Hastings Science and Technology Law Journal

Volume 12
Number 2 *Summer 2021*

Article 4

Summer 2021

Towards Optimal Liability for Artificial Intelligence: Lessons from the European Union's Proposals of 2020

Stefan Heiss

TOWARDS OPTIMAL LIABILITY FOR ARTIFICIAL INTELLIGENCE: LESSONS FROM THE EUROPEAN UNION'S PROPOSALS OF 2020

by STEFAN HEISS*

ABSTRACT

Are the E.U.'s proposals on artificial intelligence (AI) a major breakthrough or just a mere token of an initial liability regime? Several initiatives have been released in 2020 to shape Europe's digital future to the next level, whereas the U.S. leadership program is hesitant to regulate AI. However, the recent E.U. proposals by introducing strict liability or implementing a certification procedure are a first approximation of what is needed rather than an adoptable bill. Based on the lessons learned from the E.U. a scheme of liability is outlined, which strengthens the trajectory of AI's development in the long-term solely when it is socially desirable. AI is characterized by self-learning, opacity and autonomy, and its increasing ubiquity will put greater strain on the liability system. Therefore, this contribution considers the impacts of AI on U.S.'s major liability regimes, analyzes the effects of its application, and develops a flexible system for risky AI systems. Overall, a fundamental challenge of tort law raised by AI is examined: based on the question of whether the applicable U.S. tort law doctrines are capable of setting proper incentives for the usage of AI for society. The influence of AI on liability rules will be felt along two margins: First, to avoid application difficulties, adjustments must be made to existing rules; otherwise, legal uncertainty will be enhanced. Second, there is not a single existing liability regime which is capable of governing AI in a socially optimal manner. This contribution indicates that the U.S. and E.U. neglect important opportunities to reduce the risks of AI and enhance AI's innovation on account of their

* Mag. iur., Research Associate at the University of Bremen, Germany and at the Karl-Franzens-University of Graz, Austria. I am deeply grateful to Professor Patrick C. Leyens for his support and invaluable comments. Thanks to participants of workshops at the University of Bremen hosted by Professor Patrick C. Leyens and at the University of Graz hosted by Professor Walter Doralt for their comments on this project. Special thanks are also due to the editors of the Hastings Science & Technology Law Journal for their careful edits. All opinions, errors, and omissions are my own.

liability rules or new proposals. However, the U.S. already noted that the global AI race is underway. Hereinafter, a first roadmap is outlined that leads to a leading position.

TABLE OF CONTENTS

I. INTRODUCTION

The ongoing commercialization of artificial intelligence (AI) systems raises the fundamental issue that "robots cannot be sued, but they can cause devastating damage."[1] Litigation of harm caused by AI systems has already attracted the attention of courts.[2] Now, the duty of AI in society needs further clarification. Several recent E.U. declarations indicate that the European strategy tends to address this subject by striking a balance between, efficiently and fairly protecting potential victims of harm, and on the other hand, promoting innovation of the new technology by companies.[3] To some parts, this contribution emphasizes that efficiency analysis is capable of reasonably demonstrating such a socially desirable equilibrium.[4] Thus, the following focuses on liability rules which best incentivize safe and efficient technological innovations for AI. However, from a long-term perspective the E.U. attempts are failing to achieve such a balance. The U.S. is in charge of making use of these findings. Further, it has been argued that the common law system in particular is oriented along the efficiency-enhancing path and therefore, predestined to pursue the aforementioned balance.[5] Still, as

[1] United States v. Athlone Indus., Inc., 746 F.2d 977, 979 (3d Cir. 1984).

[2] *Artificial Intelligence Litigation: Can the Law Keep Pace with The Rise of the Machines?*, QUINNEMANUEL, https://www.quinnemanuel.com/the-firm/publications/article-december-2016-artificial-intelligence-litigation-can-the-law-keep-pace-with-the-rise-of-the-machines/ (showing that several courts have already dealt with the AI related technologies) (last visited Feb. 16, 2021).

[3] *See Resolution on a civil liability regime for artificial intelligence*, EUROPEAN PARLIAMENT (Oct. 20, 2020) [hereinafter E.U. Draft Bill], https://www.europarl.europa.eu/doceo/document/TA-9-2020-0276_EN.html; *White Paper on Artificial Intelligence: A European approach to excellence and trus*t, EUROPEAN COMMISSION, at 2–3 (Feb. 19, 2020) [hereinafter E.U. White Paper], https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf.

[4] One remark needs to be stressed, this contribution is aware of the fact that social welfare or efficiency is not the only fundamental aspect to align an AI framework. For instance, also privacy, data protection or ethical standards need to be addressed properly. *See generally* Horst Eidenmüller, *Machine Performance and Human Failure: How Shall We Regulate Autonomous Machines?*, 15 J. BUS. & TECH. L. 109, 124–132 (2019) (explaining that human rights only belong to humans).

[5] *See* Richard A. Posner, *What Do Judges and Justices Maximize? (The Same Thing Everybody Else Does)*, 3 SUP. CT. ECON. REV. 1, 39–40 (1993) ("[T]he theory that the common law and other areas of judge-made law are on the whole efficiency-enhancing."); *See* Paul H. Rubin, *Why Is the Common Law Efficient?*, 6 J. LEGAL STUD. 51 (1977) (explaining the theory that cases of more efficient rules settle more often than cases with less of efficient rules); *See* George L. Priest, *The Common Law Process and the Selection of*

technological advances have outpaced legislative adjustments, it is unclear if existing U.S. liability regimes are capable of promoting socially optimal behavior. Certainly, the interaction between tort law doctrines and AI poses questions that will shape the future of mankind within the coming decades.[6]

Countries across the globe are investing enormous amounts into the development of AI.[7] In February 2020, the E.U. reaffirmed that it is essential to attract more than $20 billion per year in total investment in AI throughout the E.U. over the next decade.[8] Remarkably, the U.S. budget for AI is also increasing and is on a path to double that amount by 2022.[9] However, as more funding is made available for AI technology, AI will be more widely distributed; therefore, more losses will occur. Thus, liability law is in charge of establishing an optimal outcome for society. If the liability threat is too high or too low, the technology will not be optimally used , rather it will either be overused or underused or even withheld. Such consequences are suboptimal for society since AI promises to solve some of the world's present biggest challenges: from predicting disease outbreaks or reducing fatality rates in traffic accidents to fighting climate change or anticipating

Efficient Rules, 6 J. LEGAL STUD. 65 (1977) (explaining that within the demonstrated model inefficient rules would lead to more efficient rules because there would be more litigated cases. More inefficiency means greater effort for high-level litigants).

[6] *Cf.* Horst Eidenmüller, *The Rise of Robots and the Law of Humans*, 27 OXFORD LEGAL STUD. RSCH. PAPER 1 (2017), https://ssrn.com/abstract=2941001.

[7] *See* Keith Kirkpatrick, *Artificial Intelligence Market Forecasts*, OMDIA (Dec. 23, 2019) (stating that AI software revenues are estimated to grow from $10.1 billion in 2018 to $126 billion in 2025), https://omdia.tech.informa.com/OM000840/Artificial-Intelligence-Market-Forecasts; *see also* Anand S. Rao and Gerard Verweij, *Sizing the prize: What's the real value of AI for your business and how can you capitalize?* PWC (stating that AI may boost global GDP by 14% or $15.7 trillion by 2030), https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf (last visited Feb. 24, 2021).

[8] *See* E.U. White Paper, *supra* note 3, at 5; *Communication on Artificial Intelligence for Europe*, EUROPEAN COMMISSION, at 6 (Apr. 25, 2018), https://ec.europa.eu/transparency/regdoc/rep/1/2018/EN/COM-2018-237-F1-EN-MAIN-PART-1.PDF; *Communication on Coordinated Plan on Artificial Intelligence*, EUROPEAN COMMISSION, at 3 (Dec. 7, 2018), https://ec.europa.eu/transparency/regdoc/rep/1/2018/EN/COM-2018-795-F1-EN-MAIN-PART-1.PDF.

[9] *See* WHITE HOUSE OFF. OF SCI. & TECH. POL'Y, *President Trump's FY 2021 Budget Commits to Double Investments in Key Industries of the Future*, (Feb. 11, 2020), https://trumpwhitehouse.archives.gov/briefings-statements/president-trumps-fy-2021-budget-commits-double-investments-key-industries-future/.

cybersecurity threats.[10] Hence, if there is no long-term roadmap the effort put into AI development will fizzle out quickly.

The urgent need to investigate the applicability of the liability framework regarding AI systems appears to be evident. Tech leaders, like Google or Microsoft, have already called for AI rules.[11] The U.S., due to its statement of global leadership in AI matters,[12] ought to be in the lead to meet the demands of the economic operators. It has been argued that tort law especially has played a more important role in the U.S. legal system than in those of other technologically advanced nations.[13] Even though U.S. liability rules appear predestined to govern AI, proclaimed U.S. policy initiatives do not meet such expectations. When examining the governmental strategies for AI in comparison to the liability regimes of the U.S. and the E.U. considerable differences arise. Whereas the U.S. established general AI guidelines and principles,[14] such as the recent draft memorandum in January

[10] *See* OECD, *Using artificial intelligence to help combat COVID-19*, (Apr. 23, 2020), https://read.oecd-ilibrary.org/view/?ref=130_130771-3jtyra9uoh&title=Using-artificial-intelligence-to-help-combat-COVID-19; *Report on the safety and liability implications of Artificial Intelligence, the Internet of Things and robotics*, EUROPEAN COMMISSION, at 2 (Feb. 19, 2020), https://ec.europa.eu/info/publications/commission-report-safety-and-liability-implications-ai-internet-things-and-robotics-0_en.

[11] *See* Roberto Torres, *At Davos, tech leaders call for AI regulation*, CIO DIVE (Jan. 22, 2020), https://www.ciodive.com/news/at-davos-tech-leaders-call-for-ai-regulation/570768/; *see* Monica Nickelsburg, *Microsoft President Brad Smith calls for AI regulation at Davos*, GEEKWIRE (Jan. 21, 2020), https://www.geekwire.com/2020/microsoft-president-brad-smith-calls-ai-regulation-davos/; *See Press Conference: How to Implement Responsible AI*, WORLD ECONOMIC FORUM (Jan. 21, 2020), https://www.weforum.org/events/world-economic-forum-annual-meeting-2020/sessions/ai-framework.

[12] *See* WHITE HOUSE OFF. OF SCI. & TECH. POL'Y, *Accelerating America's Leadership in Artificial Intelligence*, (Feb. 11, 2019), https://trumpwhitehouse.archives.gov/articles/accelerating-americas-leadership-in-artificial-intelligence/.

[13] *See* ROBERT A. KAGAN, ADVERSARIAL LEGALISM: THE AMERICAN WAY OF LAW 126-28 (2001).

[14] *See* White House, *supra* note 12; *See also* Brandon W. Jackson, *Artificial Intelligence and the Fog of Innovation: A Deep-Dive on Governance and the Liability of Autonomous Systems*, 35 SANTA CLARA HIGH TECH. L.J. 35, 42–44 (2019).

2020.[15] The E.U.,[16] on the other hand, took a different approach by announcing substantive considerations on liability rules solely governing AI.[17] First, in February 2020 a White Paper by the E.U. proposed a distinction between high-risk and non-high-risk AI systems as well as prior conformity assessment procedure.[18] Second, in October 2020 an in-depth Resolution was published, which included a draft bill on a "civil liability regime for [AI]".[19] In summary, the initiative suggests strict liability combined with the defense of comparative negligence for high-risk AI systems throughout the entire E.U.[20]

This contribution eschews issues of how society should deal with the challenges of ethical questions that AI evokes,[21] it neither treats AI's own legal personality.[22] Instead, the "crucial issue"[23] of harm caused by AI is

[15] *See* WHITE HOUSE OFF. OF SCI. & TECH. POL'Y, *Memorandum for the heads of Executive Departments and Agencies: Guidance for Regulation of Artificial Intelligence Application*, (Jan. 7, 2020) (focusing on a trustworthy development, testing, deployment, and adoption of AI), https://www.whitehouse.gov/wp-content/uploads/2020/01/Draft-OMB-Memo-on-Regulation-of-AI-1-7-19.pdf (last visited Feb. 16, 2021) [hereinafter U.S. Draft Mem.]; *See generally* WHITE HOUSE OFF. OF SCI. & TECH. POL'Y, *American Artificial Intelligence Initiative Year One Annual Report*, (Feb. 2020), https://trumpwhitehouse.archives.gov/wp-content/uploads/2020/02/American-AI-Initiative-One-Year-Annual-Report.pdf.

[16] Due to simplification, the running text does not differentiate between the institutions of the E.U., such as European Commission or European Parliament.

[17] E.U. Draft Bill, *supra* note 3.

[18] E.U. White Paper, *supra* note 3, at 5.

[19] E.U. Draft Bill, *supra* note 3.

[20] *See* E.U. Draft Bill, *supra* note 3, at Art. 4 & Art. 10.

[21] *See, e.g.*, Iria Giuffrida, Liability for AI Decision-Making: Some Legal and Ethical Considerations, 88 FORDHAM L. REV. 439, 453-56 (2019) (comparing the different approaches by the E.U. and U.S.); *See also High-Level Expert Group on Artificial Intelligence Ethics Guidelines for Trustworthy AI*, EUROPEAN COMMISSION (Apr. 8, 2019), (developing four main principles of AI: respect for human autonomy, prevention of harm, fairness and explicability), https://ec.europa.eu/futurium/en/ai-alliance-consultation; *DOD Adopts Ethical Principles for Artificial Intelligence*, U.S. DEP'T. OF DEFENSE (Feb. 24, 2020), https://www.defense.gov/Newsroom/Releases/Release/Article/2091996/dod-adopts-ethical-principles-for-artificial-intelligence/.

[22] *See, e.g.*, Gerhard Wagner, *Robot, Inc.: Personhood for Autonomous Systems?*, 88 FORDHAM L. REV. 591 (2019); Dalton Powell, *Autonomous Systems as Legal Agents: Directly by the Recognition of Personhood or Indirectly by the Alchemy of Algorithmic Entities*, 18 DUKE L. & TECH. REV. 306 (2020), https://dltr.law.duke.edu/2020/04/17/autonomous-systems-as-legal-agents-directly-by-the-recognition-of-personhood-or-indirectly-by-the-alchemy-of-algorithmic-entities/.

[23] *Report with recommendations to the Commission on Civil Law Rules on Robotics*, EUROPEAN PARLIAMENT (Jan. 27, 2017), https://www.europarl.europa.eu/doceo/document/A-8-2017-0005_EN.html?redirect#title1.

examined. The following cuts through the confusion about the extent to which the European draft bill achieves the objective of a more efficient AI usage. In order to do so, the losses caused by AI systems under various liability regimes are compared. In brief, as will be elaborated below, when losses are caused between several AI operators neither a single current U.S. tort law doctrine nor the new E.U. initiatives are capable of providing socially optimal behavior. The lessons learned lead to an approach, which governs AI in a beneficial way.

The aforementioned suggests five different stages of the enquiry. In Part II, the first conclusion is drawn – the necessity of a distinction between high-risk AI systems and non-high-risk AI systems depending on a probability/magnitude test. Even though the approach taken by the E.U. is fairly indeterminate and vague, the basic idea of a risk-based approach shall be endorsed. But the forceful European call for a regulatory certification procedure before an AI system is placed on the market should not be endorsed. Instead, civil liability should be the center of interest.

In Part III, selected doctrinal errors for assigning the major U.S. liability rules to AI are indicated. The exemplified uncertainty over the applicability of such rules may even hamper the innovation of AI. Further, in order to design the optimal liability system from scratch, the different incentives of conventional tort law doctrines and the E.U.'s new civil liability proposal are analyzed. Ultimately, neither one of the current major liability regimes nor the E.U. proposal is able to achieve a desirable outcome. On the contrary, only the basic approach of the E.U. might be adoptable. Since the European draft bill seems not flexible enough, it can be considered as flawed overall.

In Part IV, the lessons learned from the European proposals accompanied by improvements are illustrated. In doing so, strict liability with the defense of comparative negligence can be invoked as a basis for an AI framework. As the main lesson from the E.U.'s attempts to govern AI, it can be noted that (so far) no socially desirable solution has been achieved.

In Part V, the article presents a scheme of liability for AI systems that would desirably control the associated risks of AI. The economic operators involved are now strictly liable, but instead of compensating the other party, payments of the caused damage are made to the state. In their financial self-interest AI deployers would now act only when it is socially desirable. This solution is challenged by many difficulties, but the prospects of the new technology promise the capability of its application and enforcement.

Finally, a roadmap is provided that demonstrates first steps of how an AI liability regime of efficiency and trustworthiness can be promoted throughout the U.S. landscape.

II. DIFFERENT RULES FOR DIFFERENT RISKS OF AI

In the U.S., no general governmental definition of AI yet exists.[24] The E.U. – finally – came forward with a definition for the purposes of any possible future discussion on policy initiatives. In sum, three crucial elements of AI result from the definition: self-learning, autonomy, and opacity.[25] AI systems with these characteristics are addressed in the following of this contribution. As a result, the lack of transparency leads ex ante to a limited predictability of the AI system's behavior and ex post to a limited explainability – the so-called black box effect.[26] On the basis of these three key elements, a – final – common language for international debates on AI shall be established.[27]

A. DISTINCTION: HIGH-RISK AI SYSTEM OR NOT

The first thesis developed in this contribution is that a distinction within the liability framework for AI has to be specifically risk-based. As one of the leading tech companies, IBM has already strongly advocated in favor of a policy which emphasizes the significance of different rules for different risks of AI.[28] The risk-based approach in the context of AI was already mentioned in discussions but has not been in-depth examined so far.[29]

A stiff framework does not seem desirable at all. For instance, the author firmly believes that robo-advisors which can be described as provision of

[24] *See* John S. McCain National Defense Authorization Act for Fiscal Year 2019, Sec. 238(g) of the (Public Law 115-232; 10 U.S.C. 2358 note) (serving as guideline of reference); *See* Sofia Samoili et al., AI Watch: Defining Artificial Intelligence, JRC TECHNICAL REPORTS (2020) (analyzing 55 key documents of definitions on AI); *but see* Bryan Casey & Mark A. Lemley, *You Might Be a Robot*, 105 CORNELL L. REV. 287 (2020) (arguing that there might not be the 'right' definition).

[25] E.U. White Paper, *supra* note 3, at 16; *See also High-Level Expert Group on Artificial Intelligence Ethics Guidelines for Trustworthy AI*, EUROPEAN COMMISSION (Apr. 8, 2019), https://ec.europa.eu/futurium/en/ai-alliance-consultation.

[26] *See generally* Davide Castelvecchi, *Can we open the black box of AI?*, NATURE INT'L WEEKLY J. OF SCI. (Oct. 5, 2016), https://www.nature.com/news/can-we-open-the-black-box-of-ai-1.20731; Alex John London, *Artificial Intelligence and Black-Box Medical Decisions: Accuracy Versus Explainability*, 49 HASTINGS CTR. REP. 15, 15–17 (2019).

[27] *See* Int 1894-2020, City Council (N.Y. 2020).

[28] *Precision Regulation for Artificial Intelligence*, IBM POLICY LAB (Jan. 21, 2020), https://www.ibm.com/blogs/policy/ai-precision-regulation/.

[29] *See, e.g.*, Yavar Bathaee, *Artificial Intelligence Opinion Liability*, 35 BERKLEY TECH. L.J. 113, 162–63 (2020) (arguing that sectors of health care or public defense are high-risk applications. Although a further explanation on how to determine high-risk AI is missing).

investment advice or portfolio management services,[30] and autonomous traffic management systems should not be treated equally under the law. The former is based on a contractual relationship (voluntary creditors); generally affected parties can be determined almost conclusively. Whereas traffic management systems expose risks on third parties, who are often not aware of the operating AI system; thus, no contractual or legal relationship towards the AI operator exists (involuntary creditors).[31]

A general distinction related to the riskiness of an AI system seems thus mandatory. Further, legislative intervention is obligatory where the technology exposes many third persons to a risk, and current rules might not impose socially desirable incentives.[32] However, due to the possibility of insurance, the sole aspect of a large amount of losses would not raise any concerns.[33] Instead, the decisive factor is the assessment of the probability of the damage. The unpredictability of AI adds further complexity to calculating the probability of an event occurring and its impact. So, the more significant the criticality in terms of an AI system, the more virulent the urgency of laws which are capable of inducing injurers to internalize the entire harm caused seems to be.

However, clear parameters are required to distinguish between the relevant forms of AI. On one hand, if affected persons by AI are easy to predict or contract voluntarily under consideration of the technology, such AI systems ought to be categorized as non-high-risk AI. Robo-advisors might be classified as non-high-risk. On the other hand, if the majority of affected persons by AI are difficult to predict ex ante and no contractual relationship exists, such AI systems should be categorized as high-risk AI. An autonomous traffic management system where various pedestrians, passengers and drivers are involved might be identified as high-risk.

---

[30] *See generally* Facundo Abraham et al., *Robo-Advisors: Investing through Machines*, 21 WORLD BANK RSCH AND POL'Y BRIEFS 1, 1–4 (2019).

[31] *See generally* FRANK H. EASTERBROOK & DANIEL R. FISCHEL, THE ECONOMIC STRUCTURE OF CORPORATE LAW 50–54 (1991); RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW 541–43 (9th ed. 2014).

[32] Concerning the malfunctioning of the liability system, *see* Part III.

[33] There is hardly any hazardous activity that is not insurable for the largest assumed accident. As can be demonstrated by the insurance of nuclear accidents, *see generally* U.S. GENERAL ACCOUNTING OFF., REP. TO CONGRESSIONAL REQUESTERS, *Nuclear Regulation: NRC'S Liability Insurance Requirements for Nuclear Power Plants Owned by Limited Liability Companies* (May 2004).

Now, the E.U. proposed a risk-based classification between the aforementioned two levels of risk for AI,[34] namely (i) non-high-risk and (ii) high-risk AI. In general, the risk differentiation of AI should be endorsed and follows the exemplified probability/magnitude test. Still, several proposed attempts by the E.U. are flawed.

To qualify as high risk, the E.U. suggested two criteria which have to be cumulative met. Otherwise, the AI system is considered as non-high-risk.

First, the AI application has to be employed in a specifically listed high-risk sector. The sectoral categorization of high-risk AI should be reviewed and updated periodically where necessary.[35] The effectiveness of such an enumerative list of sectors seems questionable. A public authority has to define the high-risk sectors ex ante, before the AI system is placed on the market and causes harm.

Deploying the basic concept of *rules vs. standards* on AI's risk determination in order to decide if a legal command should be promulgated as rule or standard.[36] In doing so, factors facilitating the decision-making process on a law's shape of AI will guide them to a standard rather than to a detailed rule. One aspect is that AI systems are subject to a frequent change of conditions as well as continual development and improvement by leading companies throughout the industry which may result in information asymmetries between public authorities and private actors.[37] The approach

[34] *See* E.U. White Paper, *supra* note 3, at 17; E.U. Draft Bill, *supra* note 3, at Art. 4 & 8; *See also Liability for Artificial Intelligence and other emerging technologies*, EUROPEAN EXPERT GRP. ON LIABILITY AND NEW TECHNOLOGIES, at 40 (May 2019), https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupMeeting&meetingId=15470&Lang=EN. In principle, such a risk-based approach is nothing new, *see, e.g.*, ROBERT BALDWIN ET AL., UNDERSTANDING REGULATION: THEORY, STRATEGY, AND PRACTICE 81–86, 281–95 (2d ed. 2012).

[35] E.g. sectors of transportation (such as autonomous vehicles, traffic management systems or unmanned aircraft) or assistance (such as autonomous robots or public places cleaning devices); *See* E.U. White Paper, *supra* note 3, at 17; E.U. Draft Bill, *supra* note 3, at (14). This suggestion reaffirms the aforementioned policy by IBM *supra* note 28.

[36] *See generally* Louis Kaplow, *Rules versus Standards: An Economic Analysis*, 42 DUKE L.J. 557 (1992).

[37] Already in 2017, global players such as Amazon, Google, Microsoft, Nvidia and IBM account for 40% of open AI positions, *see* Stacy Jones, *Automation Jobs Will Put 10,000 Humans to Work, Study Says*, FORTUNE (May 1, 2017), http://fortune.com/2017/05/01/automation-jobs-will-put-10000-humans-to-work-study-says/. Additionally, the most prized AI researchers are aggressively recruited by large companies and they buy up promising AI startups before they get off the ground to ensure their primacy, *see* Cade Metz, *The Battle for Top AI Talent Only Gets Tougher From Here*, WIRED (Mar. 23, 2017), https://www.wired.com/2017/03/intel-just-jumped-fierce-competition-ai-talent/.

of detailed sectors might become obsolete at a fast rate. In the long run, it does not seem realistic that a precise rule will keep up with the pace of the technology; thus, standards are superior when there is a fast rate of modifications.[38] Further, the more complex an environment is, the more costly it is to establish a functioning norm. At present, the characteristics of AI make it almost impossible to cover every possible divergence; thus, standards are capable of governing several possible contingencies ex post.[39] Indeed, the ongoing distribution of AI will result in a frequency of application, which generally favors the implementation of rules.[40] But AI has a tremendous range of variation; thus, standards are more beneficial because little repetition of the same circumstances occurs.[41] In sum, the rule-based approach by the E.U. does not seem socially desirable; the enumerative denomination of sectors could lead to situations where high-risk AI applications are not covered.

Second, the E.U. suggests that significant risks must be likely to materialize within the respective sector in order to be classified as high-risk AI. The significance of the potential depends on the interplay between the severity of possible harm, the likelihood that the risk occurs and the procedure in which the AI system is used. Further, high-risk AI systems potentially endanger the public to a much higher degree and in a manner that is impossible to predict in advance.[42] The assignment to determine how significant the potential risk of an AI system might result in crucial difficulties. Even though such concerns of defining and assessing risk are nothing unfamiliar,[43] the broad range of AI operations makes several sectors potentially capable of creating significant harm to the general public. For example, even though autonomous high-frequency trading is not capable of

[38] *Cf.* Kaplow, *supra* note 36, at 621–22; Hans-Bernd Schäfer, *Legal Rules and Standards*, at 2 (2002), https://ssrn.com/abstract=999860.

[39] *Cf.* Vincy Fon & Francesco Parisi, *On the optimal specificity of legal rules*, 3 J. INSTITUTIONAL ECON. 147, 151–52 (2007).

[40] *Cf.* Kaplow, *supra* note 36, at 563.

[41] *Cf.* Louis Kaplow, *General Characteristics of Rules, in* V ENCYCLOPEDIA OF LAW & ECONOMICS 502, 510–11 (Boudewijn Bouckaert & Gerrit De Geest eds., 2000).

[42] *See* E.U. White Paper, *supra* note 3, at 17–18; E.U. Draft Bill, *supra* note 3, at (13); European Expert Grp. on Liability and New Technologies, *supra* note 34, at 40.

[43] *See generally* Baldwin et al., *supra* note 34, at 86–98 (mentioning that the core concern of risk studies is to define how risks should be, perceived, quantified, and responded to); ORTWIN RENN, RISK GOVERNANCE: COPING WITH UNCERTAINTY IN A COMPLEX WORLD 12–45 (2008); RICHARD A. POSNER, CATASTROPHE: RISK AND RESPONSE (2006).

hurting someone's physical integrity, flash crashes[44] can still drive a myriad of people into financial bankruptcy.

In order to be classified as high-risk the E.U. emphasizes that both criteria must be cumulatively met; unless these are fulfilled, the AI system has to be subsumed as non-high-risk. In October 2020, the E.U. published a draft bill including a first attempt to form a definition in Art. 3 (c), which clearly indicates the issues addressed above.[45] Overall, the E.U. concept of a differentiation between high-risk and non-high-risk AI can offer a solid baseline for further deliberations even beyond Europe. In sum, the desirable legislative path ought to be risk-based: a framework must depend on the riskiness of the AI system. A concrete solution is however anything but simple question to solve and goes well beyond the ability to discuss in this context.

To be clear, where AI systems impose high risks the potential of decreasing these risks is significantly large. Whereas when the associated risks are low, there is only little room for an already low risk to be decreased.[46] As a first priority, it seems legitimate to reduce the most severe risk that society is facing, i.e. high-risk AI systems. Accordingly, the following contribution only focuses on the governance of high-risk AI systems.

B. PRE-CERTIFICATION OF HIGH-RISK AI

According to the E.U., it is necessary to verify and ensure that high-risk AI systems comply with certain requirements, before placing it on the market. To achieve certification five key features must be satisfied in a specific manner by high-risk AI systems, namely: training data; data and record-keeping; information to be provided; robustness and accuracy; as well as human oversight.[47] Such a prior conformity assessment procedure ought

[44] *See generally* Elvis Jarnecic & Mark Snape, *The Provision of Liquidity by High-Frequency Participants*, 49 FINANC. REV. 371 (2014); Andrei Kirilenko et al., *The Flash Crash: The Impact of High Frequency Trading in an Electronic Market*, 72 J. FINANCE 967 (2017); *See also* the classic book by MICHAEL LEWIS, FLASH BOYS: A WALL STREET REVOLT (2014).

[45] *See* E.U. Draft Bill, *supra* note 3, at Art. 3 (c) ("'high risk' means a significant potential in an autonomously operating AI-system to cause harm or damage to one or more persons in a manner that is random and impossible to predict in advance; the significance of the potential depends on the interplay between the severity of possible harm or damage, the likelihood that the risk materializes and the manner in which the AI-system is being used").

[46] *Cf.* Steven Shavell, *The Mistaken Restriction of Strict Liability to Uncommon Activities*, 10 J. LEG. ANALYSIS 1, 19 (2018).

[47] *See* E.U. White Paper, *supra* note 3, at 18–22.

to include checks of the algorithms and of the data sets by a competent authority.[48]

It is a balance between slowing the development process of the technology and establishing desirable quality parameters. Beyond doubt, ex ante regulatory strategies can be a great aid in enhancing overall efficiency, especially when involving a joint use of liability and regulation.[49] Nevertheless, in context of the progress of technology companies in recent years and investments all over the industry,[50] it seems unlikely that the government will set appropriate guidelines and monitor compliance with them.[51] Hence, there might be at present a serious information deficit on the part of public authorities. At this stage of the technology with its ability of improvement, it may be a gamble to set the socially desirable incentives ex ante. The E.U. prior conformity assessment procedure thus does not even seem close to a Pareto efficient opportunity; rather it could erect steep barriers to enter the AI market.[52] When a country aims to maintain its leadership in AI, the author firmly believes that the applicable framework should not be excessively prescriptive, otherwise AI operators or developers face an incongruent burden.

---

[48] *See id.* at 23–24; The Council Regulation 2019/881, 2019 O.J. (L 151), 15–69 (The E.U. Cybersecurity Act) (containing an approach which could serve as a model).

[49] *See, e.g.*, Steven Shavell, *A model of the optimal use of liability and safety regulation*, 15 RAND J. ECON. 271, 275–278 (1984); Steven Shavell, *Liability for Harm versus Regulation of Safety*, 13 J. LEGAL STUD. 357, 365–71 (1984) (demonstrating that the joint use is generally socially advantageous); Massimo D'Antoni & Araham D. Tabbach, *The Complementary Role of Liability and Safety Regulation*, 21 AM. L. & ECON. REV. 150 (2019) (proposing a joint use of liability and regulation, which is based on a limitation of liability); DON DEWEES ET AL., EXPLORING THE DOMAIN OF ACCIDENT LAW: TAKING THE FACTS SERIOUSLY 3–5 & 412–38 (1996) (demonstrating a comprehensive empirical study of the effectiveness of the American tort system and the regulatory and compensatory alternatives to it).

[50] *See supra* Part I.

[51] *See also* Jackson, *supra* note 14, at 51 (arguing that it is questionable if the legislative process is able to keep up the pace with AI); Yavar Bathaee, *The Artificial Intelligence Black Box and the Failure of Intent and Causation*, 31 HARV. J.L. & TECH. 889, 930–931 (2018) (arguing that a system of regulation would ensure that only large companies can afford compliance with it and new entrants may not be able to do so); Deven R. Desai & Joshua A. Kroll, *Trust But Verify: A Guide to Algorithms and The Law*, 31 HARV. J.L. & TECH. 1, 10–16 (2017) (demonstrating the difficulties of an ex ante approach: "[f]or example, if there is a standard for the way a self-driving car brakes or avoids another car or avoids a person, what happens when the automaker pushes an update to the fleet? How can regulators be sure that the updated software complies with the standard?").

[52] *See generally* Chester S. Spatt, *Complexity of Regulation*, 3 HARV. BUS. L. REV. ONLINE 1 (2012). Also, U.S. courts have outlined that compliance costs may impede market entry, *See, e.g.*, Novell, Inc. v. Microsoft Co., 731 F.3d 1064, 1071 (10th Cir. 2013).

Finally, the prior conformity assessment is incomplete and civil liability has to be put in the loop. In particular, due to the unpredictability of the technology in connection with its extent of various potential and unknown victims, high-risk AI requires a clear allocation to liability rules. As is emphasized, if a large potential of harm is associated with the new technology a socially desirable liability system has the potential to meaningfully lower risks. The remainder of the contribution thus focuses on the governance of solely high-risk AI systems. It is assumed that the risk test is passed by an AI system. In this context, it is essential to analyze – as is done in Part III – whether and to what extent the current legal liability framework is already fit for the new technology.

III. OPTIMAL LIABILITY REGIME FOR HIGH-RISK AI

The primarily purpose of the liability system is to provide economic incentives for the liable party to prevent causing damages.[53] Only where the cost of harm caused by AI is assigned to the actors engaging in such activities, a full cost reflection of the price of the activity in question can be achieved.[54] Rational use of resources, encouragement of safety standards as well as discouragement of undesirable (risky) activities would be the result of such an AI liability framework. To be clear, hereinafter the aim is to determine such a scheme in relation to high-risk AI.[55] Otherwise, the emergence of a dynamic AI industry throughout the U.S. landscape might be jeopardized. Consequently, first, it must be determined whether and, if so, difficulties in existing U.S. tort law doctrines occur (A.). Second, to justify new rules, it needs to be ascertained if the current U.S. framework or new E.U. initiatives are capable of providing socially desirable incentives (B.).

A. LIMITATION OF U.S. TORT LAW DOCTRINES

As technical advancements bring new challenges, it might be unclear how AI technology will be treated within the legal system. Legal doctrines

[53] Of course, the objective of liability law is not to avoid accidents at all costs arising from AI. *See generally* Guido Calabresi, *The Decision for Accidents: An Approach to Nonfault Allocation of Costs*, 78 HARV. L. REV. 713, 716–21 (1965); GUIDO CALABRESI, THE COSTS OF ACCIDENTS: A LEGAL AND ECONOMIC ANALYSIS 26 (1970); Mark A. Geistfeld, *The Coherence of Compensation-Deterrence Theory in Tort Law*, 61 DEPAUL L. REV. 383 (2012); *See also* U.S. Draft Mem., *supra* note 15, at 3–5.

[54] Gerhard Wagner, *Robot Liability*, at 3–4 (2018), https://ssrn.com/abstract=3198764.

[55] See Part V (proposing a rule which achieves this objective).

are customized to human conduct, which may malfunction, when AI is used.[56] In fact, it is necessary to assess whether the current liability doctrines can be applied properly to address the risks that emerge from AI or if adjustments are required within the current framework.

i. Product Liability

Product liability could seem a nearby tort law doctrine for AI devices.[57] In general, product liability balances the expected accident costs against the costs of making the product safer to determine a manufacturer's liability, which is similar to the determination of negligence.[58] Further, it is the core principle for manufacturer liability – no contractual relation is needed.[59] Three categories emerge as common grounds of product liability: manufacturing[60], design[61] and warning defects.[62]

For product liability to be applicable, high-risk AI systems must fall within the scope of the doctrine. The subsumption of AI as product already poses crucial complications. In the case where software is embedded in hardware (e.g. robotics), product liability is applicable even if the defect only affects software.[63] However, it is highly questionable whether AI falls under

---

[56] Bathaee, *supra* note 51, at 890–91.

[57] Already in 1996, the majority of the states adopted strict product liability, *See* David G. Owen, *Defectiveness Restated: Exploding the "Strict" Products Liability Myth*, U. ILL. L. REV. 743, 745 (1996); *See also* Richard A. Epstein, *The Unintended Revolution in Product Liability Law*, 10 CARDOZO L. REV. 2193, 2195–97 (1989); George L. Priest, *The Invention of Enterprise Liability: A Critical History of the Intellectual Foundations of Modern Tort Law*, 14 J. LEGAL STUD. 461, 505 (1985). *See also* Restatement (Third) of Torts: Product Liability, § 2 (b) (1998); *See also* Restatement (Second) of Torts, § 402A (1965).

[58] *See, e.g.*, Owen, *supra* note 57, at 747–51; Posner, *supra* note 31, at 210–12; only the product manufacturing defects are "truly 'strict'", *see* David G. Owen, *Manufacturing Defects*, 53 S.C. L. REV. 851, 855 (2002). *See* Part III.A.3. (in terms of the negligence formula).

[59] Restatement (Second) of Torts, § 402A (2) (b) (1965).

[60] Restatement (Third) of Torts: Product Liability § 2 (a) (1998). *See generally* Owen (2002), *supra* note 58, at 851–905.

[61] *Id.*, at § 2(b). For an elaborate review *see* David G. Owen, *Design Defects*, 73 MO. L. REV. 291 (2008).

[62] *See generally* Watson v. Ford Motor Co., 699 S.E.2d 169, 174 (S.C. 2010).

[63] *See generally* Thomas G. Wolpert, *Product Liability and Software Implicated in Personal Injury*, 60 DEF. COUNS. J. 519 (1993). Courts have dealt with this kind of products in the past: *See, e.g.*, the claim concerning an automated surgical system, Pohly v. Intuitive Surgical, Inc., No. 15-cv-04113-MEJ, 2017 WL 900760 (N.D. Cal. Mar. 7, 2017); Reece v. Intuitive Surgical, Inc., 63 F. Supp. 3d 1337 (N.D. Ala. 2014). With regard to an alleged defective of an autopilot system in an aircraft *see, e.g.*, Ferguson v. Bombardier Servs. Corp., 244 F. App'x 944 (11th Cir. 2007). Further cases in Wagner, *supra* note 22, at 604.

the concept of a product when AI is not embedded in hardware (e.g. autonomous traffic management systems).[64] Furthermore, the question arises: which economic operator shall be liable when several parties are involved? For example, defective digital elements may be implemented after a product has been placed on the market – some of which come separately from the tangible item.[65]

Apart from basic issues, design defects are very significant in practice. Harm most likely to be caused by AI systems will be discussed under this category.[66] The Third Restatement of Torts takes the position that "[a] product . . . is defective in design when the foreseeable risks of harm posed by the product could have been reduced or avoided by the adoption of a reasonable alternative design by the seller"[67]. The aspect of foreseeability might pose insoluble challenges in the respect of AI. Unpredictability is one of the key elements of AI which makes this technology so unique. To some extent, the core idea of AI is to act in an unforeseeable manner.[68] Thus, it would be difficult to base any form of liability on foreseeable or expected risks of harm.[69] Irrespective of foreseeability, a manufacturer may be justified in taking a known risk if the production's benefit to society exceeds the overall harm.[70] AI systems now pose a new challenge to the proper safety standard because they might be compared to a non-AI-based-product operated by a human being and vice versa. In cutting-edge AI cases, such a standard seems complex.[71]

---

[64] *See* the different approaches in DAVID G. OWEN, PRODUCTS LIABILITY LAW 1082 (3d ed. 2015).

[65] E.g., a control app can be downloaded onto the user's vehicle, *cf.* European Expert Grp. on Liability and New Technologies, *supra* note 34, at 42–44.

[66] *See* Karni A. Chagal-Feferkorn, *Am I an Algorithm or a Product? When Products Liability Should Apply to Algorithmic Decision-Makers*, 30 STAN. L. & POL'Y REV. 61, 80 (2019).

[67] Restatement (Third) of Torts: Product Liability, § 2 (b) (1998).

[68] *See supra* Part II.

[69] Omri Rachum-Twaig, *Whose Robot Is It Anyway?: Liability for Artificial-Intelligence-Based Robots*, 2020 U. ILL. L. REV. 1141, 1156–57 (2020); Jin Yoshikawa, *Sharing the Costs of Artificial Intelligence: Universal No-Fault Social Insurance for Personal Injuries*, 21 VAND. J. ENT. & TECH. L. 1155, 1166–67 (2019).

[70] *See* Posner, *supra* note 31, at 210–12.

[71] *See* Mark A. Geistfeld, *A Roadmap for Autonomous Vehicles: State Tort Liability, Automobile Insurance, and Federal Safety Regulation*, 105 CAL. L. REV. 1611, 1644–47 (2017); Wagner, *supra* note 22, at 605–06; *See generally* James Boyd & Daniel E. Ingberman, *Should "Relative Safety" be a Test of Product Liability?*, 26 J. LEGAL STUD. 433 (1997).

In sum, the foregoing demonstrates a high degree of uncertainty regarding the application of product liability.[72]

ii. Strict Liability

Under a regime of strict liability, no design defects or negligence would be required to establish liability. Therefore, an injurer will be held liable for the harm that occurred, regardless of the level of care applied. "The liability arises out of the abnormal danger of the activity itself, and the risk that it creates, of harm to those in the vicinity."[73] U.S. courts insist two major criteria must be met before strict liability can be imposed: (i) the injurer's activity generates a highly significant danger and (ii) is uncommon.[74]

First, criterion (i) has to be applied upon high-risk AI, due to the fact that this replicates the distinctiveness between high-risk and non-high-risk AI.[75] However, the list of abnormally dangerous activities is short and has not been significantly expanded over the past years.[76] Additionally, technologies such as AI will typically be implemented in goods of common usage, such as self-driving cars or autonomous robots. All of those AI devices will be distributed innumerably throughout public space. Thus, the vast majority of losses might not be subsumed under the second criterion (ii).

A brief glance at Europe reveals similar problems. Legislators within the E.U. member states often responded to risks induced by new technologies by introducing strict liability.[77] Some jurisdictions,[78] like Germany, are more restrictive whereas others, like France, have even established a general rule

---

[72] *See also* Jackson, *supra* note 14, at 58–59. *But see* David C. Vladeck, *Machines without Principals: Liability Rules and Artificial Intelligence*, 89 WASH. L. REV. 117, 150 (2014) (arguing that product liability doctrine could be applied on AI without any interruption as long as machines can be conceived as agents of a human being).

[73] Restatement (Second) of Torts § 519 (1) cmt. d (1977).

[74] *See* Restatement (Third) of Torts: Physical & Emotional Harm § 20 (2010) (stating that these criteria are important in judicial decision-making as explained in cmts. e, g, h, j, and k). Although six factors ought to be weighed to conclude whether an activity is abnormally dangerous, *see* Restatement (Second) of Torts, § 520 (1979).

[75] *See supra* Part II.A.

[76] *See* John C.P. Goldberg & Benjamin C. Zipursky, *The Strict Liability in Fault and the Fault in Strict Liability*, 85 FORDHAM L. REV. 743, 757–61 (2016).

[77] *See* the contributions to THE DEVELOPMENT OF LIABILITY IN RELATION TO TECHNOLOGICAL CHANGE (Miquel Martín-Casals ed., 2010).

[78] *See* UNIFICATION OF TORT LAW: STRICT LIABILITY (Bernhard A. Koch & Helmut Koziol eds., 2002) (noting that the landscape varies throughout the E.U. member states. However, attempts to harmonize strict liability have already been initiated).

of strict liability, which applies to dangerous activities.[79] However, strict liability for the operations of AI or comparable is so far widely unknown throughout the European legislations.[80]

In general, strict liability as well as product liability may not be applicable at all or may only cover a fraction of cases caused by AI systems. Hence, the majority of accidents AI triggers will be allocated to negligence.

iii. Negligence

Unintended harms or accidents caused by someone ought to be compensated if the tortfeasor is blameworthy or at fault.[81] In general, several elements are considered in assessing whether an act is negligent.[82] One major aspect of negligence concerns the ascertainment of an appropriate standard of negligence, which seems even more challenging in terms of AI's characteristics.

In particular, a breach of duty based on a reasonable person is the standard to be applied.[83] The operation of the law of negligence to determine that standard can be explained by the formula of Judge Learned Hand, who developed three elements of measurement.[84] In short, these are: the magnitude of the specific loss, probability of the accident's occurring, and the burden of taking precautions that would prevent it.[85] However, the

[79] *See* Art. 1242 of the Code civil (French Civil Code), which is not limited to any specific object or risk (explaining that the beneficial owner of a "thing" can be liable regardless of a defective); *See generally* Gerhard Wagner, *Custodian's Liability, in* THE MAX PLANCK ENCYCLOPEDIA OF EUROPEAN PRIVATE LAW 441, 441–43 (Jürgen Basedow et al. eds., 2012).
[80] *See* European Expert Grp. on Liability and New Technologies, *supra* note 34, at 25–27; *But see* §§ 89e, 91b (8) of the Austrian Gerichtsorganisationsgesetz (Court Organization Act) (providing strict liability of the operator in terms of automated systems operated by the government).
[81] *See, e.g.*, Richard A. Posner, *A Theory of Negligence*, 1 J. LEGAL STUD. 29, 29 (1972).
[82] Namely the existence of duty of care, a breach of the duty, harm caused to the victim, and a causal link between the breach and harm caused. *See, e.g.*, W. PAGE KEETON ET AL., PROSSER AND KEETON ON THE LAW OF TORTS § 30 (5th ed. 1984); John C.P. Goldberg & Benjamin C. Zipursky, *The Restatement (Third) and the Place of Duty in Negligence Law*, 54 VAND. L. REV. 657, 658 (2001). For Supreme Court decisions *see* David G. Owen, *The Five Elements of Negligence*, 35 HOFSTRA L. REV. 1671, 1672 (2007).
[83] Restatement (Second) of Torts § 283 (1979); *see also* Pomer v. Schoolman, 875 F.2d 1262, 1268 (7th Cir. 1989).
[84] *See* United States v. Carroll Towing Co., 159 F.2d 169 (2d Cir. 1947); Conway v. O'Brien, 111 F.2d 611 (2d Cir. 1940).
[85] For further deliberations *see* John Prather Brown, *Toward an Economic Theory of Liability*, 2 J. LEGAL STUD. 323, 331–35 (1973); Posner (2014), *supra* note 31, at 191–96; Posner (1972), *supra* note 81, at 32–96.

standard specified by courts in practice is called ”due care” and might not always equal the optimal one since courts would need knowledge of all relevant facts.[86] This issue appears even more critical in the area of AI because of its opaque black-box nature.[87] Furthermore, it has been argued that courts intend to consider the risk resulting from a technology more than its advantages.[88] As a result, these prospects may likely lead to a determination of unsatisfactory standards.

Another necessity for establishing liability is a causal link between the victim's harm and the tortfeasor's sphere.[89] New emerging technologies can raise sophisticated causation issues. Victims need to prove that their losses emerge from some conduct or risk attributable to the injurer.[90] Subsequently, the required standard of proof has to be taken into consideration. In most civil law systems, judges need to be convinced of something equivalent to a degree of certainty[91] in order to side with the party carrying the burden of proof.[92] But also, within the U.S., as shown by cases like *Palsgraf v. Long Island R. Co.*,[93] only purely logical or actual causation is insufficient to establish liability.[94] Such an all-or-nothing dilemma is nothing unfamiliar to the legal system.[95] When taking the interconnectedness and enlarged dependency on external input and data into account, AI adds complexity and therefore will become much more of an issue in the future.

---

[86] *See* Richard A. Epstein, *The Social Consequences of Common Law Rules*, 95 HARV. L. REV. 1717, 1740–42 (1982); John E. Calfee & Richard Craswell, *Some Effects of Uncertainty on Compliance with Legal Standards*, 70 VA. L. REV. 965, 997–99 (1984); ROBERT B. COOTER JR. & THOMAS ULEN, LAW AND ECONOMICS 217–20 (6th ed. 2016).

[87] *See also* Rachum-Twaig, *supra* note 69, at 1164; Yoshikawa, *supra* note 69, at 1167–68; Philipp Hacker et al., *Explainable AI under contract and tort law: legal incentives and technical challenges*, 28 AI & L. 415, 420–24 (2020) (noting that already the process of choosing a legitimate AI system for economic operators poses difficulties).

[88] *See generally* Peter Huber, *Safety and the Second Best: The Hazards of Public Risk Management in the Courts*, 85 COLUM. L. REV. 277, 320–29 (1985); *See also* Matthew U. Scherer, *Regulating Artificial Intelligence Systems: Risks, Challenges, Competences, and Strategies*, 29 HARV. J.L. & TECH. 353, 388 (2016).

[89] *See* Restatement (Third) of Torts: Liability for Physical & Emotional Harm § 29 (2005).

[90] European Expert Grp. on Liability and New Technologies, *supra* note 34, at 20.

[91] At least a high degree of probability.

[92] European Expert Grp. on Liability and New Technologies, *supra* note 34, at 20.

[93] 162 N.E. 99 (N.Y. 1928).

[94] STUART M. SPEISER ET AL., 3 THE AMERICAN LAW OF TORTS § 11:1; Giuffrida, *supra* note 21, at 446.

[95] *See* PROPORTIONAL LIABILITY: ANALYTICAL AND COMPARATIVE PERSPECTIVES (Israel Gilead et al. eds., 2013) (explaining that in some circumstances a proportional liability might be a proper suggestion, accordingly the victim's claim against each potential party is reduced to a quota corresponding to the chance of happening that each of them in fact caused the harm in question).

In summary, liability rules may work well for humans, but the applicability of tort law doctrines in the context of AI cannot be ascertained in a generalized way. Accordingly, legal uncertainty over the predictability of the outcome of litigation might be another aspect to be considered. Such a result may increase costs of legal dispute resolution and undermine the innovation of companies.[96]

B. CHALLENGES OF SAFEGUARDING SOCIAL WELFARE

The malfunctioning of tort doctrines emphasizes the need for adjustments in terms of the current liability rules. The deterrence goal provides the necessary normative orientation on how to structure liability rules for high-risk AI systems.[97] If a liability framework for high-risk AI systems is designed from scratch, the effects of liability rules on parties' behavior need to be analyzed. Once again, the objective should be to establish a liability rule that provides socially desirable incentives for the usage of AI. The following analysis takes a law and economics perspective.

In October 2020, a Resolution was issued by the E.U. which included a draft bill.[98] Art. 4 and Art. 10 of this approach establish *strict liability with the defense of comparative negligence* for high-risk AI systems throughout the entire E.U. landscape.[99] Hereinafter, the E.U. proposal is compared with different liability rules in order to find the optimal solution for high-risk AI. Although the suggested approach of the new E.U. civil liability regime is flawed overall, it might be adoptable at least to some extent. Because a substantial risk of externalities occurs that conventional tort law is not designed to address.

Consequently, the effects of liability rules on parties' behavior are analyzed. Generally, it is presumed within this contribution that the social goal is broadly utilitarian in nature. Keeping it simple, two types of decisions

---

[96] *See generally* Isaac Ehrlich & Richard A. Posner, *An Economic Analysis of Legal Rulemaking*, 3 J. LEGAL STUD. 257, 265 (1974) (arguing that "[s]ince the costs of litigating are generally higher than the costs of settling a dispute out of court, an increase in the settlement rate (at least within a broad range) should reduce the total costs of legal dispute resolution. Greater certainty as to outcome might have an indirect effect on the settlement rate as well as the direct effect just discussed."). For empirical investigation on the effects of less uncertainty and innovation, *see* note 162.

[97] *See supra* Part III.

[98] E.U. Draft Bill, *supra* note 3; *See also* E.U. White Paper, *supra* note 3, at 13–16.

[99] E.U. Draft Bill, *supra* note 3, at Art. 4–7.

by the parties involved in an accident[100] are examined. On the one hand, the level of care when engaging in an activity. On the other hand, the level of activity. Especially, in terms of new technologies, both the level of care and activity shall be considered.[101] For the achievement of social welfare, both parties involved in an accident should take appropriate care by increasing safety up to the point at which a further increase of a dollar would no longer reduce the accident costs by a dollar. Further, they should also engage in their activity at a level that properly balances the utility they obtain against the extra risks they thereby create.[102] Note also that it is necessary that each party considers the full amount of an accident in order to choose socially desirable safety and activity levels.

i. Losses caused by AI under U.S. Tort Law Doctrines

First, taking the observed difficulties of the U.S. major liability rules into account,[103] it does not appear farfetched to not apply any liability rule on specific AI based accidents. Hence, the following question must be raised: is it socially desirable that "losses lie where they fall."[104]

(i) Under *no liability*, however, injurers would fail to take care. Additionally, they would engage in their activity as long as they obtain any additional utility because they would not face any liability.[105] Overall, the level of safety would be systematically low from a social perspective, and the activity level would be excessive since AI operators solely compensate their own losses.[106] Therefore, it could be considered that the U.S. policy of being hesitant to legislate AI has a detrimental effect for society.[107] The legislative aim might thus be the rejection of abstract principles and introduction of explicit assignment of liability rules regarding AI systems.

A straightforward way to achieve this seems to be the adjustment of current negligence, product liability or strict liability laws. But even so, if

[100] By the wording "accident", a harmful outcome which none of the parties involved wished to occur is meant.
[101] Hereinafter, it is assumed that tortfeasor, as well as victim, can take care and choose the level of activity and thereby lower accident risks – so-called bilateral accidents, *see generally* STEVEN SHAVELL, FOUNDATIONS OF ECONOMIC ANALYSIS OF LAW 182–93 & 199–206 (2004).
[102] *See also* STEVEN SHAVELL, ECONOMIC ANALYSIS OF ACCIDENT LAW 5–6 (1987).
[103] *See supra* Part III.A.
[104] OLIVER WENDELL HOLMES JR., THE COMMON LAW 47 (1881, republished 2009).
[105] Shavell (1987), *supra* note 102, at 11 & 22–23.
[106] *Cf.* Steven Shavell, *On the Redesign of Accident Liability for the World of Autonomous Vehicles*, 49 J. LEGAL STUD. 243, 254–55 (2020).
[107] *See* White House, *supra* note 12; U.S. Draft Mem., *supra* note 15.

these tort law doctrines can be frictionless applied, none of them lead to a socially desirable solution. This is illustrated by the following:

(ii) Under *strict liability* (ignoring for the moment the defense of comparative or contributory negligence),[108] one must bear in mind that such AI devices can also cause damage to each other, giving rise to a situation comparable to no liability.[109] The parties are reciprocally liable to each other for the same amount of losses. In this scenario, both are not better or worse off if there was simply no liability.[110]

(iii) Under *negligence*,[111] the primary issue is that courts have to specify the level of care based on the Learned Hand formula – so-called due care.[112] If the injurers apply at least due care, they would not be held liable.[113] Generally, the ability of courts to select the socially optimal level of care might be already difficult. AI is no different, its opacity might actually increase the complexity.[114] However, even if it is assumed that due care chosen by courts equals the optimal level of care, the activity level of the injurer would not be controlled. Because courts would need to ascertain the character of the benefits parties derive from their activities, this seems practically impossible.[115] An excessive level of activity would be the result.

---

[108] *See, e.g.*, Adam Rosenberg, *Strict Liability: Imagining a Legal Framework for Autonomous Vehicles*, 20 TUL. J. TECH. & INTELL. PROP. 205, 218–23 (2017) (arguing the implementation of strict liability without considering comparative or contributory negligence).

[109] *See* Part III.B.3.

[110] *See generally* Peter A. Diamond, *Single Activity Accidents*, 3 J. LEGAL STUD. 107, 117 (1974); Jennifer H. Arlen, *Reconsidering Efficient Tort Rules for Personal Injury: The Case of Single Activity Accidents*, 32 WM. & MARY L. REV. 41, 76–78 (1990).

[111] *See, e.g.*, Ryan Abbott, *The Reasonable Computer: Disrupting the Paradigm of Tort Liability*, 86 GEO. WASH. L. REV. 1 (2018) (emphasizing that negligence should be preferred over strict liability).

[112] *See supra* Part III.A.3.

[113] *See* WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF TORT LAW 63–64 (1987).

[114] *See supra* Part III.A.3 (noting the difficulties due to the information asymmetry among courts). *See* Mousa Alshanteer, *A Current Regime of Uncertainty: Improving Assessments of Liability for Damages Caused by Artificial Intelligence*, 21 N.C. J.L. & TECH. 27, 37–55 (2020) (noting difficulties in the field of AI and health care).

[115] Steven Shavell, *Strict liability versus Negligence*, 9 J. LEGAL STUD. 1, 6–7 (1980); *See also* Landes & Posner, *supra* note 113, at 66–67; Shavell (1987), *supra* note 102, at 25–26 (noting that in general, negligence is only defined as care alone, without activity. This 'defect' might be justified by the reason that the optimal and actual activity level would be difficult for courts to choose due to the lack of information).

(iv) Under *product liability of the manufacturer to third-parties*,[116] the manufacturer of the AI system may be held liable if it caused harm to third-parties.[117] Now, difficulties occur by determining the level of production under negligence rule because courts would have to balance production costs against consumer assessment.[118] Courts might be likely to choose the standard of care insufficient or excessive. Beyond a doubt, the finding of liability for victims under product liability is complicated due to the diverse doctrinal considerations.[119] Under *product liability of the manufacturer to buyers*, in contrast to before, the buyer of the AI system is the compensated party by the manufacturer. Now, buyers would wish to buy AI systems with a safety level that they find best and ignore liability rules. Therefore, buyers would only consider their own loss. AI manufacturers would have no reason to obey the safety requirements and the activity level would be socially excessive.[120]

It is important to note that a clear allocation of liability rules to high-risk AI systems seems necessary to increase its benefits for society. Further, not one conventional doctrine above is able to provide a balanced solution. Of course, these findings are not new.[121] But certainly, the unique characteristic of AI system might enhance the issues indicated above. For example, the difficulties for courts to select the socially optimal level of care. So, the E.U. seeks to take such aspects into account by the establishment of a new draft bill for AI.

---

[116] *See, e.g.*, Chagal-Feferkorn, *supra* note 66, at 61–114 (arguing that when harm is caused by AI it shall be subject to conventional product liability rules). *See also* A. Mitchell Polinsky & Steven Shavell, *The Uneasy Case for Product Liability*, 123 HARV. L. REV. 1437 (2010) (questioning the benefit challenges of product liability in general); *But see* John C.P. Goldberg & Benjamin C. Zipursky, *The Easy Case for Products Liability Law: A Response to Professors Polinsky and Shavell*, 123 HARV. L. REV. 1919 (2010); A. Mitchell Polinsky & Steven Shavell, *A Skeptical Attitude About Product Liability Is Justified: A Reply to Professors Goldberg and Zipursky*, 123 HARV. L. REV. 1949 (2010).

[117] *See* Elmore v. American Motors Corp., 1969, 70 Cal.2d 578, 75 Cal.Rptr. 652, 451 P.2d 84 (where a car collided head-on with the victim); *see generally* Keeton et al., *supra* note 82, at § 100. The type of liability rule applied depends on the category of defect, *see supra* Part III.A.1. In principle, the levels of safety and activity might be analogue to those of negligence or strict liability.

[118] The aspect that manufacturers (firms) harm third-parties is illustrated by A. Mitchell Polinsky, *Strict Liability vs. Negligence in a Market Setting*, 70 AM. ECON. ASSOC. 363 (1980); Shavell (2004), *supra* note 101, at 207–12.

[119] *See* Keeton et al., *supra* note 82, at §§ 93, 95–98; *See also supra* Part III.A.1.

[120] *Cf.* Shavell (2020), *supra* note 106, at 263–64.

[121] *See generally* Shavell (1987), *supra* note 102, at 11, 29 (demonstrating that none of the existing liability rules are leading to optimal levels of activities).

ii. Losses caused by AI under the E.U. proposal

With its draft bill, the European Union is trying to strike a balance between efficiently and fairly protecting potential victims of harm or damage while providing enough leeway for enterprises to develop new technologies, products or services.[122] This objective can be achieved by using the technology only when it is beneficial to society. Hence, the total amount of social losses by an activity needs to be internalized by the parties involved. Regardless the field of AI's application (e.g. finance, automotive or health care), the E.U. pursues the introduction of *strict liability with the defense of comparative negligence* according to Art. 4 and Art. 10 of the draft bill.

In an effort to illustrate the impacts of the E.U. proposal, it is applied on the basis of an initial model.[123] The analysis will be based on a simple example: *A* is the operator[124] of a high-risk AI system; during its application stranger *B* gets harmed and suffers a $25,000 loss, whereas *A* suffers no harm. The total social costs of the accident are $25,000.

(v) Under *strict liability with the defense of comparative negligence*, optimum social behavior of AI operators would be achieved, but the activity level of potential victims would remain unchanged. Still, the E.U. approach seems to be the most desirable one in comparison to other possibilities mentioned before.

This is illustrated by the following: the E.U. proposal would lead to the result that injurers[125] pay for all accident losses ($25,000) that they cause because they are strictly liable.[126] They would enjoy the benefits of engaging in the activity and defray the costs of care. The activity would only be engaged in if the extra utility injurers derive from it exceeds theirs costs of care as well as their expected liability payments for accidents.[127]

---

[122] E.U. Draft Bill, *supra* note 3, at (B).

[123] This following will rely on two assumptions. First, an increase in injurers' activity level will result in a proportionate increase in expected accident losses, given their level of care. Second, increasing the activity will result in an increase in their utility. *See* Shavell (1987), *supra* note 102, at 6–7 & 21–22.

[124] *See* E.U. Draft Bill, *supra* note 3, at Art. 3 (d), (e) & (f) (providing a definition for possible operators involved).

[125] For reasons of simplifications, unless explicitly noted otherwise it will not be distinguished between manufacturer's or operator's liability. The presented conclusion applies to both, because it is assumed that the manufacturer is capable of passing the costs on the buyer (operator). *See generally* Richard Craswell, *Passing On the Costs of Legal Rules: Efficiency and Distribution in Buyer-Seller Relationships*, 43 STAN. L. REV. 361 (1991).

[126] *See supra* Part III.A.2.

[127] *See* Shavell (1987), *supra* note 102, at 23; Posner, *supra* note 31, at 205–07.

Consequently, strict liability ensures that the objective of the high-risk AI operator is the same as the social objective one.[128] *A* would bear the total amount of harm ($25,000) – achieving cost internalization. Additionally, comparative negligence affects the victim's compensation on account of her or his unreasonable conduct.[129] Under Art. 10 of the E.U. declaration the AI operator's extent of liability shall be reduced in accordance with the fault of the victim and shall not be liable if the victim is solely or predominantly accountable.[130] Ideally victims are thus forced to choose due care[131] as they would not bear any of their accident losses; instead, injurers would be liable.[132] But victims would engage in their activity whenever their utility exceeded the cost of taking due care.[133] The E.U. proposal is not able to affect the activity level of potential victims. *B* may engage in her or his activity excessively. How significant this deficiency really is cannot be explained in a generalized way. The severity of this defect depends on the expected magnitude of the losses caused by an activity. If the activity by its nature creates substantial risks, it would be desirable to control the risk – as it is done with the activity level of the high-risk AI operator. The activity level of victims might not be a crucial factor, especially when they participate in activities of ordinary life (like walking).[134]

Considering that *A* is the operator of a self-driving car and *B* is a pedestrian, the activity level of *B* might not be significant. In this case, *B*'s optimum level of care might already be sufficient.

In sum, it seems certainly conceivable that the introduced E.U. legislative framework can direct a desirable solution for AI. Such an approach, however, needs to be flexible enough to provide optimal incentives when high-risk AI systems cause damage to each other.

---

[128] *See* Shavell (1987), *supra* note 102, at 23.

[129] In some circumstances the victim may only recover a portion of the suffered loss. Comparative negligence originates from contributory negligence which features an all-or-nothing rule. *See generally* A. Chalmers Mole & Lyman P. Wilson, *Study of Comparative Negligence*, 17 CORNELL L. Q. 333 (1932); Gary T. Schwartz, *Contributory and Comparative Negligence: A Reappraisal*, 87 YALE L.J. 697 (1978). In an ideal complete-information world the effects on the care level vanish between comparative and contributory negligence, *see, e.g.*, Posner, *supra* note 31, at 200–04; for a precise analysis between the economic differences *see* Oren Bar-Gill & Omri Ben-Shahar, *The Uneasy Case for Comparative Negligence*, 5 AM. L. & ECON. REV. 433 (2003).

[130] E.U. Draft Bill, *supra* note 3, at Art. 10 (referring to "contributory negligence", however it corresponds to the U.S. terminology of comparative negligence).

[131] However, difficulties occur when evidentiary uncertainty and court error are added, *see* Parts III.A.3 & III.B.3.

[132] Shavell (1987), *supra* note 102, at 13.

[133] *See id*. at 27–28.

[134] *See id*. at 29.

iii. Losses caused by AI vs. AI under the E.U. proposal

So far, the E.U. proposal seems to direct high-risk AI in the best suitable way. A single AI operator would only engage in an activity if it was socially desirable and the proper level of care by potential victims was potentially adequate. Nevertheless, all that glitters is not gold. A counter-intuitive result will be exemplified hereinafter. The European approach is insufficient due to its lack of flexibility. A pressing problem looming on the horizon was not considered by the E.U.: reciprocal accidents of two or more high-risk AI operators.

The E.U. neglects to consider the impact of the new liability rules for the long-term. In order to be effective and useful, a framework needs to reflect the aspect that high-risk based AI systems cause harm to each other. First, several self-driving cars can cause a collision.[135] Second, autonomous unmanned aircrafts (drones) may crash.[136] Third, autonomous robots are able to cause damage to each other and so on. Scenarios like these do not seem unrealistic at all and deserve attention before they become part of society on a daily basis.

In reference to our initial example above, the differences are now that harm is suffered by each party involved and both parties are high-risk AI operators. *A* and *B* each suffer a $25,000 loss. Both cause and suffer losses. The total social costs of the accident are now $50,000.[137] It is crucial to recognize that a desirable liability rule must oblige each party to incur the total social costs of expenses from an accident ($50,000). The proper incentives for the safety and activity level would be accomplished only if *A* has to bear $50,000 (the total social costs). The same applies to *B*.

(v) Under *strict liability with the defense of comparative negligence*, socially optimal care levels of AI operators would be achieved only if courts are able to calculate optimal care. Otherwise, a scenario similar to no liability

[135] *See* Paul Lienert, *Two rival self-driving cars have close call in California*, REUTERS TECH. NEWS, (June 26, 2015), https://www.reuters.com/article/us-autos-selfdriving-nearmiss/two-rival-self-driving-cars-have-close-call-in-california-idUSKBN0P601T20150626.

[136] *See, e.g.*, Dhiraj Gandhi et al., *Drone Uses AI and 11,500 Crashes to Learn How to Fly*, IEEE SPECTRUM (May 10, 2017), https://spectrum.ieee.org/automaton/robotics/drones/drone-uses-ai-and-11500-crashes-to-learn-how-to-fly (teaching a drone how to fly autonomously by crashing into objects).

[137] This example, in a simplified form, is based on Shavell (2020), *supra* note 106, at 250–53 (demonstrating the issue described on autonomous vehicles, which are subsumed as high-risk AI in accordance with the E.U. proposal). Additionally, the findings in terms of the formal analysis apply also to the following, *id.* at 264–76.

might be the outcome. Moreover, comparative negligence might add further complexity to determine the optimum care standard. Despite the negligence standard, a suboptimal activity level would remain unchanged. Overall, the E.U. proposal does not induce socially desirable incentives for AI operators.

This is illustrated by the following: *A* and *B* face strict liability. Consequently, each of them would compensate the other party with the loss of $25,000. *A* as well as *B* would, in fact, bear half of the social costs of an accident.[138] The result is symmetrical to the situation of no liability.[139] To create efficient liability rules, the E.U. proposal considers the aspect of comparative negligence to be applied along with strict liability.[140] The injurer is held liable for harm only if the victim did not act negligently, that is, when the victim's level of care was at least her or his level of due care.[141] If *A* chooses a safety level considering the loss of $25,000, he or she would be deemed negligent by courts, because *A*'s level of care is below the total costs of $50,000 (due care equals optimal care). As a result, *A* has to recover *B* for the harm caused of $25,000 (because of strict liability) as well as compensate – at least part of – her or his suffered loss of $25,000 (because of comparative negligence) and vice versa applies to *B*. Hence, in order to escape comparative negligence both *A* and *B* would choose due care,[142] which equals the total costs of $50,000; otherwise, they would have to additionally bear their own losses.

Several problematic aspects within this regime occur:

First, courts need to define due care according to the total social costs of an accident – in our case $50,000, which seems challenging. This might misguide tort law related to AI; the result of an inappropriate level of care could impede important AI developments.[143] With a new and complex technology like AI and its back-box problem, it is implausible that courts are

[138] *Cf.* Shavell (2020), *supra* note 106, at 255–56.
[139] *See supra* Part III.B.1.
[140] *See* E.U. Draft Bill, *supra* note 3, at Art. 4 & Art. 10.
[141] *See* Shavell (2004), *supra* note 101, at 145.
[142] Under perfect information comparative negligence creates efficient incentives for the level of care, *see, e.g.*, Mireia Artigot i Golobardes & Fernando Gómez Pomar, *Contributory and comparative negligence in the law and economics literature*, *in* TORT LAW AND ECONOMICS 46, 53–59 (Michael Faure ed., 2009).
[143] *See supra* Part I. *See generally* George L. Priest, *The Modern Expansion of Tort Liability: Its Sources, Its Effects and Its Reform*, 5 J. ECON. PERSPECTIVES 31, 42–49 (1991).

able to formulate desirable standards.[144] Parties may be led to take either poor or unnecessarily high care in terms of the court's information deficit.[145]

Second, comparative negligence is very costly to administer.[146] And having to face another challenge: the allocation of joint costs for courts; comparative negligence adds thus further uncertainty.[147]

Third, if the parties chose their care levels in accordance with the negligence standard, the level of activity would still be prohibitively high. Because each only bears half of the social costs – in our case $25,000. Parties make and receive damage payments due to the aspect of strict liability. Thus, if both parties chose due care, *A* would have to compensate *B* for her or his losses of $25,000 and *B* would have to compensate *A* for her or his losses of $25,000. The important point to stress is that high-risk AI systems would be used excessively. Full cost ($50,000) internalization by the parties cannot be achieved.

It is clear that the more often high-risk AI systems are used, the more losses will materialize. Different to the aspect when only one high-risk AI operator is strictly liable, now the activity level of both AI deployers does not represent the total social costs ($50,000). This insufficient outcome of the E.U. proposal gets even worse when it comes to activities of companies. In the foreseeable future, companies will retain the majority of AI users.[148] In order to compete on the market, goods have to be offered at the lowest possible price. If the price does not represent the full social costs, the demand will be too high and result in a misallocation.[149] These issues might result in serious consequences for the ongoing distribution of high-risk AI.

In conclusion, none of the conventional liability rules would perform well to regulate the risks emerging from AI. Worse yet, the new E.U. initiative does not provide a proper solution either. These observations conclude that the U.S. and E.U. forego important opportunities to reduce the

---

[144] *See supra* Part III.A.3.

[145] Courts may also wrongly assess the level of care actually taken, *see generally* John E. Calfee & Richard Craswell, *Some Effects of Uncertainty on Compliance with Legal Standards*, 70 VA. L. REV. 965 (1984).

[146] E.g. there are more claims and therefore more lawsuits in comparison to contributory negligence, *see* Stuart Low & Janet Kiholm Smith, *Decisions to Retain Attorneys and File Lawsuits: An Examination of the Comparative Negligence Rule in Accident Law*, 24 J. LEGAL STUD. 535 (1995).

[147] When evidentiary uncertainty and court error are introduced it cannot be generally concluded that comparative negligence is a superior negligence rule, *see* Bar-Gill & Ben-Shahar, *supra* note 129, at 463-64; *Cf.* Posner, *supra* note 31, at 201.

[148] *See* citations *supra* note 37.

[149] *See* Shavell (1987), *supra* note 102, at 47–72.

risks and enhance desirable development of AI on account of their liability framework or new proposals.

iv. Shielding businesses to accelerate one's leadership?

Shielding businesses from liability for the harm caused does not imply that the leadership of one's country is strengthened. Once again, it is necessary to ensure that the price of an activity represents its total costs. This can only be achieved if the costs of harm caused by dangerous activities are beard by the actor conducting such activities – so-called cost internalization.[150] On the contrary, where all or parts of the risk continue to be externalized, individuals would engage excessively in such an activity because the costs are too low for the activity.[151] In general, it is inefficient to encourage harmful activities, because this would lead to an oversupply thereof.[152] New technologies like AI do not need a special treatment, at least not in terms of the liability regime, as they will pay their way into society.[153]

IV. LESSONS FROM THE E.U.

The foregoing elaboration points irresistibly to four lessons which can be learned from the European attempt to build an AI framework.

First, the European proposed enumerative sectoral approach of high-risk AI should not be pursued.[154] In many cases an AI system might even affect several sectors and cannot be allocated to one.[155] Indeed, it rather shall be focused on a concrete framework related to the degree of risk. Overall, the risk-based approach might be an adequate criterion to ensure the general levels of safety and strengthen the competitiveness of companies. However, it has been argued that courts tend to be too cautious of new risks because these are less familiar hazards, and more common ones are not as much of a danger.[156] This issue can only be mitigated by a precise characterization of high-risk AI, so that non-high-risk AI systems do not face an incongruent

[150] *See* Shavell (2004), *supra* note 101, at 193–97.
[151] *See id*. at 193–97.
[152] *See id*. at 208–212.
[153] *See* Wagner, *supra* note 54, at 3.
[154] *See supra* Part II.A.
[155] *See also* Philipp Hacker, *AI Regulation in Europe*, at 9–10 (2020), https://ssrn.com/abstract=3556532.
[156] *See, e.g.*, Huber, *supra* note 88, at 319.

burden.[157] Still, a more in-depth and detailed assessment of the qualification of 'high-risk' is necessary to overcome the mentioned difficulties. It seems that a probability/magnitude test focusing on the riskiness could cure several difficulties of the E.U. attempt. The impacts of an event will be taken in relation to its probability of occurrence and the more serious the impact of the event, the lower its probability of occurrence may be.

The focus on the specific risk of harm can already be located in new developing areas such as cybersecurity in the U.S.[158] If such exemplified first steps will be continued, an increase of social welfare and a boost of people's trust in the usage of AI can be the consequence.

Second, the European declaration of certifying high-risk AI before placing it on the market might only result in high administrative costs and should not be pursued.[159] Given that the technological potentials of AI are currently hardly foreseeable, an ex-ante hurdle to enter the market does not seem desirable. If unprecedented questions exist and regulators may not have sufficient information in the early stage of AI technology, it cannot meaningfully be regulated ex ante. Therefore, the obligation that AI developers require a certificate to distribute their technology may harm a company's ability to innovate and to gain.

Overall, banning uncertified high-risk AI systems from the market without any possibility of foregoing certification seems burdensome, especially due to the challenging aspects of distinguishing between high-risk and non-high-risk AI. Socially desirable approaches to the high-risk sector should thus be based on tort law.

Third, in light of the myriad of challenges mentioned above and due to the limitations of existing regimes, an adjusted liability framework for AI seems to be the only viable path. Because applying existing tort law doctrines may leave losses undesirable under or even uncompensated. As long as the question of the application of U.S. liability rules is entirely unresolved and

---

[157] *See* Christiane Wendehorst, *Strict Liability for AI and other Emerging Technologies*, 11 J. EUR. TORT L. 150, 165–66 (2020) (providing a risk matrix for different categories of risks concerning AI).

[158] NAT'L INST. OF STANDARDS & TECH., FRAMEWORK FOR IMPROVING CRITICAL INFRASTRUCTURE CYBERSECURITY, 1–21 (Apr. 16, 2018) ("[t]he Framework is adaptive to provide a flexible and risk-based implementation that can be used with a broad array of cybersecurity risk management processes."); *see also* Paul Schwartz, *Risk and high risk: Walking the GDPR tightrope*, (Mar. 29, 2016) (distinguishing between two types of risks in terms of the European GDPR), https://iapp.org/news/a/risk-and-high-risk-walking-the-gdpr-tightrope/.

[159] *See supra* Part II.B.

therefore unpredictable,[160] tort law potentially has a chilling effect.[161] Empirical data has already demonstrated that if legal certainty is provided to economic operators it can result in higher innovation investments by mitigating the factor of uncertainty over the litigation trial.[162]

Nonetheless, the new European approach requires also further amendments. While the E.U. proposal of *strict liability with the defense of comparative negligence* might at least result in a desirable outcome if a single high-risk AI operator is involved.[163] However, the contrary has been achieved when two high-risk AI operators are reciprocally liable to each other.[164] Efficiency and trust throughout society cannot be accomplished. In general, the E.U.'s one-size-fits all concept shall not be pursued and rather serves as primary guideline.

Ultimately, the fourth lesson of the European proposal is to adopt strict liability with the defense of comparative negligence. But the rule ought to be applied solely related to events of damages where only one high-risk AI operator is involved. Thus, a further subdivision between, on the one hand, accidents of only one high-risk-based AI system involved and,[165] on the other hand, accidents involving at least two high-risk based systems[166] could close the gap within the liability regime. A separate liability rule for the latter needs to be considered – as is done in Part V.

V. FILLING THE GAPS IN LIABILITY LAW: AN INNOVATIVE PROPOSAL

A. SOLUTION: STRICT LIABILITY TO THE STATE

Throughout the different categories of liability regimes none of them seems capable of ensuring a social welfare optimum.[167] Having explained why current rules cover AI socially undesirable, the aspect of parties compensating each other is the crucial one. Now, based on the deliberations

[160] *See supra* Part III.A.
[161] *See, e.g.*, Gideon Parchomovsky & Alex Stein, *Torts and Innovation*, 107 MICH. L. REV. 285, 303–08 (2008).
[162] *See* Alberto Galasso & Hong Luo, *When does Product Liability Risk Chill Innovation? Evidence from Medical Implants*, at 42 (2019), https://ssrn.com/abstract=3207503; *See also* Alberto Galasso & Mark Schankerman, *Patent thickets, courts, and the market for innovation*, 41 RAND J. ECON. 472 (2010).
[163] *See supra* Part III.B.2.
[164] *See supra* Part III.B.3.
[165] *See supra* Part III.B.2.
[166] *See supra* Part III.B.3.
[167] *See supra* Part III.B.

of Professor Steven Shavell,[168] this contribution proposes strict liability with losses paid to the state,[169] not only in the case of autonomous vehicles, but rather for all cases of loss involving at least two high-risk AI systems.[170] This liability rule serves as an opportunity to close the gaps of the E.U. initiatives. Under the proposed rule, AI operators will be strictly liable where payments of harm caused are made to the state instead of compensating the other party. The characteristic of AI enables its enforcement.

Although, reinventing the proverbial wheel for each new technology does not seem to be an adequate solution,[171] the alternative of applying current liability frameworks to new technologies are more likely to lead to socially undesirable results.[172] In light of this, the objective of this contribution is to propose how regulators can fix the old wheel to accommodate for advancements in technology.

Most importantly, the core problem of a strict liability regime is that it is not possible to accomplish liability payments of the parties that reflect the total amount of social losses.[173] Further, the duty of courts to formulate optimal level of care might not result in desirable incentives for society.[174] The following discussion proposes a liability framework where parties make payments to the state and is capable of closing these gaps.

Under a *strict liability to the state* scheme, parties would be held strictly liable for the harm they cause, but payments are made to the state, and not to the injured party. This structure achieves the socially desirable level of safety and activity.[175] First, none of the high-risk AI operators involved would be reimbursed for their injuries and each would bear total cost of the harm caused. Additionally, social optimal incentives are achieved.

---

[168] Shavell (2020), *supra* note 106 (suggesting strict liability to the state in the context of autonomous vehicles); Jerry Green, *On the optimal structure of liability laws*, 7 BELL J. ECON. 553, 553–54 (1976); Shavell (1987), *supra* note 102, at 29–30.

[169] The final designation of "strict liability to the state" is still open to discussion, as it is rather akin to an administrative penalty than to a liability rule.

[170] *See supra* Part II.A (in terms of the segregation of high-risk and non-high-risk AI).

[171] *See* Lyria B. Moses, *How to Think About Law, Regulation and Technology: Problems with 'Technology' as a Regulatory Target*, 5 L. INNOV. & TECH. 1, 19 (2013).

[172] *But see* Ignacio N. Cofone, *Servers and Waiters: What Matters in the Law of A.I.*, 21 STAN. TECH. L. REV. 167, 189–91 & 197 (2018) (arguing that analogies are the best method to deal with new technologies. However, despite the optimism surrounding such analogies, the aforementioned (Part III.B.) wrong incentives will still be enhanced).

[173] *See supra* Part III.B.

[174] *See supra* Parts II.A.3. & III.B.1.

[175] *See supra* note 125 (the liability of the manufacturer as well as the operator will lead to a desirable result because the manufacturer will pass on the costs to the operator).

Using the previous example, *A* and *B* are causing damage of $25,000 to each other,[176] the framework's objective is that each party bears the total social costs of an accident – in our case $50,000. For example, under the *strictly liability to the state* scheme, *A* has to pay $25,000 to the state for the losses of *B* as well as compensate her or his own loss of $25,000. The same distribution of losses applies to *B*. Both A and B each pay the total social costs of $50,000. As a result, parties would undertake the socially desirable decisions to increase their safety level. Additionally, the resulting level of activity would be socially desirable. Since both parties' own losses equal the social losses ($ 50,000), the parties would consequently choose a socially correct decision in terms of the activity level to avoid the costs. Thus, the outcome faced under strict liability to the state would be optimal.[177]

At first glance, one could suggest that if *A* and *B* are each paying the social costs ($50,000) they cannot act socially desirable because they have to pay twice the social harm. Together *A* and *B* are paying $50,000 to the state and covering $50,000 for their own losses (in total $100,000), which would lead to excessive safety as well as overly cautious activity. This intuition would only be correct if the parties involved made their decisions cooperatively. But within this model it is assumed that *A* and *B* are strangers to each other and select their safety and activity level independently – as it might be the case in practice with regard to high-risk AI systems. No contractual relations are possible before an accident happens.

Most notably, the economic operators will be induced to make appropriate decisions. For instance, operators will invest in training AI on data sets that are sufficiently broad to avoid dangerous situations, and keep robust and accurate records and data.[178] The parties in charge will then, out of their financial self-interest, achieve the socially desirable standards for society. Furthermore, because AI systems will be used primarily by companies in the foreseeable future, adequate incentives related to the level of activity are of the utmost importance to achieve a desirable outcome for society.[179]

Critics of strict liability argue that it may impose barriers to market entry for AI companies.[180] However, by deploying strict liability to high-risk AI,

[176] *See supra* Parts III.B.2. & III.B.3.
[177] Shavell (2020), *supra* note 106, at 256–58, 260-61.
[178] *See* E.U. White Paper, *supra* note 3, at 18–21 (where these criteria are mentioned).
[179] *See supra* Part III.B.3.
[180] Bathaee, *supra* note 51, at 931–32 ("Finally, strict liability may impose significant barriers to entry. It may simply be too costly, unpredictable, or difficult to produce and deploy AI without risking potentially ruinous liability. The possibility of unpredictable liability would

it is possible to remove these barriers to market entry. First, one core aspect of strict liability is to cover hazardous activities; thus, the unpredictable manner of AI is predestined for strict liability in the way that economic operators internalize the associated costs of their activity. [181] Second, if the associated costs exceed the benefits of the activity, the harmful activity will not be undergone.[182] Now, unlike the discussed certification process above,[183] the ex-ante decision maker in charge is the informed economic AI operator. It is up to each individual to calculate the costs and benefits of an activity and finally decide whether or not to undertake it. Further, the aforementioned critical task by courts to assess a socially optimal level of care will be assigned to the economic operators,[184] who (again) are better informed about the associated risks and benefits of their activity.[185] Judges are in charge to ascertain the harm caused and to allocate it to the responsible parties, which seems efficient, because they are more experienced than other institutions.[186]

Further, the aspect that new technologies innovate too quickly for the liability framework because of the eagerness of judges to punish these for breaking from the status quo cannot be argued in relation to this proposal.[187] Once again, strict liability to the state does not require courts to formulate any level of care. Further, the aforementioned approach emerges as an opportunity to achieve the objectives of the U.S. leadership program on AI.[188] The incentives to reduce risks do not dilute because the parties involved have to bear the total harm caused in an accident – cost internalization is achieved.

---

therefore, like a byzantine regulatory structure, provide significant barriers to entry in most markets where there are already large players").

[181] *See* Shavell (2018), *supra* note 46 (arguing that a dangerous activity should be the only aspect to impose strict liability).

[182] *See supra* note 37 (because mainly companies are the developers of AI, which are aiming to maximize their net surplus).

[183] *See supra* Part II.B.

[184] *See supra* Parts III.A.3. & III.B.1.

[185] *Cf.* Hans-Bernd Schäfer & Frank Müller-Langer, *Strict Liability versus Negligence*, *in* ENCYCLOPEDIA OF L. AND ECON.: TORT L. AND ECON. 3, 11 (Michael Faure ed., 2d ed. 2009).

[186] Scherer, *supra* note 88, at 388–89.

[187] George L. Priest, *The Effects of Modern Tort Law on Innovation and Economic Growth*, *in* RULES FOR GROWTH: PROMOTING INNOVATION AND GROWTH THROUGH LEGAL REFORM 273, 273 (Kaufmann Foundation ed., 2011) (tort liability "has operated as a tax . . . without commensurate benefit to consumers. The effect of expanded tort liability has been to suppress innovation and reduce U.S. economic growth"); Huber, *supra* note 88, at 278.

[188] White House, *supra* note 12; *See* U.S. Draft Mem., *supra* note 15.

B. SELECTED APPLICATION CHALLENGES

Finally, the exemplified solution poses various emerging questions. Within this contribution four basic issues shall be dealt with. Indubitably, this listing is not exhaustive.[189]

i. Scheme of liability without compensation?

The element of furnishing compensation to accident victims is missing at the regime of strict liability to the state– as it is not necessary. Indeed, this seems unfamiliar related to liability law. But in order to set the desirable incentives to reduce risk, not even one of the operators involved needs to be compensated. On the contrary, the compensation of both parties, as shown above, would result in an inadequate standard. The broad distribution of first-party insurance in industrialized economies establishes a less costly mechanism for compensation than the tort system does by itself. Accordingly, the adoption of liability is not necessary regarding the compensation of an injured party.[190]

ii. Excessive administrative costs?

Before implementing strict liability with damages paid to the state the costs of administering the treatment of accidents must be taken into consideration.[191] The most pressing problem might be the associated costs caused by the judicial procedure after losses have occurred. Proving the obligatory facts of tort law doctrines requires analytical capacity and technical expertise, which might be prohibitively costly, especially for victims of AI systems. In general, an analysis of U.S. tort litigation costs has already demonstrated that the administrative costs are estimated to be 53% to 54% of net injured party's benefits.[192] Hence, redistributing one dollar from the tortfeasor to the plaintiff finally represents 53 to 54 cents.

In contrast to other liability regimes, strict liability to the state does not require knowledge of the standard of care or the level of care actually taken. It seems relatively easy to administer compared to conventional liability

[189] For example, further analysis with regard to insurance, competent authority or the extent of compensation seems necessary.

[190] *See* Wagner, *supra* note 54, at 3; Shavell (2020), *supra* note 106, at 279; *See generally* TORT LAW AND LIABILITY INSURANCE (Gerhard Wagner ed., 2005).

[191] Calabresi (1970), *supra* note 53, at 28 (so-called tertiary costs).

[192] James S. Kakalik & Nicholas M. Pace, *Costs and Compensation Paid in Tort Litigation*, RAND REP. NO. R-3391-ICJ, at 68–71 (1986); *See also* Charles Silver, *Does Civil Justice Cost Too Much?*, 80 TEX. L. REV. 2073 (2002).

rules.[193] But the determination of the responsible party as well as the amount of harm caused may still increase the associated costs. Of course, these final impacts are empirical questions and cannot be examined within this contribution. A possible approach to circumvent this issue might be the establishment of a blanket fee depending on which high-risk AI system caused the damage. Different high-risk AI Systems would be categorized, and payment would depend thereon. Moreover, such a suggestion is not uncommon because insurance companies cannot know an individual insurer in advance, they must predict certain classes of policyholders. Hence, an insurer already sorts the same risks and so calculates the insurance premiums ex ante, which ought to internalize the full amount of associated costs of an accident.[194]

iii. Scope of application by scenarios of mixed liability?

When mixed liability regimes are employed, the ideal incentives are going to dilute. Reinforcing the view that a distinction among accidents is paramount. Namely between accidents of (i) a single high-risk AI system and other operators (e.g. humans or other objects) on the one hand, and (ii) solely high-risk AI systems on the other hand. Assuming in light of the initial example[195] that the high-risk AI operator is held strictly liable to the state, whereas the counterpart is held strictly liable with payments to the other party. Now, the AI operator would have to bear only half of the total harm, because he or she pays $25,000 to the state but at the same time he or she is also compensated by the other one. The outcome is inefficient due to the fact that high-risk AI systems will be compensated.

Additionally, if the injurer uses a high-risk AI system that suffers little or no harm, and the victim suffers almost all of the harm, strict liability with a defense of comparative negligence will likely be able to achieve a socially desirable risk reduction – as analyzed above.[196] In terms of at least two high-risk AI systems involved, the gap between the socially desirable outcome

[193] *See supra* Part V.A. Philosophical questions like 'justice' would not arise, *see generally* Green, *supra* note 168, at 554.

[194] Herbert I. Weisberg & Thomas J. Tomberlin, *A Statistical Perspective on Actuarial Methods for Estimating Pure Premiums from Cross-Classified Data*, 49 J. RISK & INS. 539 (1982); Cheng Hsiao et al., *A Statistical Perspective on Insurance Rate-Making*, 44 J. ECONOMETRICS 5 (1990).

[195] *See supra* Parts III.B.2. & III.B.3.

[196] *See supra* Part III.B.2.

and the result of the applicable liability regime might be prohibitively large.[197] Strict liability to the state alone is capable of closing this gap.

iv. Strict Liability to the State beyond AI applications?

If strict liability to the state instills (constantly) socially optimal behavior, this regime should be broadly employed for any combination of cases of loss even without the engagement of AI. The proposed liability regime would always induce the proper incentives to take care and choose desirable levels of activity in the context of any accident. But the ascertainment of accidents would not be a trivial task. If victims are not compensated, they would not have any incentives to sue.[198] Further, parties involved in an accident would have no advantageous reason to notify the state that an accident occurred. It would, in fact, be even an incentive for the parties concerned to conceal accidents because all of them are able to jointly save a proportionate amount of their own losses.[199] However, the special future of AI offers the unique capability to report accidents through electronic systems, which are able to furnish the public authorities access to the gathered information of an accident.[200] Already prospering research can be conducted on the technical implementation of specific transmitters.[201] Overall, it may not be necessary to entirely reinvent a new agency to ensure compliance; rather those already in existence could take over this part. The accompanying administrative costs may be low and the chance to circumvent the reporting of accidents almost impossible.

Of course, privacy and data protection rules will have a strong impact on the implementation of such a reporting system. Additionally, assessment of how to collect, record or store the data of the harm caused by AI systems seems advisable. Especially the aspects of traceability and auditability in the context of privacy law need specific deliberations.

VI. CONCLUSION: A ROADMAP

[197] *See supra* Part III.B.3.
[198] *See* Posner, *supra* note 31, at 223 (demonstrating that the incentives for victims to sue is elemental to the maintenance of the tort system).
[199] *See* Green, *supra* note 168, at 554; Shavell (1987), *supra* note 102, at 30.
[200] *See* Shavell (2020), *supra* note 106, at 280.
[201] *See, e.g.*, Fizzah Bhatti et al., *A Novel Internet of Things-Enabled Accident Detection and Reporting System for Smart City Environments*, 19 SENSORS 2071 (2019) (research into transmitter implementation).

Undoubtedly, AI is capable of many further breakthroughs in the years and decades to come. As noted, AI strongly influences and challenges tort law doctrines. A solid liability regime for efficient and trustworthy AI will constitute the foundation to ensure a social welfare optimum and enable a frictionless market for further AI development. This contribution allocates the opportunity to establish such a flexible normative framework instead of a one-size-fits-all system. If the technology is to be used for the benefit of society, a framework should lead to the desired result in all different scenarios. Ultimately, the U.S. might therefore pursue the following path:

1. The E.U. initiatives on the differentiation between high-risk AI and non-high-risk AI shall only serve as a guideline. Focusing mainly on the riskiness of AI instead of sector specific applications could be a desirable path. Still, a fostered discussion on a flexible and, at the same time, determined distinction is advisable.

2. Existing tort doctrines are not capable of ensuring a social welfare optimum within the application of AI. The E.U. proposal – strict liability with the defense of comparative negligence – provides already desirable incentives with regard to losses when only one high-risk AI operator is involved and shall only cover such circumstances. Especially since each AI system can sustain harm in an accident. The E.U. approach should not be applied to accidents of several high-risk AI operators.

3. In scenarios where two or more high-risk AI operators cause harm to each other. Tort law doctrines cannot optimally address the emerging issues of such AI accidents. The solution is called strict liability with damages paid to the state. Payments are made to the state instead of compensating the other party involved. Further, to ensure its compliance, the technology shall entail an electronical tool to report an event of losses between high-risk AI operators automatically.

In sum, the E.U. declarations are neither a final breakthrough nor a mere token of an initial liability regime. These European initiatives do not delve into the essential issues – a flexible system that is capable of achieving an optimal solution for society in the long run. Overall, it is precisely this flexibility that the E.U. draft lacks. Now it is up to the U.S. to be at the forefront of AI enhancement, and the aforementioned proposed roadmap leads to a desirable path.