BEYOND THE GAS TAX

How automation opens the door for vehicle miles traveled fees

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Executive Summary

Driving exacts spillover costs on the public in the form of congestion, crashes, emissions, and infrastructure degradation. While gasoline taxes approximately capture a portion of these costs, a vehicle miles traveled fee would more efficiently capture the costs of driving to the public. The development of a regulatory framework for autonomous vehicles presents policymakers with a policy window for implementation of a vehicle miles traveled fee. This proposal provides a viable and actionable plan for state policymakers interested in incorporating vehicle miles traveled fees into an autonomous vehicle regulatory framework and includes an example for an implementation timeline in the illustrative state of Ohio.

The Problem: The Social Cost of Cars

It is not controversial to say that cars have costs. Automobile externalities come in four major categories: congestion, crashes, emissions, and infrastructure degradation.

Congestion costs grow with the number of automobiles on the road. Longer commutes mean less time for people to spend at work, with their families, at rest, and on other privately and socially beneficial activities. If an hour of time on the road is valued at the average wage rate ($27.56 in January of 2019), that means that an extra minute added to someone’s commute time would cost that person 46 cents in lost time per trip.[1] This adds up to a total cost of $230 per person over a year for an additional minute added to a commute, a function of how many additional cars are on the road.[2]

Another major cost of driving is car crashes. Crashes exact costs through property damage, injuries, and deaths. A 2015 study by the National Highway Traffic Safety Administration estimated that the 33,000 deaths, 3.9 million injuries, and 24 million cars damaged in 2010 cost the US economy $242 billion in lost productivity, medical costs, legal and court costs, emergency service costs, insurance administration costs, additional congestion costs, property damage, and workplace losses.[3] More cars on the road mean more traffic accidents, and thus more costs incurred by society.[4]

Emissions also exact costs on the public. Even without factoring in global costs of carbon dioxide emissions, emissions such as carbon monoxide, nitrogen oxide, and hydrocarbons create smog, which leads to local cardiovascular, asthmatic, and mortality impacts.[5]

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[1] Bureau of Labor Statistics, “Employment, Hours, and Earnings from the Current Employment Statistics survey (National),” Data extracted on February 17th, 2019.

[2] This assumes 250 commuting days per year, as assumed in *Bagstad, K. J. & Ceroni, M. (2007). Opportunities and challenges in applying the Genuine Progress Indicator/Index of Sustainable Economic Welfare at local scales. International Journal of Environment, Workplace, and Employment, Vol. 3, No.2, 132-153.*

[3] “The Economic and Societal Impact Of Motor Vehicle Crashes, 2010 (Revised),” National Highway Traffic Safety Administration, May 2015.

[4] Martin, Jean-Louis. "Relationship between crash rate and hourly traffic flow on interurban motorways." Accident Analysis & Prevention 34, no. 5 (2002): 619-629.

[5] Parry, Ian WH, Margaret Walls, and Winston Harrington. "Automobile externalities and policies." Journal of economic literature 45, no. 2 (2007): 373-399.

Finally, driving degrades public roads infrastructure. Since roads are a public good, drivers can use them as much as they want without incurring a cost. This can lead to a "tragedy of the commons" where public resources are overused and the public sector cannot keep up with maintenance of these assets.

One estimate of the local cost of congestion, crashes, and local emissions is nine cents per mile in 2008 dollars.[6] These are costs not being paid by drivers, but are instead being exacted on the public.

Controlling Car Costs

Currently, the tool of choice for policymakers interested in controlling the cost of driving is gasoline taxes. Gasoline taxes are advantageous because they approximate per-mile fees, adding an effective per-mile bump in cost for each consumer. Currently, the federal gasoline tax is 18.4 cents per gallon, which covers the cost of oil dependency and about half the cost of greenhouse warming, two factors of federal importance that local interests have less of a stake in.[7]

State-level gasoline taxes range from 15 cents per gallon in Alaska to 59 cents per gallon in Pennsylvania. All states have gasoline tax levels that fall below the estimated $2.14 per gallon of local external costs created by driving, not including infrastructure degradation.[8]

A gasoline tax is a much more efficient tool for raising infrastructure revenue than state general funds, which are mostly financed with income and sales taxes. This is because gasoline taxes are paid in proportion to the amount of gasoline used, which approximates a proportionate tax to miles traveled by the payer of the tax. While infrastructure financed by income or sales taxes encourages "free riding" by people who are not paying for infrastructure, gasoline taxes tie the number of miles taxpayers drive to the amount of tax they pay, discouraging them from overusing the public good of roads and providing funds to pay for their maintenance as roads are worn down.

A gasoline tax best approximates a vehicle miles traveled fee when fuel efficiency levels are consistent across a state. This means that cars are generally paying the same amount per mile through the means of the gasoline tax. A gasoline tax can be preferable to a vehicle miles traveled fee because of administrative feasibility issues with collection of a vehicle miles traveled fee. While a gasoline tax can be collected from the relatively few centralized suppliers of gasoline, a vehicle miles traveled fee would be levied on millions of individual car-owners and would lead to difficulty in implementation across an entire population.

Technological change is degrading these two gasoline tax advantages. First variation in fuel efficiency is increasing. While cars thirty years ago had a relatively small variation in fuel efficiencies, the introduction of high-fuel efficiency, hybrid, and electric cars have created a large variation in fuel efficiencies among vehicles. This is not a problem for capture of the cost of emissions, which shrink on a per-mile basis with fuel efficiency increases, but it does become a worse approximation of vehicle miles traveled-correlated externalities like congestion, crashes, and infrastructure degradation.

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[6] Ibid.

[7] Ibid, "Federal Highway-User Tax Rates - Current and Enacted for the Future," US Federal Highway Administration, Federal Highway Administration, Accessed February 18, 2019.

[8] Parry et al, "Automobile Externalities and Policies," inflation-adjusted.

At the same time, many of the barriers to collection of a vehicle-miles traveled fee are falling because of automation and computerization of automobile technology. The rise of "ride sharing" dovetails with the development of autonomous vehicles as more of the transportation system is being coordinated through centralized data hubs. While collection of a vehicle miles traveled fee in the analog era would require individual drivers to report miles travelled on an annual basis, collection in the digital era can be automated through computerization, with numbers of miles traveled collected through data hubs.

In short, the autonomous revolution is opening the door for more-efficient vehicle miles traveled fees.

Autonomous Vehicle Fees: A Proposal for Enhanced Transportation System Efficiency

Vehicle miles traveled fees are an efficient option to control congestion, crash, and infrastructure degradation costs associated with driving. Over the next decade, a key policy window will open for policymakers interested in controlling these social costs: the development of the regulatory framework around autonomous vehicles.

Autonomous vehicles are a technology that many companies will have a strong interest in adopting. A 2018 study by the American Transportation Research Institute estimates that 43% of the marginal cost of trucking is spent on labor.[9] Labor costs for ride share companies are even higher—in the 60% range at the very least.[10] These and other industries that rely on drivers will have strong reason to agree to terms that allow them to adopt autonomous technologies. Because of this, states will be uniquely positioned at this time to levy a new vehicle miles traveled fee.

In order to take advantage of this policy window, I recommend that states take the following steps.

1. First, states should pass resolutions declaring their interest in incorporating vehicle miles traveled fees into the autonomous vehicle regulatory framework so that private sector actors can prepare for the change. This will make clear to the public the state's goal as well as bring important interests to the table for sharing of information around technology and fee collection.

2. States should convene task forces or committees to allow for free flow of information between companies adopting autonomous technologies, legislators, and regulators in departments of taxation, transportation, and other key state agencies. These will allow states to develop fees with better information about how they will be implemented and will give all interested parties a part in crafting of the policy.

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[9] "An Analysis of the Operational Costs of Trucking: 2018 Update," American Transportation Research Institute, October 2018, p. 21.

[10] "Uber Fees: How Much Does Uber Pay, Actually? (With Case Studies)," Ridester.com, January 17th, 2019, Accessed February 18, 2019.

3. Vehicle mile traveled fees should then be proposed to reflect the cost of (1) congestion, (2) crashes, and (3) infrastructure degradation. Cost of emissions is still better captured by gasoline taxes, which capture the cost of emissions better than vehicles miles traveled and incentivize fuel efficiency.

4. As time goes on, fees can be set to scale with impact. For instance, motorcycles can have lower fees since they contribute less to congestion, safer vehicles can have lower fees since they cause less crashes, and lighter vehicles can have lower fees since they degrade roads slower. The specifics of these scaled fees should comport with empirical evidence of external cost variation and administrative feasibility of collection.

Revenue Options

Lastly, states will be tasked with spending the revenue they collect with vehicle mile traveled fees. A portion of the fee will of course be spent on road infrastructure, but fees collected to capture the cost of congestion and crashes will provide states with additional revenue options.

One option for use of revenue is to **offset the regressive nature of vehicle fees**. While per-mile fees are extremely efficient, they cause equity concerns since transportation spending makes up a smaller percentage of household incomes for upper-income families than middle- and lower-income families.[11] Thus, revenue could be returned to lower-and middle-income families through a tax credit or reduced tax levels for lower- and middle-class taxpayers.

Another option is to **provide support for displaced workers.** "Truck driver" is the second-most common middle-class job in America.[12] Many policymakers are concerned about the job displacement that will likely occur with the adoption of autonomous driving technology. Revenue could be used for job training or cash assistance programs for people who lose their jobs due to adoption of autonomous vehicle technologies.

Policymakers could also spend the new revenue on **high-yield economic investments** like evidence-based therapy programs in the criminal justice system, early childhood programs, and public health interventions such as smoking cessation programs and quitlines. Investments in these programs will grow the economy even larger and many have equity benefits as well.

These are of course only a few of the many options policymakers have to spend vehicle mile fee revenue on. While the primary benefit of the fee is to bring the private cost of a mile driven in line with the social cost of congestion and crashes, the extra revenue provides a bonus for the public.

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[11] "Average Individual Household Expenditures by Income Quintile, 2016," Bureau of Transportation Statistics, United States Department of Transportation, January 8, 2018, Accessed February 18, 2019.
[12] Bui, Quoctrung, "The Most Common Jobs for the Rich, Middle Class, and Poor," Planet Money, October 16, 2014, Accessed February 18, 2019.

Ohio: An Autonomous Vehicle Fee Illustration

In order to illustrate how an autonomous vehicle fee could be implemented at the state level, below is an example timeline for how the state of Ohio could roll out an autonomous vehicle miles traveled fee in the state.

- **March 2019** - The Ohio General Assembly passes a resolution on intention to "study the administrative feasibility and economic desirability of an autonomous vehicle per-mile fee."

- **April 2019** - Ohio passes biennial transportation budget, increasing gasoline tax to 46 cents per gallon, capturing a large portion of the local cost of emissions.

- **May 2019** - Governor Mike DeWine convenes a task force of legislators, Department of Taxation and Transportation administrators, trucking, rideshare, and other industry leaders, and economists to carry out the study the legislature calls for.

- **November 2019** - The Governor's task force reports that a 9 cents per mile infrastructure charge, a 4.3 cents per mile congestion charge, and a 3.7 cents per mile crash charge should be assessed on autonomous vehicles, leading to a total 17 cents per mile autonomous vehicle operation fee.[13] This is about the cost of driver benefits per mile for trucking companies, leaving the 55 cents per mile of driver wages to companies as pure profits.[14]

- **November 2019 - January 2020** - The Ohio House and Senate debate and pass an autonomous vehicle regulatory framework bill, including a 17-cents vehicle mile traveled fee with 9 cents per mile going to a state infrastructure fund, 4 cents per mile spent on expanding the state preschool program, and 4 cents per mile spent on tax credits for middle- and lower-income taxpayers.

- **February 2020** - After the House and Senate craft, debate, and pass their autonomous vehicle regulatory framework bills, Governor Mike DeWine signs a bill including the framework to pilot autonomous vehicles on roads with a 17-cent vehicle mile traveled fee.

- **February 2021** - A review report is conducted by the Department of Taxation and the Department of Transportation on the first year of vehicle mile traveled fees, with recommendations for scaling of fees for vehicles that reduce the costs of congestion, crashes, and infrastructure degradation.

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[13] These are sample fees based off inflation-adjusted estimates of the cost of congestion and crashes from Parry et al and inflation- and exchange-adjusted estimated per-mile costs of infrastructure from "Transportation Cost and Benefit Analysis II – Roadway Costs," Victoria Transport Policy Institute, Chapter 5.6, 24 April 2018, p. 6.

[14] From "An Analysis of the Operational Costs of Trucking," p. 19.