or not. The scale of damages for small and medium businesses could be substantial, which keeps fueling the cyber insurance market as a mean to manage these risks.<sup>209</sup>

The challenges of offering insurance to new technologies is salient in the underwriting process of cyber policies.<sup>210</sup> The current lack of knowledge and relatively limited number of cyberattacks lead to substantive and monetary limitations with regards to the policies insurers can and should offer. At first, most cyber policies offered low caps on the amount of coverage provided, as well as exclusions from coverage.<sup>211</sup> However, this changed over time as more information was gathered and better safety practices were implemented.

An interesting example concerning insurance covering cyber loss is the lawsuits that were filed as a result of the NotPetya cyberattack. These claims were covered under an ‘all risks’ policy, and not a specific cyber insurance policy.<sup>212</sup> The NotPetya attack

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<sup>206</sup> Jonathan Berr, “WannaCry” Ransomware Attack Losses Could Reach \$4 Billion, CBS NEWS (May 16, 2017), <https://www.cbsnews.com/news/wannacry-ransomware-attacks-wannacry-virus-losses> [https://perma.cc/U8G7-5UTW]; Andy Greenberg, *The WannaCry Ransomware Hackers Made Some Real Amateur Mistakes*, WIRED (May 15, 2017), <https://www.wired.com/2017/05/wannacry-ransomware-hackers-made-real-amateur-mistakes> [https://perma.cc/T87N-DSXF].

<sup>207</sup> Matt Butgess, *Russia Is Being Hacked at an Unprecedented Scale*, WIRED (Apr. 27, 2022), <https://www.wired.com/story/russia-hacked-attacks> [https://perma.cc/78M6-NKDQ].

<sup>208</sup> Stuart Madnick, *What Russia’s Ongoing Cyberattacks in Ukraine Suggest About the Future of Cyber Warfare*, HARV. BUS. REV. (Mar. 7, 2022), <https://hbr.org/2022/03/what-russias-ongoing-cyberattacks-in-ukraine-suggest-about-the-future-of-cyber-warfare> [https://perma.cc/CXX9-5BZG]; Stephanie Pagones, *NYC on ‘Ultra-High Alert’ Amid Increased Risk of Russian Retaliatory Cyberattack*, N.Y. POST (Mar. 8, 2022), <https://nypost.com/2022/03/08/ukraine-war-nyc-on-ultra-high-alert-amid-increased-risk-of-russian-retaliatory-cyberattack> [https://perma.cc/9KLL-NCEZ].

<sup>209</sup> The empirical literature in business and computer science is less clear on the fact that cyber-attacks lead to colossal harms. There are even results that cyber losses are smaller than traditional losses. See, e.g., Daniel W. Woods & Rainer Bohme, *Systematization of Knowledge: Quantifying Cyber Risk*, IEEE SYMP. ON SEC. & PRIV. 2021, 1, 11 (“We discover cyber harms are not exceptional in terms of typical or extreme losses.”).

<sup>210</sup> Lubin, *supra* note 140, at 64.

<sup>211</sup> Abraham & Baker, *supra* note 63, at 181.

<sup>212</sup> Autumn Demberger, *Merck Awarded \$1.4 Billion for NotPetya After 5 Years of Legal Battle*, RISK & INS. (May 8, 2022), <https://www.riskandinsurance.com/>

originated in Russia where hackers infected Ukrainian servers of a financial software program used to file taxes.<sup>213</sup> The infected servers then delivered the malware to businesses within Ukraine and around the world. Once inside the network, NotPetya encrypted records of infected devices, demanding ransom of \$300 worth of Bitcoin to decrypt them.<sup>214</sup> It was later concluded by western intelligence agencies that the NotPetya malware was launched by Russia as part of its cyber campaign against Ukraine.<sup>215</sup> An important exclusion listed in different ‘all risks’ policies, which were in effect while the NotPetya attack occurred, is an exclusion of damages resulting from “acts of war.” Insurance companies claimed that this is the case with NotPetya given that this cyberattack originated from the cyberwarfare between Russia and Ukraine.<sup>216</sup> Two major lawsuits were filed by Merck, a pharmaceutical company, and Mondelez, a food and beverage conglomerate, against their insurers. Both businesses suffered extensive damages as a result of this cyberattack and in both cases the insurance companies refused to pay citing the “act of war” exclusion. In January 2022, Merck won its insurance

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merck-awarded-1-4-billion-for-notpetya-after-5-years-of-legal-battle [https://perma.cc/JRU8-B9YT] (“Pharmaceuticals company Merck had an all-risk policy issued by International Indemnity in 2017”). All-risk policies cover all risks that are not explicitly excluded. Mila Araujo, *Do You Need an All-Risk Insurance Policy?*, THE BALANCE (Feb. 14, 2022).

<sup>213</sup> Ellen Nakashima, *Ukraine’s Ransomware Attack Was a Ruse to Hide Culprit’s Identity, Researchers Say*, WASH. POST (June 29, 2017), [https://www.washingtonpost.com/world/national-security/this-weeks-global-ransomware-attack-was-a-ruse-to-deflect-attention-from-the-true-culprit-researchers-say/2017/06/29/da455a0e-5cf0-11e7-9b7d-14576dc0f39d\\_story.html](https://www.washingtonpost.com/world/national-security/this-weeks-global-ransomware-attack-was-a-ruse-to-deflect-attention-from-the-true-culprit-researchers-say/2017/06/29/da455a0e-5cf0-11e7-9b7d-14576dc0f39d_story.html) [https://perma.cc/F3DF-VJA2].

<sup>214</sup> Greenberg, *supra* note 205.

<sup>215</sup> See *Reckless Campaign of Cyber Attacks by Russian Military Intelligence Service Exposed*, Press Release, U.K. Nat’l Cyber Sec. Ctr. (Oct. 3, 2018), <https://www.ncsc.gov.uk/news/reckless-campaign-cyber-attacks-russian-militaryintelligence-service-exposed> [https://perma.cc/C5WZ-8ERN]; *Foreign Office Minister Condemns Russia for NotPetya Attacks*, Press Release, U.K. FOREIGN OFFICE (Feb. 15, 2018), <https://www.gov.uk/government/news/foreign-office-minister-condemns-russia-for-notpetya-attacks>. Australia, New Zealand, Canada, Japan, the United States, Denmark and the United Kingdom formally attributed the NotPetya cyberattack to Russia. See Eduard Kovacs, *U.S., Canada, Australia Attribute NotPetya Attack to Russia*, SEC. WEEK (Feb. 16, 2018), <https://www.securityweek.com/us-canada-australia-attribute-notpetya-attack-russia> [https://perma.cc/U27F-5N4H].

<sup>216</sup> *Mondelez International, Inc. v. Zurich American Insurance Co.*, 2018 WL 4941760 (Ill. Cir. Ct.) (Oct. 10, 2018) (Complaint), <https://www.assets.documentcloud.org/documents/5759256/397265756-Mondelez-Zurich.pdf> (where the policy excluded “a hostile or warlike action . . . by government or sovereign power”); Adam Satariano & Nicole Perlroth, *Big Companies Thought Insurance Covered a Cyberattack. They May Be Wrong*, N. Y. TIMES (Apr. 15, 2019), <https://www.nytimes.com/2019/04/15/technology/cyberinsurance-notpetya-attack.html> [https://perma.cc/8RQV-GS8P].



claim at New Jersey Superior Court. The Court adopted the strict interpretation of the “act of war” exception to only apply if an attack was by “an official state action,” which was not the case here.<sup>217</sup> The Mondelez case was pending at an Illinois State Court but was eventually settled outside of court.<sup>218</sup>

The problems that arose with regards to these general ‘all risks’ policies in a cyber context are evidence that the traditional policies in place are not well suited to handle cyber losses. This further emphasized the need for a specialized technology policy, which were slowly but surely excluded from traditional insurance products. The cyber insurance product is a result of this exclusion process. As traditional policies excluded “cyber losses”, a need for a specialist insurance line emerged. This process essentially carved out a space for the creation of the cyber insurance policy,<sup>219</sup> and it is not unimaginable that this process will repeat itself in the future as new emergent technologies enter our commerce stream.

The NotPetya malware attack has had a significant impact on the market of cyber insurance.<sup>220</sup> It has created uncertainty for both insurers and insureds with regards to the types of cyberattacks cyber insurance, as well as other traditional policies, cover. The current triumph of Merck, as well as Mondelez recent victory,<sup>221</sup> are bound to have great impact on the future reshaping of the language of cyber policies. Insurers are faced with a dilemma as they try to “get themselves off the hook for coverage of catastrophic

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<sup>217</sup> Catalin Cimpanu, *Merck Wins Cyber-Insurance Lawsuit Related to NotPetya Attack*, THE RECORD (Jan. 21, 2022), <https://therecord.media/merck-wins-cyber-insurance-lawsuit-related-to-notpetya-attack> [<https://perma.cc/6GL7-25EF>].

<sup>218</sup> Judy Greenwald, *War Clause Language under Closer Inspection*, BUS. INS. (Mar. 1, 2022), <https://www.businessinsurance.com/article/20220301/NEWS06/912348248/War-clause-language-under-closer-inspection-Fitch-Ratings-Merck-&Co-v-ACE-Ame> [<https://perma.cc/5E5M-YEZV>]. David Jones, *Mondelez Settlement in NotPetya Case Renews Concerns about Cyber Insurance Coverage*, CYBERSECURITY DIVE (Nov. 8, 2022), <https://www.cybersecuritydive.com/news/mondelez-zurich-notpetya-cyber-insurance-settlement/636029/> [].

<sup>219</sup> JOSEPHINE WOLFF, CYBERINSURANCE POLICY: RETHINKING RISK IN AN AGE OF RANSOMWARE, COMPUTER FRAUD, DATA BREACHES, AND CYBERATTACKS 11 (2022).

<sup>220</sup> Josephine Wolff, *How the NotPetya Attack is Reshaping Cyber Insurance*, BROOKINGS (Dec. 1, 2021), <https://www.brookings.edu/techstream/how-the-notpetya-attack-is-reshaping-cyber-insurance> [<https://perma.cc/9CMK-MHSS>].

<sup>221</sup> Richard Vanderford, *Merck’s Insurers On the Hook in \$1.4 Billion NotPetya Attack, Court Says*, THE WALL STREET JOURNAL (May 2, 2023), <https://www.wsj.com/articles/mercks-insurers-on-the-hook-in-1-4-billion-notpetya-attack-court-says-528aeb01> []; David Jones, *Merck Cyber Coverage Upheld in NotPetya Decision, Seen as Victory for Policyholders*, CYBERSECURITY DIVE (May 3, 2023), <https://www.cybersecuritydive.com/news/merck-cyber-upheld-notpetya/649317/> [].

cyberattacks while still persuading their customers that most intrusions and breaches will still be covered.”<sup>222</sup>

Generally, the cyber insurance market is experiencing difficulties due to increased regulation and criminal activities, as well as insurers pulling back coverage.<sup>223</sup> Cyber renewals premiums are increasing, partly because of increased cyberattacks (such as phishing and hacking) resulting from work-from-home practices which have become dominant during the Covid-19 pandemic. On the other hand, “coverage continues to evolve and expand to address regulatory risk, reputational damage, forensic accounting and gap exposures.”<sup>224</sup> The unsteady product of cyber insurance shows that it still has a long way to go before it can be stabilized. Given the high risks associated with hacking, and the current lack of sufficient information, these policies are frequently reshaped in an attempt to implement new information gathered while still offering meaningful protection to businesses.

Policymakers are proactively involved in policing the cyber market in an attempt to ensure cyber insurance will remain available as a risk management tool and help organizations manage cyber risk.<sup>225</sup> A recent example is the New York Cyber Insurance Risk Framework, which is aimed to “foster the growth of a robust cyber insurance market that maintains the financial stability of insurers and protects insureds.”<sup>226</sup> The role of cyber insurance regulation in stabilizing this product is still unclear.<sup>227</sup> However, some involvement of the legislature is necessary if we wish to maintain the availability of this product, despite the difficulties insurance carriers face in their attempt to offer it.

At this moment, at the intersection of insurance and technology, it seems that cyber insurance is the exception to the notion of insurance acting as a successful facilitator of emerging technologies. Despite its growth and importance, cyber insurance as a product is far from perfect. Even though insurers have created a significant infrastructure for *ex post* risk management in the form of

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<sup>222</sup> Wolff, *supra* note 220.

<sup>223</sup> Tom Wetzel, *Mitigation Takes Center Stage in Hardening Cyber Market*, INS. J. (Aug. 16, 2021), <https://www.insurancejournal.com/magazines/mag-features/2021/08/16/627105.htm> [<https://perma.cc/CF9Y-LQXH>].

<sup>224</sup> *Id.*

<sup>225</sup> Wolff, *supra* note 220, at 182.

<sup>226</sup> *Insurance Circular Letter No. 2 (2021)*, NEW YORK STATE (Feb. 4, 2021), [https://www.dfs.ny.gov/industry\\_guidance/circular\\_letters/cl2021\\_02](https://www.dfs.ny.gov/industry_guidance/circular_letters/cl2021_02) [<https://perma.cc/NA5P-KGE7>]. For an analysis of this framework see Lubin, *supra* note 2, at 158.

<sup>227</sup> *Enhancing the Role of Insurance in Cyber Risk Management*, OECD (2017), <https://www.oecd.org/daf/fin/insurance/Enhancing-the-Role-of-Insurance-in-Cyber-Risk-Management.pdf> [<https://perma.cc/423E-EQRX>].

post-incident services,<sup>228</sup> many still dispute its *ex ante* effectiveness to channel the behavior of its policyholders.<sup>229</sup>

The challenges cyber insurance faces today can mainly be attributed to the combination of three factors. First, the inherent systemic risks cyber damages hold, unlike other more distributed emergent technologies.<sup>230</sup> Second, the fact a specific insurance market and product was developed to address this issue, unlike other emerging technology which were, and are, covered by traditional policies. *Prima facie*, this response proves the importance of insurance in hedging new technological risks, however, it seems that in their attempt to make fast money, inexperienced insurers offered this product with no concrete risk models to back them up. This “influx of pretenders reduced the cyber insurance industry’s understanding of the underlying risk” leading to a fragile and unstable product. This product is only now starting to recover as more experienced insurers are taking the lead, and even nudging their policyholders towards better security practices.<sup>231</sup> Third, the unique cyberwar interferences in cyber space, which cause collateral damages to companies and their consumers which is unquestionably out of their control. These circumstances create a different and unique environment under which insurance as a hedging tool, or the specific line of cyber insurance, seems to be less effective than in the context of other emerging technologies.

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<sup>228</sup> See, e.g., Daniel Woods & Rainer Bohme, *How Cyber Insurance Shapes Incident Response: A Mixed Methods Study*, WORKSHOP ON ECON. INFO. SEC. (WEIS) 2021, 19; Shauhin Talesh, *Data Breach, Privacy, and Cyber Insurance: How Insurance Companies Act as “Compliance Managers” for Businesses*, 43 LAW & SOC. INQUIRY 417 (2018) (highlighting the heavy reliance by cyber insurers on post-incident response services). More generally, cyber insurance pushed the cybersecurity industry to create affordable incident response services. This can be viewed as a sign of a maturing industry. See Daniel Woods, *The Evolutionary Promise of Cyber Insurance*, FINREG BLOG (Feb. 1, 2022), <https://sites.law.duke.edu/thefinregblog/2022/02/01/the-evolutionary-promise-of-cyber-insurance%EF%BF%BC> [<https://perma.cc/Z4D4-P7ZB>].

<sup>229</sup> Daniel W. Woods, Tyler Moore & Andrew C. Simpson, *The County Fair Cyber Loss Distribution: Drawing Inferences from Insurance Prices*, 2 DIGIT. THREATS: RSCH. & PRAC. 2021, 10:18 (“This first attempt at inferring losses from insurance prices can be improved by speaking to insurance professionals to understand how to construct a better sample of prices, including more flexible distributions to improve predictions, and by analysing performance on prices generated by a known distribution.”). Furthermore, it has been shown that cyber insurers often do very little to limit risk-taking behavior, do not condition premiums on effective discounts, and principally devote their efforts to ex post risk management rather than ex ante. See, e.g., Daniel W. Woods & Tyler Moore, *Does Insurance Have a Future in Governing Cybersecurity?*, IEEE SEC. & PRIV. (Sept. 2019); Tom Johansmeyer, *The Cyber Insurance Market Needs More Money*, HARV. BUS. REV. (Mar. 10, 2022), <https://hbr.org/2022/03/the-cyber-insurance-market-needs-more-money> [<https://perma.cc/5LTH-ZLRW>].

<sup>230</sup> Abraham & Schwarcz, *supra* note 200. Cf. Woods & Bohme, *supra* note 209.

<sup>231</sup> Woods, *The Evolutionary Promise of Cyber Insurance*, *supra* note 228.

Given that cyber policies are still in their infancy,<sup>232</sup> only time will tell if they remain a stand-alone insurance product. Either way, the creation of this product indicates the important part the insurance industry has taken upon itself in encouraging innovation by providing a risk prevention and management tool for risks associated with emerging technologies.

According to an optimistic approach, experienced insurers will be able to gather enough information over time that will allow them to reduce their uncertainty with regards to the potential risks associated with cyber space,<sup>233</sup> just as has happened with other liability insurance policies. This should lead to a broader and more accurate underwriting process on the insurers' side, as well as a greater demand of broad coverage and higher limitation caps on the insureds' side. These efforts could be supported by a regulatory framework given the importance governments may assign to the availability of this insurance product. According to a pessimistic approach, cyber insurance will be absorbed into traditional policies.<sup>234</sup> It will still be covered to a certain extent, but the demand-supply balance will eliminate the need for this designated product to cover cyber loss. Even so, risk-hedging and management of cyber space via insurance policies will still be available, to a certain extent,<sup>235</sup> to those who wishes to hedge their cyber activities. Insurance will still act as a supportive mechanism to online innovation, even if a limited one.<sup>236</sup>

#### IV. THE DARK SIDE OF INSURANCE

Insurance as an industry, as well as the products it offers, are not perfect. Though this Article tends to be optimistic when it comes to the intersection of insurance and technological innovation, it is important to note that insurance has many drawbacks, which in some respects, may even inhibit innovation. This Part provides a brief of the issues of moral hazard, stifling innovation, and adverse selection. It presents the less attractive sides of insurance, including insurance of technologies. These shortages are by no means a

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<sup>232</sup> And that inexperienced insurers are now slowly being pushed out of this market given their losses. *Id.* (“ . . . the market aligns incentives: the most informed insurers survive and the gamblers count their losses.”).

<sup>233</sup> *Id.*

<sup>234</sup> Abraham & Baker, *supra* note 63, at 182.

<sup>235</sup> For a less optimistic approach see Shauhin A. Talesh & Bryan Cunningham, *The Technologization of Insurance: An Empirical Analysis of Big Data and Artificial Intelligence's Impact on Cybersecurity and Privacy*, 5 UTAH L. REV. 967, 1015 (2021).

<sup>236</sup> For more on the limitations of cyber insurance, see WOLFF, *supra* note 219, at 215 (“Trying to describe the cyberinsurance industry makes clear the extent to which cyberinsurance is fundamentally not a single thing but rather a range of different products that deal with computer-, data-, and network-related risks that intersect with any number of different threats and types of losses.”).

comprehensive list, but they do capture the key issues involving insurance. This Part also offers some explanation as to why these shortages do not render the insurance industry as unsuitable for addressing the challenges we have so far discussed. These disadvantages are not unique to the context of emerging technologies but may present themselves with more force in this context.

Despite these deficiencies and the embedded limitations of the insurance industry, this Article maintains the position that insurance has an important role in supporting, encouraging, and ensuring the safe integration of new technologies into our society, even if it is limited at times.

#### A. *Moral Hazards*

It is difficult to discuss insurance, especially liability insurance,<sup>237</sup> without referring to its biggest counterargument: moral hazard. Moral hazard is a well-known risk embedded in the DNA of insurance. Much has been written about the perils of moral hazard and the negative effects it may have on the effectiveness of the insurance mechanism.<sup>238</sup> We review some of this literature below.

Moral hazard refers to the fact that insurance inherently removes, or at the very least reduces, insureds' incentives to prevent harm, since they know that they will not suffer liability as a consequence.<sup>239</sup> Moral hazard has been a prominent argument against the utilization of insurance since its emergence. In fact, in the nineteenth century, insurance was considered a violation of public policy due to moral hazard.<sup>240</sup> Its basic argument can be reduced into the catchphrase "less is more."<sup>241</sup> The less there is a "safety-net" for insureds against situations of loss, the more these insureds will be responsible for their own risk and will proactively behave in a manner that will better protect their interests. This will prevent an undesirable situation in which insureds will be able to make a gain from a loss.

However, the concept of moral hazard and the economics behind it ignore several crucial points about the insurance context.

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<sup>237</sup> Abraham, *supra* note 13, at 576-78, 580.

<sup>238</sup> For a discussion about cybersecurity and moral hazard, separate from the context of insurance, *see generally* Vagle, *supra* note 149, at 100. Vagle highlights attributes of technological devices that he claims exacerbate the moral hazard problem. *Id.* at 85.

<sup>239</sup> Kenneth J. Arrow, *Uncertainty and the Welfare Economics of Medical Care*, 53 AM. ECON. REV. 941, 961 (1963). For more on Arrow's work, *see* Tom Baker, *On the Genealogy of Moral Hazard*, 75 TEX. L. REV. 237, 267-69 (1996).

<sup>240</sup> *See* ABRAHAM, THE LIABILITY CENTURY, *supra* note 28, at 17 (2008); John Rappaport, *How Private Insurers Regulate Public Police*, 130 HARV. L. REV. 1539, 1553 (2017).

<sup>241</sup> Baker, *supra* note 239, at 238-39.

Moral hazard assumes that money can compensate for every loss and that the policyholder is in the best position to reduce harm by not engaging in risky behavior.<sup>242</sup> However, some injuries, such as bodily or emotional injuries, cannot be compensated by money alone, and external factors, such as software vulnerabilities, will never be in the control of the policyholders, making their ability to proactively prevent loss limited or even nonexistent. Other damages, like those caused by malicious or wanton behavior, are excluded from coverage according to the terms of the policy,<sup>243</sup> thus reducing the willingness of the insureds to behave recklessly.

Furthermore, by sharing the burdens of life, insurance protects the weaker segments of society that lack the power to negotiate their individual policies. Baker claimed that invocations of “moral hazard have helped to frame the debate over responsibility for harm in favor of the interests of the economically powerful.”<sup>244</sup> In other words, by summoning the specter of the risk-taking insured, moral hazard arguments place the burden of preventing accidents on the single consumer or worker, rather than the manufacturer or employer.<sup>245</sup> This is not always desirable from a social and economic perspective. After all, the manufacturer and employer usually hold greater power to reduce loss than their consumers and workers.

Moral hazards associated with innovation differ from traditional moral hazards, such as those posed by health, travel, and work accident insurance. Compared to the field of emerging technologies, the gravity and manner of the potential risk, peril, or injury are more predictable in traditional industries given their long history and existing data points. The expected risks are known, and exclusions have already been implemented that make explicit the risks insurers are unwilling to take upon themselves. This is not the case with regards to emerging technologies. This may encourage users, operators, or manufacturers of those to experiment with them, knowing that the potential damages they may inflict will be covered by their insurance policy, regardless of their actions.

However, this assumption is weakened once the policy covering the new technology excludes certain types of behaviors

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<sup>242</sup> *Id.* at 277-80.

<sup>243</sup> See, e.g., *General Liability*, OPERATIONAL RISK MGMT., <https://risk.gmu.edu/insurance/general-liability> [<https://perma.cc/9QWX-43BH>] (“Coverage may not be provided to employees or agents of Mason if it is determined that liability was incurred by reason of . . . [a]cts of intentional, malicious, or willful and wanton conduct.”).

<sup>244</sup> Baker, *supra* note 239, at 291.

<sup>245</sup> See *id.*; Abraham, *supra* note 13, at 586 (“The predominant rationale deployed in favor of workers’ compensation was that with the employer’s control over the workplace came responsibility for any injury that occurred there”), 601 (“ . . . manufacturers were both in the best position to minimize the risk of injury to product consumers and to insure against that risk”).

and sets safety conditions to prevent policyholders from acting recklessly. Insurance's reduction risk mechanism is essential in the context of emerging technologies where loss prevention services are scarce and desired. Insurers have powerful incentives to find and implement mechanisms of surveillance and control that will allow them to minimize their exposure to moral hazard, and to reduce premiums to compete in the marketplace. This is an important virtue of liability insurance—insurers become clearinghouses for and engines of information about safety.<sup>246</sup>

The notion of moral hazard as an insurance inhibitor is not unique in the context of emerging technologies and had been presented in the context of most new insurance products. This does not mean insurance should be foreclosed when emergent technologies appear. On the contrary, it should be viewed as a central lifeline and an inseparable instrument to facilitate the safe development of these emerging technologies.

It is important to note the issue of 'third-party moral hazard', identified by Parchomovsky and Siegelman.<sup>247</sup> This refers to situations in which third parties who have no bearing in the insurance policy are motivated by its existence to act in a reckless manner, knowing the insurer will pay for the loss. A good example is cyber insurance ransomware attacks.<sup>248</sup> The mere existence of a cyber policy can incentivize hackers to carry out these attacks knowing that the insurers will pay, thus increasing overall risks.<sup>249</sup> Traditional methods of mitigating moral hazards are less adequate with regards to third-party moral hazards as the insurance carriers do not have the means to influence the behavior of the third-party.<sup>250</sup> Parchomovsky and Siegelman offer a combination of self-help, regulatory and technological measures to mitigate this issue focusing on extra-contractual measures supported by the government.<sup>251</sup> It is true that loss prevention services as well as monitoring in the context of third-party moral hazards are less effective,<sup>252</sup> however, they have been proven as useful in the cyber insurance industry. Insurers have been trying to reduce the incentives malicious third-party actors might have by administrating

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<sup>246</sup> See Lior, *supra* note 168, at 511.

<sup>247</sup> Gideon Parchomovsky & Peter Siegelman, *The Paradox of Insurance* (draft, 2020).

<sup>248</sup> These are malicious software that encrypts users' data and provides a decryption key only when users pay ransom. See, for example, the NotPetya case in *supra*, Section IV.B.

<sup>249</sup> *Id.* See also Ronen Avraham & Ariel Porat, *Stacking the Odds: How Insurers Make our World Riskier* 19, 22 (draft, 2021).

<sup>250</sup> Parchomovsky & Siegelman, *supra* note 247, at 43.

<sup>251</sup> *Id.* at 50 (focusing on law enforcement when crimes occur, such as malicious hacking or ransomware attacks; technology standardization and reporting, and cartelization or regulation of industry structure).

<sup>252</sup> *Id.* at 44, 47.

a more nuanced underwriting process and nudging their policyholders to act more safely to prevent ransomware attacks.<sup>253</sup> Thus, though this issue presents a different type and scope of a challenge compared to ‘traditional’ first-party moral hazard, traditional and new moral hazards mitigation measurements can assist in alleviating this concern.

Moral hazard is an inherent barrier to the insurance industry that should not be ignored, but it is not sufficient to render the tool of insurance undesirable. Moral hazards can be mitigated, and are indeed mitigated in practice, by the actions of insurers themselves, who are incentivized to encourage their insureds to avoid reckless behavior and prevent loss when possible. The fewer accidents caused by their insureds, the more profit they make. These insurer incentives keep the moral hazard problem in check.<sup>254</sup>

### *B. Stifling Innovation*

Given the strict language used in liability policies and its rigid interpretation, tight underwriting by insurers may very well end up stifling or inhibiting innovation rather than encouraging it. This may happen when insurance carriers require their policyholders to follow rigid safety guidelines, for example using specific anti-virus software, preventing the dissemination of “open code”, or limiting users’ ability to tweak their devices,<sup>255</sup> for their policy to be effective. This means manufacturers’, as well as users’, ability to further push the envelope and create the next innovation will be compromised by their need to maintain their insurance policy, thus, opting for the safe and risk-hedged option—not innovating.<sup>256</sup>

Though this option is plausible, it does not render the notion of insurance as a facilitator of new technologies ineffective. In the context of cyber-insurance, Baker and Shortland stated that insurers must strive to strike a balance between their role as innovation

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<sup>253</sup> Woods, *The Evolutionary Promise of Cyber Insurance*, *supra* note 228. Cf. Talesh & Cunningham, *supra* note 235 (suggesting this nudging hasn’t worked well so far).

<sup>254</sup> See Abraham, *supra* note 13, at 582 (“Liability insurance, the court said, does not in any way relax the carrier’s duty of care and vigilance to the public.”). Given this monetary incentive, it is important to ensure public policy concerns are addressed by the regulator to avoid situations in which insurers take advantage of their power (i.e., refusing to provide policies to certain population). See ABRAHAM & SCHWARCZ, *supra* note 59, at 111.

<sup>255</sup> See, e.g., Ryan Calo, *Open Robotics*, 70 MD. L. REV. 571 (2010) (calling for “open” software to advance robotics and fulfil their promise).

<sup>256</sup> Tom Baker & Anja Shortland, *Insurance and Enterprise: Cyber-Insurance for Ransomware*, 48 GENEVA PAPERS ON RISK & INS. ISS. & PRAC. 1 (2022) (“Tight underwriting inhibits enterprise—not only for insured businesses but also the business of insurance.”).



facilitators, and their role as safety promoters.<sup>257</sup> Furthermore, tight underwriting practices can be viewed as local and do not have the capacity to inhibit the development of disruptive technologies. It is also rather limited when it comes to sustainable innovation as the readjustment of a given policy will be required in light of ‘incremental’ technological advancement. Furthermore, the lack of existing insurance has not prevented the creation of new technologies in the past, such as the steam engine, the airplane, or the internet. When there is demand for insurance, the industry will usually supply risk management tools, for the right price and with the necessary caps and exclusions. This may prolong the process of disseminating new technologies into the market, until the insurance industry will comply with the new demand, but that is not necessarily a negative outcome given our collective desire to ensure the safeness of a technology prior to its dissemination. Furthermore, insurance carriers will deny offering coverage for an activity with social costs that are too high. In this sense, insurers readiness to offer coverage reflects the net social value of the covered activity. This is not a bug in the mechanism of insurance, but rather a feature. This enables insurers to deter activities that have social costs which are too high.

With regards to exclusions, there is always a risk that some insurers may choose to exclude emerging technologies from coverage altogether, due to their unpredictability, the lack of information needed to calculate premiums, and their ability to cause great damages in nature and scope.<sup>258</sup> This can take shape in both commercial liability policies, such as a CGL policy,<sup>259</sup> and policies aimed at individual consumers, such as homeowners insurance.<sup>260</sup> This argument, however, does not justify the rejection of using insurance. All new technologies are dangerous and unpredictable to a certain degree when they are first introduced into the commercial market, as well as further along their technological development. This does not mean the insurance industry will ignore the opportunity to profit off policies. Particular kinds of claims may be excluded for emerging technologies’ policyholders at first, but as

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<sup>257</sup> *Id.* In the cyber-insurance context Baker and Shortland found that “cyber-insurance promoted enterprise by developing sophisticated remedies to contain liabilities arising from data breaches and encouraging ransomware gangs to deliver reliable decryption services, but largely left security decisions to the insured.” When cybercriminals adapted, insurers did not impose limitations and instead “turned to governments to contain criminal threats.”

<sup>258</sup> In the context of AI, *see* TURNER, *supra* note 181, at 117.

<sup>259</sup> *See* ABRAHAM & SCHWARCZ, *supra* note 59.

<sup>260</sup> When damages are caused to one’s home by emerging technologies. *See* Jim Travers, *What Does Homeowners Insurance Cover?*, U.S. NEWS (July 12, 2021), <https://www.usnews.com/insurance/homeowners-insurance/what-does-homeowners-insurance-cover>.

insurance companies collect and analyze more information, their ability to offer coverage to these excluded activities will grow.

Raising awareness about this issue within the insurance industry is also an important path to prevent it in the future or readjust the language of the policy over time. This will safeguard that the insurance industry continues to operate as a facilitator of new technologies, which is in their interest as it creates new markets for it to profit from.<sup>261</sup>

Insurance holds a part in advancing the implementation of safer technologies in existing traditional liability policies, such as medical malpractice, product liability<sup>262</sup> and automobile. Insurers can incorporate enhanced technologies into their policies in a manner that prevents loss while promoting innovation. This was most notable in the context of automobile insurance where the insurance industry pushed for the implementation of safety measures such as airbags and seat belts.<sup>263</sup> This feature enables insurers to encourage innovation, even within its existing traditional policies.

Avraham and Porat have argued that insurance companies have a perverse incentive to object to risk-reducing technological progress, such as AVs and gene editing, in light of their “understanding that more rather than less risks better serve their long term interests.”<sup>264</sup> Though this might be true, the public and regulator push towards the adoption of risk-reducing technologies forces insurance companies to make the best out of the situation and proactively act to encourage their policyholders to decrease losses in the long term and indeed adopt risk reducing technologies.<sup>265</sup> Furthermore, the fact that insurers have a long-term incentive to preserve certain levels of risks could be beneficial in the context of emerging technologies. This is because insurance carriers will always have an incentive to encourage these technologies as they maintain steady levels of risks, enabling insurers to make a profit while supporting innovation.

### *C. Adverse Selection*

In the insurance context, adverse selection refers to the information gap, in the form of asymmetric information, between insurers and insureds and its influence on market participation and

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<sup>261</sup> For more on insurance blocking technological progress see Avraham & Porat, *supra* note 249.

<sup>262</sup> For more about medical malpractice and product liability policies see ABRAHAM, *supra* note 28, at chapters 4 and 5 respectively.

<sup>263</sup> Ben-Shahar & Logue, *supra* note 146, at 213, 231.

<sup>264</sup> Avraham & Porat, *supra* note 249, at 25.

<sup>265</sup> For a critical view of their argument, see Kenneth S. Abraham & Daniel Schwarcz, *The Limits of Regulation by Insurance*, 98 IND. L. J. 215, 215, 258 (2022).

the willingness of insurers to provide insureds with accurate policies.<sup>266</sup>

Insurance is the art of pricing risk. In order to offer insurance coverage for a certain activity, insurers try to predict the probability that a specific policyholder will suffer a harm as a result of that activity and the predicted magnitude of that harm, should it materialize.<sup>267</sup> Actuarial science helps to calculate that probability via gathering and analyzing features and experience of a potential policyholder and a specific activity. In order to achieve the benefits associated with the aggregation and segregation of risks, insurers are highly motivated to establish an accurate classification based on the predictive risk of a policyholder.<sup>268</sup> These benefits derive from the fact that an accurate classification will enable insurers to add lower-risk policyholders to its risk pool and thus reduce the risk level of its insureds by charging accurate premiums.<sup>269</sup> This will lead to minimum payment of materialized accidents, which means maximum profit for the insurer.

This methodology is called risk classification and its main public justifications is to combat both moral hazards and adverse selection. Insurers can better combat adverse selection if they are able to set their premiums accurately based on risk classification.<sup>270</sup> This enables insurers to make sure low-risk policyholders enter their insurance pool by setting a tempting premium for their policy.<sup>271</sup>

Adverse selection leads to high purchase volumes of policies by those who know they need insurance, and the average premiums strikes them as a good deal, and not enough by those who do not necessarily require one, so the average premium is unappealing to them. For example, if Alex knows she is a reckless driver and that there is a high chance of her getting in an accident tomorrow,

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<sup>266</sup> See, e.g., Peter Siegelman, *Adverse Selection in Insurance Markets: An Exaggerated Threat*, 113 YALE L.J. 1223 (2004); Witt, *supra* note 165, at 780 (“Adverse selection describes the tendencies of high-risk insureds to seek out insurance and to stay in insurance pools, and of low-risk insureds to opt out of insufficiently subcategorized insurance pools that require them to subsidize the insurance of higher-risk insureds. Absent information sufficient to subcategorize insurance pools on the basis of the particular risk profiles of the insureds, adverse selection can lead to the eventual unraveling of insurance pools, as low-risk insureds abandon high-risk insureds.”).

<sup>267</sup> Rick Swedloff, *Risk Classification’s Big Data (R)evolution*, 21 CONN. INS. L.J. 339, 344 (2014).

<sup>268</sup> George L. Priest, *A Principled Approach Toward Insurance Law: The Economics of Insurance and the Current Restatement Project*, 24 GEO. MASON L. REV. 635, 640-47 (2017).

<sup>269</sup> Swedloff, *supra* note 267, at 345.

<sup>270</sup> KENNETH S. ABRAHAM, *DISTRIBUTING RISK: INSURANCE, LEGAL THEORY, AND PUBLIC POLICY* 67 (1986); Tom Baker, *Containing the Promise of Insurance: Adverse Selection and Risk Classification*, 9 CONN. INS. L.J. 371 (2003).

<sup>271</sup> For another related justification, see Swedloff, *supra* note 267, at 346 (“[P]ricing based on risk may be more fair to low risk insureds.”).

liability insurance priced to reflect the average risk of a car accident will be a bargain for her. On the other hand, if Ellie knows she is a terrific driver in comparison to the population, she will not buy a policy at the same premium rate. When the Alexes of the world buy lots of insurance and the Ellies of the world buy none, “insurers find themselves charging an average rate to a population that contains only the worst risks and end up losing money by virtue of having their product selected only by high-risk individuals.”<sup>272</sup> This situation may be harmful for both sides of the insurance bargain. Once insurance carriers cannot differentiate between high and low risks, their ability to spread loss over a large pool of insureds is compromised. A pool of only high risks insureds will result in very high premiums which may lead to a world where no one is covered.

Similar to moral hazards, adverse selection is an inherent barrier to insurance, but so far empirical studies have not supported the worst-case-scenario in which adverse selection leads to a world without insurance.<sup>273</sup> Adverse selection is mitigated by the actions of insurers themselves who follow a rigorous underwritten process as well as a careful claim management operation aimed at ensuring information flows in both ways.<sup>274</sup>

This constant flow of information helps facilitate the existence of insurance as a risk-management tool. This is true to a greater extent in the context of emerging technologies as both sides have an incentive to share information.<sup>275</sup> Sharing information will enable both sides to build a stronger foundation of technical knowledge and expertise that will ensure a smoother and safer transition of the new technology into our commerce stream.<sup>276</sup> The more information both sides of the insurance transaction have, the less likely the issue of adverse selection will raise, and the more likely policyholders’ can act safely while using or manufacturing disruptive and sustaining technology.

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<sup>272</sup> Siegelman, *supra* note 266, at 1223.

<sup>273</sup> Siegelman, *supra* note 266, at 1243; Ronen Avraham, *The Economics of Insurance Law—A Primer*, 19 CONN. INS. L. J. 29, 58 (2012).

<sup>274</sup> *Id.* at 53.

<sup>275</sup> High-innovation industry tend to guard their information, but this can be mitigated, to a certain extent, by insurers who limit and condition coverage on sharing accurate information. *See Lior, supra* note 168, at 506.

<sup>276</sup> This is not a comprehensive discussion about adverse selection in the insurance market. For more *see*, Avraham, *supra* note 273, at 44. *See generally*, Seth J. Chandler, *Visualizing Adverse Selection: An Economic Approach to the Law of Insurance Underwriting*, 8 CONN. INS. L.J. 435 (2002); Siegelman, *supra* note 266.

By definition, insurance is a profit-driven industry that benefits from the existence of risks in the short and long run.<sup>277</sup> Given the fact insurance operates in a private competitive market, it can also create negative externalities on parties not represented in the insurance contract. If third parties not covered by the policy can be left to pay the bill when damages occur, innovators might be able to drive innovation without worrying about the social costs. This can happen, for example, if tort liability rules are not in place yet, or if the innovators are able to use schemes, such as bankruptcy protections and other asset-shielding strategies, to shift costs on unsecured creditors.

As such, our expectations of insurers to proactively promote the public interest should be kept in check. Nonetheless, its track record still presents an overall welcoming approach supporting new technologies. This is because all sides of the bargain, the insurance industry, consumers, and innovators, benefit as innovative technologies enter the market and create new risks and new demand for insurance. Insurance drawbacks and negative externalities remain in check given the fact that insurance do not operate in a void. It is supplemented by other institutions, such as regulators, tort law and administrative law, to ensure that it can effectively encourage innovation without becoming a victim of its own inherent barricades.

## V. THE FUTURE OF INSURING NEW TECHNOLOGIES

Insurance constantly attempts to predict future developments of innovation. It does so with its underwriting process and the practice of selling policies for a fix price to protect from a future and uncertain harm. Nothing is more uncertain and has the potential to cause vast damages than new technologies.

Important issues that are raised in the context of insuring the next emerging technology is that of ‘known unknowns’ and ‘unknown unknowns’ risks and their influence on insurance carriers’ ability to offer meaningful coverage.

### A. KNOWN UNKNOWNNS AND UNKNOWN UNKNOWNNS

A major challenge in offering insurance to emerging technologies is setting accurate premiums.<sup>278</sup> To calculate them, actuarial science requires a preexisting pool of information.<sup>279</sup> In the context of most emerging technologies information is lacking. This

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<sup>277</sup> Avraham & Porat, *supra* note 249.

<sup>278</sup> *See supra*, Section III.B.

<sup>279</sup> These calculations provide rather accurate information about the probability of harms occurring in the future as well as their predicted severity. *See, e.g.*, Ben-Shahar & Logue, *supra* note 146, at 203.

presents a substantial challenge to insurers' ability to offer coverage for damages caused by new technologies.

In this sense, future accidents involving new types of technologies can be seen as "known unknowns,"<sup>280</sup> and in certain situations maybe even "unknown unknowns." The former refers to "contingencies that we know exist, but to which neither a probability nor a magnitude can be actuarially assigned."<sup>281</sup> The latter refers to risks that "we don't know we don't know."<sup>282</sup> As a result, insurers will usually decline to offer coverage for these types of risks, typically leaving the government as the only regulator that can act against them, and sometimes the only entity which is able and willing to offer insurance. This is because governments are not purely motivated by financial incentives, unlike insurers, but rather by other public policy goals inherent to their elective role. In essence, "insurance pools risk with other similarly suited, and balances the entire subset of risks with other independent risks,"<sup>283</sup> this is a form of hedging one's bets. An important question arises about the feasibility of insurance policies once there is not enough information to pool these risks together.

One example of such 'known unknowns' is terrorism insurance. Boardman discussed the insurability and validity of terrorism insurance policy and reached the conclusion that these types of insurance are not feasible in the US.<sup>284</sup> She explained this conclusion by stating that, when it comes to terrorism, "we are aware of the risk but are still too ignorant to calculate and redistribute the risk in an insurance pool."<sup>285</sup> This is partly because terrorist attacks must become more frequent for actuarial data to be useful in creating efficient terrorism policy.<sup>286</sup> Some may claim that this notion is also applicable to emerging technologies and the damages that they might cause upon their integration into our commercial market.

Boardman presented several incidents which are uninsured or underinsured given their unique features—their potential loss is great, possibly widespread, and impossible, or at least extremely

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<sup>280</sup> This term was first used by U.S. Defense Secretary Donald Rumsfeld, quoted in Philip Stephens, *The Unwitting Wisdom of Rumsfeld's Unknowns*, FIN. TIMES 19 (Dec. 12, 2003). See, e.g., Michelle E. Boardman, *Known Unknowns: The Illusion of Terrorism Insurance*, 93 GEO. L.J. 783 (2005). Ben-Shahar & Logue, *supra* note 146, at 229. In the context of AI regardless of insurance law see James S. Azadian & Garrett M. Fahy, *Artificial Intelligence and the Law: Navigating "Known Unknowns"*, 59-OCT ORANGE COUNTY LAW. 22 (2017). Some have even gone further by stating that "attacks on our ML [machine learning] models are unknown unknowns." See Kumar & Nagle, *supra* note 140.

<sup>281</sup> Ben-Shahar & Logue, *supra* note 146, at 229.

<sup>282</sup> See *supra* note 280.

<sup>283</sup> Boardman, *supra* note 280, at 809.

<sup>284</sup> *Id.* at 786.

<sup>285</sup> *Id.*

<sup>286</sup> *Id.* at 785.

difficult, to calculate. These include nuclear attacks, chemical attacks, utility disruption, business interruption and dirty bombs.<sup>287</sup> The scale and scope of losses these events may inflict upon commercial and noncommercial entities make their insurability questionable for insurance companies. However, as elaborated below,<sup>288</sup> it seems that most emerging technologies are not similar enough to fall within the same categories as these incidents with regards to the level of involvement we expect the government to have, the scope of their harmful ramifications, and the circumstances that led to their harmful occurrence.<sup>289</sup>

A good example to this notion can be found in the context of AI technology. Despite the great power AI potentially holds, and the warnings made by scientists against it,<sup>290</sup> AI will probably resemble car or work accidents more than nuclear or chemical attacks. AI may be used as weapons or harmful instruments in a terrorist attack,<sup>291</sup> but the emphasis will be on the nature of the terror attack itself and not necessarily on the usage of AI, or any other technology for that matter, as an instrument to carry out these attacks.<sup>292</sup> As a result, even if one views AI accidents as ‘known unknowns’, they are not similar enough to terror attacks and other widespread damages accumulating to uninsurable events. Therefore, offering coverage for these activities will be more feasible and less dangerous.

The issue of ‘unknown unknowns’ presents a slightly different challenge to insurers. Ben-Shahar and Logue claimed that “ironically, some so-called ‘unknown unknowns’ . . . may be more easily insured, at least to the extent that insurers provide coverage in the form of all-risk policies—that is, policies that cover all losses except those expressly excluded.”<sup>293</sup> In cases of ‘unknown unknowns’, insurers lack the necessary information to underwrite

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<sup>287</sup> *Id.* at 792-96. Another relevant one is global pandemics, *See, e.g., COVID-19 and the Insurance Industry*, PWC, <https://www.pwc.com/jg/en/issues/covid-19/covid-19-and-insurance-industry.pdf> [<https://perma.cc/4V9A-Z2DP>].

<sup>288</sup> *See infra*, Section VI.B.

<sup>289</sup> Inherently, terrorism will usually be connected to a specific government or civilian population in a manner that does not characterize AI accidents. For an example for a definition of an act of terror, *see* Boardman, *supra* note 280, at 804.

<sup>290</sup> An example for this is the open letter on AI, which was signed in January 2015 by, *inter alia*, Elon Musk and Stephen Hawking, calling for more research on the topic and warning from its potential pitfalls. *Research Priorities for Robust and Beneficial Artificial Intelligence: An Open Letter*, FUTURE OF LIFE INST. (Oct. 28, 2015), <https://futureoflife.org/ai-open-letter> [<https://perma.cc/F6TB-CJPM>].

<sup>291</sup> For a discussion about the benefits of gun insurance (which can be viewed as an ‘innovation’), *see* George A. Mocsary, *Insuring Against Guns?*, 46 CONN. L. REV. 1209 (2014).

<sup>292</sup> Similarly, situations in which the AI entity is misused in a way that does not manifest its unique features (e.g., throwing a security robot towards a crowd, causing damages) will not be considered an AI activity because the unique features of AI played no part in the process of causing the harm.

<sup>293</sup> Ben-Shahar & Logue, *supra* note 146, at 229.

operative exclusions into their policies. The notion of offering coverage to risks “we don’t know we don’t know” is foreign in essence to the actuarial assumptions that insurance is built upon. If we don’t know a risk is about to happen, insurers lack the capacity and knowledge to even offer policies covering or excluding these risks. In practice, though, it seems that once a policy insurance is in place to cover the usage of emerging technologies offered to consumers, until explicitly excluded in the beginning or over time, unknown unknowns will essentially be covered by insurers as an inherent feature of their policy. Once an unknown unknown risk is manifested, it transforms to a ‘known unknown’ risk, or even a ‘known known’ risk, which an insurance company can collect information about and provide a policy which is beneficial to both parties, under the appropriate premium.

Finally, when discussing governmental involvement in offering insurance for emerging technologies, it is important to note that once damages caused by them exceed a certain predetermined cap,<sup>294</sup> it is reasonable to expect governments will step in to fill the void left by insurers.<sup>295</sup> This is because in the fringe, yet possible, cases where new technologies cause excessive damage, equal in nature to nuclear or chemical attacks, governments have a compelling interest to intervene in the insurance market.<sup>296</sup> Furthermore, the US government has repeatedly and publicly declared its interest in advancing and supporting innovative technologies, such as AI,<sup>297</sup> making it a national priority that should be secured and backed-up financially in case it leads to extensive damages.

## B. THE FEASIBILITY OF INSURING EMERGING TECHNOLOGIES

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<sup>294</sup> This relates back to the notion of ‘unknown unknowns’, as they are an important part of the fact insurers require policy limits and caps in the first place. *Id.*

<sup>295</sup> See *infra* Part VI.C.1.

<sup>296</sup> For example, nuclear accidents insurance is mandatory, highly regulated, and backed by federal funds. *Insurance Coverage for Nuclear Accidents*, INS. INFO. INST. (Mar. 17, 2011), <https://www.iii.org/article/insurance-coverage-nuclear-accidents> [<https://perma.cc/Q9HJ-PP6D>]. The Price-Anderson Act (Atomic Energy Damages Act (Price-Anderson Act), Pub. L. No. 85-256, 71 Stat. 576, 42 U.S.C. § 2210 (2012)) created a three-tier insurance scheme to handle “claims of members of the public for personal injury and property damage caused by a commercial nuclear power plant accident.” *Backgrounder on Nuclear Insurance and Disaster Relief*, U.S. NRC, <https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/nuclear-insurance.html> [<https://perma.cc/27WG-CRSR>].

<sup>297</sup> See, e.g., *Maintaining American Leadership in Artificial Intelligence*, 84 Fed. Reg. 3967 (Feb. 14, 2019), <https://www.federalregister.gov/documents/2019/02/14/2019-02544/maintaining-american-leadership-in-artificial-intelligence> [<https://perma.cc/7QB7-WK84>].



Before an insurer can offer policies for a specific risk, it must first answer three questions. First, how much reserve does it need to set aside to meet all futuristic expected losses, if those occur? Second, given the reserve decided upon, how much should it charge for that specific risk via premiums? Third, how much does the insurer actually have available in order to remain solvent assuming the worst-case scenario occurs?<sup>298</sup> The first two questions are answered by actuarial science, but Boardman argues that in cases of true uncertainty, as with terrorism, one cannot fully answer these questions in a way that allows insurers to provide efficient insurance. However, as was previously argued, the vast majority of emerging technologies should not be viewed as true uncertainties in the same way some may view terrorism as a true uncertainty. This is in light of the difference between those events and the damages caused by emerging technologies, such as the traits, characteristics and position they assume within our commercial market.

Unlike terrorism and other widespread events, damages caused by emerging technologies should be viewed more as a *risk*, rather than as an *uncertainty*.<sup>299</sup> We may not be able to predict the exact timing or magnitude of a loss caused by the usage of innovative technology, similar to terrorist attacks, but we have far greater information about the statistical likelihood of technologies causing harms than other widespread risks that are considered uninsurable. This provides society with assurance that the risks associated with emerging technologies are indeed manageable, or at the very least more manageable than scenarios surrounded by profound uncertainty. Another important differential feature is the commercial context in which emerging technologies are embedded. This context provides far more predictability of loss than other wide-scale malicious events.

When we examine insurers' ability to offer policies for technological losses and risks, we must evaluate three components: calculation, distribution, and profitability.<sup>300</sup> These components are intertwined with the three questions presented above and will provide the necessary information to answer them.<sup>301</sup>

First, in order to *calculate* the risk, which manifests itself via premium estimation per policy, insurers must evaluate a few elements, chief among them are the chance an accident will happen, the expected amount of loss from said accident, a set of premiums for each category of policyholders, and the amount the insurer must

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<sup>298</sup> Boardman, *supra* note 280, at 812.

<sup>299</sup> *Id.* at 811.

<sup>300</sup> *Id.* at 813-14. See also PAUL K. FREEMAN & HOWARD KUNREUTHER, *MANAGING ENVIRONMENTAL RISK THROUGH INSURANCE* (1997). In the context of terrorism policies see, e.g., James W. Macdonald, *Terrorism, Insurance, and TRIA: Are We Asking the Right Questions?*, 18:2 *JOHN LINER REV.* 3 (2004).

<sup>301</sup> See *supra* note 298 and accompanying text.

hold in reserve. Today's emerging technologies, such as Internet of Things (IoT), biometrics, 5G technology, augmented/virtual reality, blockchain, quantum computing, gene editing, facial recognition, cyber datasets, and nanotechnology,<sup>302</sup> seem to present damages and risks which possess the ability to be calculated by insurers. Most of these technologies simply amplify and enhance our current technological and human capabilities. They rarely create a completely new ability or capacity which can be considered incalculable.<sup>303</sup> They may increase the scope and magnitude of the damages that may ensue as a result of their usage, but that enhancement, and the risks that come with it, can be monitored and managed as it develops over time. As such, insurers should be able to calculate the risks associated with the usage of these new technologies, especially given their commercial nature, even if that means they take the "worst-case-scenario" at first, leading to higher premiums that do not necessarily reflect the accurate price of risk-shifting embedded in policies.<sup>304</sup>

A good example to this notion can be found in the context of AI. Because today's AI commercial entities are mostly substituting products that already exist on the market, thus enhancing our current capabilities, insurers already possess information about these elements with regards to these products or services in the pre-AI area. This information is invaluable in the AI context and will form the baseline for insurers' calculation at the beginning, until new specific AI information incorporating the enhanced capabilities of AI-based commodity will be collected and analyzed.

The market assumes that AI will be safer by nature, and this is one of the main reasons to encourage its usage and its replacement of actions carried out by humans.<sup>305</sup> For example, there is no reason to deploy AVs unless they provide safer performances compared to a human driver. Given this assumption, the premiums of policyholders, which are based on previous non-AI based entities, should decrease over time. The insurers should be better off given the fact the overall risk has decreased because of the use of AI, and they can create a baseline calculation of the abovementioned

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<sup>302</sup> Kevin Dickinson, *10 Emerging Technologies that will Change our World*, BIG THINK (May 31, 2021), <https://bigthink.com/the-future/10-emerging-technologies-change-world> [<https://perma.cc/V3LV-YZCR>].

<sup>303</sup> Except for the potential caveat of the singularity. See Section VII.A.

<sup>304</sup> This is referred to as a "premium load", describing "the difference between the primum paid, and the *expected* present value of losses." See Neil A. Doherty & Clifford W. Smith, Jr., *Corporate Insurance Strategy: The Case of British Petroleum*, 6 J. APPLIED CORP. FIN. 3, 5 (1993). See also George A. Mocsary, *Insuring the Unthinkable*, NEW APPLEMAN ON INS.: CURRENT CRITICAL ISSUES IN INS. L. 1,4 (2018).

<sup>305</sup> For more on this substitution effect see Lior, *supra* note 168, at 474.

elements based on their existing datasets.<sup>306</sup> Thus, the calculability of AI accidents is inaccurate now, and the premiums will probably be high at first.<sup>307</sup> The emergence of new AI into the commercial market, however, will allow insurers to recalculate, adjust and readjust their premiums.<sup>308</sup> Insurers already carry out this refinement process today with regards to other potential risks and losses they offer coverage for.<sup>309</sup> This means first adopters of innovation usually pay higher premiums, but that is the price first adopter pay for their curiosity and willingness to take more risk upon themselves.<sup>310</sup>

This process, where insurance companies adjust premiums as a new technology is more widely adopted, is highly dependent on the cooperation of users and manufactures of these technologies, as well as their willingness to provide data. This may be problematic in cases where these users and manufactures, mainly the latter, wish to withhold important information about their technologies and its vulnerabilities fearing, *inter alia*, reputational harms,<sup>311</sup> proprietary issues,<sup>312</sup> or being denied insurance. Ideally, the way the mechanism

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<sup>306</sup> For a different approach see Bertolini, *supra* note 135, at 308 (“In cases where the activity is already performed through non-robotic applications, the data available may become obsolete and insignificant.”). However, Bertolini’s claim does not refer to the fact these activities should be safer than their previous non-technological human conductor.

<sup>307</sup> See *supra* note 140 and accompanying text.

<sup>308</sup> An important caveat is that cyber insurers seldom do not have access to good data because the lawyers who insurers hire to coordinate breach-response refuse to produce or disclose good information about the breach to insurers, claiming that doing so could constitute a waiver of confidentiality protections like attorney-client privilege or work product doctrine. Hopefully, this tactic could be mitigated over time via legislation or adjudication given the importance of gathering good data for insurance practices. See Daniel Schwarcz, Josephine Wolff & Daniel W. Woods, *How Privilege Undermines Cybersecurity*, [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=4175523](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4175523) [<https://perma.cc/8NV2-FPDL>].

<sup>309</sup> We saw this process during the COVID-19 pandemic where insurers stopped offering insurance or significantly increased travel premiums. See, e.g., Christopher Elliott, *This is the Surprising Way Coronavirus Has Changed Travel Insurance*, FORBES (Apr. 5, 2020), <https://www.forbes.com/sites/christopherelliott/2020/04/05/this-is-the-surprising-way-coronavirus-has-changed-travel-insurance/#1c5938e81664> [<https://perma.cc/X5K9-T66R>].

<sup>310</sup> See Graham, *supra* note 137, at 1260; Sally H. Clarke, *Unmanageable Risks: MacPherson v. Buick and the Emergence of a Mass Consumer Market*, 23 L. & HIST. REV. 1 (2005); Michael Gort & Steven Klepper, *Time Paths in the Diffusion of Product Innovations*, 92 ECON. J. 630 (1982); Arthur R. Newman, II, *Damage Liability in Aircraft Cases*, 29 COLUM. L. REV. 1039 (1929).

<sup>311</sup> See, e.g., Paula Vene Smith, *Risks That Hide Behind Reputation and Compliance*, RISK & INS. (Nov. 3, 2014), <https://riskandinsurance.com/risks-hide-behind-reputation-compliance> [<https://perma.cc/3NNZ-US6V>].

<sup>312</sup> Jason P. Cronic & Leland H. Jones IV, *The Prudential Need for Insurer Access to Information*, WILEY (Jan. 11, 2017), <https://www.wiley.law/article-The-Prudential-Need-for-Insurer-Access-to-Information> [<https://perma.cc/8LPY-KUW4>].

of insurance is built should prevent this from happening. This is because, first, risk-averse users and manufactures will want to purchase some sort of insurance policy to hedge their activities; and second, in order to purchase said policy, they will be required to provide extensive information about their technology. Hiding or omitting information will likely amount to misrepresentation,<sup>313</sup> and will lead to the insurer's rejection of indemnification claims.<sup>314</sup> Thus, it is in their best interest to provide complete and accurate information to ensure future coverage. Eventually, enough information will be collected to create more accurate policies and the pool of risk-takers will expand, allowing insurers to adjust their premiums. This leads to our second component of insurability—distribution.

Second, in order to provide insurance for a specific risk or loss, insurers must be confident in their ability to *distribute* the risk (i.e., risk shifting) and that risk-pooling is feasible and large enough<sup>315</sup> in the field they are operating in—“grouping a large number of ventures in a pool increases the probability that the losses suffered by all the ventures will be spread over time.”<sup>316</sup>

Specialized insurance companies with specific expertise will be able to ensure their risks are distributed in the field they operate in. Going back to the example of AI and AVs, auto insurance specialized carriers already have large pools of pre-existing ventures using non-autonomous vehicles. These insurers can group owners of vehicles together to ensure risk shifting once damages occur. This is also true with regards to other fields where AI will probably be dominant, such as, professional liability for lawyers and doctors, which already have risks-pools in place. The same notion is applicable to the technology of robotics not based on AI conducting activities, which were once the sole realm of humans. Policies covering emerging technologies will be balanced out with other non-emerging technologies insured risks within the insurer's pool. These insurance carriers will be able to create new designated pools for these technologies, which operate within their expertise field once enough ventures will be willing to take part in these new technological activities.

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<sup>313</sup> See, e.g., Kevin Gatzlaff, Stephen Avila & John Fitzgerald, *Material Misrepresentations in Insurance Litigation: An Analysis of Insureds' Arguments and Court Decisions*, 34 J. INS. REGUL. (2015).

<sup>314</sup> See, e.g., Garry Marr, *Lying on your Insurance Policy will Lead to Trouble Come Claim Time*, FIN. POST (July 10, 2012), <https://business.financialpost.com/personal-finance/lying-on-your-insurance-policy-will-lead-to-trouble-come-claim-time> [<https://perma.cc/N3TQ-5EM4>].

<sup>315</sup> TOM BAKER & KYLE D. LOGUE, *INSURANCE LAW AND POLICY: CASES AND MATERIALS* 14 (2017).

<sup>316</sup> Boardman, *supra* note 280, at 813; ROBERT E. KEETON & ALAN I. WIDISS, *INSURANCE LAW* §1.3 (1988).

Not all damages caused by emerging technologies are identical. This is true with regards to their nature and character, but also with regards to the timing the policy will be due. Unlike the fear of terrorism and other grand-impact events, such as global health pandemics,<sup>317</sup> that will affect many policyholders with identical damages at once, the market of different emerging technologies is far more diversified and specified. This allows expert insurers to issue policies to consumers, manufactures or whomever is obligated or desires to purchase this type of hedging within their filed of expertise.

Third is the element of *profitability*. Even though the existence of the two first elements is enough to ensure a risk is insurable, lacking the third element will essentially mean there is no market for insuring these types of risks: “it may be impossible to specify a rate for which there is sufficient demand and incoming revenue to cover the development, marketing, and claims cost of the insurance and still yield a net positive profit.”<sup>318</sup> If this element is not achievable but there is still a demand for insurance, usually the government will step in and government-subsidized premiums will bridge this profitability gap. This will allow insurers to offer policies to the public by utilizing governmental support and still make a profit.

Returning to the AI example, there should not arise any issues with the profitability of insurers to offer policies covering commercial AI damages.<sup>319</sup> This is because there already exists a vast market for activities and instruments that are supposed to be replaced by AI, such as truck drivers, security guards, radiologists,<sup>320</sup> lawyers and doctors.<sup>321</sup> In order to ensure the safe

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<sup>317</sup> *COVID-19 Loss of \$44 Bln is 3rd Largest Catastrophe Cost to Insurers – Howden*, REUTERS (Jan. 4, 2022), <https://www.reuters.com/markets/commodities/covid-19-loss-44-bln-is-3rd-largest-catastrophe-cost-insurers-howden-2022-01-04> [<https://perma.cc/J4RX-4T7K>].

<sup>318</sup> Howard Kunreuther, *Insurability Conditions and the Supply of Coverage*, in *PAYING THE PRICE: THE STATUES AND ROLE OF INSURANCE AGAINST NATURAL DISASTERS IN THE UNITED STATES* 17, 27 (Howard Kunreuther & Richard J. Roth eds., 1998); Boardman, *supra* note 280, at 814.

<sup>319</sup> Except for the caveat mentioned above. *See supra* note 296 and accompanying text.

<sup>320</sup> *See, e.g.*, Martin Lindner, *The Changing Role of the Radiologist in the Age of AI*, SIEMENS HEALTHINEERS (Nov. 7, 2018), <https://www.siemens-healthineers.com/en-us/news/mso-radiologist-profile.html> [<https://perma.cc/QA9X-648Z>].

<sup>321</sup> For lawyers *See, e.g.*, Or Bakai, *An Interview with Anat Lior: AI and Practicing Law – High Potential, High Risks*, TECH. & L. ISR. (Dec. 19, 2018), <https://techlaw.co.il/en/an-interview-with-anat-lior/?fbclid=IwAR2V4bPDzNZ79TtClS1StHInTCZCjr9D-nSJEBCceymtxmcgKpND3j8QU>. For doctors and surgeons, *see, e.g.*, Alice Park, *Machines Treating Patients? It's Already Happening*, TIME (Mar. 21, 2019), <https://time.com/5556339/artificial-intelligence-robots-medicine> [<https://perma.cc/39A5-Z2GW>].

use and dissemination of these AI-based technology into the market, there will most probably be a demand for insurance policies covering AI, whether by the users or by the manufactures. This is also true with regards to other emerging technologies that desire to disseminate their products to consumers while enjoying the risk-management benefits offered by insurance, such as nanotechnology<sup>322</sup> and eventually quantum computing.<sup>323</sup>

Here, it is important to note the issue of narrow coverage and explicit exceptions and exclusions, which presents a broad problem regarding the feasibility of insuring new technologies. Exceptions and exclusions can be silent rather than affirmative—that is, risks an insurance company has not foreseen will simply not appear in their existing policies, meaning covering damages that amount to ‘unknown unknowns’.<sup>324</sup> This tendency is particularly marked in the emerging technology space, where many risks have not yet materialized or conceptualized.<sup>325</sup> As new technologies start to cause damages, insureds turn to their existing traditional policies to receive indemnification. In response, insurance companies actively omit these new types of risks from their traditional policies. To cover these newly uncovered risks, new forms of insurance policies or special “riders” are created.<sup>326</sup> The cyber insurance field illustrates this process.<sup>327</sup> Over time, many perils overlapping between cyber insurance and traditional policies, such as property, errors and omission liability, directors and officers, and general

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<sup>322</sup> See *supra* note 166 and accompanying text.

<sup>323</sup> See *infra*, Section VII.B.

<sup>324</sup> See *supra*, Section VI.A.

<sup>325</sup> The distinction is between features which are explicitly covered—affirmative features—and features which are not mentioned nor excluded and are therefore silent. In the context of cyber insurance, for example, the distinction is between policies that offer explicit cyber protections and those that are silent and therefore ‘non-affirmative’ as to the scope of application of the insurance policy in instances of cyber harm. These policies pose “significant risk of exposure and legal uncertainty to both insurers and the insured.” Lubin, *supra* note 140, at 60. See *Affirmative vs. Silent Cyber: An Overview*, GUY CARPENTER & CO. LLC (Oct. 2018), [www.guycarp.com/content/dam/guycarp/en/cmp/Affirm%20vs%20Silent%20Cyber%20Briefing%20FINAL%20\(2\).pdf](http://www.guycarp.com/content/dam/guycarp/en/cmp/Affirm%20vs%20Silent%20Cyber%20Briefing%20FINAL%20(2).pdf).

<sup>326</sup> “Riders are essentially additional benefits added to an insurance policy that often require an additional premium payment. In this way, riders can customize a life [or any other] insurance policy to address specific needs or concerns.” Allen Wastler, *Understanding Life Insurance Policy Riders*, MASSMUTUAL (July 17, 2019), <https://blog.massmutual.com/post/insurance-riders#:~:text=Riders%20are%20essentially%20additional%20benefits,address%20specific%20needs%20or%20concerns>.

<sup>327</sup> See *Affirmative vs. Silent Cyber: An Overview*, *supra* note 325. See also, *Enhancing the Role of Insurance in Cyber Risk Management* *supra* note 33; John Egan, *Cyber Insurance: What is it and What Does it Cover?*, POLICYGENIUS (May 31, 2017), <https://www.policygenius.com/blog/cyber-insurance-cover> [https://perma.cc/GGV3-9FBN].

liability, were excluded from these traditional policies.<sup>328</sup> They are now covered by cyber insurance policies or specific riders.<sup>329</sup> This was a result of new damages relating to cyber space which insurers did not have in mind when they first offered these policies. Once these damages appeared, insurers excluded them from their traditional policies, leading to the creation of cyber-insurance specific policies.

This process is likely to repeat itself in the short term with regards to different emerging technologies, such as AI, as well as in the long term as new emerging technologies enter the market. Insurers will slowly exclude coverage for AI harms that their policy did not intend to cover. As a result, insureds will seek specialized riders to affirmatively cover these damages. This process of excluding previously silent technological damages will diminish the risk of exposure for insurers and increase legal certainty for both insurers and insureds, who will be motivated to obtain affirmative coverage. The end result is clearer knowledge of the risks posed by novel technologies for insurers and clearer coverage of those risks for insureds.

### C. OTHER INSTITUTIONS

As privately owned, profit-driven entities, insurance carriers should not operate alone or in a void. Stepping outside of the traditional relationship of an insurer and an insured, third parties, mainly the government and reinsurers, also have a pivotal role when it comes to the future financialization of insurance focused on emerging technologies. Both infuse the insurance markets with

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<sup>328</sup> See OECD, *supra* note 227, tbl. (presenting a table of the potential for overlapping coverage for cyber risk in stand-alone and traditional policies based on JLT Re 2-17).

<sup>329</sup> Another example is the damages created by the then-new World Wide Web. Traditional policies (such as Error and Omission (E&O)) have transformed into technological ones to accommodate new technological risks. See Tapen Sinha & Brady Condon, *Electronic Risk Management*, in E-BUSINESS PROCESS MANAGEMENT – TECHNOLOGIES AND SOLUTIONS 292, 308 (2007); Hazel Glenn Beh, *Physical Losses in Cyberspace*, 8 CONN. INS. L.J. 55, 56 (2001) (“gaps in coverage and the current state of uncertainty will be transitory. Insurers will respond quickly to adverse judicial decisions by drafting more ironclad exclusions and by offering more suitable insurance product”); Robert H. Jerry, II & Michele Mekel, *Cybercoverage for Cyber-Risks: An Overview of Insurers’ Responses to the Perils of E-Commerce*, 8 CONN. INS. L.J. 7, 8 (2002) (“Policyholders also face new challenges as they confront the possibility that their traditional insurance coverages are woefully inadequate either to secure their electronic and intellectual property assets or to guard against their potential e-commerce liabilities to third parties”). Another example is the transition from horses and carriages to cars and the implications it had on insurance, See, e.g., Adam F. Scales, *Man, God and the Serbonian Bog: The Evolution of Accidental Death Insurance*, 86 IOWA L. REV. 173 (2000); Edson S. Lott, *Accident Insurance*, 26 AM. ACAD. POL. & SOC. SCI. ANNALS 483 (1905).

funds it needs when it lacks the financial incentive or the financial reserves to offer coverage. These two entities, along with the tool of catastrophe bonds, will most likely have a significant role in providing coverage for emerging technologies.

### 1. Government support

Governments have an important role in supporting and enabling insurance companies to offer policies by “making risks insurable.”<sup>330</sup> Baker and Shortland suggested that “successful regimes for insuring corporates are never fully private.”<sup>331</sup> The high level of government involvement in the emerging technologies market, mostly in the form of funding and legislating, renders this observation especially apt when managing risks associated with innovation.

When insurers lack the incentive to offer policies due to profitability issues, governments often take it upon themselves to facilitate an insurance market. A prominent example for this in a federal context is insurance for the nuclear power industry.<sup>332</sup> In a state context, some states have legislated assigned-risk plans and joint underwriting associations to ensure automobile insurance is available to drivers who cannot obtain coverage through the regular insurance market.<sup>333</sup> Another example is that of the Fair Access to Insurance Requirements (FAIR) plan. This plan is a state-mandated program providing access to property insurance for homes that are considered at high-risk of damages.<sup>334</sup> In some cases, this plan was successful enough to stimulate the private insurance market in a manner that led to the phasing out of the program.<sup>335</sup> This can also be applicable in the context of emerging technologies, though to a lesser extent. This type of intervention will be useful assuming that governments have an incentive to ensure individuals have access to policies covering activities involving emerging technology. If these types of policies will be mandatory, the government will need to ensure everyone who wishes to has access to this type of coverage. Otherwise, it seems less likely that the government will proactively

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<sup>330</sup> Tom Baker & Anja Shortland, *A New Framework for Analyzing Government and Insurance, with Lessons for Ransomware* 1, 1 (2022).

<sup>331</sup> *Id.*

<sup>332</sup> Anat Lior, *AI Strict Liability Vis-À-Vis AI Monopolization*, 22 COLUM. SCI. & TECH. L. REV. 90, 121-22 (2020).

<sup>333</sup> Abraham & Baker, *supra* note 63, at 195. This is also available in some states with regards to malpractice insurance. *Id.*

<sup>334</sup> Mila Araujo, *Explanation of the FAIR Plan*, THE BALANCE (Jan. 12, 2022), <https://www.thebalance.com/fair-plan-policies-2645392> [https://perma.cc/3NPH-A52E].

<sup>335</sup> Jennifer B. Wriggins, *In Deep: Dilemmas of Federal Flood Insurance Reform*, 5 U.C. IRVINE L. REV. 1443, 1447 (2015).



push insurance companies to offer coverage for these types of activities.

## 2. *Reinsurance*

Reinsurance is known as ‘insurance for insurance companies.’ It is a traditional mechanism to finance insurance via transferring risk portfolios from an insurer (the ceding party) to another party (the reinsurer). This in essence reduces the likelihood of the ceding party’s obligation to pay a large obligation due to an insurance claim. The mechanism of reinsurance provides the ceding party security for its equity and solvency in case a widespread covered event would ensue, causing damages beyond the money reserves the ceding party has. In these cases, the lack of reinsurance will lead the ceding party to bankruptcy leaving its insureds with no ability to receive reimbursement for their claims. Reinsurance enables the ceding party to underwrite policies that cover a large quantity of risk without raising its administrative costs to cover its solvency margins.<sup>336</sup>

A notable example of the US government acting as a reinsurance is that of the Terrorism Risk Insurance Act (TRIA),<sup>337</sup> enacted by US Congress in 2002. Following the 9/11 attacks, insurers inserted terrorism exclusions into their liability policies. In an attempt to encourage these insurers to remove these exclusions and provide coverage for loss arising out of a terror attack, the TRIA established a reinsurance mechanism. The trigger for this mechanism is fulfilled once insurers paid losses of \$200 million dollar following an act certified by the Secretary of State as a terror attack. In this case, eligible insurers can “recoup reinsurance for 80 percent of their payments beyond their deductible, which is calculated as 20 percent of the insurer’s previous year’s direct earned premiums.”<sup>338</sup> The cap for aggregated government and private insurer payout for losses is \$100 billion annually.<sup>339</sup> In practice, many insurers removed their terrorism exclusion for an additional premium, thus making the TRIA successful in achieving its aim.<sup>340</sup>

So far, the government-funded reinsurance model has not been expanded to cover other types of damages, but it has been

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<sup>336</sup> *Reinsurance*, INVESTOPEDIA, <https://www.investopedia.com/terms/r/reinsurance.asp> [<https://perma.cc/S5BS-YJ9G>].

<sup>337</sup> Terrorism Risk Insurance Act (TRIA), 15 U.S.C. § 6701; 28 U.S.C. § 1610; 12 U.S.C. § 248, § 6701; 28 U.S.C. § 1610; 12 U.S.C. § 248.

<sup>338</sup> Abraham & Baker, *supra* note 63, at 195-96.

<sup>339</sup> Terrorism Risk Insurance Act (TRIA), 15 U.S.C. §6701(103)(e)(B)(2)(A).

<sup>340</sup> Federal Insurance Office, U.S. Department of the Treasury, Report on the Effectiveness of the Terrorism Risk Insurance Program 15 (June 2020). <https://home.treasury.gov/system/files/311/2020-TRIP-Effectiveness-Report.pdf> [<https://perma.cc/UVE4-KD9D>].

proposed as a mean to handle insurers' reluctance to provide coverage for potentially catastrophic risk, such as pandemic risks.<sup>341</sup> The main problem with this model is finding a balance between risks that insurance could be incentivized to cover provided a government-backed reinsurance, and a clear "political will to adopt such programs."<sup>342</sup> When this balance is not met, governments usually provide *ex post* assistance in the form of compensation, as it did with the 9/11 Victims Compensation Fund,<sup>343</sup> as well as the COVID-19 pandemic relief under the CARES Act.<sup>344</sup>

The new risks created by emerging technologies, can meet this political balance. For example, in the case of AI the US government has publicly declared its interest in advancing and supporting AI technology,<sup>345</sup> making it a national priority that should be secured and backed-up financially in case it leads to extensive damages. Given this political backing, one can claim that the government has an incentive to support the technology of AI via a government-backed reinsurance model. This can also be true with regards to other emerging technologies, such as quantum computing,<sup>346</sup> biotechnology, nanotechnology, and synthetic biology,<sup>347</sup> where the US government provides funds for companies and other institutions to research and develop these technologies and may be associated with catastrophic risks.<sup>348</sup>

Besides government-based reinsurance, other entities acting as traditional reinsurers also have an incentive to provide reinsurance for insurance companies in the context of emerging technologies. This is because of the potential of aggregated harm arising out of the usage of emerging technologies. Reinsurance in its essence is aimed at mediating the risk associated with multiple policies being

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<sup>341</sup> Kai-Uwe Schanz, *Public-Private Solutions to Pandemic Risk*, GENEVA ASS'N 20 (Apr. 2021).

<sup>342</sup> Abraham & Baker, *supra* note 63, at 196.

<sup>343</sup> 49 U.S.C. §40101.

<sup>344</sup> Pub. L. No. 116-36.

<sup>345</sup> See, e.g., *Maintaining American Leadership in Artificial Intelligence*, 84 Fed. Reg. 3967 (Feb. 14, 2019), <https://www.federalregister.gov/documents/2019/02/14/2019-02544/maintaining-american-leadership-in-artificial-intelligence> [<https://perma.cc/7QB7-WK84>].

<sup>346</sup> Stephen Shankland, *US Begins \$1 Billion Quantum Computing Plan to Get Ahead of 'Adversaries'*, CNET (Aug. 26, 2020), <https://www.cnet.com/tech/computing/us-begins-1-billion-quantum-computing-plan-to-get-ahead-of-adversaries> [<https://perma.cc/C99L-F7HJ>].

<sup>347</sup> Jessica Morrison, *Defense Advanced Research Projects Agency Sponsors Most U.S. Synthetic Biology Work*, C&EN (Oct. 19, 2015), <https://cen.acs.org/articles/93/i41/Defense-Advanced-Research-Projects-Agency.html> [<https://perma.cc/7G3D-Y6KS>].

<sup>348</sup> Abby Monteil, *50 inventions you might not know were funded by the US government*, STACKER (Dec. 9, 2020), <https://stacker.com/stories/5483/50-inventions-you-might-not-know-were-funded-us-government> [<https://perma.cc/T6HJ-SB9H>].

triggered at once via risk transferring. In the context of AI, although this technology will conduct many of the same activities carried out by individuals, there is a greater risk of aggregation harm because AIs run on common technologies and may be subject to common risks.<sup>349</sup> This very issue has hampered the development of the cyber insurance market given the fact that widespread damages may, and do, occur when many companies use the same online platforms to store their data.<sup>350</sup> Reinsurance can help mitigate these concerns, as well as similar concerns associated with widespread damages caused by emerging technologies, and by doing so, continue to encourage innovation and the research of new technologies.

### 3. *Securitization*

Another interesting financial mechanism that may be applicable in the context of emerging technologies is that of securitization. Insurance securitization means transferring risks to capital markets via creating and issuing financial securities. Unlike reinsurance, where the risk is usually transferred to a reinsurer within the insurance industry, insurance securitization transfers the risks to the broader capital markets.<sup>351</sup> This mechanism can be manifested *ex ante* via the issuing of catastrophe bonds.<sup>352</sup>

Catastrophe (CAT) bonds can be sold by insurers covering particular catastrophic risks, such as earthquakes or flood risk. In this case, premiums paid by the insureds are pooled with proceeds paid by investors interested in purchasing these bonds. These funds are put into a Special Purpose Vehicle (SPV) which serves as a fully collateralized source of recovery for the insurance companies.<sup>353</sup> This tool enables insurers to spread events which are difficult to insure more effectively and in a diversified manner, as it is spread across the global financial markets. CAT bonds are not yet a widespread tool, and they are mostly focused on natural disasters.<sup>354</sup> Thus, it remains to be seen if their attractiveness will grow for investors in the capital markets in the future. Nonetheless, considering the AI singularity, quantum technologies and other emerging technologies which may lead to catastrophic loss, these

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<sup>349</sup> For more see *infra* note 388 and accompanying text.

<sup>350</sup> Abraham & Schwarcz, *supra* note 200.

<sup>351</sup> Peter Carayannopoulos, Paul Kovacs & Darrell Leadbetter, *Insurance Securitization: Catastrophic Event Exposure and the Role of Insurance Linked Securities in Addressing Risk* 3, INST. CATASTROPHIC LOSS REDUCTION (2003).

<sup>352</sup> It can also be manifested *ex post* via litigation financing, which falls beyond the scope of this article. See Abraham & Baker, *supra* note 63, at 196.

<sup>353</sup> Carayannopoulos et al., *supra* note 351, at 5.

<sup>354</sup> Andy Polacek, *Catastrophe Bonds: A Primer and Retrospective*, CHI. FED LETTER, No. 405, 2018, <https://www.chicagofed.org/publications/chicago-fed-letter/2018/405> [<https://perma.cc/KB27-SMDK>].

types of bonds might be an important tool to ensure emerging technologies can be covered by insurance companies.

Leaning on governments, reinsurances and the broader capital markets can lead to a border protection of consumers as they decide to purchase emerging technologies products via greater risk distribution among different players. It situates the insurance industry in a good position to continue to act as a catalyzing force for the safe dissemination of novel technologies.

#### D. FIRST- AND THIRD-PARTY POLICIES

An important question that raises in the context of insuring new technologies is *who* should be responsible for purchasing an insurance policy—the consumer side of the transaction (e.g., owner or user of an AV) via a first-party policy, or the manufacturing or distributing side of the transaction (e.g., the company producing the AV or providing it to consumers) via a third-party policy.

The main burden of purchasing insurance policies should be put, at least initially, on the manufacturing side of the emerging technology transaction. Manufacturers and distributors are the best *pressure point* to ensure future research and development of practices that should provide safer emergent technologies products. This does not prevent the consumers from purchasing a first-party policy if they wish, but it does not burden them with outside risks they have little to no control over.

Moreover, there are two important benefits that the insurance industry may create, with regards to the activities conducted by its business policyholders via a third-party policy. First, businesses will adopt improvements required by their insurers following a “reasonable person” standard. Second, businesses will adjust their activity level to ensure they are operating in a safe and efficient manner that will enable them to pay for damages that they might incur under their insurance policy.

The identity of these pressure points may also evolve over time, changing the suitable party to purchase an insurance policy. The insurance industry is one of the best suited institutions to monitor and adapt to the ever-changing emerging technologies landscape. This is due to its ongoing collection and review of data, as well as its ability to implement change faster than the traditional tort system.<sup>355</sup>

In many instances in practice, consumers are the one purchasing the liability policy, for example in the context of cyber insurance. It is not the software producers (e.g., Microsoft and IBM) that purchase cyber insurance, but rather the technology users

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<sup>355</sup> Ben-Shahar & Logue, *supra* note 146, at 233 (locating this advantage in “the fine-grained, individually adjusted, feature- and experience-rated, and continuously updated costs that insurers uniquely collect.”).

themselves (e.g., Mondelez and Merck). Since there are few regulations in this industry and given the other challenges this insurance market is facing discussed above,<sup>356</sup> consumers may hedge their risks, but their ability to do so is relatively low compared to the innovator of the technology. This may very well happen in other instances of emerging technologies as well, but it seems economically undesirable at least at the early stages of new technologies. This may be unavoidable, however, as early adopters worry about the possibility of receiving no compensation in the likely case of losses and damages, given a lack of clear liability rules. Thus, it is sensible that first-party policies will be attractive for risk-averse users and should be offered to those who wish to purchase them.

Lastly, in the context of big tech companies developing innovation, such as Google, IBM and Meta, it seems less likely that they will purchase third-party policies if there is no regulation obligating them, relying instead on self-insurance.<sup>357</sup> This is because these companies lack an economic incentive to purchase insurance as they are literally ‘too big to fail’.<sup>358</sup> The bigger a corporation is “the more predictable its stream of comparatively small liabilities, and the more sense it makes for the entity to serve, in effect, as its own insurer of these highly predictable liabilities.”<sup>359</sup> In case of an accident, big tech companies may opt to cover the damages on their own without approaching the insurance market, as they have the

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<sup>356</sup> See Part IV.B.

<sup>357</sup> Abraham, *supra* note 53, at 407. This trend toward self-insurance signifies that corporate entities have chosen to bear an increasing percentage of small liability risk themselves rather than insuring against this risk. “For sizable corporations, CGL insurance has become increasingly important as a tool used mainly to protect against large, potentially catastrophic liabilities.” *Id.*

<sup>358</sup> Iain Withers & Huw Jones, *For Bank Regulators, Tech Giants Are Now Too Big to Fail*, REUTERS (Aug. 20, 2021), <https://www.reuters.com/world/the-great-reboot/bank-regulators-tech-giants-are-now-too-big-fail-2021-08-20> [<https://perma.cc/59RY-ZY5R>]; Alex Hern, *Facebook and Other Tech Giants ‘Too Big to Fail’*, GUARDIAN (Aug. 11, 2020), <https://www.theguardian.com/technology/2020/aug/11/facebook-too-big-to-fail-says-oxford-university-research-paper> [<https://perma.cc/4PC7-W8N5>].

<sup>359</sup> Abraham, *supra* note 53, at 408 (“In fact, it is not at all clear why the largest corporations purchase any liability insurance at all.”). An interesting example of this approach is the case of BP which did not carry insurance coverage and paid out of pocket for the damages caused in 2010 after the Deepwater Horizon blowout of oil in the Gulf of Mexico. See Steve Olenski, *Nearly Four Years After Deepwater Horizon, Has BP’s Brand Image Recovered?*, FORBES (Jan. 24, 2014), <https://www.forbes.com/sites/steveolenski/2014/01/24/nearly-four-years-after-deepwater-horizon-has-bps-brand-image-recovered/?sh=16d4c03561f6> [<https://perma.cc/H3M2-MVJT>] (“[T]he company remains an economic behemoth and a major player in a commodity the world hopelessly depends on.”). For more on the insurance approach of BP, insuring small losses while self-insuring large losses, see Doherty & Smith, Jr., *supra* note 304, at 11.

financial resources to do so.<sup>360</sup> This is especially true with regards to large losses that exceeds the capacity of the insurance market.<sup>361</sup> As long as no clear liability rules have been established attributing liability to the manufacturer under certain circumstances, it is a common-sense practice of risk-averse users to hedge their risks while using emerging technologies to ensure remedy when needed.<sup>362</sup>

The question of the entity who should purchase the policy is a challenging one, and there is no obvious answer. Regardless of the entity who chooses or is obligated to purchase coverage, the existence of such a policy enables the safer implementation of a new technology. In cases of market failure, the regulator has a strong interest to enforce mandatory coverage,<sup>363</sup> as has happened in the medical malpractice and automobile markets. In cases where the regulator chooses inaction, liability rules set by the court will eventually determine the appropriate entity who should purchase insurance. Until then, risk-averse users and manufacturers will purchase policies in preparation for future liability rules set by the courts.<sup>364</sup>

## VI. FIGHT OR FLIGHT

When new types of liabilities are created or expanded by the court, insurance can either fight-or-flight.<sup>365</sup> In most cases, the insurance market will choose to fight, meaning, it will meet the new demand for insurance created by these new types of liabilities, as has been the case with regards to medical malpractice as well as

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<sup>360</sup> See, e.g., Peter Eavis & Steve Lohr, *Big Tech's Domination of Business Reaches New Heights*, N. Y. TIMES (Aug. 19, 2020) <https://www.nytimes.com/2020/08/19/technology/big-tech-business-domination.html> [https://perma.cc/WE58-NRLY]; Chris Alcantara, Kevin Schaul, Gerrit De Vynck & Reed Albergotti, *How Big Tech Got So Big: Hundreds of Acquisitions*, WASH. POST (Apr. 21, 2021), <https://www.washingtonpost.com/technology/interactive/2021/amazon-apple-facebook-google-acquisitions> [https://perma.cc/Y8TH-33K9].

<sup>361</sup> Doherty & Smith, Jr., *supra* note 304, at 14. This might be less true with regards to small accidents, as these companies can take advantage of the competitive insurance market and its comparative advantage in service provision, such as claim management. See *id.* at 12.

<sup>362</sup> For a different approach advocating the purchase of insurance policies regardless of the size of the corporation, see TOM BAKER & SEAN J. GRIFFITH, ENSURING CORPORATE MISCONDUCT: HOW LIABILITY INSURANCE UNDERMINES SHAREHOLDER LITIGATION 57–76 (2010). See also Victor P. Goldberg, *The Devil Made Me Do It: The Corporate Purchase of Insurance*, 5 REV. L. & ECON., 541, 543 (2009) (arguing that insurers supply valuable risk management services); Avraham, *supra* note 273, at 38-39.

<sup>363</sup> Michael G. Faure, *Economic Criteria for Compulsory Insurance*, 31 GENEVA PAPERS 149, 154-55 (2006).

<sup>364</sup> See *infra*, note 367 and accompanying text.

<sup>365</sup> ABRAHAM, *supra* note 28, at 222.

product liability coverage.<sup>366</sup> This leads to a spiral of liability vis-à-vis insurance coverage, where liability is imposed “where insurance is already in place or is expected to become available.”<sup>367</sup> As liability expands, so does insurance due to the increased purchase of liability policies by potential defendants. The availability of greater amounts of liability policies leads to more suits and greater awards and settlements, creating a reinforcement loop in which “liability insurance . . . contributes to the creation of its own demand.”<sup>368</sup>

In a subset of cases, however, the insurance market will choose to flee, meaning, insurers refuse, or are unable, to provide coverage against a new type of liability. For example, as a result of the rise of “retroactive, strict, and joint and several liability for the sometimes enormous cost of environmental cleanup”<sup>369</sup> in the 1980s under a federal cleanup program (CERCLA),<sup>370</sup> pollution liability insurance disappeared.<sup>371</sup> Another example is that of systemic risk that might occur in a financial context during a bank run.<sup>372</sup> Abraham concluded that “where civil liability goes, liability insurance will often, but not always, follow.”<sup>373</sup> This conclusion is especially apt in the context of emerging technologies. The ongoing discussion of the liability regime that will be attached to damages caused by emerging technologies creates even more uncertainty in this field.<sup>374</sup> This uncertainty leads different stakeholders, especially small to medium technology companies, which should be the

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<sup>366</sup> *Id.* at Chapter 4 (medical malpractice) and Chapter 5 (products liability).

<sup>367</sup> *Id.* at 222.

<sup>368</sup> *Id.* at 222. See also Kent D. Syverud, *On the Demand for Liability Insurance*, 27 TEX. L. REV. 1629 (1994).

<sup>369</sup> Abraham, *supra* note 53, at 356.

<sup>370</sup> *Superfund: CERCLA Overview*, EPA, <https://www.epa.gov/superfund/superfund-cercla-overview> [<https://perma.cc/U6FN-SSSJ>].

<sup>371</sup> ABRAHAM, *supra* note 28, at 223. See also Abraham, *supra* note 53, at 390 (“The only recommendation that ISO squarely adopted was to insert an absolute pollution exclusion into ISO’s revised 1986 standard form policy. That eliminated a considerable portion of the coverage of longtail liability that CGL policies have provided ever since.”).

<sup>372</sup> See, e.g., Rory Van Loo, *Digital Market Perfection*, 117 MICH. L. REV. 815, 821 (2019).

<sup>373</sup> ABRAHAM, *supra* note 28, at 223. The court system seemed to believe that liability insurance will always follow. See *Escola v. Coca Cola Bottling Co. of Fresno*, 150 P.2d 436, 441 (Cal. 1944) (Traynor, J., concurring) (“The cost of an injury and the loss of time or health may be an overwhelming misfortune to the person injured, and a needless one, for the risk of injury can be insured by the manufacturer and distributed among the public as a cost of doing business.”).

<sup>374</sup> In the context of AI, different scholars have argued for different regimes. See, e.g., David C. Vladeck, *Machines Without Principals: Liability Rules and Artificial Intelligence*, 89 WASH. L. REV. 117 (2014) (arguing for a strict liability regime); Bryan Casey, *Robot Ipsa Loquitur*, 108 GEO. L. REV. 225 (2019) (arguing for a negligence regime); Omri Rachum-Twaig, *Whose Robots is it Anyway?: Liability of Artificial-Intelligence-Based Robots*, 2020 U. ILL. L. REV. 1141 (arguing for the creation of safe harbors).

potential defendants of the near and far future liability suits, to purchase more insurance. This process triggers the liability spiral described above. The fear of strict liability rules leads to greater availability of insurance, which in turn pushes for changes in civil liability law, and eventually leads to the spread of more insurance. In the context of emerging technologies, this loop could be viewed as a positive process ensuring risky activities are properly managed and hedged via the insurance industry.<sup>375</sup>

We are not always able to predict when the insurance industry will choose to ‘fight or flight’ when an emergent technology presents itself. However, there are three main parameters that can help different stakeholder predict how the insurance industry will react. These are profitability, current and expected regulatory intervention (including the long-tail liability issue), and widespread impact due to the realization of correlated risks.<sup>376</sup>

First, *profitability*. Where there is a need for risk-management tools once emerging technologies enter the market, the insurance industry will find a way to provide them, so long as it can make a profit. Given the nature of the parties involved, tech companies and usually savvy tech consumers, and the important role technology has in our lives,<sup>377</sup> it seems clear that tech companies and tech consumers are seen as a lucrative market for insurers.<sup>378</sup> Furthermore, the insurance industry can help mitigate potential issues that might rise with regards to the profitability of a given technology liability policy via higher premiums, lower caps and a wide array of exclusions. As more information is gathered the use of these instruments will decrease, making liability insurance even more appealing to both policyholders and insurance carriers.

Second, *current and expected regulatory intervention*. As described above, CERCLA led to the annihilation of pollution liability insurance.<sup>379</sup> This presents a scenario in which regulatory intervention can lead to the destruction of an existing insurance product or prevent the creation of such a product. This directly connects to the first parameter of profitability. Once regulation abruptly shifts the burden of liability to a specific policyholder with no caps when insurance policies are already in place, it is no longer

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<sup>375</sup> The positivity of this process also depends on the entity purchasing these policies.

<sup>376</sup> These are “simultaneous occurrence of many losses from a single event”, such as natural disasters and global pandemics. *See Correlated Risks*, WORLD FIN., <https://www.worldfinance.com/home/risk-encyclopaedia/correlated-risks> [https://perma.cc/2AJD-S9UY].

<sup>377</sup> *See, e.g., The Role of Technology*, KNIGHT FOUND. (June 10, 2016), <https://knightfoundation.org/digitalcitizenship/technology> [https://perma.cc/SP6E-23ZQ].

<sup>378</sup> *See* Part VI.B for a discussion about the profitability element in providing insurance.

<sup>379</sup> *See supra* note 370 and accompanying text.



profitable for insurance carriers to offer such a product. This parameter is difficult to predict, as some legislation can affect existing policies in a manner that nudges the insurance industry to flee. However, it is less likely that this type of legislation will apply in the context of emerging technologies. The White House has emphasized numerous times the importance of emerging technologies and their development. Thus, it generally avoids any hampering regulation out of fear of stifling innovation. This in great part can be attributed to the American agenda to defeat China on the technological front and win the global tech-race.<sup>380</sup> This relates back to Citron's 'hyper-vigilant' stage of law's reaction to new technologies.<sup>381</sup> Once the regulator or the court system understands and appreciates the benefits associated with a new technology, they align the legal regime to support that technology rather than inhibit its development. The obvious goal of American government to advance technological development makes the occurrence of negative regulatory intervention less plausible.

Still, it is important to note that in the context of damages to the environment, which inherently contain long-tail liability issues, similar to the above pollution liability insurance,<sup>382</sup> the government has a much more obvious and strong incentive to regulate. This should lead emerging technologies in fields with greater future impact on the environment, or other areas where long-latent harms might occur, to take into consideration the potential lack of insurance and the complexity of long-tail claims.<sup>383</sup> This should be especially notable in cases where these technologies might create future widespread damages to the environment as well as individuals, leading us to our third and final parameter.

Third, *widespread impact*—the wider the negative impact in the form of losses resulting from an emerging technology, the less likely insurance carriers will be willing or able to offer coverage. This can happen as a result of the realization of a correlated risk

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<sup>380</sup> See, e.g., Thomas Franck, *Senate Passes \$250 Billion Bipartisan Tech and Manufacturing Bill Aimed at Countering China*, CNBC (June 9, 2021), <https://www.cnbc.com/2021/06/08/senate-passes-bipartisan-tech-and-manufacturing-bill-aimed-at-china.html> [<https://perma.cc/DX57-28KV>]; Jeanne Whalen & Chris Alcantara, *Nine Charts that Show Who's Winning the U.S.-China Tech Race*, WASH. POST (Sept. 21, 2021), <https://www.washingtonpost.com/technology/2021/09/21/us-china-tech-competition> [<https://perma.cc/5WXQ-FPR5>]; Mike Rogers & Glenn Nye, *Why America Must Boldly Win the Technological Race Against China*, HILL (Oct. 21, 2019), <https://thehill.com/opinion/technology/466705-why-america-must-boldly-win-the-technological-race-against-china> [<https://perma.cc/3QJ3-5MQL>].

<sup>381</sup> Citron, *supra* note 150.

<sup>382</sup> Abraham, *supra* note 53, at 356.

<sup>383</sup> For more on long-tail claims, see *supra* Part II.

triggering numerous liability policies at once.<sup>384</sup> Pollution liability insurance also demonstrates the applicability of this parameter as these policies ended up covering high volumes of losses given the extensive damages caused by pollution. Another potential example is that of systematic risks in the banking context and cyber insurance that could lead to billions of dollars of damages to property.<sup>385</sup> Focusing on cyber insurance, given the wide-scale impact of the damage associated with online hacking and data breaches, it seems that the insurance industry is slowly retreating from this product, at least in its current form.<sup>386</sup> This parameter could be mitigated by incorporating caps and exclusions into the policy, however, in light of the widespread losses too many exclusions and a lower cap could render the insurance product offered insufficient and ineffective.<sup>387</sup> Though this issue cannot be completely eliminated, it seems less significant in the context of other emerging technologies because most of these can operate on different platforms in light of their different functions and goals, which are not limited to data storage as in the cyber context. Manufacturers may also prevent widespread damages by ensuring that their products operate on different, closed circle and protected platforms, thereby mitigating, and distributing risks. Such mitigation can be encouraged by insurers who have an incentive to prevent these types of aggregate disasters,<sup>388</sup> completing a full circle to the parameter of profitability.

The regulator has an important part when it comes to insurers' decisions to 'fight or flight'. Besides the clear impact via the second parameter of legislating liability rules, regulators also have the power to manage the occurrence of correlated risks. They can do so by either providing insurance by themselves, e.g., flood insurance created through the National Flood Insurance Act of

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<sup>384</sup> Avraham, *supra* note 273, at 102 ("Correlated risks are those risks that, if they come to fruition, will affect a large portion of the insurance pool. Hurricanes, floods, and acts of war are examples of these types of risks.").

<sup>385</sup> Jonathan W. Welburn et al., *Systemic Risk: It's Not Just in the Financial Sector*, RAND CORP. (2020), [https://www.rand.org/pubs/research\\_briefs/RB10112.html](https://www.rand.org/pubs/research_briefs/RB10112.html) [<https://perma.cc/E53R-GGC3>].

<sup>386</sup> Emil Sayegh, *The Imminent Death and Rebirth of Cyber Insurance*, FORBES (Jan. 25, 2022), <https://www.forbes.com/sites/emilsayegh/2022/01/25/the-imminent-death-and-rebirth-of-cyber-insurance/?sh=674e10f47080> [<https://perma.cc/3EUV-D5UT>]; Elizabeth Blosfield, *Ransomware Has Been a 'Game Changer' for Cyber Insurance*, INS. J. (Aug. 30, 2021), <https://www.insurancejournal.com/news/national/2021/08/30/628672.htm> [<https://perma.cc/C7FT-XFUF>]; Tom Johansmeyer, *Cybersecurity Insurance Has a Big Problem*, HARV. BUS. REV. (Jan. 11, 2021), <https://hbr.org/2021/01/cybersecurity-insurance-has-a-big-problem> [<https://perma.cc/X8N6-TNAA>].

<sup>387</sup> Abraham & Schwarcz, *supra* note 200.

<sup>388</sup> Lior, *supra* note 168, at 508.

1968,<sup>389</sup> or by providing reinsurance, e.g., the Terrorism Risk Insurance Act of 2002.<sup>390</sup> Furthermore, when the element of profitability is not attainable, the government is often the only entity that can provide insurance, such as in the case of nuclear energy.<sup>391</sup> Thus, regulators hold immense power to support the offering of insurance, and in some cases even mandate it,<sup>392</sup> if they so choose to. It is in the interest of the government to facilitate the offering of insurance as an important instrument to ensure emerging technologies are being distributed to users in a safe manner. They can do so by creating legislation mandating insurance once emerging technologies of added risks enter the market, or by providing a supporting insurance frame to mitigate concerns associated with the three parameters detailed above. In that sense, governments have an important role to guarantee that insurance is available and attainable to both manufactures and users when new technologies are developed and distributed to consumers.

It is important to note that sometimes the regulator might abuse this power in collaboration with insurance carriers. For example, in 1997 Congress passed the Amtrak Reform and Accountability Act<sup>393</sup> as part of a tort reform claiming to “save and secure passenger rail service in America.”<sup>394</sup> The Act included a “statutory-mandated limitation on damage awards in major railway negligence cases.”<sup>395</sup> The Act imposed a cap on amounts awarded in civil cases where liability has been proven to \$200,000,000.<sup>396</sup> On September 12, 2008 a train accident in Chatsworth, California led to losses far exceeding this amount. A Metrolink passenger train ran a

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<sup>389</sup> *50 Years of the NFIP (1968-2018)*, FEMA [https://www.fema.gov/sites/default/files/2020-05/NFIP\\_50th\\_Final\\_8.5x11\\_Regional\\_Printable.pdf](https://www.fema.gov/sites/default/files/2020-05/NFIP_50th_Final_8.5x11_Regional_Printable.pdf) [<https://perma.cc/W4RZ-SJB7>]; *Flood Insurance*, FEMA, <https://www.fema.gov/flood-insurance> [<https://perma.cc/DTZ4-FHSM>].

<sup>390</sup> See Terrorism Risk Insurance Act (TRIA), NAIC (Oct. 18, 2021) <https://content.naic.org/cipr-topics/terrorism-risk-insurance-act-tria> [<https://perma.cc/5XU7-JJLN>]. See also Avraham, *supra* note 273, at 103.

<sup>391</sup> See *supra* note 332 and accompanying text.

<sup>392</sup> See, e.g., the Financial Conduct Authority (FCA) in the UK obligates, under some circumstances, partnership with an insurer in order to be eligible for a ‘regulatory sandbox’. See, e.g., *Regulatory Sandbox Lessons Learned Report*, FCA (Oct. 2017), <https://regulatory-sandbox-lessons-learned-report.pdf>; *Regulatory Sandbox Eligibility Criteria*, FCA (Mar. 3, 2022), <https://www.fca.org.uk/firms/innovation/regulatory-sandbox/eligibility-criteria#example-proposals> [<https://perma.cc/M663-G7QY>].

<sup>393</sup> Pub. L. No. 105-134.

<sup>394</sup> Andrew Cohen, *The Real Victims of ‘Tort Reform’*, ATLANTIC (July 18, 2011), <https://www.theatlantic.com/national/archive/2011/07/the-real-victims-of-tort-reform/242030> [<https://perma.cc/7JEF-SJ2C>].

<sup>395</sup> *Id.*

<sup>396</sup> Amtrak Reform and Accountability Act, 49 U.S.C. § 28103(a)(2) (“The aggregate allowable awards to all rail passengers, against all defendants, for all claims, including claims for punitive damages, arising from a single accident or incident, shall not exceed \$200,000,000.”).

red light and collided with a Union Pacific freight train. Twenty-four people died and more than a hundred were injured when the passenger train engineer missed the stop signal because he was on his phone. The judge presiding over this case concluded that the reasonable award should have been at least \$264,000,000.<sup>397</sup>

These types of tort reforms are beneficial to insurance companies.<sup>398</sup> It provides them with certainty regarding the total amount they will be obligated to pay or reimburse and thus they can provide accurate liability policies with more ease. However, these reforms leave victims uncovered and pushes judges to make impossible decisions in allocating a predetermined amount that is simply not enough in some cases. As insurance companies operate in a private profit-driven market they have a business incentive to encourage these types of reforms. However, when implementing a cap, victims should not be left stranded with inadequate remedy. Once the legislator sets a cap it should also define an entity, most probably itself, which is responsible for the residue damages, just as it did in the TRIA Act of 2002 covering damages caused by terrorism attacks exceeding a predefined cap. In that sense, the regulator has immense responsibility when it implements statutory caps. Society should not be burdened by the remainder of the damages exceeding the cap. It should be compensated by the government ensuring the availability of insurance on the one hand, while maintaining a fair and adequate system of compensation on the other.<sup>399</sup>

The cases of AI singularity and quantum computing present interesting case studies that will challenge the insurance industry and its current products and would require regulatory intervention to ensure the availability of insurance. This intervention is key to the successful and safe implementation of these types of technologies. This is not a call to enforce mandatory liability insurance on these emerging technologies, but rather a call to ensure a robust infrastructure for insurers to offer such policies to users and manufactures who wish to hedge their tech-related risks. This could take form via an act of regulation similar to the New York Cyber Insurance Risk Framework.<sup>400</sup> An AI-focused insurance risk framework would push for best practices when insurers offer policies covering AI. The six priorities for best practice identified in the New York Framework could be of value in implementing a

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<sup>397</sup> *Magdaleno v. S. Cal. Reg'l Rail Auth. dba Metrolink* (Case No. PC043703) (July 13, 2011).

<sup>398</sup> Abraham, *supra* note 53, at 386.

<sup>399</sup> For more on tort reforms and its potential negative implications, *see, e.g.,* HOT COFFEE (HBO 2011).

<sup>400</sup> See *supra* note 226 and accompanying text.

similar AI framework.<sup>401</sup> For example, managing and minimizing situations where an insurer is obligated to cover AI losses under a policy that doesn't explicitly mention those harms. Another example is obtaining AI expertise via recruiting and hiring practices making sure insurers have the necessary expertise to underwrite AI risks. Moreover, given the volatile nature of AI risks, the regulators could also offer to set a cap from which the government would be responsible for AI losses, similar to the TRIA Act,<sup>402</sup> essentially creating a reinsurance mechanism for the benefit of policies covering AI harms. The details of such a framework should be more carefully fleshed out, but it presents the immense power the regulator has in maintaining and supporting the virtuous innovation cycle.

The regulator will have an imperative role in the near and far future to ensure insurance could continue to play its part within the virtuous innovation cycle. As mentioned, the current technological landscape suggests that the two of the next central emerging technologies will be that of AI and quantum computing. Based on the above parameters, it can be predicted that the insurance industry will strive to offer coverage to both AI singularity and quantum computing as they incorporate into our commercial market, and that the regulator will strive to create a strong foundation to support this process.

#### A. *AI Singularity*

The singularity refers to 'strong' or 'general' AI where an AI-based technology "may exhibit sentience or consciousness, can be applied to a wide variety of cross-domain activities and perform at the level of, or better than a human agent, or has the capacity to self-improve its general cognitive abilities similar to or beyond human capabilities."<sup>403</sup> When, or if, the singularity occurs, insurers might not be able to offer coverage to this type of activity. The perils inflicted by strong AI can be classified as 'unknown unknowns'—

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<sup>401</sup> The six priorities are: manage and eliminate exposure to "silent" cyber insurance risk; evaluate systemic risk; rigorously measure insured risk; educate insureds and insurance producers; obtain cybersecurity expertise; and require notice to law enforcement. *Id.*

<sup>402</sup> See *supra* note 337 and accompanying text.

<sup>403</sup> OFF. MGMT. & BUDGET, MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES, 4, <https://www.whitehouse.gov/wp-content/uploads/2020/01/Draft-OMB-Memo-on-Regulation-of-AI-1-7-19.pdf> [<https://perma.cc/Y4CL-2Y48>]. See also MURRAY SHANAHAN, *THE TECHNOLOGICAL SINGULARITY* (2015); Jayshree Pandya, *The Troubling Trajectory of Technological Singularity*, FORBES (Feb. 10, 2019), <https://www.forbes.com/sites/cognitiveworld/2019/02/10/the-troubling-trajectory-of-technological-singularity/#4ebb17496711> [<https://perma.cc/F8DN-NKBE>].

the types of risks, as well as the way in which they will be manifested, are simply unknowns.<sup>404</sup>

Therefore, all three parameters of profitability, regulatory intervention and widespread impact are uncertain at the moment. Profitability is uncertain as the potential damages caused by the singularity are extremely vague, thus challenging accuracy of the underwritten process of a policy. Furthermore, given the lack of information, regulators might be pressured to legislate strict liability rules against the singularity, despite its inherent inclination to generally support emerging technologies, and AI specifically.<sup>405</sup> Lastly, the widespread damages that might occur as a result of the singularity are extremely opaque, but if they are anything like the damages portrayed by science fiction novels and movies,<sup>406</sup> insurance companies will worry about the potential widespread damage that they may impose.

Nonetheless, given the immense demand for innovation in the AI context and its inevitable circulation into our commerce stream,<sup>407</sup> including the ultimate desire to achieve the AI singularity, it seems likely that insurers will operate to offer policies covering it. Given this demand, insurance companies will have the financial incentive to offer these types of policies. Regulatory intervention seems less possible given the strong American agenda to dominant this field and win the international tech-race. Lastly, the issue of widespread impact should be mitigated by regulatory, or industry set exclusions and caps that will be adjusted over time as the threat landscape of the AI singularity becomes clearer.<sup>408</sup>

The scenario of the singularity is still theoretical in essence, and it should be decades before it becomes a reality, if it ever

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<sup>404</sup> See Part VI.A.

<sup>405</sup> *National Artificial Intelligence Initiative*, <https://www.ai.gov> [<https://perma.cc/H5LH-A86S>].

<sup>406</sup> See, e.g., ISAAC ASIMOV, I, ROBOT (1950) (detailing a fictional history of robotics); 2001: A SPACE ODYSSEY (Metro-Goldwyn-Mayer 1968) (imagining a world in which a spaceship computer system, HAL, rebels against human astronauts); THE MATRIX (Warner Bros. 1999) (describing a world in which an artificial intelligence character, known as Agent Smith, keeps order in Matrix system by terminating troublesome programs and humans); THE TERMINATOR (Hemdale 1984) (envisioning a cyborg assassin, known as the Terminator, sent from the future by self-aware artificial intelligence program Skynet); HER (Annapurna Pictures 2013) (imaging a scenario where a man falls in love with Samantha, his operating system).

<sup>407</sup> Mauricio Featherman et al., *The Impact of New Technologies on Consumers Beliefs: Reducing the Perceived Risks of Electric Vehicle Adoption*, 169 TECH. FORECASTING & SOC. CHANGE (2021) (focusing on the trends of EV tech as a case study for technological innovation); Jess Matthias, *New Research: How Ready are Consumers for Emerging Technology?*, SABRE (June 27, 2017), <https://www.sabre.com/insights/new-research-how-ready-are-consumers-for-emerging-technology> [<https://perma.cc/62FA-93MX>].

<sup>408</sup> For a broader discussion of insurance alternatives in the context of AI singularity, see Lior, *supra* note 168, at 527.

does.<sup>409</sup> Nonetheless, it should not render the instrument of insurance as irrelevant. The existence of an AI superintelligence entity is likely to create a market failure given the inherent insolvency of strong AI. Coercive insurance, or a mandatory registry accompanied with a compensation fund set by the regulator, can help fix this market failure.<sup>410</sup> These schemes should name the party responsible for purchasing the policy or contributing to the compensation fund, assuming it will not be the strong AI itself.

### B. Quantum Computing

Quantum computing is shaping to be the novel emerging tech of the upcoming years.<sup>411</sup> Estimations state that the market of quantum computers in 2030 will be around \$50 billion.<sup>412</sup> At the moment, this technology is concentrated at the hands of pedagogical institutions,<sup>413</sup> as well as big tech-companies,<sup>414</sup> this is in light of the vast resources necessary to research and develop this technology.<sup>415</sup> Alongside its many potential benefits, such as tighter encryption

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<sup>409</sup> See, e.g., John Markoff, *When Is the Singularity? Probably Not in Your Lifetime*, N.Y. TIMES (Apr. 7, 2016), <https://www.nytimes.com/2016/04/07/science/artificial-intelligence-when-is-the-singularity.html> [https://perma.cc/2BQL-FN5T]; Cem Dilmegani, *995 experts opinion: AGI / singularity by 2060 [2020 update]*, AI MULTIPLE (June 7, 2020), <https://research.aimultiple.com/artificial-general-intelligence-singularity-timing> [https://perma.cc/7KNZ-F52Y].

<sup>410</sup> See Faure, *supra* note 363, at 150.

<sup>411</sup> *Quantum Computing use Cases are Getting Real—What you Need to Know*, MCKINSEY DIGITAL (Dec. 14, 2021), <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/quantum-computing-use-cases-are-getting-real-what-you-need-to-know> [https://perma.cc/3LAH-NE2H]; Chuck Brooks, *The Emerging Paths of Quantum Computing*, FORBES (Mar. 21, 2021), <https://www.forbes.com/sites/chuckbrooks/2021/03/21/the-emerging-paths-of-quantum-computing/?sh=1c4ec7956613> [https://perma.cc/9YXZ-8ZMA]; CHRIS JAY HOOFNAGEL & SIMON L. GARFINKEL, *LAW AND POLICY FOR THE QUANTUM AGE* (2022); Walter G. Johnson, *Comment, Governance Tools for the Second Quantum Revolution*, 59 JURIMETRICS J. 487-521 (2019).

<sup>412</sup> Duncan Stewart, *Quantum Computers: The Next Supercomputers, But Not the Next Laptops*, DELOITTE INSIGHTS: TECH., MEDIA, & TELECOMM. PREDICTIONS 2019, at 96, 97 (2019), [https://www2.deloitte.com/content/dam/insights/us/articles/TMT-Predictions\\_2019/DI\\_TMT-predictions\\_2019.pdf](https://www2.deloitte.com/content/dam/insights/us/articles/TMT-Predictions_2019/DI_TMT-predictions_2019.pdf) [https://perma.cc/E6TB-WKT6].

<sup>413</sup> *Quantum Institutes Around the World*, <https://quantuminstitute.yale.edu/resources/quantum-institutes-around-world> [https://perma.cc/649Q-PPWH].

<sup>414</sup> Cade Metz, *Yale Professors Race Google and IBM to the First Quantum Computer*, N.Y. TIMES (Nov. 13, 2017), <https://www.nytimes.com/2017/11/13/technology/quantum-computing-research.html> [https://perma.cc/QH4C-QEZX].

<sup>415</sup> Martin Giles, *We'd Have More Quantum Computers If It Weren't So Hard to Find the Damn Cables*, MIT TECH. REV. (Jan. 17, 2019), <https://www.technologyreview.com/s/612760/quantum-computers-component-shortage> [https://perma.cc/9CQH-H6FM].

capabilities and lightning-fast computing,<sup>416</sup> this technology holds the ability to inflict great damages.<sup>417</sup> On the one hand, national security concerns arise from the development of this technology by research institutions and governmental bodies.<sup>418</sup> On the other hand, this technology is also being developed by the private sector, mostly by big-tech companies, such as IBM and Google,<sup>419</sup> which presents different types of risks and damages in a commercial consumer setting, such as, enhanced cyberattacks and extensive privacy breaches via surveillance.<sup>420</sup>

Quantum computing applies quantum theory in an attempt to produce computers that are significantly faster and more powerful than the classical computers we use today. In an oversimplified manner, quantum computers possess the ability to “successfully solve a problem that no classical computer can solve.”<sup>421</sup> While classical computers use bits to conduct computations and solve problems, quantum computers use quantum bits (qubits). Bits only have the ability to represent ones and zeros each time, meaning they have only one state and can only carry the value of zero or one. This limits the algorithms we can run on a classical computer to a binary state. Qubits, however, can represent zeros and ones simultaneously, a state known as *superposition*.<sup>422</sup> Superposition is a phenomenon in which “information exists in multiple states at once through a process in which these superimposed qubits are intimately correlated and connected (even over a certain distance), known as *entanglement*.”<sup>423</sup> For the purpose of our legal, non-technical, discussion, it is enough to state that once qubits are entangled, “they offer exponentially more computational power than the same number of classical bits.”<sup>424</sup> This enhance technical capability is the

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<sup>416</sup> Ali El Kaafarani, *Four Ways Quantum Computing Could Change the World*, FORBES (July 30, 2021), <https://www.forbes.com/sites/forbestechcouncil/2021/07/30/four-ways-quantum-computing-could-change-the-world/?sh=267353b94602> [<https://perma.cc/FGQ3-G8BZ>].

<sup>417</sup> SUBCOMMITTEE ON QUANTUM INFORMATION SCIENCE, NAT’L STRATEGIC OVERVIEW QUANTUM INFO. SCI. 2 (2018), [https://www.quantum.gov/wp-content/uploads/2020/10/2018\\_NSTC\\_National\\_Strategic\\_Overview\\_QIS.pdf](https://www.quantum.gov/wp-content/uploads/2020/10/2018_NSTC_National_Strategic_Overview_QIS.pdf) [<https://perma.cc/3QH2-54TN>]; Salahudin Ali, *Coming to a Battlefield Near You: Quantum Computing, Artificial Intelligence, & Machine Learning’s Impact on Proportionality*, 18 SANTA CLARA J. INT’L L. 1 (2020).

<sup>418</sup> Ali, *supra* note 417, at 10; Salahudin E. Ali, *Quantum Supremacy, Network Security & The Legal Risk Management Framework: Resiliency for National Security Systems*, 23 SMU SCI. & TECH. L. REV. 103 (2020).

<sup>419</sup> For IBM *see* <https://www.ibm.com/quantum-computing> [<https://perma.cc/2VKU-YRP4>]; for Google *see* <https://quantumai.google> [<https://perma.cc/5FEF-LZ2J>].

<sup>420</sup> Johnson, *supra* note 411.

<sup>421</sup> Ali, *Quantum Supremacy*, *supra* note 418, at 106.

<sup>422</sup> Ali, *Coming to a Battlefield Near You*, *supra* note 417, at 9.

<sup>423</sup> *Id.* *See also* Johnson, *supra* note 411, at 494.

<sup>424</sup> *Id.* at 495.



ultimate manifestation of the tech-oriented mantra “move fast and break things,”<sup>425</sup> where computer power is significantly faster, and respectively significantly more dangerous compared to classical computing.<sup>426</sup> Thus, the concept of offering insurance policies to cover quantum computing activities carried out by researchers, and eventually by consumers, is still unclear and is a source of concern to insurance carriers, as well as reinsurances.<sup>427</sup>

While discussing the regulation of the quantum revolution, Johnson offered to turn to soft law rather than strict regulation, to optimize “the risk-benefit curve” in the usage of quantum technologies.<sup>428</sup> These may include voluntary codes of conduct, third-party standards, as well as other regulatory programs.<sup>429</sup> Insurance could also be considered as a soft law mechanism that could enable the maximization of the benefits quantum computing holds, while “mitigating domestic injustice.”<sup>430</sup> Insurance can help disseminate this important technology while hedging the risks associated with it, mostly on a consumer level. It is safe to assume that given the lack of data about this technology combined with the early stages of its development, premiums will be high, exclusions will be abundant and monetary limitations will be imposed. However, given the cycle of insurance coverage when facing a new technology, and as long as there is a demand for this type of coverage, over time these features should change and adjust to accommodate the place quantum computing will have in our society and commercial stream.

Nonetheless, there is more room for pessimism when it comes to quantum computing as it combines the two biggest challenges the insurance industry faces in relation to emerging technologies: national security concerns and big-tech companies. On the national security front, damages and losses may be excluded being regarded as “acts of war”, as we have seen happen in the cyber insurance context.<sup>431</sup> On the big-tech companies front, currently in the private sector, mostly big tech companies operate in this field. This resonates the concern that these companies will not purchase insurance as they are “too big to fail.”<sup>432</sup>

As a result, it is too uncertain at the moment to decide whether the insurance market will ‘fight or flight,’ especially given

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<sup>425</sup> JONATHAN TAPLIN, *MOVE FAST AND BREAK THINGS: HOW FACEBOOK, GOOGLE, AND AMAZON CORNERED CULTURE AND UNDERMINED DEMOCRACY* (2017).

<sup>426</sup> See SWISS RE SONAR, *supra* note 130, at 44.

<sup>427</sup> *Id.* Furthermore, it seems that quantum institutions fall under the general insurance umbrella covering the University's research activities.

<sup>428</sup> Johnson, *supra* note 411, at 487.

<sup>429</sup> *Id.* at 508.

<sup>430</sup> *Id.* at 487.

<sup>431</sup> See *supra*, Part IV.B.

<sup>432</sup> See *supra* note 358 and accompanying text.

the current underdeveloped state of this technology in the consumer context.<sup>433</sup> However, similar to the singularity, the great importance the government attribute to this technology as part of the American desire to win the technological arm-race,<sup>434</sup> will probably lead to the parameter of regulatory intervention leaning towards the “fight” side of the scale, especially in a consumer setting. This notion strengthens in light of the vast funding the US government had invested in the development of this technology.<sup>435</sup> The parameter of wide-scale impact can be mitigated by government intervention as well as exclusions and caps. The latter should be adjusted over time as the true potential of quantum computing will be realized in the upcoming years.<sup>436</sup> Lastly, the parameter of profitability is questionable as currently this field is dominated by big-tech and academic institutions. However, when quantum computers will be sold to consumers, presumably in the 2030s,<sup>437</sup> profits opportunities for insurance carriers are sure to expand along with a clearer understanding of its potential risks and threats. This should alleviate some of the concerns that are currently prevalent in the insurance industry with regards to this disruptive technology.<sup>438</sup>

## CONCLUSION

“Invention is the mother of necessity.”<sup>439</sup> Every technological innovation leads to additional technological advances in a cycle that perpetually drives the creation of new technologies. As long as this cycle continues, new risks are an unavoidable

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<sup>433</sup> Christianna Reedy, *When Will Quantum Computers Be Consumer Products?*, FUTURISM (July 31, 2017), <https://futurism.com/when-will-quantum-computers-be-consumer-products> [<https://perma.cc/7KPU-LK46>] (“Almost 80 percent of respondents believed we will be able to buy our own quantum computer before 2050, and the decade that received the most votes—about 34 percent—was the 2030s.”).

<sup>434</sup> See *supra* note 417.

<sup>435</sup> The National Quantum Initiative Act, enacted in 2018, relocated over \$1 billion in the next five years to support quantum innovation. National Quantum Initiative Act, 15 U.S.C. §§ 8831, 8842, 8852. The race to achieve quantum computing has motivated governments across the world to heavily fund quantum lab programs. See Johnson, *supra* note 411, at 490-91 (providing the example that between 2013 to 2018 the UK funded \$358 million; the EU \$1.1 billion; China \$11.4 billion and the US \$1.2 billion via different quantum projects).

<sup>436</sup> John Horgan, *Will Quantum Computing Ever Live Up to Its Hype?*, SCI. AM. (Apr. 20, 2021), <https://www.scientificamerican.com/article/will-quantum-computing-ever-live-up-to-its-hype> [<https://perma.cc/T46L-KQXA>]; Mikhail Dyakonov, *The Case Against Quantum Computing*, IEEE SPECTRUM (Nov. 15, 2018), <https://spectrum.ieee.org/the-case-against-quantum-computing> [<https://perma.cc/822Z-H2YN>].

<sup>437</sup> Reedy, *supra* note 433.

<sup>438</sup> Swiss Re SONAR, *supra* note 130, at 44-45.

<sup>439</sup> Sacasas, *supra* note 82 (stating Kranzberg’s second law of technology).

consequence of this bargain.<sup>440</sup> Insurance acts to mitigate these risks for the benefit of consumers and manufactures alike in order to continue to fuel this cycle of innovation.

Whenever there arises a need for new coverage of risks, the supply and demand sides of the insurance market will likely make it happen. This is evident from past policies offered by insurance companies in response to raising demand. These types of policies include riots risks,<sup>441</sup> environmental risks,<sup>442</sup> terrorisms risks,<sup>443</sup> cyber risks,<sup>444</sup> flood risks,<sup>445</sup> and even risks associated with global pandemics.<sup>446</sup> The insurance market requires an adaptation period to be able to offer accurate policies addressing new risks, both in type and scope. This process takes time, is challenging, and not always successful. However, once insurers learn there is a demand for a policy and assuming there is a potential for profit, both sides have an incentive to increase the scope of insured risks. This is true when emerging technologies become prevalent in our society. This does not necessarily mean new types of policies will be created. Amending and adjusting existing traditional policies is also a valid option, as long as the insurance industry adapts in light of the new risks it faces.

Emerging technologies are constantly accompanied with a heightened perception of risks, especially given the potential of catastrophic risks.<sup>447</sup> This type of risk is an important determiner of “judgments of perceived and acceptable risk”<sup>448</sup> that influences individuals choices to embrace new technologies into their lives. Once a technology has the potential to inflict catastrophic damages, consumers’ ability to accept risks associated with it is lower as they perceive them as unknown, unfamiliar, and uncontrollable, which may lead to volumes of casualties.<sup>449</sup> Today, ample of new

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<sup>440</sup> In the context of consumers, *see, e.g.*, Michal S. Gal & Niva Elkin-Koren, *Algorithmic Consumers*, 30 HARV. J.L. & TECH. 309, 322 (2017).

<sup>441</sup> *See, e.g.*, Notes and Comments, *Riot Insurance*, 77 YALE L. J. 541 (1968).

<sup>442</sup> ABRAHAM & SCHWARCZ, *supra* note 59, at 560-61.

<sup>443</sup> Though not without issues, *see* Boardman, *supra* note 280.

<sup>444</sup> *See supra*, Part IV.2.

<sup>445</sup> HOWARD C. KUNREUTHER & ERWANN O. MICHEL-KERJAN, AT WAR WITH THE WEATHER: MANAGING LARGE-SCALE RISKS IN A NEW ERA OF CATASTROPHE 4-10 (2011); Jennifer Wriggins, *Flood Money: The Challenge of U.S. Flood Insurance Reform in a Warming World*, 119 PA. ST. L. REV. 361 (2014).

<sup>446</sup> Abraham & Baker, *supra* note 63, at 203; Carolyn Cohn, *Underwriters Puzzle Over How to Make Pandemics Insurable Again*, REUTERS (Mar. 10, 2021), <https://www.reuters.com/business/finance/underwriters-puzzle-over-how-make-pandemics-insurable-again-2021-05-10> [<https://perma.cc/V99G-2QT2>].

<sup>447</sup> Slovic et al., *supra* note 121, at 207.

<sup>448</sup> *Id.*

<sup>449</sup> In the past, this fear was most consistent with nuclear power. *Id.* at 207-08.

technologies, such as AI and quantum computing, present this balance of fear with low-probability, high-consequence hazards that surround their innovation. This fear is, and will continue to be, mitigated by the risk hedging mechanism insurance offers manufactures and consumers. The public yearns for risk reduction, and as long as more scientific information is not available to ease their mind, insurance can hedge these unpredictable risks, at least to some extent. In doing so, insurance will provide remedy to those who suffer damages or injury, create an incentive to prevent accidents and reduce aggregated losses, and enable safe and healthy innovation into the market. It is important to emphasize the role of the regulator, whether via legislation or acting as a reinsurer to these insurance companies, in creating a robust infrastructure for these policies. The large scale of innovation today and the different risks associated with them renders this regulatory intervention imperative for the continuing success of the virtuous innovation cycle, as well as achieving more innovation at large. It is currently significantly lacking from our legislative landscape.

Abraham and Baker observed that only time will tell if cyber insurance survives as a stand-alone policy or be absorbed into existing traditional insurance policies.<sup>450</sup> This may be true with regards to other technology specific future insurance products. Either way, whether a specific policy is dedicated to an emerging technology, or whether its risks are covered by existing traditional policies, the tech industry and its users should pay more attention to insurance and its vital role in supporting innovating technology. The insurance industry has an important part in the virtuous cycle of innovation by encouraging it and ensuring its safe implementation into our commerce stream. It has done so since the inception of liability insurance, coinciding with the early days of technological innovation.

Emerging technologies lead to new types of risks and losses, creating new liability rules which in turn drive the purchase of liability insurance. Other times, tort law reacts slowly to harms caused by emerging technology leading to the purchasing of liability insurance first and only then to the formation of liability rules, which are undoubtedly influenced by the existence of these policies. Yet in other instances, which stand at the heart of this Article, the existence of liability rules and insurance helps facilitate the safe dissemination of emerging technologies into our commercial stream. Liability insurance allows consumers and manufactures of emerging technologies to innovate while hedging their risks, thus it acts as a catalyzing force of innovation itself and is certain to continue to do so with regards to the technologies of the future. The regulator holds

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<sup>450</sup> Abraham & Baker, *supra* note 63, at 182.

an important role in ensuring this virtuous cycle will continue to facilitate innovation along a robust commercial market, all while protecting consumers and providing them an essential remedy when needed.