Freight Megaregional Planning and Financial Policy

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16. Abstract
Like the national fuel tax, state fuel taxes face problems of declining real revenue due to inflation and improvements in fuel efficiency. This report examines state fuel tax levels, how states have responded in the past decade to maintain transportation funding, and how the nature of freight transportation means alternatives to fuel taxes might benefit from cooperation at the megaregional level.

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Table of Contents

Chapter 1. Motivation

Various transportation funding mechanisms are available to states, including the traditional and pervasive motor fuel tax as well as newer options, such as freight corridor tolling and taxes on vehicle-miles travelled (VMT). While the motor fuel tax is by far the most prevalent, current research within CM2[1] is establishing that fuel-tax revenue per freight VMT is declining. This decline is linked in part to inflation, and in part to improvements in truck fuel economy, similar to the improvements in passenger fuel economy that have also served to decrease fuel-tax revenue.

This CM2 Year 3 research will examine the role of freight planning at the megaregion level. It builds on prior CM2 research, which established the important role megaregions play in inducing freight trips.[2] This report will look at how that influence can be leveraged to ensure state transportation financing remains stable, and the opportunities that exist in state and regional freight planning. By examining freight infrastructure funding from the megaregion perspective, this report will contribute to the body of knowledge necessary to protect, preserve, and expand freight infrastructure within megaregions.

As the Oregon Department of Transportation states, "The gas tax is currently the main source of transportation funding, which means that the health of the transportation system is directly tied to each gallon of fuel burned."[3] This linkage means that any change in transportation funding will have profound impacts on the ability of planning agencies to prepare transportation systems for future demand. While new technologies are affecting the social costs of truck operations, this project considers, based on different adoption rates, how the freight planning process will be affected. Factors and technologies considered include MPO and state freight transportation planning, truck-only lanes, autonomous trucks, and truck toll rates.

[1] Harrison, R., Matthews, R., Colton, V., & Mason, S. (2018). *Megaregion (MR) Freight Mobility: Impact of Truck Technologies.* The University of Texas at Austin. Austin, Texas, United States: Cooperative Mobility for Competitive Megaregions. Retrieved August 19, 2020, link

[2] Steiner, F., Yaro, R., & Zhang, M. (2020). *Mega-Travel in Megaregions: An Update on Growth Trends and Research Needs.* Retrieved September 13, 2020, link

[3] Jones, K., & Bock, M. (2017, April). *Oregon's Road User Charge: The OReGO Program Final Report.* Retrieved September 13, 2020, link

The relationship between transportation funding and policy can vary greatly from place to place. Some taxes are established to bring about planning outcomes, while others are merely meant as tools for infrastructure preservation.[4]

[4] SteadieSeifie, M., Dellaert, N., Nuijten, W., Van Woensel, T., & Raoufi, R. (2013). *Multimodal freight transportation planning: A literature review.* European Journal of Operational Research. link

Chapter 2. Survey of State Transportation Finances

This section discusses the various means currently used to finance transportation at the state level, how they vary between states, and emerging trends. The most prevalent tool for transportation financing is the fuel tax—typically an excise tax set per unit volume of gasoline or diesel. This section also discusses other direct transportation funding sources states have employed, such as user fees, and the extent to which state general funds are tapped for transportation.

2.1. Fuel Taxes

Fuel taxes are the most common form of state transportation funding in the United States, generally taking the form of excise taxes on fuel consumption. They were historically implemented to link road use with roadway maintenance and construction costs. In addition to the federal fuel tax, nearly every state has some form of a direct fuel tax.[5]

As Figure 1 shows, the gasoline tax rate varies widely among the states. California has the highest rate in the country, at 80.87 cents per gallon, followed by Pennsylvania (77.1 cents) and Illinois (70.41 cents). Alaska and several states in the south and southwest have very low rates, with Alaska having the lowest rate at 32.17 cents. All the rates in the figure include the 18.4-cent federal gasoline tax.

[5] American Petroleum Institute. (2020). *Notes to State Motor Fuel Excise and Other Taxes.* Retrieved September 13, 2020, link
Pennsylvania is the only state without a direct tax on gasoline and diesel, but its other taxes give it the second-highest total fuel tax rate in the country.

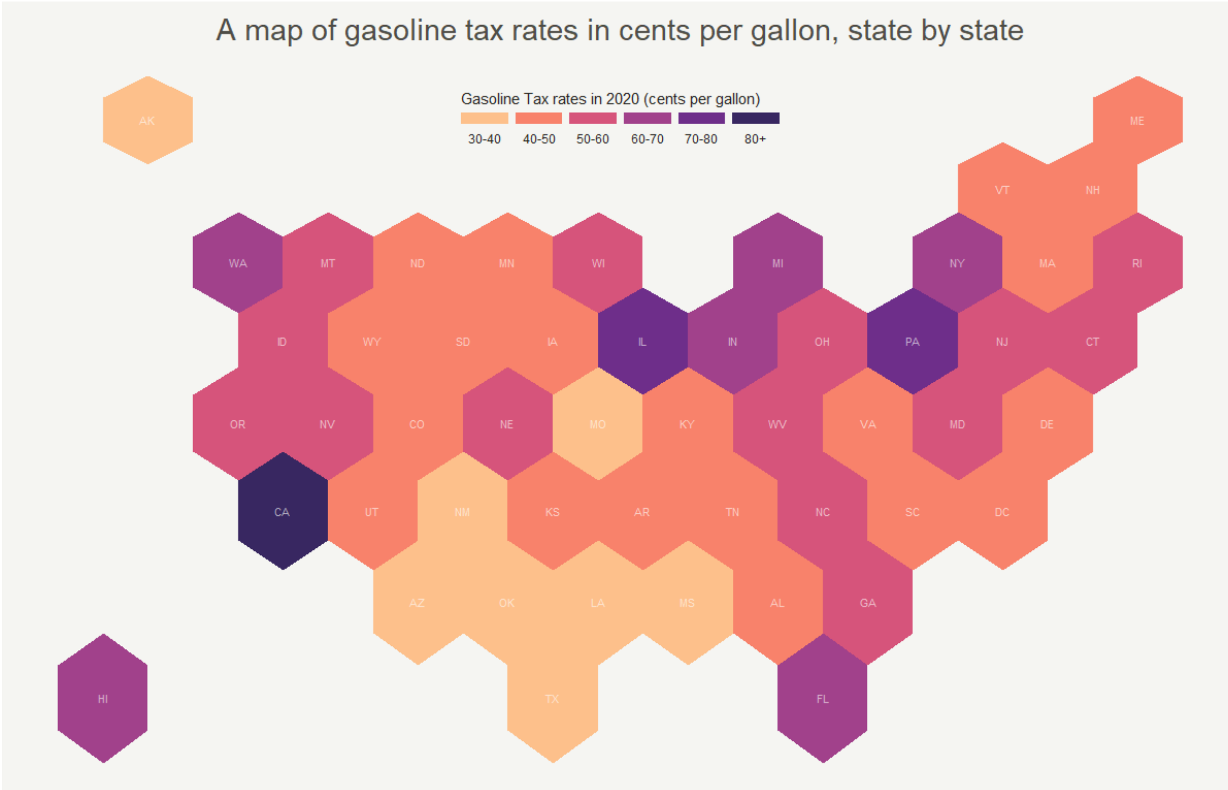

Figure 2.1. Hexbin choropleth of the total gasoline tax in each state. California, Pennsylvania, and Illinois have the highest rates, while the group of states from Mississippi to Arizona has relatively low rates. Data for this plot comes from the American Petroleum Institute and include the 18.4-cent federal gasoline tax.[6] *The figure was generated with code adapted from the R Graph Gallery.*[7]

The rates for diesel fuel taxes follow a similar trend, although they are generally higher. Figure 2 shows the diesel fuel tax rate by state. On average, the diesel fuel tax rate is 7.1 cents higher than the gasoline tax rate (61.88 cents per gallon versus 54.78 cents per gallon). Accounting for the different between the federal gasoline tax (18.4 cents per gallon) and the federal diesel fuel tax (24.4 cents per gallon), the average state tax on diesel is only 1.1 cents higher than the average state tax on gasoline. Because diesel vehicles tend to consume roadway pavements at much higher rates than gasoline vehicles, this means that diesel vehicles contribute less to state transportation budgets than gasoline vehicles relative to the amount of roadway consumption they are responsible for.[8]

[6] *Ibid*.
[7] The R Graph Gallery. (2018). *Hexbin map in R: an example with US states.* Retrieved September 13, 2020, link
[8] Rufolo, A. M., Bronfman, L., & Kuhner, E. (1999). *Effect of Weight-Mile Tax on Road Damage in Oregon.* Salem, Oregon: Oregon Department of Transportation. Retrieved September 13, 2020, link

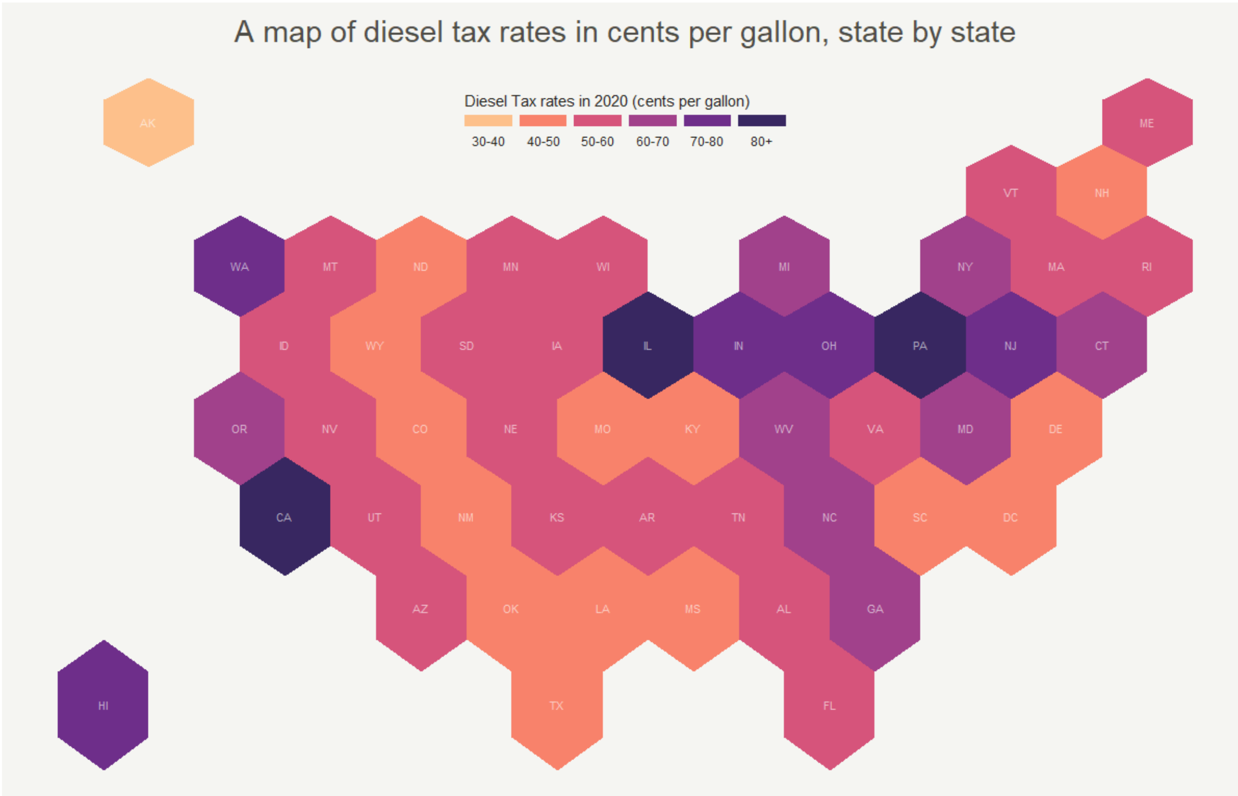

Figure 2.2. Diesel tax rates by state. Diesel fuel tax rates follow a similar trend to gasoline, although they are generally higher. The average gasoline tax rate is 54.78 cents per gallon, while the average for diesel is 61.88 cents per gallon. Data come from the American Petroleum Institute and include the 24.4-cent federal diesel fuel tax.[9] *The figure was generated with code adapted from the R Graph Gallery.*[10]

Many studies have shown that the federal fuel taxes are producing lower real revenue over time as the rates have failed to keep pace with inflation and vehicles have become more efficient.[11] Some states have similar disparities, while others have implemented policies that have increased their fuel tax revenues. The following section discusses state fuel tax legislation.

[9] American Petroleum Institute. (2020). *Notes to State Motor Fuel Excise and Other Taxes.* Retrieved September 13, 2020, link

[10] The R Graph Gallery. (2018). *Hexbin map in R: an example with US states.* Retrieved September 13, 2020, link

[11] Schroeder, A. (2015). *A Primer on Motor Fuel Excise Taxes and the Role of Alternative Fuels and Energy Efficient Vehicles.* U.S. Department of Energy Office of Energy Efficiency & Renewable Energy. Golden, Colorado, United States: National Renewable Energy Laboratory. Retrieved September 13, 2020, link

2.1.1. Legislation to Increase Fuel Taxes

The National Conference of State Legislatures has compiled information about states that have updated their fuel taxes in the past decade.[12] Figure 3 shows when states most recently increased their fuel tax rates or altered their rate structure in an attempt to reverse the declining trend in revenues. There is some overlap between the states that have not recently updated their fuel tax rates and the states that have relatively low rates, which would be expected if the rate is not indexed to inflation.

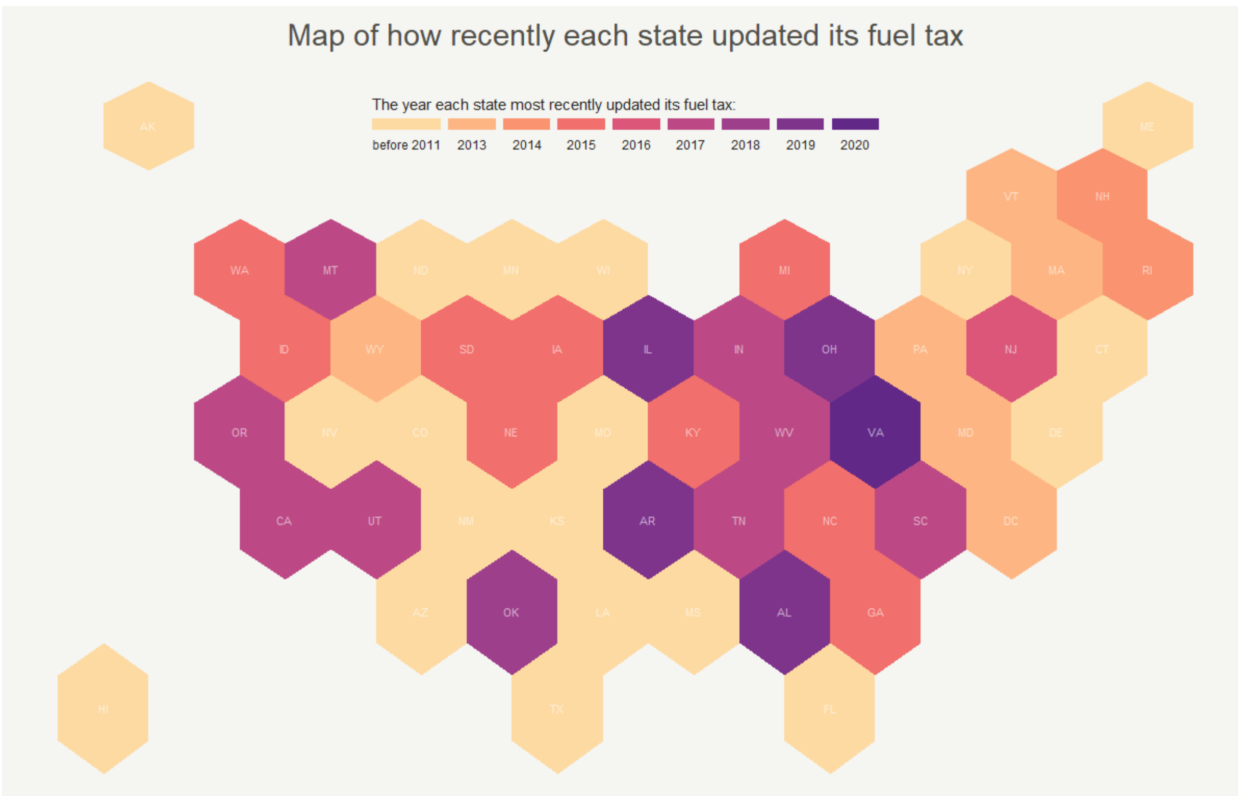

Figure 2.3. The year each state most recently updated its fuel tax rate. There is some overlap in the south and southwest between states that have a relatively low fuel tax rate and states that have not updated the rate recently. Data about fuel tax legislation come from the National Conference of State Legislatures.[13]

Like the federal fuel tax, most states do not index their fuel taxes to inflation. This results in declining real revenues over time unless the state legislature increases the rate through new legislation. New legislation to increase a tax rate can be politically difficult, which might explain

[12] National Conference of State Legislatures. (2020). *Recent Legislative Actions Likely to Change Gas Taxes.* Retrieved September 13, 2020, link

[13] *Ibid*.

why nineteen states have not increased their fuel tax rates in the past decade.[14] A few states increase their rates based on inflation, circumventing the political problem of updating the rate through new legislation, although most of the states that do so have also updated their rates in the past decade.[15] Of the states that have not updated their rates, only Florida adjusts the rate for inflation, indexing it to the consumer price index.[16]

Rather than indexing for inflation, some states simply set their rate as a percentage of the wholesale price of gasoline.[17] This strategy means that the tax, when measured in cents per gallon, will be higher when the price of gasoline increases and lower when the price of gasoline falls.

2.1.2. State Revenue from Fuel Taxes

How much does fuel tax revenue vary from state to state?

Setting a fuel tax rate does not directly lead to state transportation revenue. If states set a high rate, road users in that state may be motivated to purchase more fuel-efficient vehicles, partially offsetting any potential revenue increase. Additionally, small states might have to contend with significant numbers of drivers crossing the state boundary to buy cheaper fuel in a neighboring state. This section explores these issues by first calculating each state's expected fuel tax revenue (based on the state's fuel tax rate) and the amount of driving in the state, and then comparing those expected revenues with the state's actual fuel tax revenue collected.

For this analysis, tax revenues come from the 2019 fiscal year, the last full year available. These data come from the Census Bureau, which surveys states annually on tax revenue in a broad

[14] *Ibid*.
[15] Bishop-Henchman, J. (2014, September 30). *State Inflation-Indexing of Gasoline Prices.* Retrieved September 13, 2020, link
[16] *Ibid*.
Maine also indexed for inflation until that measure was repealed in January 2012.
[17] American Road and Transportation Builders Association. (2015). *Variable-Rate State Gas Taxes.* Retrieved September 13, 2020, link
Nine states tax a percentage of the wholesale price in addition to a flat excise tax. This includes several larger states such as California and New York.

number of categories.[18] State VMT estimates come from the Eno Center,[19] the Census Bureau,[20] and the Federal Highway Administration (FHWA).[21] State fuel tax rates are based on a weighted average of each state's 2020 gasoline and diesel fuel tax rates using total 2019 supplies from the U.S. Energy Information Administration (EIA).[22]

In Figure 4, each state's expected 2019 fuel tax revenue is plotted against the state's actual reported revenue for 2019. The expected fuel tax revenue is based on a simple model of the state's fuel tax rate and the estimated VMT in the state for 2019. Because the actual revenue closely follows the expected revenue from this simple model, it is unlikely that fuel tax revenue exhibits a high degree of elasticity based on the rate that states set. This means a state might be able to increase its fuel tax rate and expect to see a proportionate increase in fuel tax revenues, despite the potential reductions that could result from road users buying more fuel-efficient vehicles or buying cheaper gas in neighboring states.

[18] United States Census Bureau. (2020, April 29). *2019 State Government Tax Tables.* Retrieved September 13, 2020, link
The detailed table uses the category 'Motor Fuels Sales Tax'. Revenues are for the 2019 fiscal year, which means that the timeframe does not entirely match the estimates for VMT.

[19] Davis, J. (2019). *U.S. VMT Per Capita By State, 1981-2017.* Washington, DC, USA: Eno Center for Transportation. Retrieved September 13, 2020, link
2017 was the most recent year with a state-level breakdown of per capita VMT. The authors were unable to find more recent state-level VMT figures from other published sources.

[20] United States Census Bureau. (2019, December 30). *State Population Totals and Components of Change: 2010-2019.* Retrieved September 13, 2020, link
State population estimates were used to calculate the 2017 state VMT totals based on the per capita VMT reported by the Eno Center.

[21] Federal Highway Administration. (2020). *Traffic Volume Trends.* Office of Highway Policy Information, United States Department of Transportation. Retrieved September 13, 2020, link
The ratio between the total 2017 and 2019 VMTs was used to estimate the state-level VMT for each state based on each state's 2017 per capita VMT and 2017 population estimate.

[22] Energy Information Administration. (2020, July 31). *Petroleum & Other Liquids: Product Supplied.* Retrieved September 13, 2020, link

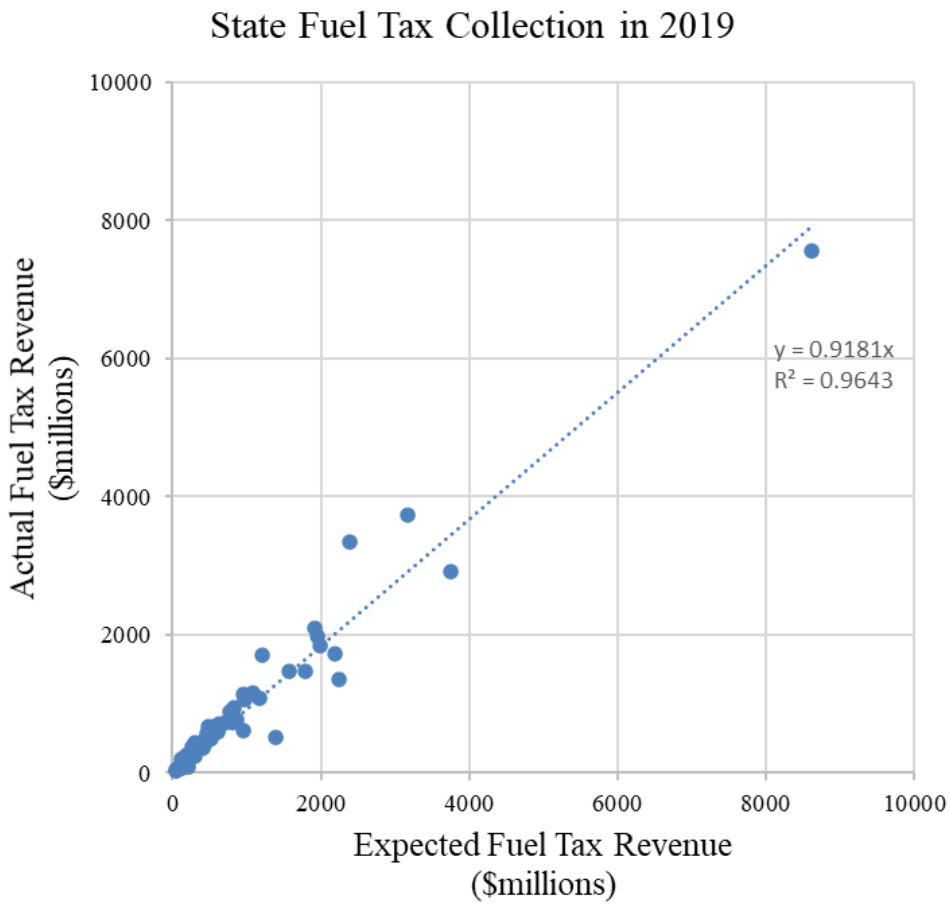

Figure 2.3. Each state's expected revenue from motor fuel taxes closely matches the actual revenue collected in 2019. Data come from the state fuel tax rates discussed earlier in this section,[23] *state fuel tax revenues reported to the Census Bureau,*[24] *Census Bureau state population estimates,*[25] *and estimates of each state's VMT.*[26]

This analysis could be improved in several ways, such as finding VMT and revenue data from coincident time frames, using 2019 fuel tax rates, and breaking revenue down between diesel and gasoline fuel taxes, but this simple analysis indicates that there may be a very low demand elasticity for driving based on the fuel tax rate. A low elasticity would mean states have more flexibility in setting a rate according to their transportation funding needs.

[23] American Petroleum Institute. (2020). *Notes to State Motor Fuel Excise and Other Taxes.* Retrieved September 13, 2020, link

[24] United States Census Bureau. (2020, April 29). *2019 State Government Tax Tables.* Retrieved September 13, 2020, link

[25] United States Census Bureau. (2019, December 30). *State Population Totals and Components of Change: 2010-2019.* Retrieved September 13, 2020, link

[26] Davis, J. (2019). *U.S. VMT Per Capita By State, 1981-2017.* Washington, DC, USA: Eno Center for Transportation. Retrieved September 13, 2020, link

2.2. General Revenue Funds

While fuel taxes provide a significant portion of overall transportation funds, other funds come from general tax revenues. In 2014, appropriations from general funds accounted for less than 8% of state transportation spending, but they did account for 37.5% of federal spending and 40.4% of local spending.[27] As fuel efficiency and inflation cause the real revenue from fuel taxes to fall, some of the difference might be made up in transfers from general revenue funds.

[27] BATIC Institute, an AASTHO Center for Excellence. (2020). *Transportation Funding and Financing.* Retrieved September 13, 2020, link

Chapter 3. Transportation Financing and Freight

The largest user fee charged to the freight transportation system is the fuel tax on diesel. This tax is not only paid by the freight system, and not all parts of the freight system pay this tax, but it is still a large outlay from the trucking and rail sectors. Perhaps because the freight sector involves more market-based modal competition than the passenger transportation sector, more controversy has arisen over the varying fuel taxes used for freight in different states. For example, a lawsuit brought by the Class I Railroad CSX alleged that Alabama's use of different fuel taxes for trains and trucks (a fixed excise tax on diesel used by trucks and a percentage sales tax on diesel used by trains) constituted unfair favoritism.[28] The structure of the tax on diesel is generally similar to the overall fuel taxes discussed in the previous section. This section by contrast will focus on the aspects that are different, the way taxes are imposed on non-highway freight modes, and the effects of improved freight efficiency.

3.1. Trucking Efficiency and Transportation Financing

Unlike light-duty vehicles, heavy-duty vehicles such as trucks were not subject to fuel efficiency standards until 2007 when the Energy Independence and Security Act was passed—four decades after the US's first light-duty vehicle fuel efficiency standards.[29] Prior to that legislation, heavy-duty vehicles in the US had been subject only to emissions regulations. The heavy-duty fuel efficiency standards were increased in 2014. In 2020, light-duty vehicles fuel economy standards were relaxed, but that change does not affect heavy-duty vehicles.[30, 31] A separate regulatory change from 2017, however, removed emissions requirements for "Glider Vehicles," which are new Class 8 chassis fitted with used engines by a third party.[32] With the number of increases and

[28] Povich, E. S. (2014). *Does a State Fuel Tax Unfairly Favor Trucks Over Trains?* PEW. Retrieved September 13, 2020, link

[29] Harrison, R., Matthews, R., Colton, V., & Mason, S. (2018). *Megaregion (MR) Freight Mobility: Impact of Truck Technologies.* The University of Texas at Austin. Austin, Texas, United States: Cooperative Mobility for Competitive Megaregions. Retrieved August 19, 2020, link

[30] Environmental Protection Agency. (2020, July 1). *Regulations for Greenhouse Gas Emissions from Commercial Trucks & Buses.* Retrieved September 13, 2020, link

[31] Environmental Protection Agency and National Highway Safety Administration. (2020, April 30). *The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks.* Retrieved September 13, 2020, link

The previous regulation would have increased the standards for passenger cars and light trucks annually by 5% starting with model year 2021. The new standards increase fuel efficiency annually by 1.5% instead.

[32] National Service Center for Environmental Publications. (2015, July). *Frequently Asked Questions about Heavy-Duty "Glider Vehicles" and "Glider Kits".* Retrieved September 13, 2020, link

reductions in fuel efficiency standards for US vehicles in the past decade, there is uncertainty over how much regulations will drive improvements in truck fuel efficiency. Fluctuations in the price of diesel likewise mean that future efficiency increases driven by the market are uncertain. Figure 5 shows how the average US retail price of diesel has changed over the past decade, based on data from the EIA.[33] Future heavy-duty fuel efficiency uncertainty is further exacerbated by the various timelines surrounding the adoption of technologies that enable truck platooning and other fuel-efficiency-improving technologies.[34]

Figure 3.1. Diesel prices have fluctuated significantly over the past decade, driven by recovery from the 2008 recession, the rise of hydraulic fracturing, global oil supply changes, and most recently the COVID-19 global pandemic. Data come from the EIA.[35]

The new rule means "Glider Vehicles" are not considered new vehicles and therefore not subject to fuel economy standards for new vehicles. The EPA observed a large increase in glider sales coinciding with new heavy-duty vehicle efficiency and emissions regulations (a ten-fold increase in sales from 2004 to 2006), which might suggest that gliders are being used to bypass regulations. Because the engines placed in gliders are often older than 2001, a glider vehicle can have significantly worse fuel economy and orders of magnitude more emissions than a new vehicle. As of 2015, new glider sales accounted for about 2% of new heavy-duty vehicles, but about half of heavy-duty vehicle oxides of nitrogen and particulate matter.

[33] Energy Information Administration. (2020, July 31). *Petroleum & Other Liquids: Product Supplied*. Retrieved September 13, 2020, link

[34] Mishra, S., Golias, M. M., & Kaisar, E. I. (2019). *Modeling Adoption of Autonomous Vehicle Technologies by Freight Organizations.* Florida Atlantic University, College of Engineering and Computer Science. College Park, Maryland, United States: Freight Mobility Research Institute. Retrieved September 13, 2020, link
By varying the coefficients of innovation and imitation in a technology acceptance model, the researchers were able to show a wide range in the potential adoption of connected and autonomous vehicle technologies.

[35] Energy Information Administration. (2020, July 31). *Petroleum & Other Liquids: Product Supplied*. Retrieved September 13, 2020, link

With a high amount of uncertainty over the efficiency of trucks, there is also uncertainty in the amount of revenue diesel excise taxes will provide states.

3.2. Freight's Share of Transportation Costs

The generally higher rate for the diesel tax and the lower per-mile efficiency for trucks versus passenger vehicles mean that freight vehicles pay more per mile travelled on the roadway network. However, pavement consumption is exponentially correlated with vehicle weight.[36] This section examines the current differences in user fees relative to the amount of wear-and-tear generated by freight and passenger vehicles.

The increased impact of heavy vehicles on roadway maintenance is a well-studied phenomenon. As early as 1977, a Government Accountability Office report estimated a fully loaded tractor-trailer truck requires roadway maintenance equivalent to 9600 passenger vehicles.[37] Based on relative fuel tax rates and relative fuel efficiencies, it is possible to determine the average tax paid per mile driven. According to the Bureau of Transportation Statistics, in 2016, the average US passenger vehicle had a fuel efficiency of 22.1 miles per gallon.[38] For the same year, combination trucks had a fuel efficiency of only 5.9 miles per gallon.[39] Figure 6 shows the fuel efficiencies of the two modes over time.

[36] Luskin, D., & Walton, C. M. (2001). *Effects of Truck Size and Weights on Highway Infrastructure and Operations: a Synthesis Report.* University of Texas at Austin, Center for Transportation Research. Austin, Texas, United States: Texas Department of Transportation. Retrieved September 13, 2020, link

[37] Office of the Comptroller General. (1977). *Excessive truck weight: an expensive burden we can no longer support.* Washington, D.C., United States: Government Accountability Office. Retrieved September 13, 2020, link

[38] Bureau of Transportation Statistics. (2018). *Average Fuel Efficiency of U.S. Passenger Cars and Light Trucks.* Retrieved September 13, 2020, link

[39] Bureau of Transportation Statistics. (2018). *Combination Truck Fuel Consumption and Travel.* Retrieved September 13, 2020, link

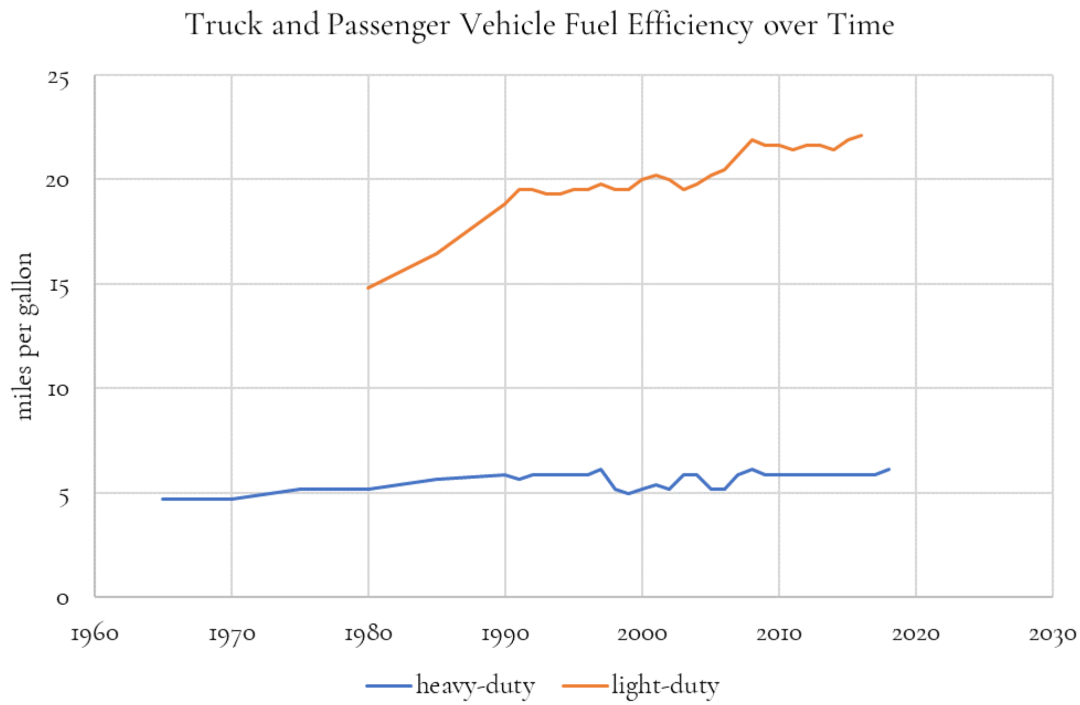

Figure 3.2. Fuel efficiency over time for passenger and freight vehicles. While both have generally trended upwards, freight vehicles' increase has been less steady and less drastic overall. Data come from the Bureau of Transportation Statistics.[40, 41]

Based on population-weighted averages, the gasoline tax is $0.56 per gallon, and the diesel tax is $0.66 per gallon. Combined with the fuel efficiency values, the use-charges for light-duty and heavy-duty vehicles as of 2016 were 2.5 cents per mile and 11.2 cents per mile. This means that heavy-duty vehicles pay slightly over four times as much in equivalent use taxes per distance traveled, but they account for nearly ten thousand times the pavement consumption. The current level to which passenger vehicles subsidize freight vehicles on the roadways might help inform the appropriate starting amounts for any VMT taxes.

[40] Bureau of Transportation Statistics. (2018). *Average Fuel Efficiency of U.S. Passenger Cars and Light Trucks.* Retrieved September 13, 2020, link

[41] Bureau of Transportation Statistics. (2018). *Combination Truck Fuel Consumption and Travel.* Retrieved September 13, 2020, link

Chapter 4. Innovations in Transportation Financing

This section discusses two newer strategies being studied or trialed for transportation financing. The VMT tax is a tax paid per distance travelled, while congestion pricing is a fee charged based on where and when a driver uses the road network.

Federal support of financing innovations was provided in the most recent federal transportation authorization, the Fixing America's Surface Transportation (FAST) Act, which established the Surface Transportation System Funding Alternatives Program (STSFA) to provide states with grants to test user-based transportation funding alternatives.[42]

4.1. Vehicle Mileage Fees

The Texas Transportation Institute studied the mechanics of implementing a VMT tax in Texas.[43] That study identified several potential impediments to implementing a state VMT tax, including enforcement, privacy concerns, and administration. By its nature, a VMT tax would tend to increase the tax burden of those operating newer, more fuel-efficient vehicles relative to the tax burden of drivers of less fuel-efficient vehicles. The study concluded that this effect needs more exploration to determine whether a transition to a VMT tax at the state level would be equitable.

Outside of the United States, VMT taxes are not a new thing. A similar scheme, called a road user charge (RUC), was implemented in New Zealand in 1978.[44] New Zealand's RUC was originally established specifically to capture the cost of road consumption by heavy-duty vehicles. In fact, the RUC is only charged to diesel-fueled vehicles, while gasoline-fueled vehicles pay an excise tax, as in the US system.[45] The RUC charges users for distance-based licenses in blocks of one thousand kilometers each. The cost of a block varies based on the type and weight of the vehicle used to travel those kilometers. New Zealand's Ministry of Transport considers the cost of administering the RUC to be small, but it is likely still higher than the cost of administering

[42] Federal Highway Administration. (2017, February 8). *Surface Transportation System Funding Alternatives Program*. Retrieved September 13, 2020, link

[43] Baker, R., & Goodin, G. (2010). *Exploratory Study: Vehicle Mileage Fees in Texas.* Texas Transportation Institute. College Station, Texas, United States: Texas Department of Transportation. Retrieved September 13, 2020, link

[44] Binder, S. J. (2019). *Road User Charge: Applying Lessons Learned in New Zealand to the United States.* Project Panel on Administration of Highway and Transportation Agencies. Bethesda, Maryland, United States: Cambridge Systematics, Inc. Retrieved September 13, 2020, link

[45] *Ibid*. p.1

fuel excise taxes. The higher administrative cost owes partly to the much greater number of payers (i.e., there are more vehicles than fuel stations), and officials estimated that the total administrative cost of collecting the RUC revenue might be twice the cost of their fuel excise tax collections.[46]

This raises the question of how US states would need to structure VMT taxes to serve as direct replacements of fuel taxes. Figure 7 shows the amount each state would need to charge per thousand miles traveled to provide equivalent revenue to 2019 fuel taxes.

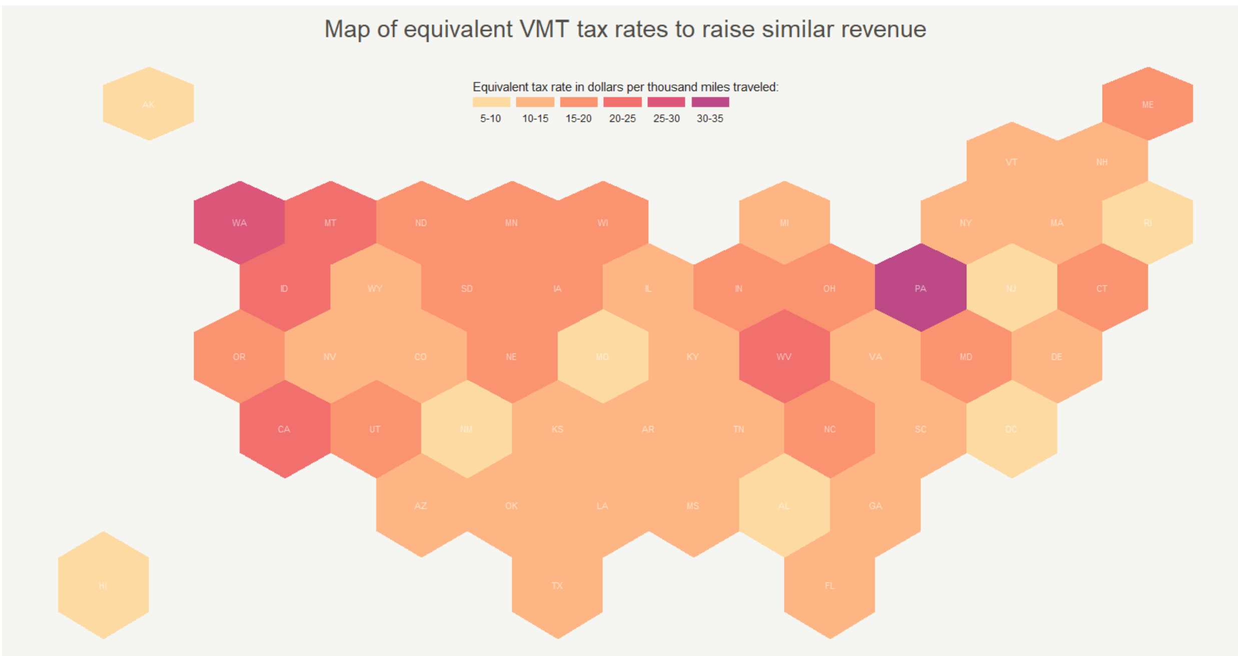

Figure 4.1. Equivalent VMT tax rates by state. Based on the current fuel tax revenue and amount of driving, it is possible to calculate the VMT tax rate necessary to raise similar funds for each state. Compared to the fuel tax rates shown in Figure 1 and Figure 2, the range of rates might be much higher—the highest state fuel tax is only 2.8 times higher than the lowest, but the highest equivalent VMT tax is nearly five times higher.

Thirty-seven states would have a rate between $10 and $20 per thousand miles traveled. Note that these rates are based on the total VMT in each state—the rate for heavy-duty vehicles would likely be higher, and the rate for light-duty vehicles would likely be lower. Additionally, rates would rise or fall depending on whether each individual state required larger or smaller amounts

[46] *Ibid*. p.22

of revenue. These rates also assume that the total VMT in each state would remain the same once a VMT tax was implemented to replace fuel taxes.

Relative to New Zealand's RUC, one complication in the United States would be tracking miles traveled in each state separately, to allow accurate VMT assessment per state.

4.2. Congestion Pricing

Congestion pricing works similarly to VMT taxes, except the per-mile charge varies based on the amount of congestion where the travel takes place. While VMT taxes primarily raise funds for roadway maintenance and expansion—and thus are more directly linked to the physical cost of using a roadway—congestion fees address the time cost a traveler imposes on other travelers of the roadway. According to the FHWA, "There is a consensus among economists that congestion pricing represents the single most viable and sustainable approach to reducing traffic congestion."[47]

There are several different versions of congestion pricing. The most common version in use is a managed lane system, in which one set of lanes along a facility will have a congestion-based charge to ensure those lanes maintain a specified speed. Another type of congestion fee is cordon pricing, in which entering a certain area imposes a fee during high-use times of the day. In order to serve as a substitute for state fuel taxes, a different model known as "pay as you drive" might need to be implemented, in which drivers pay a fee based on when and where they drive, with higher-demand roadways imposing higher fees. So far, most of the trials of pay-as-you-drive systems in the United States have utilized fixed rates, making them functionally equivalent to VMT taxes.[48]

One way in which VMT taxes vary from congestion pricing is the effect on driver behavior. While both potentially raise revenue that could replace falling fuel tax receipts, congestion pricing has the potential to disincentivize driving along particular routes or at certain times. Especially for long-distance truck trips, where there might be more potential flexibility in the route selected, congestion pricing could be a means, if coordinated at the megaregion level, to reduce the costs of maintenance along key corridors. For example, if combined with technologies to detect early

[47] FHWA Office of Operations. (2020, March 2). *What is Congestion Pricing?* Retrieved September 13, 2020, link

[48] *Ibid*.

signs of pavement damage, coordinating congestion pricing throughout a megaregion might reduce the number of trucks that use a stretch of roadway before it can receive preventative maintenance.

Chapter 5. Conclusion and Recommendations

Like the federal fuel tax, state fuel taxes have faced declining revenues due to inflation and improvements in fuel efficiency. States have generally been more successful in updating their fuel taxes than the federal government has, however. The amount of fuel taxes various states charge varies widely, and moving to different funding strategies, such as a VMT tax or congestion pricing, might pose unique challenges to the freight transportation sector.

Policies and planning at the megaregion level might have the potential to increase the efficiency of new transportation financing techniques. Cooperation between states may be necessary when vehicles routinely travel many miles across different states, which trucks tend to do more often than passenger vehicles. For VMT taxes, coordination within and between megaregions might reduce the difficulty in administering the tax, which can be twice as expensive as a similar fuel tax.

The high correlation between each state's fuel tax rate and its fuel tax revenue implies that there might be a low elasticity in drivers' response to road user taxes. If this low elasticity holds true, policymakers might have a high degree of flexibility in designing an alternative to the fuel tax.

Appendix A: Additional Matters at the End of the Report

This table provides the numeric values used in Figure 1, Figure 2, Figure 3, and Figure 7.

State	Gasoline Tax (cents/gallon)	Diesel Tax (cents/gallon)	Most Recent Year Changed	Equivalent VMT Tax ($/1000 miles)
Alabama	45.61	52.55	2019	8.35
Alaska	32.17	38.09	before 2011	8.17
Arizona	37.4	51.4	before 2011	13.12
Arkansas	43.2	53.2	2019	13.27
California	80.87	105.68	2017	21.25
Colorado	40.4	44.9	before 2011	12.31
Connecticut	54.15	69	before 2011	15.46
Delaware	41.4	46.4	before 2011	13.76
District of Columbia	41.9	47.9	2013	7.42
Florida	60.69	59.67	before 2011	12.94
Georgia	50.6	61.94	2015	13.72
Hawaii	64.68	73.65	before 2011	7.92
Idaho	51.4	57.4	2015	20.88
Illinois	70.41	82.84	2019	12.27
Indiana	66.02	76.4	2017	17.75
Iowa	48.9	56.9	2015	19.62
Kansas	42.425	50.425	before 2011	14.02
Kentucky	44.4	47.4	2015	14.26
Louisiana	38.41	44.41	before 2011	13.04
Maine	48.41	55.61	before 2011	17.03
Maryland	54.7	61.45	2013	18.71
Massachusetts	44.94	50.94	2013	11.39
Michigan	60.38	67.58	2015	14.14
Minnesota	47	53	before 2011	15.19
Mississippi	37.19	42.8	before 2011	10.72
Missouri	35.82	41.82	before 2011	9.29
Montana	51.15	54.6	2017	20.19
Nebraska	52.5	57.9	2015	18.33
Nevada	52.18	52.96	before 2011	12.27

State	Gasoline Tax (cents/gallon)	Diesel Tax (cents/gallon)	Most Recent Year Changed	Equivalent VMT Tax ($/1000 miles)
New Hampshire	42.23	48.23	2014	13.22
New Jersey	59.8	72.9	2016	6.54
New Mexico	37.28	47.28	before 2011	8.61
New York	61.52	67.83	before 2011	13.67
North Carolina	54.75	60.75	2015	17.00
North Dakota	41.4	47.4	before 2011	19.84
Ohio	56.91	71.41	2019	16.97
Oklahoma	38.4	44.4	2018	12.39
Oregon	57.23	62.46	2017	15.60
Pennsylvania	77.1	99.6	2013	32.17
Rhode Island	53.4	59.4	2014	9.26
South Carolina	43.15	49.15	2017	12.53
South Dakota	48.4	54.4	2015	19.16
Tennessee	45.8	52.8	2017	14.08
Texas	38.4	44.4	before 2011	13.02
Utah	49.51	55.51	2017	17.48
Vermont	48.57	56.4	2013	11.30
Virginia	47.8	52.9	2020	12.46
Washington	67.8	73.8	2015	26.70
West Virginia	54.1	60.1	2017	22.37
Wisconsin	51.3	57.3	before 2011	15.86
Wyoming	42.4	48.4	2013	11.34

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