The Competition to Shape the Regulatory Environment of Autonomous Vehicles

An STS Research Paper
presented to the faculty of the
School of Engineering and Applied Science
University of Virginia

by

Daniel Wu

March 26, 2020

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

Signed: _____

Approved: _____ Date _____
Peter Norton, Department of Engineering and Society

The Competition to Shape the Regulatory Environment of Autonomous Vehicles

Automation is a latecomer to driving. A seemingly mundane task, driving actually presents a plethora of complex problems that have still yet to be solved. The National Center for Statistics and Analysis (2019) indicates that more than 36,000 people died in motor vehicle crashes in 2018. In 94% of all crashes, responsibility was assigned to the driver; the remaining percentage is attributed to the environment or vehicle failures (Singh, 2018). Autonomous vehicles (AVs) have the potential to eliminate the need for a driver at the wheel, thereby eliminating issues such as drunk driving, distraction, and fatigue. However, skeptics fear that this new technology may bring more issues than they intend to solve. As a result, various groups, organizations, and companies have been competing to influence the regulatory environment governing AVs. The US Department of Transportation's (USDOT) National Highway Traffic Safety Administration (NHTSA) enforces regulations known as Federal Motor Vehicle Safety Standards (FMVSS) to implement laws from Congress. Self-driving car companies and the organizations that represent them have banded together to influence the standards governing the operation, testing, and deployment of AVs. But consumer advocacy groups and other stakeholders of AV technology have cautioned against the rush to AV-friendly policies. While automotive and self-driving car companies have extensively lobbied lawmakers and regulators for regulations favorable to AVs, skeptical stakeholders remain apprehensive, and demand greater caution and information in pursuing this new technology.

Review of Research

Numerous researchers have conducted studies on the current state of regulations concerning autonomous vehicles as well as provided their guidance for policymakers (Anderson et al., 2014). Mordue, Yeung, and Wu (2020) explain the challenges in regulation that will arise as automotive firms achieve higher levels of vehicle autonomy. Some historians have offered interpretations of existing regulation in the context of AVs to enable engineers and authorities to keep autonomous vehicles accountable (Costescu, 2020) and others have even explored how autonomous systems could be classified as legal persons (Janssens, 2018). Hess (2020) analyzes the political strategy of civil society organizations in altering the pace of transition toward AV policy making. While all of these studies offer great perspectives on different directions legislative activity could take on, they don't comprehensively explain the competition to shape the regulatory environment of AVs.

Social scientific discussion surrounding the regulations and safety of autonomous vehicles appear to dominate, however, it may be important to consider the social impacts of AVs. Bissell, Birtchnell, Elliot, and Hsu (2020) offer insight into some of the broader social implications that AVs may bring. They argue that AVs have the potential to not only transform how people travel, but also exacerbate social inequalities, shift labor, and even change the landscape of current mobility systems. This investigation could be applied to the competition to shape AV regulation by supplementing the perspectives of participant groups with the motivation behind their viewpoint.

The struggle of AV developers to influence the regulatory landscape has a recent analogue in ridesharing companies' similar efforts. Suder and Weaver (2016) examine how ridesharing companies such as Uber and Lyft fought litigation concerning accident liability and

driver employment classification. Mohamed, Rye, and Fonzone (2019) investigate a case of Uber in London, and evaluate stakeholders such as service providers, transport operators, and drivers to determine regulations for ridesharing services. Even quantitative research has been conducted on a minimum wage for drivers, a cap on the number of drivers or vehicles, and a per-trip congestion tax (Li, Tavafoghi, Poolla, & Varaiya, 2019). Drawing parallels from similar transitions in legislation can reveal how different participant groups leverage lawmakers to advance their agendas.

Special Exemption from FMVSS

Automotive and technology companies as well as associations that represent them have expressed demand toward expanding policies that grant autonomous vehicles exemptions from the NHTSA's current FMVSS. During a hearing before the House Committee on Energy and Commerce, a representative of General Motors asserted that “it is imperative that manufacturers” test self-driving vehicles “in greater numbers,” and suggested that “one good way to accomplish this goal is to grant the Secretary of Transportation authority to grant specific exemptions for highly automated vehicle development.” Toyota, another vehicle manufacturer, has suggested “updating the Federal Motor Vehicle Safety Standards to address the handful of standards that are inconsistent with, or incompatible with autonomous vehicle technology.” Lyft, a ridesharing company, urged Congress to “revise NHTSA's exemption authority to allow for a greater number of autonomous vehicles to be allowed on the road for testing and deployment purposes” and “direct NHTSA to begin a rulemaking process to update current FMVSS standards to accommodate the development, deployment, and introduction into commerce of AVs at a commercial scale” (Self-Driving Cars: Road to Deployment, 2017). Organizations that represent

these companies along with many more have also displayed support for these exemptions. The Alliance for Automotive Innovation is a trade group whose members include auto manufacturers, original equipment suppliers, and technology companies. It appealed to Congress for "a regulatory framework that allows for the safe testing and deployment of automated vehicle technologies" claiming that "FMVSS exemptions are necessary to act as a bridge for the safe deployment of AV technologies which will then help generate the real world data that is needed to establish new safety standards for AVs" (Autonomous Vehicles..., 2020). The Consumer Technology Association, a standards and trade organization representing more than two thousand consumer technology companies, states that "NHTSA needs to evaluate the FMVSS and update outdated standards before" self-driving vehicles "can be deployed widely" and expand exemptions of vehicles from existing FMVSS to "allow manufacturers and other entities to gather the data they need to improve safety and performance" (Autonomous Vehicles..., 2020).

Centralizing Regulation

Developers of autonomous vehicle technology are pushing for legislation that centralizes regulation on autonomous vehicles to provide consistency among all states. Google is one of the earliest developers of self-driving vehicles and has proposed that "Congress move swiftly to provide the Secretary of Transportation with new authority to approve lifesaving safety innovations" since it believes that "if every state is left to go its own way without a unified approach, operating self driving cars across state boundaries would be an unworkable situation and one that will significantly hinder safety innovation, interstate commerce, national competitiveness, and the eventual deployment of autonomous vehicles" (Hands Off..., 2016). Volvo Car Group, a vehicle manufacturer, claimed that the current legislation on self-driving

cars could “discourage market entry and stifle AD development.” It testified to Congress to “request that the states refrain from legislating and regulating self-driving cars” and “build consumer confidence in unsupervised driving” (Self-Driving Cars: Road to Deployment, 2017). Nvidia develops much of the underlying processing hardware used in autonomous vehicles and relies on testing its AI algorithms in as many different conditions as possible. It expressed that “a patchwork of different regulations in different regions hampers development and progress” and that “it would be enormously beneficial to have a unified set of regulations across all states” (Paving the Way..., 2017).

Supporters of AV technology have also expressed the need for greater consistency among legislation governing autonomous vehicles. During a hearing on self-driving vehicle legislation before the House Committee on Energy and Commerce, several organizations urged Congress to resolve the patchwork of laws that pervade the states. The Self-Driving Coalition for Safer Streets is made up of various technology and automobile companies such as “Ford Motor Company, Lyft, Uber, the Volvo Car Group, and Waymo.” The coalition believes that “states should be discouraged from just creating a patchwork of inconsistent laws and regulations relating to [motor vehicle safety standards].” The Alliance of Automobile Manufacturers (now known as Alliance for Automotive Innovation), a trade group of automobile manufacturers, seeks to provide a “uniform national framework to address concerns about the development of a patchwork of conflicting rules and regulations.” It has noted state laws and regulations to be “impediments to the testing, development, and deployment of self-driving vehicles.” The Chamber Technology Engagement Center was formed by the US Chamber of Commerce to advance technology’s role in the economy. It argues that “for the United States to continue to be globally competitive in the self-driving vehicle market, [it] must provide American innovators

with a single set of standards as opposed to a patchwork of laws by individual states" (Self-Driving Vehicle Legislation, 2017). Mothers Against Drunk Driving is a non profit organization which seeks to eliminate drunk driving; one of the prongs in their campaign being the development of advanced vehicle technologies. It believes that "states should leave the self-driving car safety issues to the automotive safety experts at the federal level" and fear that "their involvement could hinder the technological progress in the deployment of this life-saving technology." (Paving the Way..., 2017). By centralizing control over AV legislation, the US would be able to develop a consistent framework to allow companies to advance self-driving technology.

Data Transparency

Insurance companies and transportation agencies are among a handful of groups that demand testing and crash event data from AV manufacturers be publically available. State Farm is the largest auto insurance company in the US and admits that "data access is a key issue for the insurance industry." It has stated that data access is "essential to developing proper pricing and underwriting of vehicles, critical for liability determinations, and from the general public's perspective, important in determining the safety and reliability of technology" (Impact..., 2018). American Family Insurance, another auto insurance company, believes that "customers should have unrestricted access to their vehicle's operating data and the ability to share that data with third parties." Moreover, in the event of an accident, crash data is vital to "determine relative liability for the inevitable crashes and compensate crash victims" (Impact..., 2018). The San Francisco Municipal Transportation Agency has asked Congress to "require companies to include event data recorders in autonomous vehicles that preserve all information from sensors

before a collision" and to "ensure that every safety incident involving an autonomous vehicle is documented in a national database that is available to researchers and the public." Moreover, they stressed the importance of excluding "any change to the existing federal preemption language" from AV legislation (Autonomous Vehicles..., 2020). The National Transportation Safety Board has issued several safety recommendations aimed at preventing crashes involving vehicles operating with partial driving automation systems, one being the mandatory installation of event data recorders. The Board notes, "As more manufacturers deploy driving automation systems on their vehicles, to improve system safety, it will be necessary to develop detailed information about how the active safety systems performed during, and how drivers responded to, a crash sequence" (Highly Automated Vehicles..., 2019). Many parties have demonstrated that a greater accessibility to data will lead to a greater informed public and hasten the development of AVs.

Advocates for Safety

Safety and consumer advocates remain apprehensive about the state of autonomous driving systems and seek more comprehensive safety standards. The Center for Auto Safety advocates on behalf of consumers for lemon laws across every state and pressures automakers to issue recalls on unsafe car parts. It has outlined a need for "strong, mandatory performance standards which allow for innovations but protect populations" It advocates for legislation that doesn't "preempt existing protections provided by state and local rules of the road regarding the operation of vehicles on their streets" (Center for Auto Safety, 2020). Advocates for Highway and Auto Safety urged Congress to "ensure that the U.S. DOT conducts thorough oversight, establishes regulations that set minimum safety performance standards and require industry

accountability before driverless cars are available in the marketplace and sold to the public." Consumer Watchdog, another consumer advocacy group, seeks stricter autonomous vehicle regulation. It demonstrated support for a proposed city ordinance that would ban self-driving robot cars from the streets of Chicago in the absence of enforceable federal safety performance standards. Consumer Watchdog does not oppose testing of autonomous vehicles on public streets, "so long as there is a test driver who can take over and there is complete transparency about the test programs." (Simpson, 2017). Some US senators, notably California Senator Dianne Feinstein, demand stronger safety standards. In a letter to the secretary of the USDOT, Feinstein (2020) states that similar to the Boeing 737 MAX crash incidents, "new technologies cannot be rushed to market before rigorous oversight is conducted and comprehensive safety rules are enacted." Another US senator, Ed Markey, has urged Tesla to address safety flaws in its autopilot system. Markey (2019) notes, "Tesla drivers have identified a variety of ways to circumvent the safety alerts and automatic shut-off feature that are designed to activate when a user of Autopilot is no longer paying attention to the road" and demands Tesla to "quickly take action to address these risks before any tragedy occurs." Safety is one of AVs' largest challenges, and advocates seek to establish clear standards before its widespread rollout.

Standardizing Testing Methods

Skeptical experts and organizations insist on further developing standard methods of testing and evaluation for autonomous vehicles. RAND Corporation is a nonprofit research institution committed to improving public policy through objective research and analysis. Its recommendations for policy making are to "rapidly develop practical methods of testing safety" and build them into "a flexible, adaptive regulatory framework that specifies what level of safety

performance autonomous vehicles need to meet before they're allowed on the roads." Furthermore, RAND suggests that "that strategic pilot studies and data sharing can help" in developing such a regulatory framework (Self-Driving Cars: Road to Deployment, 2017). Mary Cummings, the director of Duke Robotics and the Duke University Humans and Autonomy Laboratory, is "wholeheartedly in support of the research and development of self-driving cars." However, she believes that the technology is not yet ready and "NHTSA needs to provide leadership for a testing program that ensures that self-driving cars are rigorously tested for what engineers call the "corner cases", which are the extreme conditions in which cars will operate" (Hands Off..., 2016). Alan Morrison, the Lerner Family Associate Dean for Public Interest & Public Service at GW Law, displayed skepticism toward major changes to current AV legislation. Morrison (2017) observes that "some of the draft bills would allow large numbers of vehicles to be deployed outside their testing by manufacturers" and believes that should not be permitted (Self-Driving Vehicle Legislation, 2017). The American Center for Mobility is a collaborative effort of government, industry and academic organizations focused on accelerating the mobility industry. It has suggested authorizing and funding the USDOT's Automated Vehicle Proving Ground program, a combination and range of track, on-road, and simulation facilities and capabilities across wide geographic areas and environmental conditions. The Center argues that it would facilitate "the foundation for the development of safe testing, operation, and deployment, including the necessary voluntary standards and mandatory regulations" (Paving the Way..., 2017). The Consumer Federation of America, a consumer advocacy group, notes, "the voluntary standards that the current administration is favoring simply won't work as a means of regulating one of the most sophisticated products in history." It has suggested that "significant investments must be made in the regulator's ability to test and evaluate AV performance"

(Impact..., 2018). Proponents of stricter testing methods seek to ensure the reliability of AV performance before regulations are to be loosened.

Investing in Collision Avoidance Systems

Several groups believe that the proliferation of driver assistance technologies are a critical step in ensuring the success of highly automated vehicles. Advocates for Highway and Auto Safety finds it “essential to take lifesaving action now to require all new vehicles be equipped with [advanced driver-assistance systems], which prevent and lessen the severity of crashes.” It urges Congress to “require that advanced technologies which have proven to be effective at preventing and mitigating crashes be standard equipment with minimum performance standards” (Autonomous Vehicles..., 2020). Continental is an automotive parts manufacturing company developing technologies toward “a future with zero traffic fatalities, zero injuries, and ultimately zero accidents.” It believes higher levels of automated driving can be achieved “with building block technologies like automatic emergency braking, adaptive cruise control, and rear backup assist” (Self-Driving Cars: Levels of Automation, 2017). Bosch argues that “driver assistance systems such as automatic emergency braking and blind spot detection can assist in reducing the rising fatality and injury numbers” in the United States (Self-Driving Cars: Levels of Automation, 2017). The Insurance Institute for Highway Safety is a nonprofit research institute that identifies ways to reduce deaths, injuries, and property damage on highways. It strives toward making US roads safer and states that “the newest tool in the vehicle safety toolbox is automation of the vehicle controls that can prevent crashes in the first place and reduce the severity of those that aren't prevented.” The institute has also made it clear that “government policies aimed at ensuring the availability of highway safety data are important to

enhance highway safety research on the effectiveness of [automated driving] technologies" (Self-Driving Cars: Levels of Automation, 2017).

Alternative Motivations

Other various organizations have pushed for AV regulations favorable to their own agendas. The National Federation of the Blind has expressed their interest in AV technology and how it could be used to enhance independence by providing accessible and reliable transportation as well as improve productivity, economic outcomes, and community engagement for the blind. It wants to ensure that any legislation promoting AVs protects "the blind and other people with disabilities from discrimination in the licensure process" and contains "requirements related to nonvisual accessibility of user interfaces and vehicle design" (Autonomous Vehicles..., 2020). Mothers Against Drunk Driving seeks increased support for level four and five automation as "alcohol and drug impairment have lasting effects, so it is imperative for maximum safety that the car be able to completely take control and remove the driver from driving" (Paving the Way..., 2017). Delphi Automotive (now known as Aptiv) manufactures auto parts for autonomous systems and believes that "in an automated future, cars will need to be able to communicate not just with their owner but also the surrounding environment, other vehicles and infrastructure." Therefore, it has suggested that the government can help by "keeping the necessary spectrum both available and free from harmful interference" (Hands Off..., 2016). The American Association of Justice has pressed Congress to ensure that "those who are injured or harmed by automated driving must be able to hold the driver manufacturer accountable in a courtroom and not be forced into arbitration" and claims that if companies "are allowed to

operate automated vehicles without being accountable, then none of the promised safety benefits of automated driving will ever come to pass" (Autonomous Vehicles..., 2020).

Conclusion

The competition to shape the regulatory environment of AVs has shown to be diverse and complex. It was born out of rapid development in technology, leaving lawmakers overwhelmed. Companies and stakeholders invested in AV technology are compelled to accelerate its regulation to keep up with development, but they face resistance from other members of society who fear that it is too early to allow robots to roam the streets. A great avenue for further exploration could be investigating the social effects of widespread highly autonomous vehicles. Research on how AVs are changing society may offer insight into future technological paradigm shifts. The state of the current legislative landscape is sure to continually transform, but it won't be due to the advancements in advancements in the technology; it will be a result of battle between various interest groups and their efforts to influence regulators.

References

Anderson, J., Kalra, N., Stanley, K., Sorensen, P., Samaras, C., & Oluwatola, O. (2014). Current State Law and Legislative Activity. *In Autonomous Vehicle Technology: A Guide for Policymakers* (pp. 41-54). RAND Corporation.

Autonomous Vehicles: Promises and Challenges of Evolving Automotive Technologies: Hearings before the Subcommittee on Consumer Protection and Commerce, of the House Committee on Energy and Commerce, 116th Cong. (2020).

Bissell, D., Birtchnell, T., Elliott, A., & Hsu, E. L. (2020). Autonomous automobilities: The social impacts of driverless vehicles. *Current Sociology, 68*(1), 116–134. https://doi.org/10.1177/0011392118816743

Center for Auto Safety (2020). *Statement Regarding Need for Safety in Autonomous Vehicle Legislation.* https://www.autosafety.org/statement-regarding-need-for-safety-in-autonomous-vehicle-legislation/

Feinstein D. (2020). Letter to Elaine Chao. https://www.feinstein.senate.gov/public/_cache/files/4/2/426d989a-9d91-4e8a-8ec1-5ea2 388d8aea/9D7AC2B90C445755A689E7E316 64A1C1.10-02-2020-df-et-al-to-secretary-c hao-re-avs.pdf

Hands Off: The Future of Self-Driving Cars: Hearings before the Committee on Commerce, Science, and Transportation, Senate, 115th Cong. (2016).

Highly Automated Vehicles: Federal Perspectives on the Deployment of Safety Technology: Hearings before the Committee on Commerce, Science, and Transportation, Senate, 116th Cong. (2019).

Impact of Autonomous Vehicles on the Future of Insurance: Hearings before the Subcommittee on Housing, Community Development and Insurance, of the House Committee on Financial Services, 115th Cong. (2018).

Janssens, L. (2018). A Prospect of the Future.: How Autonomous Systems May Qualify as Legal Persons. In L. Janssens, E. Bayamlioğlu, I. Baraliuc, & M. Hildebrandt (eds.), *Being Profiled : Cogitas Ergo Sum: 10 Years of Profiling the European Citizen* (pp. 116–121). Amsterdam: Amsterdam University Press.

Li, S., Tavafoghi, H., Poola, K., & Varaiya, P. (2019). Regulating TNCs: Should Uber and Lyft set their own rules?. *Transportation Research Part B: Methodological. 129,* 1 93-225. https://doi.org/10.1016/j.trb.2019.09.008

Markey, E. J. (2019). Letter to Elon Musk. https://www.markey.senate.gov/imo/media/doc/Letter%20--%20Tesla%20Autopilot%20Safety%20System%2011-19-19.pdf

Mohamed, J. M., Rye, T., & Fonzone, A. (2019). Operational and policy implications of ridesourcing services: A case of Uber in London, UK. *Case Studies on Transport Policy, 7*(4), 823-836. https://doi.org/10.1016/j.cstp.2019.07.013

Mordue, G., Yeung, A., & Wu, F. (2020). The looming challenges of regulating high level autonomous vehicles. *Transportation Research Part A: Policy and Practice. 132,* 174-187. https://doi.org/10.1016/j.tra.2019.11.007

National Center for Statistics and Analysis. (2019). *Early estimate of motor vehicle traffic fatalities for 2018 (Crash•Stats Brief Statistical Summary.* Report No. DOT HS 812 749). Washington, DC: National Highway Traffic Safety Administration.

National Highway Traffic Safety Administration (2017). *Automated Vehicles for Safety.* https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety

Paving the Way for Self-Driving Vehicles: Hearings before the Committee on Commerce, Science, and Transportation, Senate, 115th Cong. (2017).

Self-Driving Cars: Levels of Automation: Hearings before the Subcommittee on Digital Commerce and Consumer Protection, of the House Committee on Energy and Commerce, 115th Cong. (2017).

Self-Driving Cars: Road to Deployment: Hearings before the Subcommittee on Digital Commerce and Consumer Protection, of the House Committee on Energy and Commerce, 115th Cong. (2017).

Self-Driving Vehicle Legislation: Hearings before the Subcommittee on Digital Commerce and Consumer Protection, of the House Committee on Energy and Commerce, 115th Cong. (2017).

Singh, S. (2018, March). *Critical reasons for crashes investigated in the National Motor Vehicle Crash Causation Survey.* (Traffic Safety Facts Crash•Stats. Report No. DOT HS 812 506). Washington, DC: National Highway Traffic Safety Administration.

Simpson, J. M. (2017). *Consumer Watchdog on Ordinance to Ban Autonomous Vehicles from Chicago's Streets, Section 9-76-240.* https://www.consumerwatchdog.org/resources/chicagotestimony082117.pdf

Suder, M. P., & Weaver, K. N. (2016). Recent Developments in Automobile Litigation. *Tort Trial & Insurance Practice Law Journal*, *51*(2), 289–306. doi.org/10.2307/26421943