Union of Concerned Scientists

FACT SHEET

Amping Up EV Incentives

Making the Transition to Electrification Faster and More Equitable

Providing more households with access to electric vehicles is critical to address climate change and reduce the health risks of air pollution, but systemic barriers related to housing, income, and finance are stalling progress. Smart policy design can help overcome these barriers, accelerate the adoption of electric vehicles, and more equitably realize the benefits of vehicle electrification. Essential steps include improving the federal electric vehicle tax credit and targeting new programs at low- and moderate-income consumers and communities with the worst air quality.

Introduction

Transportation represents the largest source of global warming emissions in the United States, with light-duty passenger cars and trucks as the largest contributor.[1] These vehicles are also a significant contributor to poor air quality, and pollution from on-road transportation disproportionately affects communities of color. The health impacts include exacerbated asthma—particularly in children—and premature deaths from lung and cardiovascular disease (Reichmuth 2019; EPA 2019; EPA 2020b). The disproportionate impacts of COVID-19 on communities of color underscore the importance of immediate action to address the systemic health risks facing these communities (Tai et al. 2020).

A more just and equitable transportation system includes expanding access to and increasing the reliability of public transit and other mobility options apart from privately owned automobiles. However, cars and trucks remain the dominant mode of personal transportation in the United States, and a rapid shift toward electric vehicles (EVs), replacing gasoline- and diesel-powered vehicles, is necessary to address climate change, on-road pollution, and related inequities simultaneously.

The EV market today remains in a nascent state owing to a variety of factors, including challenges related to pricing, availability, and consumer education. While local air pollution and climate change are pressing problems demanding *urgent* remedies, the turnover of the passenger vehicle fleet is quite slow. The expected lifetime for passenger vehicles exceeds 15 years: the average vehicle sold in 2035 is likely to still be on the road in 2050, by when net-zero emissions will need to be achieved to limit the worst impacts of climate change (Bento, Roth, and Yiou Zuo 2018; IPCC 2018). Therefore, it is critical that we *accelerate* a transition to the lowest-emission technologies, replacing the 250 million registered passenger vehicles on the road today with zero-emission vehicles as quickly as possible (Davis and Bundy 2020).

To electrify personal mobility in the United States—and to do so equitably—requires a suite of policies, including improving the availability and accessibility of charging infrastructure (Liao, Molin, and van Wee 2017; Hardman 2019; Houston 2021). Further, an important catalyst to increasing EV adoption would be regulatory pressure on the automotive industry, something that has not been done sufficiently at the federal level. Nevertheless, while these policies can help drive EV adoption, monetary incentives for the electrification of personally owned and operated vehicles remain crucial for the 92 percent of households that own personal vehicles.

Today's Electric Vehicle Marketplace

The market for electric vehicles has steadily improved over the past decade as the number of electric models has grown and the relevant technologies have advanced. In the leading US market for EVs, California, sales of new electric vehicle have reached 8 percent. However, at just 2.5 percent of the market for new vehicles nationwide, EVs remain well short of mainstream adoption. While households show an increasing interest in EVs, only a limited number of EV models and vehicle types are available, and manufacturers have largely limited model availability to California and the few other states with sales requirements (Preston 2020; Bui, Slowik, and Lutsey 2020). Moreover, even as manufacturers make big promises about the future being electric, many of them continue to restrict their offerings in the United States to expensive, low-volume vehicles, as opposed to mass market, mainstream automobiles. With lax federal vehicle-emissions and fuel-economy regulations, and cost parity with conventional gasoline-powered vehicles a few years away, manufacturers show little interest in producing EVs at scale for the United States, instead focusing their energy on China and the European Union (UCS 2018; Lutsey and Nicholas 2019; BloombergNEF 2020; Keating 2020). The manufacturer's suggested retail pricing (MSRP) for EVs in the United States remains significantly higher than that for similar gasoline-powered vehicles, despite an 89 percent drop in battery costs over the past decade (BloombergNEF 2021).[2]

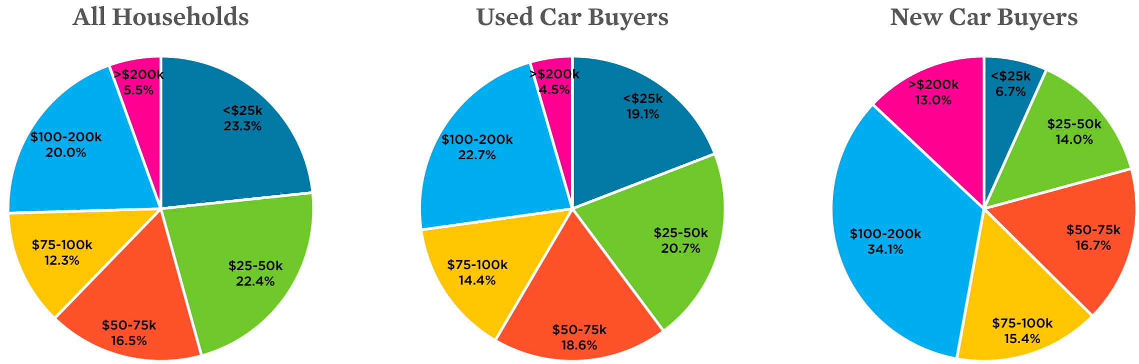
Federal tax incentives are designed to help close that gap and promote EV purchases in this country.[3] Currently, a purchaser of a new EV can take a federal tax credit of up to $7,500 per vehicle.[4] Additionally, property owners and businesses can take a tax credit for 30 percent of the cost of purchasing and installing EV infrastructure, up to $1,000 for individuals or $30,000 for businesses. This helps defray the costs of home-charging for car buyers able to take advantage of it, as well as for business owners who may wish to deploy charging infrastructure for employees or customers. However, no parallel credit is available to renters, who face their own challenges and costs for charging EVs at home. Another shortcoming is that both the vehicle purchase and charging-infrastructure tax credits are nonrefundable; in other words, tax filers with liability less than the credit cannot take its full value.

Existing federal incentives have provided important support to the early EV market, but moving to mainstream adoption will require revisiting the design and scope of federal EV incentives.

New-Car Buyers Are Not Representative of the General Public

To understand how best to shape EV incentives for a more just and equitable transition to electrified transportation, it is important to understand the complexities around who purchases new vehicles, how new technologies move through the marketplace, and who stands to gain the most from the electrification transition. While cars are a dominant, nearly ubiquitous mode of transportation in the United States, new-car buyers do not necessarily reflect the average household. Most cars on the road are bought secondhand: used-car purchases outnumber new by more than two to one.[5] And although new-car buyers are not representative of the general public, the availability of used cars for the average household is predetermined by choices made by a richer, Whiter new-car-buying public (Figure 1).

Figure 1. Car Market Income Demographics



While used-car buyers have only slightly higher household incomes than the typical household, new-car buyers have significantly higher earnings. Households making more than $100,000 annually purchase nearly half of all new, privately owned cars.
SOURCE: UCS ANALYSIS OF FHWA 2017.

Unfortunately, this imbalance is getting worse as manufacturers increasingly cater to an ever-more-upscale customer (Baum and Luria 2016; Bomey 2021).

In the case of EVs, the newness of the technology compounds the disparity between new-car buyers and the rest of the public. EV owners are more educated and wealthier than the average new-car buyer, a result common to new technologies (Rogers 2003). Today's EV purchasers can be predominantly categorized as either technology "innovators" or "early adopters." Innovators are at the cutting edge: they tend to be more educated and wealthier, which enables them to buy into technologies that could ultimately fail. Early adopters are more choosey than innovators: while they, too, have greater financial resources than average, this broader class of technology adopters plays a critical "opinion leadership" role in how a technology is viewed.

As in the case of other technologies, EVs are expected to gradually "diffuse" through the marketplace and become a larger part of the market (Figure 2). The developments spurred by the early adopters (e.g., improved battery technology), as well as a better understanding of how these vehicles fit into everyday lives through lived experience, will help shape the market for the early majority.

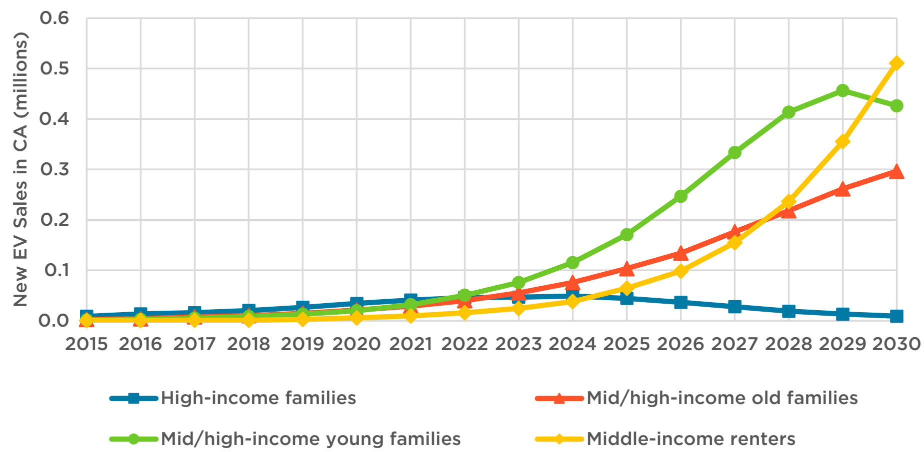
Improving Federal EV Incentives

In assessing ways to improve EV incentives, it is important to focus on addressing equity gaps in the car market, growing the EV market share, and accelerating adoption for the early majority. A key goal is to identify ways to expand access to EVs while understanding some of the tradeoffs involved in program designs that could aid such efforts.

AVAILABILITY OF THE FEDERAL EV TAX CREDIT TODAY

The design of the federal EV tax credit shapes who can best use it. Because current federal incentives for vehicles and infrastructure are nonrefundable tax credits, they favor households with significant tax liabilities. For example, a family of four taking only the standard tax

Figure 2. Diffusion Model of EV Purchases in California



While high-income households may make up a large fraction of early purchasers of EVs, technology diffusion models based on data from the California Clean Vehicle Rebate program project how this could shift toward households that may have higher barriers to electrification and/or more loss aversion. Improvements to existing federal programs, including income-based incentives, could be part of a suite of policies aimed at accelerating this diffusion process.
SOURCE(S): REPRODUCED FROM LEE, HARDMAN, AND TAL 2019[6]

deduction would need to make almost $120,000 annually to take full advantage of both vehicle and charger tax credits.[7]

Extending these data to the full new-car market, the Union of Concerned Scientists estimates that only about 40 percent of all new-car buyers would be eligible to receive the full value of both tax credits.[8] The lower-income households that are not eligible are those for which the credit is more likely to make the marginal difference in deciding whether or not to buy an EV. While the market is moving slowly toward broader adoption, cost is becoming an increasingly important factor for those new-car buyers (Figure 2) (Jenn et al. 2020). Reforming the current EV incentive program can accelerate that shift.

Households that lease vehicles are not eligible for a vehicle tax credit. However, leasing companies are eligible and pass on most, if not all, of the credit to consumers (Preston 2020). This may push households in the market for an EV toward a lease, particularly households that do not have enough tax liability to take the full credit. However, the rate of leasing for EVs is no higher today than it is for new vehicles overall (Miller 2020; Zabritski 2020).

ENSURE ALL CAN ACCESS FULL VALUE OF INCENTIVE

To heighten the impact of the EV tax credit, particularly among non-early-adopter households, it should be fully available to all households. The most effective option would be converting the credit into a point-of-sale rebate ("cash on the hood"). This approach can be up to twice as effective as a tax credit per available dollar (Narassimhan and Johnson 2018 Appendix 4). Alternatively, making the credit fully refundable would at least ensure that any household can take advantage of its entire value, regardless of income. States and municipalities have an additional tax-related tool at their disposal to reduce up-front costs: they could exempt EVs from local or state sales taxes.

Additional challenges beyond upfront costs confront low- and moderate-income individuals entering the EV market, especially in communities of color. Racial inequity in income shapes racial inequity in outcomes—including vehicle ownership. For example, White households with annual incomes exceeding $150,000 buy as many new cars as do *all* Hispanic and Black households combined, despite being just one-third as numerous. Structural racism regarding wealth and opportunity in the United States in part explains this economic disparity, yet there are differences even within the same income categories. For instance, Black households in most income categories are less likely to make vehicle purchases and more likely to buy used vehicles when they do. A history of discriminatory, predatory lending in the auto industry exacerbates these differences (Rice and Schwartz 2018; Butler, Mayer, and Weston 2020).

IMPORTANCE OF ACCESSIBLE AND EQUITABLE FINANCING

When it comes to vehicle ownership, low- and moderate-income households pay a much larger share of their income on fuel and maintenance (Goldman 2017). With lower operating and maintenance costs, EVs could significantly reduce the cost burden of ownership for such households, which in turn could help reduce additional compounding challenges of vehicle ownership, including the risk of default and repossession—*if* they can access these vehicles (Harto 2020).

While lowering upfront costs helps reduce barriers to EV ownership, low-income consumers often lack access to financing at reasonable terms to purchase a vehicle (Greenlining Institute n.d.). Financing pathways are highly important for low-income drivers—and will become critical if other incentives for EVs and infrastructure are phased out. New legislation or rules from the Consumer Financial Protection Bureau must protect low-income drivers from predatory lending practices for purchases of EVs and charging infrastructure.

Rethinking and restructuring the incentive programs could help address some of the systemic financial issues limiting the applicability of the current incentives. Loan guarantees, which a number of federal programs use, could help open up lower-interest car loans to qualifying low-income households.[9] Requiring the availability of low- or no-interest loans would augment assurance against predatory financial products. Additionally, an incentive program working with financial institutions directly could help ensure that affordable financing options are available and that rebates directly target reducing upfront costs at the point of purchase. Such programs have been demonstrated at the state level.[10]

INCENTIVES FOR NEW VEHICLES BASED ON INCOME

The current federal incentive program is insufficient for serving the needs of low- and moderate-income households. These households would not typically purchase new vehicles, electric or otherwise, owing not only to the substantially higher upfront costs of new cars and trucks but also to structural constraints that reduce access to equitable financing. Increasing the value of the current incentive in a targeted way could help these households access EVs. Because of the urgency of addressing transportation pollution in overburdened communities, implementation of any such new-vehicle supplemental program could preferentially target communities with the worst air quality.

In lieu of, or in addition to, a flat incentive, a tiered federal incentive that includes a larger incentive for lower-income households can help redress inequities in the new-vehicle market. Growing the market for EVs means expanding beyond richer, Whiter, more highly educated early adopters and into the much larger number of people who deal with the burdens of inequitable transportation access and poor air quality. California's experience with income-tiered rebates, which provides an additional $2,000 for lower-income households, shows that this can help narrow some gaps in equity (Ju, Cushing, and Morello-Frosch 2020). Federal programs should build on this model.

Given the substantial upfront costs, even a supplemental incentive for new vehicles may not substantially improve the adoption of EVs among lower-income drivers. Moreover, such an incentive risks burdening community members with high-priced loans, so any supplemental program should include favorable financing. Because there are additional barriers to EV adoption in many of these communities, such as reduced homeownership and higher proportions of multiunit dwellings, it may be appropriate to make any increased new-vehicle incentive part of a suite of regionally targeted policies addressing the broad array of challenges facing EV adoption in these communities.

USED-VEHICLE INCENTIVES

Most vehicle purchases are made on the secondary market, and that is especially true for communities of color and low-income families.[11] At the same time, it is precisely those households that stand to gain the most from the transition to electrification because transportation pollution disproportionately impacts them (Reichmuth 2019). The disparities in both vehicle ownership and economic status warrant programs that go above and beyond the "one size fits all" approach of the new-vehicle incentive.

In addition to a new-vehicle incentive, incentives to buy used EVs are a prudent strategy for putting cleaner transportation technology in the hands of those most in need. In the absence of a used-EV incentive at the federal level, some states have implemented their own programs, and a federal proposal is part of the proposed GREEN Act of 2021 (US Congress 2021). Targeting used vehicles does not lead to a direct increase in the number of EVs on the road, but it would improve access to EVs for low- and moderate-income households by lowering upfront costs. It could also help catalyze EV sales by increasing communities' experience with EVs. Direct exposure to trusted voices with experience with these vehicles can help bridge the information gap and improve the diffusion of EVs through different market populations (Taylor and Fujita 2018; Blomqvist 2021).

Opening up incentive programs to include used vehicles would improve equity by improving access to mobility choices for individuals with a broader range of economic status. And used-EV incentives must be either point-of-sale rebates or refundable tax credits: the consumers they target are unlikely to have the tax liability necessary to take a regular deduction.

One challenge of such rebates could be their impact on the used-vehicle market. If all used-EV purchases are eligible, this could raise the market price of a used EV, effectively subsidizing the first owner a second time rather than lowering the price of entry to the market for the buyer. One way around this is to limit the scope of the program, either through income caps or regional limitations (e.g., prioritizing communities with the worst air quality).

EARLY RETIREMENT PROGRAMS

Another type of incentive that may be well-suited for low- and moderate-income communities is a "scrap and replace" program that provides cash incentives for retiring older, more polluting vehicles. While not exclusive to purchases of EVs, such a program can target a minimum level of improvement in efficiency in order to maximize the resulting environmental benefits. The value of the incentive can also be based on income or even paired with an alternative voucher that a person could apply to transit passes or other forms of shared mobility in an effort to reduce vehicle miles traveled and clean up the air without necessarily burdening participants with a new purchase.[12] This type of incentive could give priority, or be exclusive, to regions with the dirtiest air.

One important consideration is that a scrappage program be well targeted. A scrappage incentive applicable to a large share of on-road vehicles could reduce the supply of used vehicles enough to spark price increases in the remaining vehicle fleet (Jacobsen and van Benthem 2015). This would be a substantial disbenefit for low- and moderate-income households seeking to buy used vehicles but not participating in the program. Thus, it could reinforce issues of pollution and financial inequity in transportation.

Program Restrictions: Income or Vehicle Price Limits

Several states have instituted restrictions on eligibility for their incentive programs to reduce overall expenditures and focus resources on where it will make the biggest difference to accelerate the conversion to EVs.[13] Two strategies to accomplish these goals are discussed most heavily: making the incentive available only to households with an income below a specific value (an income cap), and placing an upper limit on the value of the vehicle purchased (a sales or transaction price cap). While the EV market has shifted only gradually toward households for which the incentive can make a bigger difference (Figure 2) (Jenn et al. 2020), careful consideration is needed to assess the potential impacts of such limitations on the overall market.

INCOME CAPS

One goal of an income cap is to focus a program on those for whom it will make the most difference, given that higher-income individuals are more likely to buy EVs regardless of the incentive (Jenn et al. 2020). Equity and justice are additional considerations, as focusing resources on those most affected by transportation pollution will help ensure more equitable outcomes. Different designs may result not only from the size and scope of program funding but also from overall goals with respect to the degree to which a program aims at increasing overall sales vs. increasing sales in those frontline communities most affected by poverty and pollution: the lower the cap, the more focused on lower-income and more diverse households. However, too low a cap could forego incentivizing large numbers of households that buy new cars to make the switch to EVs, which could limit overall EV uptake (Table 1).

It may be preferable to vary eligibility based on local income, thus more accurately differentiating by community need—e.g., via the Department of Housing and Urban Development's "area median income." However, such measures may not fully capture the inequality of an area; the added level of uncertainty about eligibility could lessen the effectiveness of the program.

An income cap could also affect a program's implementation. For example, it may be more challenging to implement an income cap together with a point-of-sale rebate because income verification is most typically assessed via tax documents. While preapproval or some type of income verification in advance of purchase could accommodate this challenge, data from pilot programs show limited use (CVRP n.d.; Changus and Orose 2020). Point-of-sale rebates are preferable because of their greater efficacy, but implementation of any incentive program will have tradeoffs based on eligibility, ease of use, and equity (TRB and NRC 2015).

Table 1. Examples of How an Income Cap Impacts Eligibility and Representation

Household Income Cap:	1 Adult	$25,000	$37,500	$50,000	$75,000	$100,000	None
	2+ Adults	$50,000	$75,000	$100,000	$150,000	$200,000	None
Recent EV Buyers Excluded		94%	80%	70%	38%	29%	0%
Total New-Car Buyer Eligibility		16%	31%	46%	70%	82%	100%
Total Used-Car Buyer Eligibility		35%	54%	69%	87%	94%	100%
Share of Eligible Households Below Median Income		100%	70%	51%	35%	30%	24%
Non-White Share of Eligible Households (34% Nationally)		38%	34%	32%	30%	29%	28%

In setting eligibility limits for an EV incentive, legislation must balance the goal of driving EVs toward those most affected by local transportation pollution with the goal of accelerating the EV market overall to reduce global warming emissions. Reducing the income cap would enable the eligible share of new-car buyers to be more representative of the overall population; it could even explicitly target more vulnerable households. However, restricting eligibility to lower and lower incomes limits eligibility to a smaller and smaller share of new vehicle buyers.
Note: Bins selected based on identified income levels in the National Household Travel Survey dataset.
SOURCE: UCS ANALYSIS OF FHWA 2017

SALES OR TRANSACTION PRICE CAPS

Placing a cap on the purchase price of the EV is another way to make the credit available to those who need it and also to limit its use for luxury vehicles. The most straightforward way to implement such a cap is based on the MSRP (list price) of a vehicle. Such data could be published for consumers in advance of purchase.

A downside is that such a cap could be susceptible to gaming by manufacturers.[14] One way around this is to base the cap on the final transaction price, including all trim options, destination charges, and other costs. However, the cap could create uncertainty about eligibility for consumers for a vehicle priced near the cap. For example, some optional features could push the price over the cap and result in tradeoffs between eligibility and luxury or even safety features.

One benefit of any price cap is the signal it sends to manufacturers, incentivizing them to place a higher priority on producing EVs that are more affordable. However, even gasoline-powered vehicle prices differ substantially by vehicle type: for example, while the average price of a new vehicle is nearly $40,000, the average price for a full-size pick-up truck is just over $50,000 (KBB 2020). This could suggest different caps for different use classes.

Accelerating a More Just, Sustainable, and Electric Future

Decades of investment in sprawl have subsidized a transportation system designed around privately owned vehicles. Access to those vehicles is distributed inequitably, and low-income communities and communities of color bear disproportionate negative environmental impacts.

Electric vehicles provide an opportunity to simultaneously address climate change and air pollution from passenger vehicles, but systemic inequality limits the ability of many communities to participate in the market for new vehicles. Access to EVs is further limited by the novelty of the technology, racial disparity in housing and land use, and a host of other issues.

While reductions in battery costs and the expansion of charging infrastructure will help to advance electrification, the health burden of our transportation system and the urgency of addressing the climate crisis demand accelerating that future. Financial incentives, combined with regulatory and other complementary policies, can play a critical role in the near-term adoption of EVs. Current programs have helped advance the early EV market, and now they must be improved substantially to better support those who are most likely to benefit from the emissions reductions, as well as those for whom the funds will most directly incentivize purchases. For new-vehicle sales, such policies could include supplemental incentives targeted at lower-income individuals, complementary programs such as “scrap-and-replace,” and financial assistance that mitigates some current inequities related to vehicle purchases.

Implementing a used-vehicle incentive can improve access to those EVs already in the fleet. While this will not directly increase the size of the EV fleet, it will again result in immediate emissions reductions for communities experiencing the worst air quality, helping address some of the systemic injustice in the US transportation system. Complementary policies can help accelerate the transition to EVs, particularly investments in charging infrastructure and strong emissions standards.

Ultimately, what is needed is a robust plan to electrify personal mobility over the next 10 years, and it must center around the communities that so desperately need cleaner air.

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Organizational affiliations are listed for identification purposes only. The opinions expressed herein do not necessarily reflect those of the individuals who reviewed it. The Union of Concerned Scientists bears sole responsibility for the report’s contents.

ENDNOTES

1. Direct tailpipe emissions total nearly 17 percent of all emissions (EPA 2020a). However, indirect emissions related to the upstream impacts of oil extraction and distribution associated with the gasoline and diesel combustion in these vehicles total an additional 4 percent (DOE 2020).

2. Values in real dollars.

3. The Plug-in Electric Drive Vehicle Credit (26 U.S. Code § 30D) and the Alternative Fuel Vehicle Refueling Property Credit (26 U.S. Code § 30C) are available to businesses and residents. This fact sheet focuses on its application to individuals and households.

4. The minimum amount is $2,500 for eligible plug-in vehicles with a battery capacity of at least 5 kWh, plus $417 for each kWh capacity exceeding 5 kWh, up to a maximum of $7,500. Most plug-in hybrid-electric and battery-electric vehicles qualify for this credit.

5. Because many used-car sales occur on the private market, there is no single, reliable source for used-car data. Market analyses cite numbers of around 42 million used-car purchases and 17 million new-car purchases annually (e.g., Miller 2020). However, those 42 million used "purchases" include registration transfers for 3 million families who move interstate as well as more than 9 million auction sales, most of which are between middlemen. Similarly, 17 million new sales include more than 1 million medium-duty vehicles and 3 to 4 million government and corporate fleet purchases of new vehicles. 2017 data from the National Household Travel Survey (NHTS) include only self-reported information on sales, which may result in an undercount. However, the reported data include 11 million new-car-buying households and 25 million used-car-buying households, a comparable ratio.

6. More detail on the characteristics of the different clusters of purchasers identified by researchers can be found in a paper by Jae Hyun Lee, Scott Hardman, and Gil Tal (2019 Table 2). Renters exist in all categories, including about half of the middle- and high-income young families. Moreover, one-quarter of the cluster identified as middle-income renters own their home. However, other household characteristics around income, education, age, the number of drivers, and more suggest similarities that result in the particular multivariate clustering identified by the researchers.

7. Assuming the 2020 standard deduction ($24,800), a jointly filing married household would need to make $119,891 to incur $12,500 total tax liability (2 children x $2,000 per Child Tax Credit + $7,500 vehicle rebate + $1,000 charging infrastructure rebate).

8. This assumes standard deductions and would likely be reduced further when accounting for all deductions. Here UCS used data from the NHTS to assess vehicle ownership and household characteristics (FHWA 2017). Because the value for the infrastructure credit is capped at 30 percent of the installation cost, and installation costs are unlikely to exceed $3,333 (the value needed to max out the $1,000 cap), we used the range of $0–$1,000 to gauge our estimates, at 42 percent and 38 percent of new-car buyers, respectively.

9. Examples include Federal Housing Administration home loans, federal Perkins student loans, and Small Business Administration 7(a) small business loans.

10. See, for example, California's Clean Vehicle Assistance Program, administered by the Beneficial State Foundation (Beneficial State 2021).

11. A UCS analysis of the 2017 "National Household Travel Survey" shows that Black households are significantly less likely to purchase vehicles in a given year, with a much larger share of low-income Black households having no car (FHWA 2017). Hispanic households also have a larger share of households without a car than do White households, but those households that do own cars are more likely to purchase vehicles, particularly used vehicles.

12. See, for example, California's Clean Cars 4 All program (South Coast AQMD n.d.).

13. Examples include California's rebate, which is limited to household incomes below a threshold level ($300,000); Washington's sales tax exemption, limited only to the first $32,000 of the vehicle; and a supplemental "low-income" rebate program in Maine.

14. For example, when Canada introduced an incentive applicable to models based on the base price of the vehicle, Tesla did reduce the base price of the lowest-level Model 3 below the cap, but the company limited availability of this cheaper Model 3. Most of the Model 3s sold had an MSRP $10,000 Canadian above the cap (Bennett 2019).

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