Title

Equity and Road Pricing: Fairness andAffordability

Author

Manville, Michael, PhD

Publication Date

2026-08-01

DOI

10.7922/G2N014XB

WHITE PAPER

Institute of Transportation Studies | UNIVERSITY OF CALIFORNIA

Equity and Road Pricing: Fairness and Affordability

Michael Manville, Ph.D., Professor, Department of Urban Planning, University of California, Los Angeles

August 2026

UCLA Institute of Transportation Studies

Report No.: UC-ITS-2025-28-T1.3 | DOI: 10.7922/G2N014XB

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
UC-ITS-2025-28-T1.3	N/A	N/A

4. Title and Subtitle Equity and Road Pricing: Fairness and Affordability	**5. Report Date** August 2026
	6. Performing Organization Code UCLA ITS
7. Author(s) Michael Manville, Ph.D., https://orcid.org/0000-0002-4218-6427	**8. Performing Organization Report No.** N/A
9. Performing Organization Name and Address Institute of Transportation Studies, UCLA 3320 Public Affairs Building Los Angeles, CA 90095-1656	**10. Work Unit No.** N/A
	11. Contract or Grant No. 65A1059
12. Sponsoring Agency Name and Address The University of California Institute of Transportation Studies www.ucits.org	**13. Type of Report and Period Covered** White Paper (July 2025 – August 2026)
	14. Sponsoring Agency Code Caltrans

15. Supplementary Notes

DOI: 10.7922/G2N014XB

16. Abstract

This white paper reconsiders the equity of road pricing by distinguishing between fairness and affordability—two concepts that are otherwise often conflated. A fair price assigns costs in proportion to the burdens a user imposes on others; an affordable price is one that users can pay without hardship. While both are important, these are distinct objectives, and treating them as interchangeable can obscure judgments about whether pricing is morally or ethically correct. Applying this framework suggests congestion pricing is more equitable than flat VMT charges because it better aligns payments with the social costs of driving. While congestion pricing may raise affordability concerns for some users, these concerns can be addressed through targeted redistribution of toll revenues. By contrast, unpriced roads and poorly targeted charges allow drivers to impose substantial external costs on others, undermining fairness even as they appear more affordable.

17. Key Words	18. Distribution Statement
Road pricing, Transportation equity, Vehicle miles of travel, User charges, Externalities	No restrictions.

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	37	N/A

Form Dot F 1700.7 (8-72) Reproduction of completed page authorized

About the UC Institute of Transportation Studies

The University of California Institute of Transportation Studies (UC ITS) is a network of faculty, research and administrative staff, and students dedicated to advancing the state of the art in transportation engineering, planning, and policy for the people of California. Established by the Legislature in 1947, ITS has branches at UC Berkeley, UC Davis, UC Irvine, and UCLA.

Acknowledgments

This study was made possible with funding from the California Department of Transportation (Caltrans). The authors would like to thank the State of California and Caltrans for its support of university-based research, and for the funding received for this project.

Disclaimer

Institute of Transportation Studies | UNIVERSITY OF CALIFORNIA

Equity and Road Pricing: Fairness and Affordability

Michael Manville, Ph.D., Professor, Department of Urban Planning, University of California, Los Angeles

August 2026

UCLA Institute of Transportation Studies

Report No.: UC-ITS-2025-28-T1.3 | DOI: 10.7922/G2N014XB

Table of Contents

Table of Contents

Contents

I. Introduction

Transportation academics have long argued that governments should price their major roads. This recommendation is sometimes made in the name of raising revenue, but the primary argument for pricing is that it can ease congestion and improve the performance of the transportation system. Recommendations to price, however, are often met with concerns about equity. Few people doubt that pricing would be efficient; many wonder if it would be equitable (e.g., New York Times Editorial Board 2019; Highsmith 2021; BBC News 2019). This paper examines that idea. In what follows I will consider the equity implications of road pricing, using the cases of both flat per-mile charges (vehicle miles traveled, or VMT, pricing) and dynamic charges designed to reduce traffic delay (congestion pricing).

This topic isn't new. Numerous researchers have attended to pricing and equity over the years, and my goal is not to rehash their findings (Ecola and Light 2009; Levinson 2010; Manville and Goldman 2018; Manville et al. 2022). My contribution instead is to highlight a distinction that I believe past research has sometimes overlooked—one that provides a frame for discussions that might otherwise collapse into subjective value judgments. The distinction I refer to is between fairness and affordability. Both these concepts are components of equity, and many if not most discussions about equity, address at least one. But they are different from each other, and in discussions the two concepts can be inadvertently blurred. Affordability problems are often treated as evidence of unfairness. This conflation isn't helpful.

For our purposes, a price is *fair* if it assigns burdens that are proportional to costs imposed. Thus it is fair if someone who creates \$3 of costs to society is charged \$3 for doing so, and fair if someone who creates no costs to society is charged nothing. Is this the only possible conception of fairness? No. But as I will discuss, it is probably the conception best suited to questions about allocating scarce, rival goods like road space.

The second definition is more straightforward. A price or charge is *affordable* if people can pay it without straining their budget—if it is not overly high relative to their income. One can reasonably argue about what that ratio might be, but the concept is hard to dispute.

Road prices can be unaffordable, and to the extent they are unaffordable they can be inequitable. The flip side, however, is that many road prices are also fair. Operating a vehicle can impose substantial costs on others, and it is fair for the government to ask drivers to account for those costs.

From one perspective this situation is a dilemma. We have a policy—charging for road use—that satisfies one intuitive equity criterion but may violate another. But the dilemma can be resolved fairly easily with two questions. First, which of the two problems (fairness or affordability) is more prevalent, and second, which is easier to remediate? In other words, a) is the unfairness of driving when it is free more common than the unaffordability of driving would be if it was priced, and b) is it easier to price the roads and then help people who have trouble affording the prices, or to leave the roads free and then find some other way to make drivers pay for the costs they impose? The answers here are fairly obvious. The fairness problem is more prevalent. All driving imposes at least some social costs, while only some drivers would struggle to afford tolls. And it is much easier to help low-income drivers pay than it is to make high-income drivers account for their externalities through methods other than pricing.

To put this another way: suppose governments charge for driving, and get the efficiency gains that arise from doing so, and then use some of the resulting revenue to help drivers who can't afford the prices. In that case the fairness criteria and the affordability criteria are both satisfied. If the government leaves the road free, in contrast, no one is burdened by tolls, but there is also no clear path to mitigating the many social costs driving creates. Thus only the affordability criterion is satisfied (and even this outcome depends on whether and how the government tries to raise a similar amount of revenue through other means). In using prices a government can achieve both fairness and affordability; in neglecting prices the government surrenders fairness in affordability's name.

An important corollary to this reasoning is that the equity of road pricing is hard to separate from its efficiency, and pricing's efficiency is conditional on the goal it is trying to achieve. The goal of congestion charges, for example, is to reduce congestion. Congestion pricing is not a progressive transfer program whose purpose is to make the transportation system more affordable or inclusive. One could design such a program, but it wouldn't look like congestion pricing, or indeed pricing of any kind. Most likely it would involve the government providing reliable automobile access for people who lack it (Blumenberg and Pierce 2012; King et al. 2022). Such a policy would be valuable, but it would do nothing to address the problem of congestion, and on the margin it could make congestion worse. And just as it would make little sense to pretend this program was about congestion, and evaluate it as such, it also makes little sense to pretend congestion pricing is an equity program, and evaluate it as such. We should ask if it is an equitable way to achieve its stated goal of reducing congestion.

All that reasoning might seem obvious, but we can take it a step further and reach a more surprising conclusion. If pricing's equity is bound up in its efficiency—if our evaluation of pricing's equity must account for what pricing is trying to do—then pricing programs that are less efficient may also be less equitable. This suggests in turn that dynamic congestion charges are more equitable than flat VMT charges. A flat charge may be more affordable to many people, particularly if—as is often proposed—the government uses VMT charges as a revenue-neutral replacement for gas taxes. But a pricing regime that charges the same for every mile driven represents a sharp departure from fairness. The social costs of driving can vary widely by time and place. Some miles traveled impose large costs on society, while others are almost harmless. A congestion charge more accurately captures much of this variability, and thus does a better job assigning burdens. A VMT charge, in contrast, treats all miles-driven equivalently, and in doing so replaces fairness with equality. Every mile is charged the same, which means that low-cost miles (e.g., in free flow conditions) subsidize higher cost miles (in congested conditions) that do the most damage. Flat VMT charges reduce variation in what drivers pay but weaken the connection between payment and harm.

The paper proceeds as follows. The next section elaborates briefly on the fairness/affordability distinction. Section III examines the fairness of congestion charges, and contrasts them with the fairness of VMT charges. This discussion elaborates on the points I have made above, and is the meat of the argument.

Section IV turns to the question of affordability, and how to address affordability problems when they arise. This section for the most part synthesizes existing research, and argues that the best approach to affordability is to redistribute some of the toll revenue, as cash, to low-income people. I also make the point, however, that for many middle-class households pricing could change the composition of transportation expenditures rather than the size of those expenditures. This shift would both blunt equity concerns and increase efficiency.

A caveat before moving on. This is not a paper about the political acceptability of pricing, so it touches only glancingly on the question of whether people *believe* pricing is fair. In general, they don't (Harrington, Krupnick, and Alberini 2001; Dawid 2019; Agrawal and Nixon 2024; Zmud 1999), and the reasons for that are not mysterious. Psychologists and behavioral economists have by now shown repeatedly that people do not believe priced exchanges are mutually advantageous (Johnson et al. 2022; Rubin 2003); that they are particularly suspicious of prices that frequently change (Kahneman et al. 1986; Campbell 1999; Rious et al. 20212, 2014); and that this suspicion is exacerbated if the good being priced was once free (Tversky and Kahneman 1974; Bolton et al. 2003; Huang et al. 2014; Shampaneur et al. 2008; Ariely et al. 2008). A proposal to put dynamic charges on a free road is thus a recipe for disapproval. The same instincts that animate laws against price gouging (Zwolinski 2002), and that motivate disapproval of Uber's surge pricing (Dholakia 2016), are arrayed against proposals to take free roads and charge for them (Fan et al. 2025; Cooke et al. 2024; Holz et al. 2024).

But these are *perceptions*, and they are in many ways incorrect. Most economic transactions are in fact win-win, surge prices tend to make consumers better off (Castillo 2025), and even price gouging can be beneficial, if it prevents hoarding and shortages. It is without question a political problem that so many people believe prices are unfair, but this paper is not about changing those perceptions. It is about whether the prices are in fact equitable, by some reasonable definition of the term.

II. Efficiency, Fairness and Pricing the Roads

Road pricing is a broad term that can encompass a variety of actual policies. The simplest version is the flat VMT charge: a single rate per mile of driving. More sophisticated forms of road pricing, like dynamic congestion tolls, have charges that vary by time or place. Still more complex forms, which at this point remain largely hypothetical in the U.S., combine prices for road use with charges based on attributes of the vehicle or driver (e.g., vehicles are charged more for driving at peak hours on busy roads, and also charged more if they are heavier, less fuel efficient, or driven by a young person or someone with a poor safety record).

To keep things simple, in this paper I discuss flat VMT charges and congestion prices that vary with demand. I leave aside more elaborate pricing schemes, in part because they remain over the horizon and in part because the essential argument remains unchanged even as pricing becomes more sophisticated.

A VMT charge would levy a flat rate (say two cents per mile) regardless of where and when a vehicle travels. A dynamic congestion charge, in contrast, would apply to a particular road or network of roads (e.g., a region's freeways) and charge the lowest price that achieved a particular performance standard—for example, the lowest price that keeps traffic moving between 45 and 55 miles per hour. The price could vary both according to where a vehicle is on the network (e.g., higher in areas more prone to bottlenecks), and by time of day (e.g., higher at 8 a.m. than 8 p.m., or just generally higher whenever demand rises).

These pricing instruments are different because they have different goals. Any tax or price will accomplish some combination of two things: raising revenue and changing behavior. In general, a price designed to do more of one will do less of the other. A charge that is intended to maximize revenue cannot be so high that it deters many people from driving. A charge high enough to deter driving, in turn, may not raise as much revenue.

While a VMT charge can, in principle, be designed to change behavior, in practice people who propose VMT charges usually do so to raise revenue. Specifically, policymakers frequently discuss VMT pricing as a replacement for the gas tax. (The gas tax has been the fiscal workhorse of the U.S. transportation system for upwards of a century, but in recent decades its revenue power has been steadily declining, largely because the tax has rarely been raised even as fuel efficiency has improved.) A rule of thumb in public finance holds that taxes intended to maximize revenue should apply a low rate to a broad base—in other words, tax many things lightly.

The low rate makes the tax less salient, and thus minimizes behavior change. The broad base, in turn, compensates for the low rate; it lets the government make up in volume what it gives up in price.

A congestion charge, in contrast, is designed to manage congestion, and so first and foremost it must change behavior. Specifically, it must deter some people from driving when demand for the road is high. This is *not* to say that a congestion charge won't raise revenue (real world experience suggests otherwise) only that it will likely raise less revenue than a comparable flat VMT charge. Pricing regimes with different purposes will have different price structures.

Note that in principle, the two types of charges can be combined: one could imagine a pricing regime where a government imposes a low flat rate on all driving, but piggybacks a dynamic price onto it. In such a system the rate gets higher when vehicles use facilities prone to congestion. I return to this possibility later; one of the stronger arguments for a flat VMT charge is that it could create a platform and precedent for subsequent congestion charging.

For road prices of any sort, the typical equity concern is that they are regressive. A tax or charge is regressive if its burden rises as income falls. A road price qualifies. Suppose it costs $3 to traverse a length of freeway. That price creates a larger burden for someone making $10,000 a year than someone making $100,000.

Regressivity alone, however, is an unreliable guide to equity. Road prices are regressive, but so too are gas taxes, sales taxes and property taxes. If regressivity disqualifies road pricing, it should disqualify many other, much more common taxes as well. One might argue that charging for road use is different from taxing sales, since driving is an essential activity, and many sales taxes exempt goods considered necessities. But most vehicles need gasoline to drive, and we regressively tax gasoline. For that matter we routinely condition access to essential network infrastructure on the ability to pay regressive charges: we meter electricity, water and heating fuel with prices whose burden rises as income falls. Most people do not consider such charges intrinsically unjust.

Regressivity is often a red flag because regressive charges *can* be unaffordable. These charges don't scale to income, and as such they violate what is called the "ability to pay" principle of fairness. This approach, as its name implies, holds that people's payments should be scaled according to their income or wealth. The ability to pay principle is satisfying because it conforms to two other, instinctively appealing notions. The first is *vertical equity*, or the idea that those who have more should pay more, and the second is *horizontal equity*, or the idea that people who have the same should pay the same (Auerbach 2002).

A charge can violate these notions, however, and not generate concerns about affordability. In the early 1990s, the U.S. government levied a 10 percent excise tax on yachts, furs, and private aircraft. This "luxury tax" was undoubtedly regressive, but few people worried that consumers could not afford it, since it was regressive through a very affluent population (would-be yacht and aircraft consumers). Was it unfair? Certainly some people thought that the idea of taxing these goods was unfair, but if a multi-millionaire and a billionaire each buy the same $700,000 boat, ethics don't seem to demand that the billionaire pay a larger sales tax for the purchase. It is not intrinsically alarming if a government charge doesn't scale with income.

Something can be perceived as unfair, or indeed be unfair, yet nevertheless be affordable, just as many things can be unaffordable even if they are fair. As an example of the former, it is almost certainly unfair that people in the United States pay more for sugar than they need to, as a result of American tariffs (GAO 2023). One reason this unfair situation persists, however, is that it *doesn't* make sugar unaffordable. Sugar costs twice as much in America as in the rest of the world, but in absolute terms the impact on consumers is miniscule—on the order of pennies per day. The typical person, as a result, never notices it (de Rugy 2012). The tariffs unjustly enrich domestic sugar producers (because the pennies per day, per American household, add up to an extra $2.5 billion in revenue), but even for poor households the tariffs don't put sugar out of reach.

As a converse example, too many Americans struggle to afford food. Yet few Americans believe the act of selling food (rather than giving it away) is fundamentally unfair. Rather than demand that all food everywhere be free, people concerned about the affordability of food (which is also priced regressively—loaves of bread don't scale to income) tend to support policies like food stamps, which can mitigate the burden of prices without abolishing them.

The same reasoning can apply when we consider priced roads. Driving is a valuable activity with many benefits, but drivers also create costs for society when they pull onto the road. It is fair for drivers to pay prices that correspond to those costs. This definition is sometimes called the "user pays" or "benefits received" principle. As the name implies, this idea suggests that government services should be paid for by the people who use them, and/or that people should pay for the benefits they receive, and not shunt the costs onto others.

Many people may believe priced roads are unfair, but will also be able to afford them. Some people may find road prices unaffordable, but think the reasoning behind them valid, and consider them fair. The key point is that beliefs about fairness are separate from affordability. When prices are unaffordable, the government can step in and mitigate the hardship. But the fact of the hardship is not prima facie evidence that pricing is unfair. The hardship may suggest the existence of *other* forms of unfairness, such as unfairness in the distribution of income, but an unfair distribution of income does automatically imply that any given price is unfair, nor suggest that changing prices is the best way to address income unfairness. It is generally considered unwise, in fact, to redistribute income by manipulating or distorting prices. Such efforts jeopardize efficiency and do little to promote equity. Imagine, for example, a proposal to remedy American income inequality by making all gasoline free. A policy of free gas would almost certainly increase American gasoline consumption, which would create more pollution and—if history is any guide—create gasoline shortages as well (Manville 2021). But it isn't clear at all that free gas would reduce income inequality, or improve the welfare of lower-income people.

To summarize, suppose someone rejects a user-pays approach to road use. They might do so based on some combination of two beliefs: that drivers do not create costs when they use roads, and/or a belief that some people will have a hard time paying. The second belief, crucially, is not actually an argument against a user pays approach. It is an argument for redistribution to help lower-income drivers pay, but nothing about a user-pays method rules out redistribution. Indeed, redistribution is arguably easier with a user pays approach, because the same mechanism that causes an affordability problem (the price) can also generate revenue to help solve it (Manville et al. 2022). *Only* the first belief—that drivers do not create external costs, and that the correct price for an additional vehicle entering the road is zero—would automatically justify abandoning the user pays principle and embracing ability to pay. But that first belief is wrong. Roads are finite goods, so additional users impose additional costs, and in fact the costs rise more than proportionally with the number of users. This is why roads often become so congested. We turn to this issue next.

III. Fairness and Pricing

A. The Fairness of Congestion Charges

Roads are valuable but finite goods, and when the demand for them exceeds the supply—as it does on urban freeways for many hours each day—drivers encounter a shortage. This shortage creates the rolling queue that we commonly call traffic congestion. The logic behind congestion pricing is that this shortage can be reduced, and sometimes even eliminated, if demand and supply are mediated by a price.

One can arrive at this fairly straightforward conclusion through any number of different economic frameworks. I will emphasize two. Note that while both these frameworks are consistent with standard efficiency principles, the focus here is on fairness—specifically, whether costs are assigned to those who cause them.

First let's consider a collective goods framework. A free road is a commons: it is *rival* (if one vehicle is occupying some road space, another cannot simultaneously use that same space) and it is *non-excludable* (people can use the road without directly paying for it). The hallmark of a commons is that it is prone to overuse and depletion; because users are unrestrained they inflict costs on each other that eventually swamp the road's benefits. This is the "tragedy of the commons," and the canonical solution to the tragedy is "enclosure"—converting the commons to a private good by assigning property rights through prices. A toll is an instrument of enclosure; when people must buy the right to consume scarce road space, they are more judicious in their consumption, and the commons does not collapse (Ostrom 1990; Schelling 1978).

A closely related framework involves the logic of externalities. When roads are free, people decide to use them largely by considering the costs to themselves (e.g., "how much will I be slowed down by getting on this busy road?"). They are less likely to consider the costs they might impose on others (e.g., "If I get on this busy road, how much will I slow down *everyone else*?"). But the latter cost often exceeds the former. A car pulling onto a busy freeway creates substantially more damage than it absorbs. This is so because vehicles entering a crowded road experience the prevailing level of delay: if congestion has already made a ten-mile trip five minutes slower than it otherwise would be, the entering vehicle is slowed down by five minutes. That five-minute penalty is the driver's *private* cost of congestion. In getting on the road, however, the driver also exacerbates the problem he suffers from.

He slows down the vehicles already there, and brings the roadway closer to the tipping point where bottlenecks or triggernecks can form, which send waves of delay backward through multiple parts of the road system.

In light-to-moderate congestion, the incremental delay the new driver causes is almost imperceptible—in entering the road he might slow every other car down by 0.5 seconds. Even in moderate traffic, however, the road has many other cars, and this small increment of per-vehicle delay sums to a large amount of aggregate damage. Suppose the road has 1,000 vehicles on it. The new vehicle will cause (1000 * 0.5 seconds = 500 seconds), or over eight minutes of delay, substantially more than the five minutes of delay it incurs. As the number of vehicles on the road rises, moreover, the damage rises as well. When a road is on the brink of hypercongestion---a condition of near-total gridlock---the marginal vehicle can impose social costs three to five times as large as the private costs it experiences (Small and Verhoef 2007).

In economic terms, each new vehicle experiences the average cost of congestion but imposes the marginal cost, and the marginal cost is larger.[1] To relate this back to the point above, the driver's private cost is the average cost, but the private cost is well below the marginal social cost. The difference between the private (average) cost and the social (marginal) cost is the congestion externality (Vickrey 1969; Anas et al. 1997; Arnott et al. 1993; Small and Verhoef 2007). Importantly, this externality grows as the traffic level increases, and indeed grows *faster* than the level of traffic, such that in very congested conditions, a small proportion of entering vehicles account for a large share of total delay.

It is this growing divergence between average and marginal cost (or social and private cost) that explains why drivers keep entering the road even as the road's performance degrades; each additional vehicle does more damage, but more of that damage is absorbed by *other* vehicles. It follows that many drivers, if asked to pay the full social cost of their trip, rather than just the average cost, would not consider the trip worthwhile. This is what a congestion toll set equal to the externality accomplishes.

[1] The marginal cost or benefit of an action refers to the value of its next increment. Marginalism's power as an analytical tool lies in recognizing that the value of an additional increment is often a function of the existing quantity. A meal is more valuable to someone who has fasted four days than to someone making their fourth trip to the buffet. The first bite after fasting has far more benefits than costs. The fourth trip to the buffet likely involves the reverse: the eater is doubtless mostly full, and each additional bite just invites a stomachache. It makes little sense, in these circumstances, to try to compute an average value of food.

It forces drivers to *internalize* costs they would otherwise spread around, which is just another way of saying the price forces drivers to be considerate, and account for what their actions will do to other people.

A toll set at the externality is a toll that reflects the marginal cost. Because the marginal cost changes, and changes rapidly as more vehicles want to use the road, the toll needs to be dynamic. The point of a dynamic toll is not just to ensure that each individual user pays (a flat toll could do that), but that their payment reflects the likely cost they will impose. A small share of vehicles accounts for a disproportionate share of traffic delay. If those vehicles can be deterred, the road's performance is protected. If those vehicles are not deterred, the road fails at the moment it is most valuable (the moment when the greatest number of people want to use it).

Note that this logic involves, if only implicitly, a distinction between *providing* a road on the one hand, and charging for its *use* on the other. People sometimes complain that congestion pricing constitutes "double taxation" or say it is unjust because the "road has already been paid for." In some cases the road has in fact been paid for, via gas taxes or property taxes, in other cases the debt incurred to build it is still being paid down. But whether the road has been paid for is also irrelevant, because congestion charges are not designed to finance or produce road space. Their goal instead is to efficiently *allocate* space on roads that already exist. If the goal is to provide roads, it's true there is nothing terribly special about a toll. Governments can finance roads using any number of revenue instruments—from sales taxes to income taxes to handing out a hat at public meetings. But if the government doesn't price the road at marginal costs once it is built, it will get congested, because drivers will be free to impose costs on each other. More specifically, a small share of drivers will be free to impose large costs on everyone else. Put simply, congestion charges do not hold drivers accountable for the cost of building a road. They hold drivers accountable for the costs created by getting on the road, and (in so doing) for denying the use of the road by others. The prices are instruments of allocation, not provision.

Understanding that fact helps put the regressivity of a congestion charge into perspective. The toll is regressive, but it *should* be. The regressivity is not regrettable. If a toll's purpose is to reflect the harm a new vehicle inflicts on others, the driver's income becomes irrelevant. Consider a pickup truck with two people in it, bumping its way onto a crowded freeway. The driver is rich and the passenger poor. The pickup, as it enters the road, creates social costs, in the form of congestion and pollution. The magnitude of those costs doesn't change if the driver and passenger switch seats. It is the vehicle that creates the externality, and a dollar of damage is a dollar of damage, regardless of who is behind the wheel it.

(To see this even more clearly, consider an autonomous vehicle that pulls onto a busy freeway with a person in the back, but then—after dropping her off at her destination—gets back on that same stretch of freeway. Is the now-empty vehicle creating more or less congestion than it did when a person was in it?)

So, a congestion charge set to the level of the externality can be both blind to income and fair. But here we see the aforementioned distinction between fairness and affordability. The regressive charge is fair because it accurately reflects the damage the driver is doing. But the fair price could be unaffordable. The toll level reflects the marginal damage a vehicle causes, and that damage is, again, separate from any given driver's individual income. It is not separate, however, from the *average* income of *all* drivers. To the contrary, marginal congestion damage will be strongly correlated with average income, because the social cost of congestion is derived in part from the average value of time, and the average value of time is correlated with average income. The optimal congestion charge is built from a weighted sum of driver time costs, and time costs are higher when income is higher.[2]

Does this automatically imply affordability problems? No. In a world with perfect income equality, all drivers will have identical time costs, so the optimal toll won't be high relative to any given driver's income. But of course, the real world is not perfectly equal, and as income inequality grows, the optimal toll can climb beyond the comfort level of lower-income drivers, creating an affordability problem.

This affordability problem does not, however, suggest that roads should remain unpriced. Remember that the point of congestion charging is to reduce congestion. If a government concerned about affordability abandons marginal cost pricing, and embraces an ability to pay approach to fairness, it essentially abandons that goal. One might argue that abandoning the goal is sensible, and that congestion simply isn't a big problem, but that's a separate conversation. Assuming we *do* want to reduce congestion, we shouldn't adopt policies that make congestion almost inevitable.

[2] To be clear: the average value of time is not the only, or even the primary, determinant of a toll level. Bento et al. (2024) examined dynamically priced toll lanes and demonstrate empirically that "urgency" explains more willingness to pay more than average time values. A person in a hurry, almost regardless of income, is willing to pay more to avoid congestion (imagine two people of the same income, on her way to an airport to catch a flight and one on the way back from the airport, having just landed. The first person is more likely to pay the toll). On the one hand accounting for urgency could reduce affordability concerns. On the other hand Bento et al.'s evidence is drawn from opt-in managed lanes, rather than a fully tolled facility with no free options. Drivers using opt-in toll lanes have a free option to travel the same route. In a world where entire road networks are dynamically priced, average time values might exert more influence on the toll level.

The ability to pay principle is a perfectly reasonable conception of fairness, but not one well-suited to the allocation of roads. A road, as mentioned above, is a rival good: two cars cannot simultaneously occupy the same piece of pavement. Not all goods are rival. Governments also produce “pure public goods.” These are non-excludable like free roads, but also *nonrival*, meaning they can be simultaneously consumed by an infinite quantity of people. The classic example, and useful point of contrast to a road, is a lighthouse: conditional on it being in sight, there is no limit on the number of people who can benefit from a lighthouse beam. One ship guided safely away from a shoal does not reduce the quantity of light available for other ships nearby.[3]

These same conditions make charging for a lighthouse not just extremely difficult but socially undesirable. Charging is difficult because there is no obvious mechanism to make ships pay. It is undesirable because once the lighthouse exists, the marginal cost imposed by an additional user (and thus the efficient price for that user) is zero. This makes the lighthouse a financial conundrum, because revenue is necessary to bring it into existence, and to maintain its operation once it is there. Since there is no feasible way to do this by charging for consumption of the beam, it can be sensible to a government to produce the lighthouse by spending using general tax revenues. The government can also protect lower-income people by taxing progressively, in conformance with the ability to pay principle.

Nothing is lost by severing the lighthouse production from a direct price. Because the lighthouse is a pure public good, the challenge lies in providing it, not allocating it, and using the ability to pay principle lets us differentially charge lower income people to produce the lighthouse without distorting its use or performance (because, again, it is intrinsically immune to overuse).

To state the obvious, a lighthouse is very different from a road. A government could, as mentioned above, use progressive taxation to *build* a road. The United States doesn’t do this—it mostly relies on gas taxes—but many other countries do, and doing so isn’t obviously unfair. Because the road is congestible, however, leaving it unpriced once it is built *changes its nature*, by degrading its quality and undermining its performance. There are literally no costs to giving away a lighthouse beam for free; the costs if anything would come from an attempt to charge for it. The costs of giving a road away for free, in contrast, are legion. On a free road drivers will impose not just delay on each other but stress, anxiety, headaches, back pain, and elevated blood pressure (Stutzer and Frey 2004; Hennessy et al. 2000; Nadrian et al. 2019; Eliasson 2014).

---

[3] To make the distinction here plain, the harbor and the waterway approaching the lighthouse *are* rival. One ship cannot be located in another ship’s exact location. So the realistic limit on use of the nonrival lighthouse beam arises not from the beam itself, but from the rival nature of the water nearby. If a lighthouse seems like an inapt example, a traffic signal is also a pure public good.

Congestion also imposes costs on people who *aren't* driving, through the air pollution it creates (Houston et al. 2018; Currie and Walker 2011; Manville and Goldman 2018; Sampson 2020). All driving creates air pollution, but congestion makes vehicular air pollution worse in multiple ways. For vehicles with internal combustion engines, congestion increases tailpipe emissions, because the vehicles spend less time in "steady cruising"—the periods of smooth travel where fuel efficiency is highest, combustion is most complete, and emission control devices like catalytic converters work best—and more time idling, or accelerating from low speeds. These actions increase emissions absolutely and per mile.

Electric vehicles don't have tailpipe emissions, so congestion cannot exacerbate them. But congestion also increases non-exhaust pollution, primarily from brake and tire wear. In stop-and-go traffic, repeated acceleration and deceleration increases braking friction and the amount of force generated when tires meet the road. These actions produce more particles from the vehicle itself, and also create "resuspended dust" (the pollution that occurs when particles that have settled on roadway get kicked up from new vehicles rolling over them (Grigoratos and Martini 2015; Beddows and Harrison 2020)).

These pollution costs of congestion are high, and fall disproportionately on people whose incomes are lower. Congestion costs are often created by peak hour drivers, who tend to have higher incomes. To the extent these higher income drivers are imposing costs on each other (as they do with delay) their incidence does not create a large equity problem. Vehicular air pollution, however, is not like delay; it falls not just on other drivers but on people who live and work near congested roads. The radius at which near-road air pollution is harmful varies with the pollutant, but the literature generally suggests that people within 500 to 1000 feet of a roadway will bear the costs. Those costs include higher rates of asthma, cancer, low birth weight, and premature birth, among others (Currie and Walker 2011; Currie 2009; Currie and Rosemary 1999). Crucially, lower-income people are more likely to live near congested roads. The higher-income people who use the roads most heavily emit pollution that disproportionately harms lower-income people who use roads much less (Manville and Goldman 2018).

B. The Fairness of a Flat VMT Charge

The preceding discussion contends that congestion charges are fair (even if they are sometimes unaffordable. Analyzing a flat VMT charge yields the opposite conclusion. Assuming the rate is low (as befits a charge designed to raise revenue) a VMT charge is less likely to be unaffordable. If we further assume the VMT charge will a revenue-neutral replacement for a gas tax, the affordability issues may be smaller still. In such a transition the typical household will gain one driving related expense but shed another.

While some individual households will pay more or less (e.g., people who drive Priuses long distances will pay more, and people who drive heavy trucks short distances will pay less), the difference in most cases is likely to be small (Knittel et al. 2025; Glaeser et al. 2023; Rahman et al. 2025). Still, a flat charge may unfairly undercharge some vehicles and overcharge others. It will fail to account for many costs some drivers impose, charge many drivers for costs they don't impose, and allow the roads performance to degrade.

Consider a four-person carpool in an electric vehicle that drives the length of the I-10 freeway in Los Angeles at 3 AM. This vehicle will neither create nor absorb congestion delay, and because it is an EV traveling in free flow conditions it will emit almost no pollution. The social costs of this trip, in both absolute and per-person terms, are miniscule. But this vehicle will pay the same VMT charge as a solo driver who traverses the same length of road during rush hour in a gas-guzzling SUV (Manville 2024). That equivalency would not exist in a congestion charging regime; with congestion pricing—the second vehicle would pay much more. (For that matter, the second vehicle would also pay more in gas tax regime) Because the VMT charge is not marginal (not dynamic it is at best a noisy proxy for the social costs of driving.

One might counter that I have painted an incomplete picture. I have focused above on congestion and pollution, but driving creates other costs as well. Perhaps a VMT charge would account more accurately for those. For example: vehicles put wear-and-tear on the roads. If more driving causes more road damage, then a per-mile VMT charge could appropriately assign the burden of road maintenance and repair. This is a nice thought, but it is mostly wrong. More driving does not, in any meaningful sense, create more road damage. Road damage is if anything even more concentrated than congestion damage. Most passenger vehicles—which is to say most vehicles—cause effectively zero road damage, while a small share of vehicles account for virtually all damage done to roads.

Traffic engineers use a rule of thumb, called the Fourth Power Law, to estimate the wear and tear that vehicles cause. The Fourth Power Law says that vehicular damage is a function of a vehicle's axle load relative to the road's weight-bearing capacity, raised to the fourth power. This is a highly nonlinear relationship. It suggests, for example, that a 10,000 pound 3-axle delivery truck will cause over 50 times more damage than a 2,500 pound 2-axle sedan.[4]

[4] To see this in more detail: Assume the road has a 2,000 pound capacity (for our purposes here any number will do). Divide the 10,000 pound delivery truck by its three axles and then by 2,000. The quotient is 0.167. Raise 0.167 to the fourth power and the result is 7.8. Now do the same for the sedan: 2,500 pounds divided by two axles divided by 2,000 = 0.625. Raise that to the fourth power and the result is 0.15. The relative damage of the truck to the sedan is therefore 7.8/0.15 = 51.8, meaning the truck, which weighs four times as much as the sedan, causes 52 times as much damage each time it passes over the road.

Thus while the electric vehicle driving at 3 a.m. creates far less pollution than the SUV driving at rush hour, both create the same amount of road damage, which is basically none. Virtually all road damage is caused by heavy trucks, and in particular by heavy trucks with fewer axles. A pricing system that fairly assigned responsibility for road damage would levy high tolls on those vehicles, and not charge others.[5]

The point here is that while the typical passenger vehicle creates substantial costs, relatively few of those costs will be accurately captured by a flat per mile charge, because most driving costs are nonlinear, and vary widely at the margin. In addition to congestion, pollution and road damage, driving also increases the risk of crashes, and crash externalities are sizable, both in absolute terms and relative to the contemporary insurance-and-tort regimes designed to capture them (Edlin and Picu-Mandar 2006). But crash externalities rise with traffic density. The opportunity for vehicles to collide scales with the number of potential pairs, meaning that when the number of vehicles on the road doubles, crash frequency more than doubles. Crash frequency, then, behaves like pollution or congestion, escalating rapidly as more vehicles enter the road. Pricing at the margin is the appropriate instrument to reduce crash frequency.

In fairness, reducing crash frequency might increase crash *severity*—the probability that a crash results in serious injury or death. Where crash frequency is driven by vehicle density, crash severity is driven by vehicle speed. And when congestion falls speed rises. But even if we acknowledge this is a potential problem with congestion charging, it isn't clear that it justifies a flat VMT charge. Flat VMT charges are orthogonal with respect to speed: A vehicle traveling 20 miles pays the same regardless of how fast it goes.

Finally, roads also have operating and maintenance costs unrelated to vehicle-induced damage. Roadways need lights, striping and signage, and so on. To the extent drivers who use the roads are the primary beneficiaries of these services, arguably they should pay for them.

---

[5] I am actually simplifying the problem of assigning responsibility for road damage, because axle weight (which is under control of the driver) interacts with pavement thickness (which is a choice made by the government). The Fourth Power Law implies that damage from vehicles depends not just on axle weight, holding the road capacity constant. But roads differ dramatically in their ability to handle loads—largely as a result of the thickness of the pavement. Some evidence suggests, in fact, that pavement thickness matters *more* than axle weight. Where road damage rises to the fourth power of axle weight, pavement life rises to the *seventh* power of pavement thickness. Depending on the conditions, for example, a rigid pavement that is 11.5 inches thick will last twice as long as one that is ten inches thick (Small and Winston 2004). The problem this introduces is that pavement thickness lies outside the vehicle operator's control. In the medium- to long-run, then, road damage is as much a function of the government's infrastructure decisions as it is of vehicle composition. A fair road charge in this case would be difficult; assigning all the burden to vehicles would assume optimal infrastructure investment, which may not be accurate. Assuming the government plays a role meanwhile, would mean that vehicles would be responsible in the long run for less road damage.

Could this justify a broad VMT charge? The first observation to make about these costs is that they are relatively small. The second observation is that many of these services are pure public goods; road signs, traffic signals and streetlights are neither rival nor excludable, so there is little natural justification for funding them via user charges. As a practical matter, a government *could* fund them with road charges (because it could fund them out of anything) but there is little relationship between the costs of maintaining these services and miles driven. Road signage is necessary almost regardless of how heavily a road is used, and signs and signals don't not wear out faster if people drive more miles on a road.[6]

A third point is that drivers are not the *only* beneficiaries of these services—many non-drivers benefit from safe and navigable road systems.[7] That fact suggests that user fees are not entirely appropriate, and at least some of the costs should be spread more broadly.

If the above is correct, what *is* the best argument for a flat VMT charge? Consider again the idea that any tax will result in some combination of raising revenue and changing behavior. A high price on VMT could reduce VMT, but we've established thus far that the public benefits of simply reducing VMT are probably modest. *Some* VMT has extraordinary social costs, but much does not, and a charge indifferent to that distinction will have limited efficacy and may create perverse incentives. It does not make sense, conceptually, to use a fee to simply depress total travel, rather than travel's negative externalities.[8]

The main justification for a VMT charge, then, lies in its potential to raise revenue. From a fairness perspective, however, the desirability of raising revenue with VMT charges isn't obvious. This is particularly the case if the government replaces the gas tax with a VMT charge. The gas tax directly targets a large negative externality of vehicle travel: burning gasoline for internal combustion. Its burden thus falls more heavily on behaviors that burn more gasoline per mile, such as driving a heavier car, speeding, or driving more intensively (rapidly accelerating and then abruptly braking). A VMT charge ignores such distinctions, so transitioning to it will replace a tax on a driving externality with a tax on driving overall.

[6] Road striping, in fairness, may wear out slightly faster with more miles, but even here weather will be responsible for most degradation.

[7] Imagine a completely user-paid highway system, and consider a trip to visit family members. The family members will derive value from the trip (and the infrastructure that enables it) even though only the travelers pay. If the road is not safe and the travelers get lost or injured as a result, the family will incur costs alongside the injured traveler.

[8] The state of California officially considers VMT to be pollution, and is committed to reducing it, but the reasoning behind this position is difficult to follow. See Manville (2024) for a discussion.

The gas guzzler or aggressive driver who once had to pay more than others will now pay the same price per mile as the responsible driver or the EV owner, both of whom will see their relative burdens rise.[9] On the margin, this transition could reduce the rate at which drivers adopt electric vehicles (Davis and Sallee 2024).

This line of argument may be surprising. One justification for VMT charging, after all, is that EVs are becoming more popular, and under a gas tax regime they do not pay their "fair share." By now it should be clear that this reasoning has limits; it just isn't clear what such a fair share looks like. It's true that if a government adopts a policy saying that all vehicles using the road must help pay for the road in proportion to the miles they drive, then electric vehicles should pay some sort of per mile tax. But that's also tautological. It isn't clear *why* a government should have such a policy, rather than a policy that charges vehicles in proportion to the costs they impose. Electric vehicles aren't perfect, but they objectively impose fewer costs than internal combustion vehicles. The price they pay for road use should not be zero, but also shouldn't be the same as internal combustion vehicles.[10]

Gas taxes also enjoy administrative efficiencies that VMT charges do not. The fuel tax is a rare revenue instrument that has both a broad base and a concentrated collection platform. In economic terms, the gas tax is paid by millions of drivers, at the fuel pump. The tax's statutory incidence, however, is upstream; the government collects the revenue when fuel leaves a terminal rack. The firms pay themselves back by adding the tax to the retail price of gas. Fuel departs terminal racks at only about 100 locations statewide (California Department of Energy n.d.). This concentration makes collecting the gas tax easy and evading it difficult, and helps explain its extremely low administrative costs, usually on the order of one to two percent (Congressional Research Service 2025).

A VMT charge, like a gas tax, has a very broad base: millions of drivers. But its collection and compliance costs, while falling, remain much larger than those for gas taxes. Different ideas exist for collecting VMT charges, but all require some ability to track individual vehicles. In some cases, the tracking can be centralized (using onboard or plug-in GPS devices, for example) while in others it would involve more labor intensive measures, like odometer audits. Administrative costs for VMT charges as a result are often estimated at between five and 13 percent, and of course in many cases driver compliance costs rise as well, as does the risk of evasion (Congressional Research Service 2025).

[9] Or, perhaps more precisely, whatever burden they face will now be divorced from their externalities.
[10] The optimal solution to this problem is to introduce a VMT charge that applies to EVs while *keeping* the gas tax and then rebating all gas tax revenue to all households on a per capita basis. This approach would make EVs pay, but maintain their advantage over internal combustion vehicles (Davis and Sallee 2024). Needless to say, this approach is probably a political non-starter.

The argument here, to be clear, is *not* that flat VMT charges are a bad idea. The point is only that charging for VMT, along most dimensions, is harder to justify on fairness grounds than charging at the margin for congestion (or for burning gas). VMT charges and congestion charges are both regressive, but the VMT charge assigns burdens with less accuracy, and thus encourages much more socially costly behavior. When people pay congestion charges, they get roads with less congestion, less pollution and fewer crashes, regardless of how the revenue is spent. When people pay flat VMT charges, in contrast, it is less clear what they get in return. Much depends on how the revenue is spent. In this way the charge looks less like a user fee and more like a run-of-the-mill tax. Taxes of course have their place, but a VMT charge, when stacked next to other common taxes, does not look very efficient, and this is especially true compared to the tax it is supposed to replace. Moving from a gas tax increases administrative burdens. The benefit of this transition is an improved alignment between taxes paid and miles driven. But there is no obvious economic rationale for doing so, since the typical mile driven imposes relatively few costs.

One could respond with a political economy argument. Yes, congestion charging is superior, but also unpopular enough to make superiority meaningless. Few governments will have the political cover or courage necessary to introduce congestion charging. Some may, however, be able to introduce VMT charges and use them as a steppingstone to congestion pricing. A state could, in short, enact VMT charges and then eventually build a hybrid system where the flat rate is complemented by dynamic charges that account for congestion damage. I don't think this political economy argument is wrong, but it also doesn't change the main point. If we believe a price is fair to the extent it assigns burdens accurately, a flat VMT charge by itself falls short of satisfying this criterion, and one argument for a VMT charge is simply that it is a small step toward a price that *would* be fair.

IV. Affordability and Redistribution

Both VMT pricing charges and congestion charges can create affordability concerns for some households. (As discussed above, the risk of affordability problems is much lower for VMT charges that sunset and replace the gas tax while staying revenue neutral.) But while pricing raises the possibility of a financial burden, it also contains a built-in mechanism to mitigate that burden: the revenue it produces. Standard models of congestion pricing predict revenue collections that substantially exceed the value of congestion damages (Lindsey 2006), and empirical studies of pricing programs—whether supportive or critical—consistently emphasize that a large share of their potential benefits lies in how the resulting revenue is used (Santos 2008; Leape 2006; Giuliano 1992; Prud'homme and Bocajero 2005).[11]

This observation motivates a long-standing recommendation in the literature: that governments can overcome equity concerns related to pricing by "recycling" the revenues it raises (King et al. 2006; Eliasson 2014; Börjesson and Kristoffersson 2018). I agree with this recommendation, but want to distinguish between recycling to make pricing politically more popular, recycling to make it progressive, and recycling to actually reduce harm caused by tolls that are not affordable. These goals aren't the same. It isn't clear *a priori*, for example, what sort of spending will make road pricing more popular. It could be spending on roads, transit or broader public services. What is politically popular may or may not be progressive.

Perhaps more important is that progressive spending will not automatically address affordability. A common proposal, for example, is to dedicate toll revenue to public transit (Eliasson 2014). Doing so can make pricing progressive in a balanced-budget sense, since transit users as a group tend to have lower incomes than drivers. But increased progressivity, by itself, doesn't solve the relevant problem. It's true that a congestion pricing program could be progressive if its revenues fund bus service, because bus riders have low incomes. Once we acknowledge that, however, it's hard not to think about the many groups that have lower incomes than bus riders, and to conclude that pricing would be even more progressive if we sent the toll revenue to those groups instead. We could, for example, make pricing very progressive by spending the toll revenue on malaria prevention programs in the Global South. People vulnerable to malaria have *much* lower incomes than American drivers.

[11] Saying that many benefits are locked up in the revenue can be confusing, because strictly speaking the revenue is a transfer, and it has no bearing on the efficiency of pricing itself. The *disposition* of the revenue, however—unless it is blown up or sunk in a harbor—will almost certainly change overall welfare.

But I suspect many proponents of revenue recycling would find such a proposal bizarre, which suggests that progressivity may not actually be the most relevant issue when we consider pricing and equity.

The equity concern that arises from pricing is not that pricing is regressive, but that because it is regressive some people have trouble affording it. That seemingly small distinction matters. The policy imperative is to *help the specific people who can't afford the tolls*, not to make pricing more progressive overall. Investing in bed nets or even bus service risks doing the latter but not the former. Low-income people as a group may benefit from faster buses, but not every low-income person can easily switch from driving to taking the bus, and the affordability problem is by definition about the people who can't. In this way congestion pricing illustrates a broader limitation of group-based approaches to equity: the benefits of a progressive policy toward some groups do not automatically undo the harms experienced by individual people who are adversely affected. Those harms must still be addressed directly. In this case that means helping those people pay.[12]

If the goal is to ensure that vulnerable people are not harmed by pricing, however, the best approach is to redistribute some toll revenue, as cash, to low-income people. Existing literature suggests that such redistribution can be manageable, because the number of low-income people burdened by pricing will likely be small relative to the total revenue pricing collects (Manville et al. 2022). This is so not just because low-income people are a minority in every urban area, but lower-income households tend to drive less overall, and are less likely to drive during peak periods, when tolls are highest (Manville and Goldman 2018; Manville et al. 2022; Wang and Renne 2023).

Occasionally a redistribution proposal will advocate in-kind rather than cash redistribution, for example by giving low-income people credits to drive on priced roads (e.g., Kockelman and Kumanje 2005). These ideas have may in some cases be easier to implement than cash disbursements. But cash is ideal, in part because it is neutral with respect to mode. A rebate or credit conditions people's assistance on their decision to drive. People who receive cash, in contrast, can use it to pay tolls, but also, if they'd prefer, to pay transit fares, hail an Uber, or buy a bike or a sturdy pair of walking shoes. If they don't have much need to travel, they could use the money to just pay other expenses. A cash system, as opposed to toll credits or transit passes, would not just protect low-income people but also preserve incentives to economize on vehicle travel.

[12] The point here is not that toll revenue should never go to transit, only that dedicating revenue to transit will not make pricing more affordable. Note too that congestion pricing can, by itself, improve transit service. Reduced congestion makes buses faster and more reliable, which attracts additional riders, further reduces traffic, and enhances transit's viability (Federal Highway Administration 2024). To the extent this occurs, pricing can be progressive, and benefit low-income transit riders, even if no toll revenue is spent on transit.

If a cash program were infeasible, policymakers could adopt more targeted programs aimed specifically at low-income drivers. These might include tax-based rebates akin to the Earned Income Tax Credit, or discounted toll transponders, similar to lifeline pricing for utilities. Utility safety net programs are a reasonable model, along many dimensions, for affordability programs related to road pricing. Governments do not make electricity or water free for everyone; instead, they price usage while providing targeted assistance to vulnerable households. This model preserves price signals—preventing overuse—while ensuring access (Jamasb and Pollitt 2011). Roads can be treated similarly: congestion pricing promotes efficient use, while revenue recycling ensures affordability. The precise design can vary, but the central point is that redistribution is both feasible and precedented (Manville et al. 2022).

A tempting alternative to cash redistribution is exemptions for certain groups—declaring, for example, that low-income people needn't pay congestion charges. While appealing in theory, exemptions tend to perform poorly in practice. One problem is overuse. Making a service free for a sufficiently large group reintroduces the inefficiencies of unpriced access: demand rises, congestion worsens, and the system's effectiveness declines (Burgess et al. 2020). California's experience with Clean Air Vehicle stickers illustrates this risk: allowing single-occupant hybrid and electric vehicles into carpool lanes eventually led to overcrowding and diminished the lanes' effectiveness (Bento et al. 2024).

Another problem is abuse. As the price rises, the exemptions become more valuable, and create incentives for fraud, resale, and informal sharing. California's star-crossed experience with disabled parking placards offers a clear example. Although intended for people with disabilities, they are frequently misused or transferred, undermining parking pricing and availability (Manville and Williams 2013, 2014; Shoup 2011a, 2011b).

Finally, exemptions are also prone to unanticipated changes in the exempt population. London's congestion charge initially exempted taxis, which was manageable given that the city could directly control the size of the taxi fleet. The advent of platform ridehailing, however, flooded London with Ubers, which qualified for the taxi exemption but did *not* fall the city's power to control fleet quantity. The number of exempt vehicles rose dramatically, and the policy's effectiveness fell until the exemption criteria could be revised (Badstuber 2018).

While the primary concern of affordability policy is protecting low-income households, in an expensive state like California even middle-income households might object to new argue that they represent an affordability burden. To some extent this is a political problem rather than an equity problem: the question of whether a fair allocation of costs involves making driving more expensive is separate from the question of whether a fair allocation will fly with the electorate. If we take the affordability issue for middle-income households seriously, however, it's worth mentioning that in the medium to long run a switch to congestion charging does not need to increase a typical household's costs. Specifically, congestion pricing could change the composition of a household's transportation budget, rather than increase it, by leading households to spend more on tolls and less on vehicles.

It is no secret that almost all households, and especially higher-income households, buy vehicles for reasons that extend beyond their functional transportation needs. Vehicles are status goods and identity markers, and people choose their cars with that in mind, often paying substantially more than is necessary, if "necessary" is defined by safely moving themselves and their family (Turrentine and Kurani 2007; Li et al. 2022). In 2025, the average expenditure on a new private automobile was over $50,000, and the average price paid for a used vehicle was $26,000. For decades now, the bestselling vehicles in America have been Ford's F-Series pickup trucks, which begin at roughly $60,000 and have capabilities (such as towing over 10,000 pounds) that the typical driver rarely if ever uses.

There's nothing wrong with such expressive consumption, but it does suggest that in many cases a household's basket of transportation spending will not be fixed in its component parts, and many households can find some surplus in the basket if necessary. Suppose a household plans to purchase a $35,000 vehicle, but learns congestion tolls are coming. If they instead buy a $30,000 vehicle, they free up roughly $90–$100 per month, which could be used to pay tolls. The transportation budget changes, but doesn't grow. And this is conservative: imagine the household was initially planning to buy a new Ford F-150, at $70,000, and instead bought a $36,000 Honda CRV. This decision would free up hundreds of dollars per month over the life of a 60-month loan.

To be clear, the argument is *not* that households should buy new vehicles in response to pricing. That would not save money. The point is that the typical household buys a new vehicle every 5–7 years, and many households could, in light of pricing, buy a less expensive option without sacrificing meaningful vehicle quality, and free up money for tolls in doing so (Manville 2022).

If households did respond to charging in this way, road pricing would shift transportation expenditures away from vehicle ownership (a fixed cost) and toward road use (a marginal cost). Such a shift has two advantages. First, it probably improves welfare. Automobiles in the United States are already high quality and perform well. The typical urban road network in the U.S., in contrast, performs poorly. For this reason, a dollar spent making roads perform better (by avoiding the worst congestion) will yield larger gains than dollars spent trying to improve already high-quality vehicles. (Put differently, a commute without congestion is probably worth more, to most travelers, than leather trim on the seats.)

Second, moving to marginal costs enhances efficiency and environmental outcomes. Households that sink most of their transportation budget into vehicles have little incentive to drive less, and may even have modest incentives to drive more (to "make the most" of their purchase). When more of their transportation costs are marginal, and tied to their decision to drive, they have stronger incentives to economize on trips, reducing congestion and emissions.

A final strategy for addressing affordability, which can complement the above but also work well alone, is to introduce road pricing lane-by-lane. Rather than pricing an entire freeway network, a region could start by pricing two lanes on every route. Eighteen months later, it could add an additional lane, and a year after that convert a fourth, and so on, until the entire road network is priced. Pricing in this manner gives people time to adjust, and lets pricing begin to create benefits and revenue, while still maintaining a free option during a transition period (Manville et al. 2022).

V. Conclusion

The equity of a road pricing program depends on two factors: whether the price itself is fair—in that it assigns burdens proportional to costs—and whether that fair price is affordable. An affordability problem, in almost all cases, can be solved if some of the toll revenue is redistributed to lower-income people. The fairness problem is more intrinsic. If the price isn't right, the policy is less fair. What this reasoning suggests is that free roads are affordable but unfair, roads that charge a flat rate per mile are often affordable (particularly if the gas tax is replaced) but still unfair, and that congestion charging is fair but carries with it risks of unaffordability. A program that charges the marginal cost for driving while redistributing some toll revenue, then, is likely the most equitable approach to road allocation. The alternatives are unappealing: Policies that avoid pricing in the name of equity often do so by obscuring who pays, not by improving outcomes for those least able to pay.

References

Arnott, Richard, Andre de Palma, and Lindsey Robin. The Welfare Effects of Congestion Tolls with Heterogeneous Commuters. *Journal of Transport Economics and Policy* 28:139–61.

Banister, David. 2008. “The Big Smoke: Congestion Charging and the Environment.” In *Road Congestion Pricing in Europe: Implications for the United States*, edited by Richardson Harry, Bae Christine, 176–97. Cheltenham, UK: Edward Elgar.

Barth, Matthew, and Boriboonsomsin Kanok. 2008. “Real World Carbon Dioxide Impacts of Traffic Congestion.” *Transportation Research Record* 2058:163–71.

Barter, P. 2020. *Congestion Pricing: Why It’s Time to Move from Talk to Action*. International Transport Forum.

Beevers, Sean, and David Carslaw. 2005. “The Impact of Congestion Charging on Vehicle Emissions in London.” *Atmospheric Environment* 39:1–5.

BBC News. 2019. London congestion charge: Drivers to pay more for polluting vehicles. *BBC News*, April 8.

Blumenberg, E., and Pierce, G. 2012. Automobile ownership and travel by the poor: Evidence from the 2009 National Household Travel Survey. *Transportation Research Record*, *2320*(1), 28–36.

Board of Governors of the Federal Reserve System. (2016). *Economic well-being of U.S. households.*

Bolton, Lisa. Luk Warlop, and Joseph Alba,. (2003). *Consumer perceptions of price (un)fairness. Journal of Consumer Research*, *29*(4), 474–491.

Börjesson, Maria., and Ida Kristoffersson. (2018). The Swedish congestion charges: Ten years on. *Transportation Research Part A: Policy and Practice*, *107*, 35–51.

Brehm, Jack. W. 1966. *A theory of psychological reactance.* Academic Press.

Brehm, Jack. W., and Brehm, S. S. 1981. *Psychological reactance: A theory of freedom and control.* Academic Press.

California Department of Transportation. nd. California’s Terminal Facilities. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/californias-terminal-facilities.

Campbell, Margaret 1999. Perceived price unfairness: Antecedents and consequences. *Journal of Marketing Research*, *36*(2), 187–199.

Currie, Janet. 2009. Healthy, Wealthy and Wise. *Journal of Economic Literature* 47 (1): 87–122. Crossref. Web of Science.

Currie, Janet. 2011. Inequality at Birth. *American Economic Review* 101 (3): 1–22. Crossref. Web of Science.

Currie, Janet, and Hyson Rosemary. 1999. Is the Impact of Health Shocks Cushioned by Socioeconomic Status? The Case of Birth Weight. *American Economic Review* 89 (2): 245–50. Crossref. Web of Science.

Currie, Janet, and Reed Walker. 2011. Traffic Congestion and Infant Health: Evidence from E-Z Pass. *American Economic Journal: Applied Economics* 3 (January): 65–90. Crossref. Web of Science.

Deakin, Elizabeth, and Greg Harvey. 1996. *Transportation Pricing Strategies for California: An Assessment of Congestion, Emissions, Energy and Equity Impacts: Final Report*. Sacramento, CA: California Air Resource Board.

Downs, Anthony. 2004. *Still Stuck in Traffic*. Washington, DC: Brookings Institution.

Cooke, D. 2024. The user pay myth: We all pay for our roads, not just drivers. *The Equation*. March 13.

Dholakia, Utpal2016. Why do consumers hate Uber's surge pricing? *Urban Edge*. January 26.

Ecola Liisa, and Thomas Light. 2009. *Equity and Congestion Pricing*. Santa Monica, CA: RAND Corporation.

Edlin, Aaron, Karaca-Mandic Pinar. 2006. "The Accident Externality from Driving." *Journal of Political Economy* 114 (5): 931–55. Crossref. Web of Science.

EPA (Environmental Protection Agency). 2014. "Cars, Trucks, Buses, and 'Nonroad' Equipment." http://www.epa.gov/airquality/peg_caa/carstrucks.html.

Edmunds. (2024). *Automotive market trends report.*

Eliasson, Jonas. 2014. The Stockholm congestion charges: An overview. *Transport Policy*, *21*(2), 38–45.

Eliasson, Jonas. 2014. The role of attitude structures, direct experience and reframing for the success of congestion pricing. *Transportation Research Part A: Policy and Practice*, *67*, 81–95.

Experian. 2024. *State of the automotive finance market.*

Fan, Yingling. Astrid Wood, and Evelyn Blumenberg. 2025. Urban transport as a social construct: Reimagining transport's role in urban studies. *Urban Studies*, 0(0).

Federal Highway Administration. 2017. *2017 National Household Travel Survey.* U.S. Department of Transportation.

Federal Highway Administration. 2024. *Congestion pricing: International case studies.* U.S. Department of Transportation.

Hennessy, D. A., Wiesenthal, D. L., and Kohn, P. M. 2000. The influence of traffic congestion, daily hassles, and trait stress susceptibility on state driver stress: An interactive perspective. *Journal of Applied Biobehavioral Research*, *5*(2), 162–179.

Highsmith, Brian. 2021. Republicans want you (not the rich) to pay for infrastructure. *New York Times*. June 23.

Houston, Douglas, Hu Jun, Ong Paul, and Winer Arthur. 2004. "Structural Disparities of Urban Traffic in Southern California." *Journal of Urban Affairs* 26 (5): 565–92.

Huang, S. C., Dong, P., and Mukhopadhyay, A. 2014. Penny Wise and Pound Foolish: When consumers react to "free" changing to "fee". *Journal of Consumer Research*, *41*(2), 472–487.

INRIX. 9024. *2024 Global Traffic Scorecard*.

Harrington, Winston, Alan Krupnick and Anna Alberini. (1998). *Overcoming public aversion to congestion pricing*. Resources for the Future.

Jamasb, T., and Pollitt, M. (2011). *The future of electricity demand: Customers, citizens and loads.* Cambridge University Press.

Johnson, 'SGB, Zhang J, Keil FC. Win-win denial: The psychological underpinnings of zero-sum thinking. J Exp Psychol Gen. 2022 Feb;151(2):455-474. doi: 10.1037/xge0001083. Epub 2021 Aug 9. PMID: 34370502.

Kahneman, D., and Amos Tversky, A.1978. Prospect theory: An analysis of decision under risk. *Econometrica*. 47(2):263-292.

Kahneman, Daniel., Jack Knetsch, and Richard Thaler. 1986. Fairness as a constraint on profit seeking: Entitlements in the market. *American Economic Review*. 76 (4): 728-741.

King, David, Michael, Manville, and Donald Shoup. 2007. The political calculus of congestion pricing. *Transport Policy*, *14*(2), 111–123.

Kockelman, Kara., and Sukumar Kalmanje. 2005. Credit-based congestion pricing: A policy proposal and the public's response. *Transportation Research Part A: Policy and Practice*, *39*(7–9), 671–690.

Lehe, Lewis. 2019. Downtown congestion pricing in practice. *Transportation Research Part C: Emerging Technologies*, *100*, 200–223.

Manville, Michael, and Emily Goldman, E. 2018. Would Congestion Pricing Harm the Poor? Do Free Roads Help the Poor? *Journal of Planning Education and Research*, *38*(3), 329-344.

Manville, Michael, Gregory Pierce, Bryan Graveline. (2022) Guardrails on priced lanes: Protecting equity while promoting efficiency, *Transportation Research Interdisciplinary Perspectives* (15).

Manville, Michael. (2019). The fairness of congestion pricing. *Transfers.*

Manville, Michael. (2020). Roads, Prices and Shortages. A Gasoline Parable. UCLA ITS.

Manville, Michael. 2024. *Induced Travel Estimation Revisited.* UCLA Institute of Transportation Studies.

New York Times Editorial Board. 2019. Yes, congestion pricing can work in New York. *The New York Times.* March 30.

OECD. 2019. *The governance of inclusive growth: Universal basic services.*

Ostrom, Elinor. 1990. Governing the commons. Cambridge University Press.

Sampson, Robert. 2020. Traffic congestion, environmental justice, and health disparities. *Urban Studies, 57*(12), 2458–2475.

Schelling, Thomas, 1978. Micromotives and macrobehavior. New York: W.W. Norton & Co.

Small, Kenneth. 2012. Road pricing and public economics. *Transportation Research Part A: Policy and Practice, 46*(6), 972–991.

Small, Kenneth 2012. Energy policies for passenger motor vehicles. *Transportation Research Part A: Policy and Practice, 46*(6), 874–889.

Small, Kenneth and Verhoef, E. T. 2007. *The economics of urban transportation.* Routledge.

Stutzer, Alois., & Bruno Frey. 2008. Stress that doesn't pay: The commuting paradox *Scandinavian. Journal of Economics.* 110(2): 339–366.

Tversky, Amos and Daniel. 1974. Judgment under uncertainty: Heuristics and biases. Science. 185 (4157):1124-1131.

U.S. Bureau of Labor Statistics. (2024). *Consumer expenditure survey.*

Wang, Peng, Ruhan Zhang, Shida Sun, Meng Gao, Bo Zheng, Dan Zhang, Yanli Zhang, Gregory R. Carmichael, and Hongliang Zhang. 2023. Aggravated air pollution and health burden due to traffic congestion in urban China. *Atmospheric Chemistry and Physics, 23*, 2983–2996.

West, Sarah. 2004. Distributional effects of alternative vehicle pollution control policies. *Journal of Public Economics, 88*(3–4), 735–757.

Rioux, Christine, Gute David, Brugge Doug, Peterson Scott, & Parmenter Barbara. 2010. "Characterizing Urban Traffic Exposure Using Transportation Planning Tools." *Journal of Urban Health* 87 (2): 167–88.