

Mackinac Center for Public Policy

Issues and Ideas Forum

“Smart Regulations for the Coming Driverless Car Revolution”

Speakers:

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Associate Dean for Faculty and Research and Frederick Paul Furth, Sr.
Professor of Law,
University of Michigan

Caleb Watney,
Technology Policy Associate,
R Street Institute

Dan Mahaffee,
Senior Vice President and Director of Policy,
Center for the Study of the Presidency & Congress

Introduction and Moderator:
Michael Van Beek,
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MICHAEL VAN BEEK: All right. Good afternoon, everybody. It is technically afternoon. Welcome to this Issues and Ideas Forum hosted by the Mackinac Center. I'm Michael Van Beek. I'm the director of research at the Center. Thank you all for joining us. Hope you are enjoying your lunch, or already have enjoyed it. I want to welcome the people who are viewing this – our live web stream of this event. Just so you know, that's going to be available on our website after this is over. So, if you want to go back and watch this again or share it, you can do that at our website, at Mackinac.org. I also want to take a moment and thank Auto-Owners Insurance. They sponsor these events that we have, these luncheons. So thank you for their support.

And a couple other items. Outside of the room there's a publication's table. Feel free to look at take any of the material that you find there. The Mackinac Center does policy research on a wide variety of issues, so you might find something of interest there. And then for the – later in the session, after our presentations, we'll do Q&A. If you have a question, please jot it on – write it down on a card that's at your table there. I'll have one of my colleagues or myself come and pick that up. And then I can read the question from the podium to the panelists. The reason we do that is so people viewing the livestream can hear all the questions and know what's going on.

So, for today, our topic for this I&I is “Smart Regulations for the Coming Driverless Car Revolution.” And policymakers need to think hard about how to properly regulate new technologies like autonomous vehicles. Regulations, after all, are powerful and often blunt tools. They can be used to foster innovation, competition and economic growth, and then can be used to prevent change, snuff out invention, and slow technological advances. The predicted benefits of autonomous vehicles to society are large and wide-ranging. And Michigan and other states need to ensure that their residents can take full advantage of these upsides.

And to discuss that we have three panelists today. I will introduce them all and then will do – they will provide a presentation and then Q&A at the end. The first panelist we have is Dan Mahaffee. He is the senior vice president and director of policy at the Center for the Study of the Presidency & Congress, which published a report titled “The Autonomous Vehicle Revolution: Fostering Innovation with Smart Regulation.” And the information for that report was gleaned from roundtable discussions that they had with government and private sector representatives.

After Dan will be Caleb Watney. Caleb is a technology policy associate at the R Street Institute in D.C. He manages the institute's Technology Policy Working Group. He studies emergency technologies, including autonomous vehicles, artificial intelligence, drones, robotics, and medical tech.

And last will be Dan Crane. He is associate dean for faculty and research and the Frederick Paul Furth, Senior professor of law at the University of Michigan. Professor Crane has been a leading advocate for the right of automobile manufacturers to distribute their vehicles directly to consumers. And he's studied similar or other issues related to autonomous vehicles. He also serves as a member of the Mackinac Center's Board of Scholars.

So join me in welcoming our panel. And I look forward to their – to their comments. (Applause.)

DAN MAHAFFEE: Thank you, Mike. And coming here to Michigan, I can't imagine a better place to be discussing automobile technology and automobile innovation. You know, it's the center of this. And, you know, when you are not shaking up Big 10 football standings, it is the home of this. And I say that – my girlfriend went to Penn State, so if she's watching this I'll be sleeping on the couch tonight. (Laughter.)

But, you know, you have this mixture of leading automobile manufacturers, leading research institutions, and really a state and political leadership that understand the importance of this industry to the people of Michigan, as well as the global leadership in transportation. And every time we look at innovation I always still think of Henry Ford's quote, "If I asked my customers what they wanted, they would have said a faster horse." And that is the leadership that is necessary to continue to innovate and look beyond faster horses to drive marketplaces and to drive the leadership that the U.S. has in his field.

We looked at the area of innovation, when it came to automotive technology, the revolution that is coming in terms of autonomous vehicle technology and self-driving cars, and said what is the environment that policymakers need to think of at a time when technological transformation moves much quicker than regulatory and political processes. And how can we understand the role that leaders will play and the decisions they make as this technology comes into becoming a technology.

And for us, approaching it as a think tank that looks at the national level, it was really to look at how state policies can avoid creating a state-by-state patchwork that impedes the adoption of this technology, how we can understand that technical solutions rather than regulatory or political solutions will largely drive solving some of these challenges, how we look at an environment that favors testing, avoiding issues of regulatory capture that might impede certain innovations. And then, beyond that, planning for the future, having discussions about the effects this technology, second and third-order effects that we don't necessarily think of when we think of automotive transportation and technology.

As I said, we see this change coming much faster than political and regulatory environment operates. But we also see the benefits that this technology can provide for society, that we have, perhaps – you know, we see the data moving in the direction of distracted driving, human error. We see death rates on the road rising for the first time in a while. And how can we take these 94 percent of accidents that result from human error and reduce that, and perhaps have one of the greatest public health victories since anti-tobacco campaigns came into place?

How can we also look at it too in terms of the opportunities that will open up for the disabled, the blind, the elderly, young people, people who are otherwise unable to operate an automobile? What economic and social opportunities will be opened up to them with access to transportation? And then how will we look at the efficiency of transportation, the use of resources, the ways that this can all revolutionize transportation? And how do we foster that dialogue?

Simply, for us, the crux of it is to keep it simple and to look at how existing frameworks work and adapt them as needed, as well as to avoid policies that perhaps close off paths of innovation, or tip the scales one way or another. For us, you know, certainly, the recommendations we found were these consistent approaches of perhaps where you allow to look at these standards that exist currently, where a person can – because a car meets federal safety standards – and Caleb will discuss this in further detail – operate a car from Key West to Seattle, Washington without worrying about changing safety systems or turning features on or off, and how that allows for a consistent transportation experience across this country, while states retain important roles in terms of insurance, licensing and registration.

That balance has worked for traditionally operated automobiles. So how do we continue to provide that consistency as new technologies come online? How do we also look, when thinking about innovation – particularly from a government standpoint – what are simple ways that can help foster the adoption of this technology? Too often, and particularly we've seen this in Washington, a lot of the discussion focuses on dedicated short-range communications or vehicle-to-vehicle technologies – technical solutions where government is trying to weigh in on one standard or the other.

Though, perhaps, for many of these technologies, better painting the lane lines on the road and clearer signage that a computer can read, as well as benefitting current existing human drivers will solve many of those navigation challenges that we're trying to look for, you know, high-tech answers when, perhaps, there are simple ones that can be applied consistently and evenly across the transportation environment. How do we look and understand the simple approaches that have worked, such as that? And I look forward to further discussion on that s we go forward.

I think also that we realized too that the testing and innovation go hand-in-hand. We see a lot of this technology being tested in Nevada, California, the deserts of Arizona. But as someone who grew up in Chicago, and as you all are Michiganders, there is snow, there is rain, there are hills, there are lots of obstacles that this technology needs to understand. And just as we as humans learned at 15-year-olds and 16-year-olds from our parents have to navigate those hazards and circumstances, allowing testing in a wider range of climates and areas and geographic localities will be key to the success of this technology, so that the leaders need to continue to think how do we create permissive environments and continued responsible dialogues with a wide range of market entrants and firms, to allow for more learning, allow for more opportunities. Because, again to use the human analogy, we wouldn't tell young drivers not to go get experience on the roadways. We want to foster that as we go through testing innovation.

Finally, when we get to the longer-term effects – and this is where we, again, find the need for regulatory and political humility when considering these, because we don't want to act on these issues right away because, again, technology will likely drive solutions. Research, thoughtful dialogue between academics, the government and the private sector can look for solutions and begin to anticipate this. But, for example, there will be the first-order impacts on

transportation, how car ownership models, road usage, tolls, tickets, all that kind of ancillary structure around transportation will change.

We'll see the economic and job effects. Data we ran on Michigan itself that 4 percent of the workforce here is employed in a job that requires driving – trucking, busing, taxis, delivery services, things of those nature. And they will be replaced. But what jobs will be created in terms of servicing fleets or new jobs in terms of building and programming that are higher tech, higher paying jobs? How do we also square concerns about automation and job impacts when many fleet operators complain to you about a shortage of drivers? How do you balance that approach to the – to the job pool? And then what are also the other impacts that we'll see beyond that? And I think – you know, we may think of some of them during the Q&A itself.

But right now, in urban planning, parking lots across the United States take up roughly the same amount of size of Lake Michigan. That'll be real estate that'll be opened up and used in different ways if you have fleets that aren't necessarily parking, but constantly moving in many areas.

What will be the impact in terms of sprawl? Will people, since they can occupy their time watching movies or listening to – reading, or listening to, you know, conference calls, or stuff like that, while driving, will that make a longer commute more palatable? Or will you want to be in an urban area where there are more self-driving cars, so you have quicker transportation options? Questions that are unresolved, but still need to be considered.

What will we see, too, in terms of, you know, finally third-order effects? And interestingly enough, we will see the benefits from safety, but we also understand, and the data shows, that 60 percent of organ donation comes from automobile accidents. Without that, how do we look for solutions in a wide range – and that's just one example of how biomedical research might change when you have to adjust based on assumptions that have existed from this field.

So it's an exciting area. I think we have a lot to continue to discuss. We will be – you know, for us, as an organization, fostering these dialogues between the government and the private sector, and gaining too the experience that you all have as leaders at the state level, really for us to listen and bring this dialogue back to Washington I think is a healthier way to approach this, rather than too often as we come in and say: We have all the answers for you. So I look forward to your questions and your thoughts on this as well. Thank you.

CALEB WATNEY: Well, it's great to be with you all here in Michigan. It's a good reminder that D.C. winters are not so bad. I saw on the forecast there's supposed to be a little bit of snow today, so hopefully. It'd be nice to see a little bit of white, you know, before heading back to the urban landscape of D.C.

But I want to talk about a couple of things within the context of driverless cars here. First, I wanted to emphasize why it's important that we think about the timing of deployment, and why that's so important. Second, I wanted to kind of give a layout of what's happening on the federal level, and what we should think about in terms of the federal versus state balance of

regulation. And finally, I want to talk about sort of a unique opportunity to Michigan has to be a leader in driverless cars.

So, first, why is it so important that we think about timing? I think sometimes – a good analogy I like to use for this is if you thought of a virus that every year kills 40,000 people, and then suddenly we're able to develop a vaccine that's able to mostly cure this disease, with 94 percent efficiency. You would want to think about two primary things. One, you'd want to think about testing the vaccine to make sure it works. But, two, you would want to think about getting this vaccine out to as many people as possible in as short a time as possible, because every day that you don't allow the vaccine to be out on the market is another 90 to 100 people that are dying every single day.

And while it's weird to think about, that's essentially the situation that we're in with human drivers today. Forty thousand people died last year. And as Dan pointed out, it's increasing. Drunk and distracted driving, people are looking at their cellphones more and more people are dying every single day. So, yes, we do want to be careful and make sure that these technologies are working and are as least as safe as the average human before we let them on the roads. But we shouldn't hold them up to, you know, a utopian standard of making absolutely no errors before we allow them onto the roads, because every day matters in terms of getting these cars on the road.

A little bit ago we actually tried to model the costs of a delay in deployment in driverless cars. And we found that even if you just slow the deployment curve 5 percent, that leads to an additional 15,000 fatalities over a 30-year period. So I think this is fundamentally a public health problem that we're talking about. But, of course, you know, it's different because it's also a technology and innovation question, which leads to some interesting intersections.

Next, I kind of wanted to give an overview of what's happening on the federal level. So NHTSA, the National Highway Traffic Safety Administration, is the primary federal regulator over vehicle safety and security. And I think it's important to emphasize that they have a really powerful backstop as we're thinking about the deployment of this technology. They have a really wide recall authority.

So, for any reason, if they find that there is a model of car that has a significant safety defect that leads to unreasonable safety losses, they can recall that vehicle off the road. And so that's really important kind of backstop that we have. It's not like we're just letting these cars, you know, be the wild, wild west out there. There is a federal regulator who is monitoring this, looking at the statistics. And if for any reason they find a default in safety, they can recall the vehicles.

The primary legislative action that's happening right now is in the form of the SELF DRIVE Act in the House and the AV START Act in the Senate. So the SELF DRIVE Act has passed the House. And the AV START Act has gone through committee in the Senate and should hopefully be going to a floor vote in the next couple months. It's still unclear what the timing is like on there. But there's a couple of main provisions that I think it's worth talking about.

One, you may have heard that these bills give pretty wide federal preemption to NHTSA over state regulators. Now, I think that's a bit of a misnomer. I think it's better to think about this as solidifying the existing spheres of regulatory authority between the states and the government, rather than giving the federal government a whole new power, because essentially the division has always been that the state will regulate the driver and the roads and the laws within that local jurisdiction, and the federal government will handle vehicle security and safety.

And that's essentially what we're having going on now. The main question comes in, how that the driver is essentially a piece of software or, you know, physical modifications to the car, is that part of vehicle safety? Or is that still part of the licensing and registration of the car? And we think it's pretty clearly party of the vehicle safety. And thus, it makes sense for NHTSA to be able to have sort of – make sure that there's not a federal – or, a state patchwork across all 50 states.

And think about this practically. If Michigan says – and I think you guys do – you recently passed a law that said you could have a driverless car in Michigan that doesn't have a steering wheel. But if neighboring states of Illinois says that you do have to have a steering wheel, is the car going to have to be, you know, physically changed as it's going over state borders? You can imagine that being a really big barrier to interstate commerce. And so I think there's a compelling reason to make sure that, at least in terms of core manufacturing and safety defects, we have unified framework across the 50 states. And that's essentially what the SELF DRIVE Act and the AV START Acts would do.

The second thing that it does is it expands the exemption process. So right now, vehicles are primarily regulated under the federal motor vehicle safety standards. It says, you know, you have to have brake lines that work, you have to have, you know, windows that can roll up and down. You have to have a steering wheel, and whatnot. Anytime a manufacturer wants an exemption for those, they have to go to NHTSA, they have to prove to NHTSA that their vehicle is just as safe as the car would have been in the absence of meeting those safety standards, and then they're allowed to deploy their cars.

And so that's been really useful for AV manufacturers, because they're thinking about whole new ways of manufacturing cars in light of the new benefits that this technology can bring. But the exemptions are very limited. And so the AV START Act and the SELF DRIVE Act would greatly expand the number of exemptions. And this is kind of a good stopgap measure while NHTSA is trying to reevaluate how to work out federal motor vehicle safety standards for an era of driverless cars, and the exemption process will allow that to kind of work in the midterm.

One the third things it does is it mandates cybersecurity plans – written cybersecurity plans from each of the manufacturers go to NHTSA. And this is primarily an information-sharing act so NHTSA can have a better understanding of the cybersecurity capabilities of these manufacturers and how they're planning to respond to different attacks or failure of primary systems. But there's also cool sort of private mechanisms that are developing to regulate cybersecurity as well.

One worth noting is the Auto-ISAC, the Information Sharing and Analysis Council. That has membership from 99 percent of light vehicle manufacturers, and it's essentially a clearinghouse where manufacturers can share cyber vulnerability information and push out updates. So, if, you know, Toyota recognizes that we have this cyber defect, they can tell the Auto-ISAC. They can alert other manufacturers that they may have similar defects. And as solutions are found, that's pushed off across the entire membership of the Auto-ISAC. And so that's a kind of a good private mechanism for reconciling some of these cybersecurity things.

And kind of one other thing worth pointing out in these bills is the fact that trucks are not included, which we think is a major issue. Trucks are looking to be one of the first viable commercial applications of this technology. Because highways are very low-complexity environments, relative to a city where you could have pedestrians or bicyclists, you know, come into your lane. It's much easier to manage and predict what the highway is going to look like. And so trucks are looking to be one of the first viable commercial applications. And it'd be a real shame if we kept them out of this bill primarily because we're concerned about job loss. And as you can expect, the labor unions have been a major force in pushing for the exemption from trucks.

But we even think that this job concern is misguided. In the short term and the medium term, it's looking like this technology is going to be more like driver-assistance technology rather than driver replacement technology. You can imagine a useful partnership where drivers will handle the truck while it's in first mile, last mile, difficult weather, going over mountains, managing logistics in the meantime. But on well-marked highways, the autonomous truck could take over. And that could allow, you know, longer shifts, while still making sure the driver is rested, greater productivity, which could actually boost trucker wages in the short run. And as Dan, again, mentioned earlier, there's already a trucking shortage.

The other point is that the average age of truckers right now, if you look at the demographics, is 49. And so by the time we actually get fully autonomous trucks, it could be that the vast majority of truckers are ready to retire anyways. But certainly, if you know anyone who's, like, 21 and thinking about a career in trucking, I would advise them not to go into that.

Lastly, I want to talk about sort of a unique opportunity that Michigan has right now. I think it's worth pointing out, driverless cars are on the road right now. Just a couple of days ago, Waymo launched a pilot program in Phoenix, Arizona. And there was no driver in the driver's seat. That's how confident they are in this technology. There's still a test driver who's in the back, who has sort of a stop button that they can push. But they driver – but the car is fully driving itself all over Phoenix. And they're planning on launching this into a full-scale sort of taxi – autonomous taxi service. Which is exciting.

But they're going to need testing grounds in sort of more northern parts of the country where there is rain, there's snow, there's cold weather, which makes driving these vehicles a lot more difficult. And, Michigan, you guys have already been pretty good in terms of setting out a federal framework that these car companies know that they can operate safely without all sorts of regulatory compliance issues. And I want to encourage you to continue doing that, because I

think as they are looking for test sites in the north to be able to, you know, test in all these different weather conditions, Michigan could be a really big hub, especially given, you know, the big three being located here.

Yeah, so I hope that you guys will, you know, be excited about the potential for driverless cars. There's lots of laws that can be saved. I think we have important federal backstops already. Again, NHTSA can recall any of these vehicles if they find that they're not safe enough. And Michigan has a real opportunity to be a leader in this area. And I'm sure Dan is going to have lots of interesting comments as well.

DAN CRANE: Well, thanks, Caleb. Is this on? So I do have a few slides that I – Mike told me I could just push the green button. And there they are. Whoops, go back a little bit. OK.

So I'd like to say a few words about an overview of the relationship between law and technology, in terms of the ways that there are feedback relationships, and the way we should think about driverless cars and the feedback between law and technology. So you can think about lots of the things that Caleb was just talking about, the ways in which law mediates technological change. But you can also think about the ways in which technology itself creates legal and regulatory changes.

So if you think about the railroad, for example. The railroads in the 19th century is a great example of where a revolutionary technology had a tremendous social and economic change, that in turn really changed the way that lots of legal concepts were framed and operating. So law and technology have this sort of symbiotic feedback relations. And I want to think about sort of how that plays out, how we should think about that in the context of the coming driverless cars revolution.

So Mcity at my home institute, University of Michigan, has on its website a number of predictions, some of which Dan already alluded to, about how big this coming revolution will be in terms of the way in which we live and get around. And so just a few of them to point out: Motor vehicle fatalities, Dan already mentioned, falling by something like 90 percent. So that's like 35,000 lives annually saved in this country alone, 1.2 million around the world. Also, the system will become much more efficient. Transportation time will fall in half. So your commuting time may be reduced by 50 percent. And as Dan mentioned, that can have effects on how people live, how they get around.

Also, as he also mentioned, land mobility – or, land use for mobility will be cut in half. And so think about how urban areas can be transformed if all the parking garages and bridges and tunnels and roads, lots of those can be repurposed for other kinds of uses. So there are very, very large coming changes not just to the way we drive, but to the way we live. And that, of course, raises the question as to how law itself and regulation will be affected by the coming mobility revolution.

I want to take a little digression for a minute to another context, that involved a huge change demographically, economically, politically and legally, arising from a technological

change, the rise of the Sun Belt in the late 19th century. So, if you think about the rise of the Sun Belt and all the ways that affected American life and society – humongous, tremendous effects on our way of life, on our political scene, our legal, regulatory concepts. I've just listed a few things here, but you could go onto a long, long list of ways in which the rise of the Sun Belt had an effect on the way we live, the way we govern ourselves.

What caused the rise of the Sun Belt? Well, in demographic terms it's simply a function of the South's market share of the population growing exponentially from the '60s forward. All right, the South was losing market share in terms of the percentage of people living in the South until the 1960s. And from the '60s forward, you see this tremendous growth in the population of the South. So what technology caused this change? Anyone want to hazard a guess? Yeah, the air conditioner, right? So the air conditioner – if you look at the data – the air conditioner is the obvious, big answer to the question: What caused the rise of the Sun Belt, right?

But the thing is that when you think about the relationship between the rise of the air conditioner and the rise of the Sun Belt, and all those second and third and fourth-order effects that one can think about, it's a really indirect relationship. We know that there's a very strong causal relationship between the rise of the Sun Belt and these huge transformations in American life. But there was never, like, a law of the air conditioner.

If you go to the University of Michigan Law School, my home institution, and look at our course catalogue, you will not find any course devoted to studying how we regulate the air conditioner, with an eye towards mediating all these important social changes, right? We know that there's a causation story that's there. It was all very predictable at the time. And yet, there's very little in the actual roll out of technology that could be regulated or mediated by law that can affect these effects that we see so prevalently in our society.

So I want to contrast the air conditioner with another technology, which is the internet, right, where, like the air conditioner the rise of the internet has tremendous implications for how we live. It has tremendous implications for law, right? The internet changed in dramatic ways many different ideas in law. And yet, unlike the air conditioner, the changes the internet brings about are mediated by law. We can actually regulate or not regulate the internet in ways that shape the ways in which the internet itself transforms legal and regulatory and social and business contacts.

So think about the Digital Millennium Copyright Act is a great example of this, or the whole argue over net neutrality, or today over search neutrality. These are all questions about how we structure this technological change in ways that influence the kinds – not just the direct technology itself, but all the second, third, and fourth-order effects that those things can have.

So the question that this is all leading up to is are driverless cars like air conditioners or are they like the internet, right? Is the coming revolution, which we can predict, which we know is going to happen, one that's kind of like the air conditioner, insofar as we can predict a bunch of changes – social changes resulting from it, but there's not any real way to regulate the technology in order to mediate or to manage those changes? Or is it more like the internet where

we know that changes are coming and the way in which we choose to govern the internet itself affects those changes?

Well, I think it's a little bit of both, actually. I think it's a little that there's some things that will not be directly mediated that this revolution will affect, that we can't really directly regulate. But there are a number of ways that's actually more like the internet, that we can actually make policy decisions around the way in which driverless car technology is deployed that will have important implications for all these spillover effects arising from driverless cars.

So I certainly don't have an exhaustive catalogue, but I want to talk about three areas in which I think connected and automated vehicles will reshape law and regulation, and give us opportunities to think about how we want to anticipate those things and in sort of a feedback way design these technological changes to be sensitive to their likely outcomes.

The first one has to do with policing, criminal law, and the Fourth Amendment. So think about the fact that about half of all police-citizen interactions start with routine traffic stops. And I don't just mean that statistically about half of all police-citizen interactions. I mean that half of all interactions start that way. But it's much more important in terms of big crimes, even, than simply the fact of the routine traffic violations. So, for example, 40 percent of all drug arrests start with a routine traffic violation, right? Traffic stops are the leading entry point for law enforcement in interacting with citizens.

What happens in a world when driverless cars no longer commit moving violations, right, and the police no longer have an occasion to stop cars? What happens to policing? Well, this is kind of the glass half-full, the glass half-empty question. If you're particularly concerned about police-citizen interactions, particularly the racial components of that which we know so much today coming out of Ferguson and places like that, and you'd like to minimize friction between the police and citizens, maybe this is a good thing. Maybe this is an opportunity to say we'll get the police further away from citizens, create safe zones where citizens are not in constant friction with the police.

On the other hand, if you sort of have a law – a law and order mentality, there go half of the opportunities to monitor citizen behavior for potentially risky or unlawful behavior happening, right? And so the question is, as we think about the design of driverless cars, how do we think about policing and how that'll change the culture of policing? Now, I don't have answers for you. I'm just an academic, so I don't give answers I just ask questions. But as we sort of think about the possible kinds of ways we could react to this coming change, which is certain to happen, right, it could move in either direction.

We could – we could, for example, think that the demise of routine traffic violations means that we need to move towards random stops, right, a sort of checkpoint system – electronic checkpoint system, where we sort of stop people randomly in order to search the car so that we can have sort of the level of police engagement that'll lead to safe vehicles. Or maybe we have automation that eliminates police discretion. We have an automatic ticketing system, for example, where the computer tickets a car's computer, without ever the need for police-

citizen interaction, right? If we want to maintain a space where police are less interacting with drivers.

Lots of ridesharing systems will have internal cameras, just to keep the driver safe – the passengers – or the – not the drivers, the passengers safe. Do we want police access to the internal cameras on cars, right? Make cars really super-regulated spaces, where we can now actually get at the root of lots of criminal behavior just very spontaneously. And with connected vehicles, vehicle to infrastructure or vehicle to everything type connectivity, do we want to give police the ability technologically sort of to tap right into your car and to pull it over, right? If we want to do random checks, for example, how do we want to design the technology in terms of policing, right?

Again, lots of other questions you could ask, but just if we're thinking about the effects of driverless cars, there will certainly be a big impact on the way in which policing itself happens, the Fourth Amendment happens, and criminal law is constituted going forward. Another big category, which Dan also mentioned, is the changes that will happen to the way we live in urban density and living patterns. So here's an artist's imagination of what happens when we can transform parking garages and streets and tunnels and bridges into green spaces in urban cities, right?

But also, as I said before, there's a simultaneous effect that people might want to move outside of cities if your commuting time comes down by 50 percent, right? Every time traditionally commuting time falls people live further away, right? It's more convenient to get to work and still live on your farm 50 miles out, if you will. So what will be the combined effect of those two interactions? Of urban centers becoming less dense in terms of mobility infrastructure, but also people possibly living further and further away? All kinds of implications for living patterns, urban usage patterns, racial zoning issues, all these things.

So lots of questions, again, for law and regulation to think about. Do we have an opportunity here to rethink how we approach zoning and land-use regulation, right? If we wanted to rethink that, here's a moment to rethink it since lots of land will be coming on the market. Should we rethink how we think about the divide between public and private ownership of land? Most of this land right now we're talking about is publicly owned land. Should that remain within the public sphere? Or should we think about privatization of this land as it becomes no longer necessary for public infrastructure?

And also, if we're concerned about tendencies towards urban sprawl, if we're concerned about racial re-segregation, for example, concerned about urban cores losing their population, are there other kinds of interventions we should think about to encourage people to continue to live in urban areas as this revolution takes place? Again, I'm not suggesting answers. I'm just suggesting these are – these are kinds of things that we should be thinking about as we think about the overall landscape of driverless cars coming online.

And then finally, what happens to the great American romance with the automobile, right? Think about it, we're moving towards a world in which all the projections are that people will stop largely owning their own cars. Everything will be Uber and Lyft, ridesharing with

automation. It's already happening, of course, even with drivers and ridesharing. But once we have full automation and cars will come to you seamlessly whenever you call for them, why would you want to own your own car anymore?

So if the prediction is right and we move towards a world in which ridesharing and automation go hand-in-hand, what happens to ideas around identity and property that are so tied up today with the automobile, right? The automobile, for many people, is the first and perhaps the last important item of property they actually end up owning. Cars express our ideas about our identity in particular kinds of ways. They are locuses of freedom, of property. And what happens as those ideas change?

So lots of questions here for how law will interact with this coming revolution in terms of property rights. Should consumer interests in ride-sharing services be viewed primarily through a property lens or through a liability lens? So, for example, can the fleet operator collect data without the consumer's consent? Or does the consumer have to give consent, right? That's a really important question about sort of a property regime versus a liability regime, and how we sort of construct that set of relationships in this emerging technology will be really important to how consumers experience the relationship for the long haul.

Similarly, should we think about ridesharing in the sort of mobile, automated economy as a kind of quasi-public function? Should we think about rideshare as a kind of common carrier or entity effect with the public interest that has obligations of nondiscrimination, reasonable pricing, and universal service? Or should we still think about the car as basically private property, owned by a private fleet, that is subject to the ordinary conventions of contracting and individual choice, right? Those are all kinds of questions that will be entailed by this coming revolution in automation that we need to be thinking about as we go forward.

So, to conclude, just a few friendly words about what smart regulation looks like in this space. So first of all, think forwardly. Although much is unpredictable, much is very predictable, right? And we don't know exactly what the world will look like, but there are many smart guesses we can make today. And we can start planning for those things. Secondly, think systemically. Lots of the effects are not about a single facet of automated vehicles, but about their interaction. Think, again, about this example from a minute ago about the interaction of repurposing land in urban areas and commute time falling, right? Those have some predictable kind of interactions that we need to think about in terms of their regulatory, legal impacts.

And finally, think adaptively. I think it's really important at this moment in time not to overly lock into regulatory frameworks that impair decisionmakers from adapting as technological changes come online. One of the issues I'm looking at right now at the University of Michigan Law School, with a class at the university, which is level three automation, which is the level of automation that some car companies, like Audi, are rolling out even this year, where the car drives itself within a particular operator-design domain, until the car says, you know, I can't reliably do this anymore, and hands it back to the human driver, right?

All kinds of issues around level three automation, how well it works, but level three automation raises a distinct set of legal and regulatory issues from, say, level four, where the car

just drives itself and never asks the human driver to take back over responsibility again. And it would be a mistake to sort of lock into a single understanding about what automated driving is – say, a level three vision or a level four vision – and not think adaptively about how this technology will continue to change as it develops over time. So regulation needs to think from the future, it needs to think systemically, and it needs to think adaptively. Thank you.

MR. VAN BEEK: All right, great. Thank you all for those presentations. We're going to have Q&A right now. So if you have a question, put it on the card and my colleague – you're going to do this – can pick up – (laughs) – pick up those cards and bring them up. While he's doing that, I will ask a couple that I thought of. So I hope they're decent ones. One of the things that was mentioned on a couple different occasions was the threat of regulatory capture. So could you talk about what that – what that threat is specifically, and then also come up – explain how we could avoid that? And I'd open it up to anybody, whoever wants to jump in.

MR. WATNEY: Yeah. I think regulatory capture is certainly an issue to be aware of and cautious towards. And for those who don't know, regulatory capture is essentially when the agency that is regulating an industry becomes captured by players within that have lots of influence over how the regulations operate.

And I think a good example of this that was attempted a little bit earlier I think was General Motors, I believe – I'm not sure, though, so don't quote me on that – was pushing a bill in several different states that would have made only traditional auto manufacturers able to produce automated vehicles. And that would be in contrast to tech companies like, you know, Google, that's trying to make cars themselves, but are not a traditional automaker. And that would be an example of, you know, an auto manufacturer having lots of influence with the regulatory or the legislative bodies, and then pushing laws or regulations that benefit them disproportionately.

And I think another area to maybe be cautious about is if sort of the fleet model takes over, if primarily individuals are operating with autonomous vehicles through fleets that are managed like Uber, you could sort of see deployment arbitrage. So you could imagine, just for example, the city of Boise, telling Waymo, if you give us priority deployment we'll give you an exclusive operating agreement. We'll let you be the only one that's allowed to operate within our jurisdiction.

And then that would sort of long term lead to a very de-competitive environment. There would not be nearly as much competition. And competition is really what drives down prices and makes sure that operators are responding appropriately. So it would be appropriate to make sure that there's no exclusive operating agreements, that manufacturers don't have, you know, rules in either the laws or the regulations that benefit them disproportionately.

MR. MAHAFFEE: And if I may add to that, there's the examples you provided there, but I also think there's an intersection with technical standards and regulatory capture as well, where in the example of dedicated short-range communication. In 1996, the government set aside spectrum on the radio frequencies specifically for communication between cars. In 1996, who could, beyond, you know, the cutting-edge telecommunications research labs, imagine 4G,

5G, total coverage of highspeed broadband internet over a wide range of areas? So, at the time, it seemed like a good idea to set aside this radio frequency for communication.

But technology moved much faster and we now see the ability for internet-based technologies or other technologies to handle that same mission, even though many in the – you know, and GM has been the biggest on this – want to reserve that space still for that technology, even as other automakers, other countries are now going towards the cellular or Wi-Fi or internet-based standards, rather than dedicated spectrum, which is something that, in this day and age, is as valuable as platinum or gold when it comes to having that radio frequency band.

So how do you also not just have the challenge where you have the relationship between firms and municipalities and state governments, but also how do we ensure that when we're making these technical decisions that we leave it to the innovators rather than government – often with the best of intentions – tipping the scales to one framework or the other when it comes to the technological implementation?

MR. CRANE: So I agree with both Dan and Caleb on this, except I would also say that there's a bit of a tension here that goes back to Caleb's point about delay meaning really big loss in lives, which is right now 5.9 gigahertz DSRC communication is a – is a technologically possible means of V2V and V2I communication. 5G is not. I mean, 5G is not a thing yet. And so if we say let's wait until – like, 5G might be a lot better. Well, when will it be a thing, right? And it may be next year, it may be three years. So there is a tradeoff between standardizing – waiting to standardize until the technology is as good as it's going to get, which has some advantages. But then you might actually lose some of the benefits until – in the waiting period.

So I'm not saying that the rule on mandatory DSRC radios should be adopted, but I do think that there is a tension between just sort of a wait and see, let competition sort of it out, and also the idea that there does need to be some coordination at some point to move forward, even if we're not moving forward, necessarily, on the very best that will ultimately emerge.

MR. VAN BEEK: This one is – this question is maybe taking us a step back here, but can you describe a little bit of what obstacles are currently standing in the way of autonomous vehicles being deployed? I mean, are there – you know, what sort of regulatory changes need to happen. And are there examples from states that are – have got out ahead on this? Or the opposite, of states who are sort of taking the wrong approach, in your opinion?

MR. WATNEY: I think one barrier is – as I mentioned with the SELF DRIVE Act – there's a limited number of exemptions that companies can get to deploy these vehicles. So if, you know, Waymo wants to deploy an autonomous vehicle that does not comply with the existing federal motor vehicle safety standards, they have to get one of these limited number of exemptions before they can deploy it. And until the exemption cap is raised, that's going to significantly limit the number of cars that are autonomous that can be deployed. So I think that's going to be one of the barriers. And hopefully we'll see, you know, legislation to address that.

There's also technical barriers. You know, while we are seeing deployment in, you know, areas like Arizona, there's a lot of auto manufacturers that, you know, while making

enormous strides towards full autonomy, you know, are still trying to work out and see what works best. I think there's also kind of a level three, level four distinction that makes some of these challenges hard, as Dan was talking about. When you have level three, which is sort of this interplay between humans and technology both sharing control, that can lead to situations where the human overemphasizes how in-control the computer is, isn't paying attention, and then there's a crash.

And that was essentially what happened with the Tesla crash that happened, I think, last year or the year before. And so you're seeing some manufacturers, even though they could deploy level three now, are waiting until they have complete level four, level five before they deploy, because they want to avoid that sort of awkward interaction space between humans and technology.

MR. CRANE: I'd also just add, on legal barriers, some states still have driver laws, like New York, for example, that requires a driver with one hand on the wheel at all times. Well, you know, who's the driver in that case? Is it a computer that's the driver? Do they have to have a hand on the wheel? How do we think about – so these laws, which were probably really well-intentioned at the time, which need to be updated to allow some of these technologies to happen.

The other issue is just a level of confidence question. So I think the statistic is that right now human drivers produce one death per 100 million miles driven. How many miles do we have of automated vehicles on the roads? If you look at – if you add up what Google and companies, you know, like Tesla and other experimental companies have done, we're not anywhere near the threshold yet of even having one statistical death from an accident, much less to sort of know in the aggregate how safe the technology is.

There's a problem that – and so if you insist on proof of safety before deployment, you know what, it's going to be a long time before we deploy, a lot of test-driving before that can happen. I think that's the wrong way to think about it, though. If we're quite confident in the long run this will be a better technology, we may have to tolerate a period where things are not great to get to the place where things are a lot better. And it's not – it's not a message people like to hear, right? If you're the one whose loved one dies because of some malfunction to say, well, in the long run it's going to get better. And actually, this accident helped us learn how to do that. It's a hard moral case to make. But as a society, we have to make that case, otherwise we're stuck in the dark ages forever.

MR. MAHAFFEE: And I think a challenge too, beyond the regulatory and political side, is that these – the example you described there, the communication between industry and policymakers too often happens with the media in between. And if you look at any article on self-driving cars, nine times out of 10 you'll see a major headline about an accident or a fender bender. And when you get down to the third or fourth paragraph, that's when they finally tell you that the human driver in the other car was at fault. Or you hear the story of the Tesla accident, which was a tragic flaw, but also raises issues about level three involvement and the human involvement there.

But no one writes in the newspaper that we are facing the equivalent of two 777s falling out of the sky every week when it comes to death on the roadways. And so the way media pays attention to this will require a certain amount of skepticism from both the public and policymakers as they look to, you know, perhaps counter headlines that are, perhaps, a little more sensationalist than necessary.

MR. CRANE: Great example is this morning. So yesterday Navya, which is a French shuttle company – automated shuttle company, it's actually a partner of ours at Mcity, started their Las Vegas deployment. On the first day out, a truck driver backed into a properly stopped Navya shuttle. And the headline on so many big media platforms is: On first day of deployment, driverless shuttle crashes. It didn't freaking crash. (Laughter.) Someone backed into it. The best human driver couldn't have avoided that either. So it just doesn't – again, it's a headline that gives the impression that this technology is really vulnerable and really tricky. It may be, but don't allow the media to tell you that a driverless shuttle that someone else crashes into is somehow a system failure. That's just not the case.

MR. VAN BEEK: A two-part question: Will driverless vehicles be affordable? And, related, right now it seems like all of the development of these – of this technology is done by the big players. Do we – is there reason to think that there will be more competition in this space in the future? Will smaller companies get involved?

MR. WATNEY: On the affordability question, I think that that raises a lot of interesting questions about sort of what's the ownership model. And whether or not someone is outright buying a driverless car, or whether or not they are using a ridesharing service is going to matter a lot. I think potentially there's an opportunity for this to be way, way, way more affordable than traditional automobiles. If you're to take the average price of an Uber right now, subtract the driver's salary, and then, you know, cut the insurance premium into a tiny fraction of that – because there's no longer very many crashes – then the long-run potential for especially kind of subscription-serviced fleet operation is going to be way more affordable, that it won't make sense for the majority of people, especially in urban areas, to own a car.

The other thing is that there's still lots of technological progress where even if it's safe enough right now, you could make it cheaper with additional progress. And so the main way that these cars can, you know, sense what's happening around them is LiDAR. And most of the best LiDAR systems right now are still mechanical. But we're getting really close to making a breakthrough in digital LiDAR, which will allow the per-unit cost of these LiDAR systems to dramatically fall.

And then kind of on that second question, on competition, yeah, kind of initially there usually are a couple of main players, especially in an environment that requires this much investment to really make moves forward. But I think we can expect that there's so many potential models for ownership here, that smaller competitors, once the technology is ready, can try out all sorts of new things. But it's important to make sure that we have a legal system that will not disproportionately benefit, you know, some companies over others, to make sure that we have long-run more competition.

MR. MAHAFFEE: I think too – and I'll just touch on the competitive side – I think, one, that as long as you continue to have policy frameworks that allow for a wide range of market entrants into testing, into responsible approaches to testing and development, we will see competition. I think, two, that you'll see a – perhaps, you know, we'll see the utility or ridesharing model. But what will also be innovative concepts for automobile use that we don't even think of now?

Will there be, you know, a van that you can hire to be an automated – you know, almost like a sleeper suite that will drive you overnight from Washington to Detroit, replacing a short flight but you still get to sleep on it? You know, if someone comes up with that service, how does that affect, you know, models of transportation that we haven't even thought of yet? So you may see, you know, not even necessarily in the hardware a sense of competition, perhaps even greater competition in the uses or applications of the technology?

MR. CRANE: Yeah. And I think in the long run the car itself will become a commodity. Once people aren't investing in a car as part of their personal identity and self-expression then it'll become much more commoditized and standardized and, exactly, that there'll be competition around the service. It's interesting in terms of the way the cost curve will go here. I've been talking to insurance company people who say that even though we all think that insurance rates will go down because the – you know, accidents will become less common, they say insurance rates are going to go up because the cost of an accident will be so much higher.

A fender bender right now you take to your car dealer and they just pop out the fender. Lots of the sensor technologies are in the fender. And even if the sensor technologies are not damaged in the crash, the whole thing will have to be recalibrated after a crash. And so they're expecting that, at least in the short run, insurance premiums could actually go up, just because even relatively small accidents will result in more property damage.

But as to competition, I think there's an opportunity here for the car market to be shaken up. Tesla's market capitalization passed that of Ford and GM earlier this year. That's absolutely nuts, by the way. There's no justification for that. But I think that the market is predicting that lots of niche players or new entrants can ride this moment to get ahead. It's also not just that – you know, the car companies themselves doing this. And so, you know, Waymo, Google's driverless car arm, is an example of a non-car company that's developing technologies. I don't think in the long run Google will be actually manufacturing cars. I think they'll be licensing this technology.

Lots of the tier ones, the Delphis and the Boschs of the world, are also making big investments in automated vehicle sort of turnkey operations that could be deployed in lots of different cars. So the innovation's not all coming out of traditional car companies. It's coming from many different entry points.

MR. VAN BEEK: All right. We've got time for one more. There's a couple questions here that are – that are related, asking about how this might be used for – or interact with public transportation. So is there any movement along those lines, where cities potentially are looking

at this – these kinds of technologies to provide public transportation for people, and how that might work?

MR. MAHAFFEE: Well, I think you have some limited examples that we can extrapolate from, when some municipalities have begun to look at how you take bus routes that had low usership, low frequency, and replace that with some kind of subsidized rideshare service. Largely, when you think about the relationship with this and public transportation, you'll hear the term of catchment area. How do you improve the reasonable area that a person is willing to go from their home to a train station, light rail, something of that nature? And does an autonomous vehicle make it easier for someone or a ridesharing make it easier for them to get from home to the station, then on rail, which would still have a probably lower cost per person per mile in terms of efficiency?

But, you know, again, that is – you know, I caveat that with a lot of American conceptions of automobiles and independence, and the idea that, you know, do I want my autonomous vehicle to get me to a train that I share with other people? Or do I like my autonomous car because it's a little suite, I can watch a movie, recline, have a beverage or two, and not have to worry about dealing with public transportation? I think that's – you can see arguments on both sides of that. I don't think, until we begin to see more of these ridesharing examples extrapolate from, can we – can we make a solid determination on that yet.

MR. WATNEY: I think that the degree to which it interacts with public transportation – as we're thinking about major, say, like, metro or light rail systems, is going to depend on what it looks like sort of at the beginning. If a city already has a very extensive, you know, well-supported, you know, efficient public transportation system, then the ridesharing and autonomous vehicle model may kind of like curve around that, and provide, you know, more accessible access to the main stations. But if, you know, you're dealing with a public transportation system that's very inefficient, expensive, kind of a boondoggle, then ridesharing may kind of replace a lot of that.

But I think there may be a way for cities who want to provide, you know, subsidy access to all sorts of public transportation, to low-income consumers especially, to interact with driverless cars. We just want them to do it in a technology or a platform-neutral way. So, as I mentioned, you know, you're starting to see some cities who are – they're provide a specific subsidy credit to either Lyft or to Uber.

And then that's a huge benefit to obviously whichever one of those platform gets it in terms of that specific city. And we think it would be better for – you know, companies should not – or, cities should not privilege one company or one platform over the other. And they should, you know, be technology or platform agnostic. But they can, you know, provide subsidies for low-income consumers as much as they would like. But, again, platform neutral is the way to do that.

MR. CRANE: Yeah, I agree with that, platform neutral. I also think in the long run it's not clear that public transportation is even the right category, right? So think about the food stamp program. Cities don't largely run retail grocery stores. They give people an opportunity

to participate in markets, which I think is a much better way to provide efficient services to many people. So you could imagine a system where there's a qualification to get some kind of a credit to use the ridesharing system. And now you're just part of the same transportation infrastructure as everyone else and you're being subsidized so that you can afford to do that.

MR. VAN BEEK: Well, very good. Join me in thanking our panel for their comments. (Applause.) And thank you all for joining us. Again, this'll be available on our website, a recording of this event – Mackinac.org. I want to thank again, once more, Auto-Owners Insurance, for sponsoring this luncheon. And thank you all for attending. And we hope to see you next time.

(END)