THE ROLE OF THE MOTOR FUEL TAX AS AN ENVIRONMENTAL TAX AND CLIMATE CHANGE POLICY IN THE UNITED STATES

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ABSTRACT

This article examines the effectiveness of the motor fuel tax as an environmental tax, which penalizes the emission of greenhouse gases and its role in government policy to combat the effects of climate change. The examination of the motor fuel tax will focus primarily on the use and implementation of the tax at various levels of government within the United States and whether the tax is or potentially can be an efficient policy means of protecting against greenhouse gas emission and environmental harm for the benefit of society. Based on current evidence, it does not appear that the motor fuel tax being levied as an efficient tax.

INTRODUCTION

Gasoline and diesel-fueled vehicles, commonly used for transportation, create numerous problems in modern society. Widespread use of gasoline and diesel-fueled vehicles damages the roads, creates traffic congestion, pollutes the quality of the air, and produces greenhouse gases that contribute to climate change (Fisher, 2016, p. 548-555). With so many negative externalities generated by gasoline and diesel-fueled vehicles, it is justifiable for a government to tax vehicles for transportation to discourage their use and/or to generate revenue to pay for the damages caused by vehicles. Along with toll collections for some roads, the tax on motor fuel is one of the most widely used methods for a government to levy a fee for the use of gasoline or diesel-fueled vehicles for transportation.

Both the United States Federal Government and state governments use the motor fuel tax (MFT) as a means of charging drivers for the use of roads and discouraging traffic congestion, with the revenue primarily funding the maintenance of public roads. However, with increased concern about the environment and climate change, the MFT has acquired growing recognition as a Pigouvian tax to reduce pollution and the emission of greenhouse gases (Williams III, 2017, p. 67).

In light of increasingly grim reports on the long-term effects of climate change, driven by international agreements like the Paris Climate Accord, governments are seeking to heavily curb emissions of greenhouse gases that retain heat and contribute to climate change (United Nations, 2017). Although more robust greenhouse gas emission-reducing policies such as cap-and-trade systems and carbon taxes exist, the MFT is currently the most widely implemented form of environmental tax targeting emissions of greenhouse gases in the U.S.

and internationally (Williams III, 2017, p. 67). The United States Federal Government, every state government (including the District of Columbia), and nearly every industrialized country levy the decades old MFT (Fisher, 2016, p. 372-373). The MFT is also politically accepted since it targets various negative externalities, and its implementation has wide (if begrudging) public acceptance. Justifications for the MFT avoid public opposition to new government action to combat climate change because the MFT does not explicitly target greenhouse gas emissions, unlike the carbon tax (Watts, 2013).

The Motor Fuel Tax as an Environmental Tax versus Other Roles of the Tax

The MFT was not implemented as an environmental tax. Taxing gasoline fuel consumption was implemented decades before the development of any public consciousness of climate change. The federal and state governments applied the tax on the sale of motor fuel to place an indirect charge on vehicle usage to generate revenue for the maintenance and construction of public roads and highways (Williams III, 2017, p. 67). Despite the original intent of the tax, the MFT is actually better suited as an environmental consumption tax targeting greenhouse gas emissions rather than an excise tax aimed at traffic congestion or damage to roads from heavy vehicle use. MFTs can change consumer behavior, reducing the prevalence of negative externalities, but it is not the most efficient from a policy perspective. The MFT does not reliably generate revenue from the use of public roads or highways. Because the tax is applied during the sale of fuel, the MFT can lack geographic coverage, and drivers can purchase fuel from stations along roads they do not frequently drive, which may also result in a different locality collecting the tax revenue. Collecting road tolls or taxing drivers based on vehicle miles travelled tends to be much more effective methods of charging driver for the specific use of roads (Fisher, 2016, p. 548-555). The MFT potentially enables governments to levy a charge for routine damage to public roads since larger vehicles, which require greater amounts of fuel, tend to do more damage to roads than smaller vehicles. However, this advantage is moot if the revenue from the tax is not collected by the locality maintaining the road (Fisher, 2016, p. 548-555).

The MFT is also comparatively ineffective as a tax on traffic congestion. The MFT price is uniformly set within local jurisdictions. To discourage drivers from entering congested areas, the government would have to adjust the price of the MFT in different areas at times of high traffic congestion to create an incentive to use less congested roads. Even if regular congestion adjustments to the tax price were implemented, the MFT still only affects drivers when they purchase fuel, so the drivers could simply purchase fuel when there is less traffic congestion, largely avoiding the impact of the tax. Combating traffic congestion is better served by other means, such as road tolls that only take effect at moments of high traffic congestion (Fisher, 2016, p. 548-555; Margolis, 1987, p. 44).

Unlike road use and traffic congestion, the purchase and consumption of motor fuel is directly tied to emissions of greenhouse gases. Vehicle greenhouse gas emissions are produced from vehicles' use of gasoline and diesel fuel. The size of the burden of the MFT on a given driver directly corresponds with the emission of greenhouse gases from that driver's vehicle (Williams III, 2017, p. 67-68). The harm caused by greenhouse gases is functionally global; the location where the tax is collected is less significant because emissions are universal across all localities, although, which jurisdiction collects the revenue from the

tax is important for determining the added value of the use of revenue. Accordingly, a change in driver behavior to consume less gasoline or diesel fuel results in less harm being done to society through negative externalities created by the driver's vehicle like the emission of greenhouse gases (Fisher, 2016, p. 372-375).

However, it is important to note that the effect of the MFT will not always be proportional to changes to the tax. The inconsistent proportionality is partially due to the fact that the behavior change created from an increased penalty through raising the MFT will not be uniform for every consumer. Consumers who simply drive vehicles less often will reduce the harm to society more significantly than consumers who respond by purchasing more fuel-efficient vehicles and continuing to drive with the same frequency. Unfortunately, many drivers are not able to reduce their frequency of driving as a means of transportation past a certain point. Increasing the MFT beyond this point will either fail to further change consumer behavior to reduce driving or cause people to drive less at the expense of a practice that would add more societal value than the preventing harm through the tax (Williams III, 2017, p. 67-68).

Ultimately, the MFT carries the same potential drawbacks inherent to any consumption tax. As long as the MFT is levied at an efficient rate, it will be an effective environmental tax, reducing greenhouse gas emissions and more directly impacting climate change.

Efficiency

To maximize societal benefit from the MFT, the price of the tax must be set at an efficient amount to both properly change consumer behavior and sustainably generate revenue to further address the negative externalities created by the use of vehicles. As stated previously, there are diminishing returns on the added benefit from increasing the value. R. H. Coase established in The Problem of Social Cost that a Pigouvian tax price that is set too high on the basis of damage from negative externalities will actually be more damaging to society by creating economic inefficiencies (1960, p. 32-34). The value gained from penalizing the harmful externalities created by gasoline and diesel-fueled vehicles does not increase at a consistent rate. The value will eventually decrease the overall societal value of the tax if it is made too austere past the point of efficiency. Correspondingly, a MFT price that is set below the efficiency point also fails to be fully effective as a sufficient policy response to the negative externalities.

Parry and Small calculated an optimal tax rate for the MFT in the United States based on the costs of the following negative externalities: traffic congestion, traffic accidents, and pollution (including the effects of climate change) calculated at median cost of $25 per metric ton of carbon dioxide (2005, p.1279). Parry and Small also take into account the price elasticity of demand for gasoline for American consumers specifically. They estimate that the optimal U.S. MFT price would be approximately 1.01 dollars per gallon (in 2000 dollars), which contributes a societal welfare benefit of roughly 7.4 percent of pre-tax fuel expenditures (2005, p.1279). It should be noted that Parry and Small's estimated optimal tax rate was calculated with the assumption that the revenue generated from the MFT would be used to finance labor tax reductions, and therefore the estimated optimal tax rate would increase or decrease if the revenue from the tax was instead used for public spending of greater or lesser additional societal value, respectively (2005, p.1279).

West and Williams calculated a slightly higher optimal U.S. MFT rate of 1.12 dollars per gallon (in 2000 dollars) using Parry and Small's findings on the basis of a predicted increase in household labor supply as an externality of increased gasoline prices (West & Williams III, 2007, p.608-610; West & Williams III, 2004, p.550-554; Williams III, 2017, p. 67-68). West and Williams' estimated optimal tax rate would be about 1.55 dollars per gallon (2015 dollars) (West & Williams III, 2007, p.608-610; West & Williams III, 2004, p.550-554; Williams III, 2017, p. 67-68).

In comparison to the estimated optimal MFT rates put forth by Parry and Small and West and Williams, the federal U.S. MFT rate is 0.184 dollars per gallons as of 2017. Pennsylvania has the highest MFT rate at 0.593 dollars per gallon as of 2017. Therefore the highest combined state and federal MFT rate in the U.S. is approximately 0.7770 dollars per gallon, which is well below the estimated optimal tax rate (American Petroleum Institute, 2017).

When Parry and Small's estimates are adjusted for 2015 dollars, the added welfare value highest combined federal and state MFT rate appear to be roughly on par with or approaching the added value of Parry and Small's estimated naïve tax rate of 1.76 dollars per gallon (2005, p. 1284). The naïve tax rate was based on simply adding together the cost of the negative externalities and disregarding fiscal interactions to create a poorly-conceived, overly burdensome high MFT rate for comparison purposes as an example of an extremely inefficient tax rate (Parry & Small, 2005, p.1284; Williams III, 2017, p.68). The combined state and federal MFT rate theoretically generates a similar added societal welfare value as the naïve tax rate, but it is an excessively low tax rate rather than an excessively high tax rate (Parry & Small, 2005, p.1284). The combined state and federal MFT rate is currently highly inefficient in added societal value at the far, low end of the optimal tax rate spectrum.

The inefficiency of MFT rates in the U.S. is alarmingly low, given that the combined federal and Pennsylvania tax rate of 0.7770 dollars per gallon is the highest MFT. The average combined U.S. state and federal MFT rate is approximately 0.5173 dollars per gallon as of 2017. Alaska is at the extreme low end with a combined U.S. federal and state MFT rate of approximately 0.3061 dollars per gallon as of 2017 (state rate alone is roughly 0.1221 dollars per gallon) (American Petroleum Institute, 2017). These low values suggest that the U.S. is falling well short of efficiently utilizing the MFT for societal benefit through either revenue collected or changes in consumer behavior. Currently, the MFT is far too low to be as effective as it could be as a policy tool and a means of acquiring revenue for government services. From a public policy perspective, the MFT should be increased appropriately to play a more effective role as an environmental and consumption tax.

Distributional Effects

The MFT is an inherently regressive tax, like many other excise taxes, for which the burden of the tax is shifted onto the consumer at the sale of gasoline or diesel fuel. Households with lower income that are dependent on driving gasoline or diesel-fueled

vehicles for transportation tend to spend larger percentages of their household budgets on gasoline than households with higher income. The tax is more burdensome on people with lower income (Williams III, 2017, p. 68). This is partially because household spending on the purchase of fuel for motor vehicles generally tends to be inelastic, although there are some exceptions across household income levels.

The relative household budget share for the purchase of motor fuel does not hold completely for lower income households along the income distribution, unlike expectations for the purchase of other energy goods. The lowest income households are not affected by changes in the price of gasoline or diesel fuel because they tend not to own or drive gasoline or diesel-fueled vehicles, and thus are not penalized by the MFT raising the price of gasoline and diesel (Williams III, 2017, p. 68-69).

Although the trend for a larger relative share of spending on fuel amongst lower income households is more consistent for the rest of the income distribution, the demand for motor fuel tends to be more elastic for lower income households than the demand for motor fuel for higher income households, limiting the regressiveness of the tax. Changes in consumer behavior to drive less frequently or to use less fuel (by using other forms of transportation, carpooling, or just avoiding unnecessary driving) reduces the tax burden on lower income households. West finds that elasticity of demand for motor fuel was highest for the lowest income decile (a tenth of the examined population), and the demand for motor fuel also tended to be elastic for higher income deciles, but the demand for gasoline fuel for the two highest income deciles was more elastic than the demand for third and fourth-highest income deciles (2004, 749-752). Accordingly, the burden of the MFT amongst the lower-income households (i.e. the five-lowest income deciles) appears to be progressive, while the tax burden amongst the higher income households (i.e. the five-highest income deciles) appears to be regressive. The burden of the MFT is also relatively flat across the second decile through the eighth decile (the second-lowest income decile through the third-highest income decile), suggesting the tax burden on households across the income distribution does not vary significantly except amongst the lowest and highest income households. The MFT burden appears to be greatest for middle income households, although the burden of the tax is still regressive overall in West's findings (2004, 749-751).

While the effects somewhat offset the distribution of the burden towards lower-income households of the MFT, the impact of the tax remains inherently regressive despite these considerations. West and Williams find that the increase in the MFT to the efficient optimal tax rate would still most heavily burden the second-lowest income quintile at 3.01 percent of annual expenditures and impose the lowest burden on the highest income quintile at 1.60 percent of annual expenditures (2004, p. 550-554). The burden for the highest income quintile is also significantly lower relative to the lowest four income quintiles, which appear to be more flat and tight-grouped in their burden estimates (West & Williams III, 2004, p. 550-554).

Similarly, Teixidó and Verde find the MFT (as well as the carbon tax) to be highly regressive. Teixidó and Verde calculated the relative burden of the tax based on households' ability-to-pay while taking into account wealth-adjusted household income alongside household income and total expenditures (2017, p.114-117). The relative burden of the MFT does not change significantly when wealth-adjusted income is considered for lower income households, but higher income households show a more significant decrease in the tax burden compared to measures based on income or total expenditures. The burden of the MFT consistently increases as household income decreases, without the variation in the change of the tax burden within groupings of lower income households that appears in estimates that rely on total expenditures or income (Teixidó and Verde, 2017, p.114-117). If the wealth-adjusted estimates of the MFT burden are more accurate measures than the estimates based on total expenditures used by Parry and Small and West and Williams, the estimated optimal MFT rate mentioned previously may be inaccurate and the correct efficient tax rate may actually be lower. The MFT will unavoidably have a regressive burden because consumption taxes are almost always inherently regressive. However, the regressiveness of the MFT can be offset by how the revenue generated from the tax is used.

Use of Revenue

The revenue from MFTs is most commonly used for the maintenance of public roads and highways. Although the MFT does not perfectly target the use of the roads, maintenance is a logical use of the revenue. If the MFT is applied more effectively as an environmental tax or even just as a general consumption tax, then the revenue collected could fund related policies meant to encourage the use or development of more fuel-efficient transportation or other means of counteracting the effects of climate change, adding to the environment-related social benefit of the tax. Increasing the MFT rate would likely generate enough revenue to fully fund the maintenance of public roads, so alternative uses of the tax revenue could be applied without removing necessary funding from public roads if the MFT is utilized as an efficient environmental tax (Parry & Small, 2005, p. 1284).

The MFT revenue could be used to counteract the regressive effects of the tax by reducing the cost for consumers to switch to alternative means of transportation, either by subsidizing public transportation or fuel-efficient vehicles. Either option would also increase the overall environmental benefit to society by further reducing the use of gasoline and diesel vehicles. The MFT revenue could accomplish this by either funding the construction or maintenance of a public transportation system such as a rail or bus system or by subsidizing the purchase and sale of fuel-efficient vehicles or electric or alternative fuel vehicles.

The revenue could support a public transportation system by subsidizing usage fee, which would simultaneous offset some of the penalty of the MFT on lower income households. However, subsidizing public transportation systems accordingly may require more revenue than the increase in MFT rate can efficiently provide. The size of the subsidy per person who uses public transportation necessary to make it sufficiently accessible to counteract the regressive impact of the MFT would likely have be greater than the per person fee charged for using public transportation, especially for rail transportation (Fisher, 2016, p. 555-556). Using the tax revenue to subsidize public transportation to the point that it can be an accessible and equal alternative to driving gasoline and diesel-fueled vehicles is highly problematic because of the high amount of funding necessary, and thus it is probably an

inefficient use of revenue.

Funding assistance to replace older vehicles with newer, more fuel-efficient vehicles would be a less costly use of MFT revenue. Newer, gasoline-fueled vehicles are more fuel efficient than their older counterparts because of improvements in technology and the increasing strictness of the Federal Government Corporate Average Fuel Economy (CAFE) standards. The changes made by vehicle manufacturers to meet government requirements increase the price of vehicles, especially larger vehicles that are inherently less fuel efficient, making it more difficult for lower income households to replace less fuel-efficient vehicles with new, fuel-efficient vehicles. Although subsidies for the purchase of newer fuel efficient vehicles could make it more accessible for lower income households to replace older cars that use more fuel, a simple subsidy for the purchase of newer vehicles would actually yield less environmental benefit overall and be more regressive, benefiting higher income households more than lower income households. This effect occurs because higher income households tend to purchase more vehicles more frequently and own more vehicles at a time than lower income households. Higher income households would have more opportunities to receive the benefit of the subsidy than lower income households, and therefore the purchase of newer vehicles would not necessarily lead to the consumption of less gasoline and diesel fuel. Including a requisite of disposal of an old vehicle for the subsidy to purchase a newer, more fuel-efficient car might correct these problems and make the subsidy progressive. The requisite would ensure that the purchase of a newer vehicle removes a significantly less fuel-efficient vehicle from usage and that the subsidy is not being used simply for the purchase of surplus vehicles (West, 2004, p. 751-754). If some form of subsidy funded by the MFT revenue is carefully designed to help lower income households replace older, less fuel-efficient vehicles with newer vehicles, it will add to the overall benefit of the MFT as environmental policy and mitigate some of the regressive effect of the tax, incentivizing lower income households to consume less fuel when they drive.

Political Feasibility

Tax increases rarely enjoy enthusiastic support; Americans in particular have a reputation of being hostile toward taxes. Accordingly, politicians do not like having to justify the implementation of new taxes on their constituents, which is one major difficulty for implementing new environmental taxes, such as the carbon tax in the United States and in other industrialized countries. By contrast, the MFT sidesteps the acceptance issue since it already has public participation as a user charge for driving vehicles, largely because it has been in place for several years. Although the carbon tax or other environmental taxes may be more effective in covering a wider scope of greenhouse gas emissions and environmental damage, from a political perspective, it is easier for a government to build upon the existing administrative infrastructure to accomplish environmental policy goals (Gawande, 2009). Public acceptance may become even more important as a public backlash to climate change policies appears to be developing in many industrialized countries, including the U.S. The MFT may not be as effective as other specific environmental taxes, but it will be more politically feasible for the federal or state governments to justify and apply the MFT to policy goals related to pollution and greenhouse gas emissions.

While the current MFT has administrative infrastructure for enforcement in place and does not require public acceptance, the tax rate still needs to be greatly increased from current prices to be an effective environmental tax, for which it is difficult to gain public support. The fact that the MFT is currently regressive does not help generate public support for a rate increase. Unsurprisingly, many American politicians have repeatedly shied away from the prospect of raising the MFT rate (Kaplowitz & McCright, 2015, p. 380). However, it is possible to work around the public aversion to a tax hike by generating public support on the basis of the use of the tax revenue. Kaplowitz and McCright found that public support and acceptance for larger increases in the MFT rate rose when proposals for the tax rate increase included possible uses of the tax revenue (2015, p. 379-380). On average, people supported a rate increase of 0.32 dollars per gallon and would accept an increase of 0.53 dollars per gallon when the proposals included plans for how to use the excess revenue. These plans included a tax rebate to offset the regressive impact of the tax, funding the maintenance of transportation infrastructure, and funding fuel-efficient transportation. In the absence of revenue spending plans, only a rate increase of .10 dollars per gallon was supported (Kaplowitz & McCright, 2015, p. 379-380). The rate increase of 0.53 dollars per gallon still falls short of the efficient MFT rate, determined by Parry and Small and West and Williams, but it would nonetheless significantly improve the efficiency of the tax and, in many states, would more than double the current MFT rate (Parry & Small, 2005, p.1283-1284; West & Williams III, 2007, p. 608-610, American Petroleum Institute, 2017). Support from wide varieties of political interest groups with lobbying and campaigning abilities may also increase when the use of the revenue is central to the justification for the tax rate increase (Watt, 2013). Even disregarding the benefit from the use of the revenue, Kaplowitz and McCright estimate a MFT rate increase of 0.53 dollars per gallons could create an added benefit of an 11 to 14 percent reduction in the consumption of gasoline in the long term (2015, p. 380-381). The estimated environmental benefit will likely be greater if the revenue is used to fund incentives to use or develop more fuel efficient transportation, for which there is significant public support.

Justifying an increase in the MFT rate by the use of revenue likely offers enough leeway in public support and acceptance to establish a MFT rate that is a reasonably effective environmental policy tool and is politically feasible. However, raising the MFT rate to an optimal efficiency depends on the strength of the public support or opposition. Despite this obstacle, the current failure to implement a carbon tax or another major environmental tax suggests that the MFT is probably the most politically feasible and most effective environmental tax for the government to utilize as a policy tool (Williams III, 2017, p. 67).

Policy Impact

The exact impact of increasing the MFT is difficult to predict, particularly regarding changes in consumer behavior. Tiezzi and Verde find that responses to increases in gasoline fuel prices are flawed predictors of consumer behavior regarding MFT increases. People tend to react differently when the price of motor fuel rises as a result of a tax increase as opposed to other causes (2016, p. 84-87). People are more likely to change their behavior more

significantly in response to a MFT increase than in response to a simple rise in fuel prices, meaning that demand for motor fuel is more elastic for tax price increases (Tiezzi & Verde, 2016, p. 84-87). Li et al. suggest that the discrepancy in the change in consumer behavior may occur because people expect MFT increases to have a more permanent effect on the price of motor fuel, while other changes in price may be viewed as more likely to continue to fluctuate, so consumers will react more cautiously (2014, p. 322-327). Both Li et al. and Tiezzi and Verde indicate that tax increases may also be more salient to households as a result of news media coverage of tax increases, so households will be more likely to change their behavior simply because they are more aware that there is a change in price of the good (Li et al., 2014, p. 322-327; Tiezzi & Verde, 2016, p. 86-87).. Tiezzi and Verde additionally propose that people's' aversions to taxes may cause consumers to react more strongly to tax increases because they have stronger emotions regarding tax increases than other price increases (2016, p. 86-87).

Tiezzi and Verde depict that a stronger consumer response to MFT increases compared to other price changes impacts important policy implications (2016, p. 82-87). First, raising the MFT rate may cause a greater change in the targeted consumer behavior than expected, implying that the efficient rate for reducing the consumption of gasoline may actually be a lower rate than the rate that was previously predicted. Second, the tax will ultimately generate less revenue than expected because people changed their behavior to consume less gas at a more significant rate, which worryingly affects the use of revenue aspect of the MFT as a policy (Tiezzi & Verde, 2016, p. 82-87).

Consumer reactions aside, the MFT is still an effective tax for addressing pollution and climate change externalities created by gasoline or diesel-fueled vehicles, and may have a more significant impact on reducing greenhouse gas emissions from vehicles than previously estimated. The implementation of a MFT increase must be done cautiously so as to not overestimate the efficient tax rate and create an excess burden; although, the tax rates in the U.S. are already so low there is some leeway for error. The likelihood of the MFT generating revenue must also be considered because it will determine the ability of that revenue to offset the regressive effect of the tax and fund other environmental energy policy goals. An efficient MFT will provide added social value as an environmental tax despite the problems raised, but the tax ultimately has a regressive impact that should be mitigated.

The MFT is clearly a useful tool for governments at the state and federal level to enact environmental protection goals by taxing drivers for creating pollution and greenhouse gases through the use of gasoline and diesel-fueled vehicles. However, the current MFT price is too low to be effectively utilized to benefit society (Williams III, 2017, p.67-68).

CONCLUSION

The MFT has the potential to be a very useful and effective environmental policy tool, but its current implementation in the United States does not fulfill that role. Although the optimal tax rate estimated by Parry and Small and West and Williams may leave out some factors, it clearly demonstrates that the state and federal tax rates are too low for the MFT to function as a consumption tax (Parry & Small, 2005, p. 1283-1284; West & Williams, 2007, p. 608-610). The MFT is limited in scope to use of motor vehicles, unlike the carbon tax, but the MFT can be implemented as an environmental tax much more easily and quickly than more recently developed forms of environmental and climate change taxes. Even within its limited applicability to gasoline and diesel-fuelled vehicles, the MFT still targets one of the largest sources of greenhouse gas emissions, but it is a largely unexplored and unutilized strategy for government climate change policy. The federal and state governments should at least double the current MFT rate, both to generate revenue and to be an effective environmental policy; and in doing so, will not push the tax beyond the limits of public support. Use of the increased tax revenue for additional energy-efficiency policies will further the environmental benefit of the tax. The MFT could relatively easily be an effective consumption tax limiting greenhouse gas emission, but the tax rate is not nearly high enough anywhere in the United States to realize this potential benefit.

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