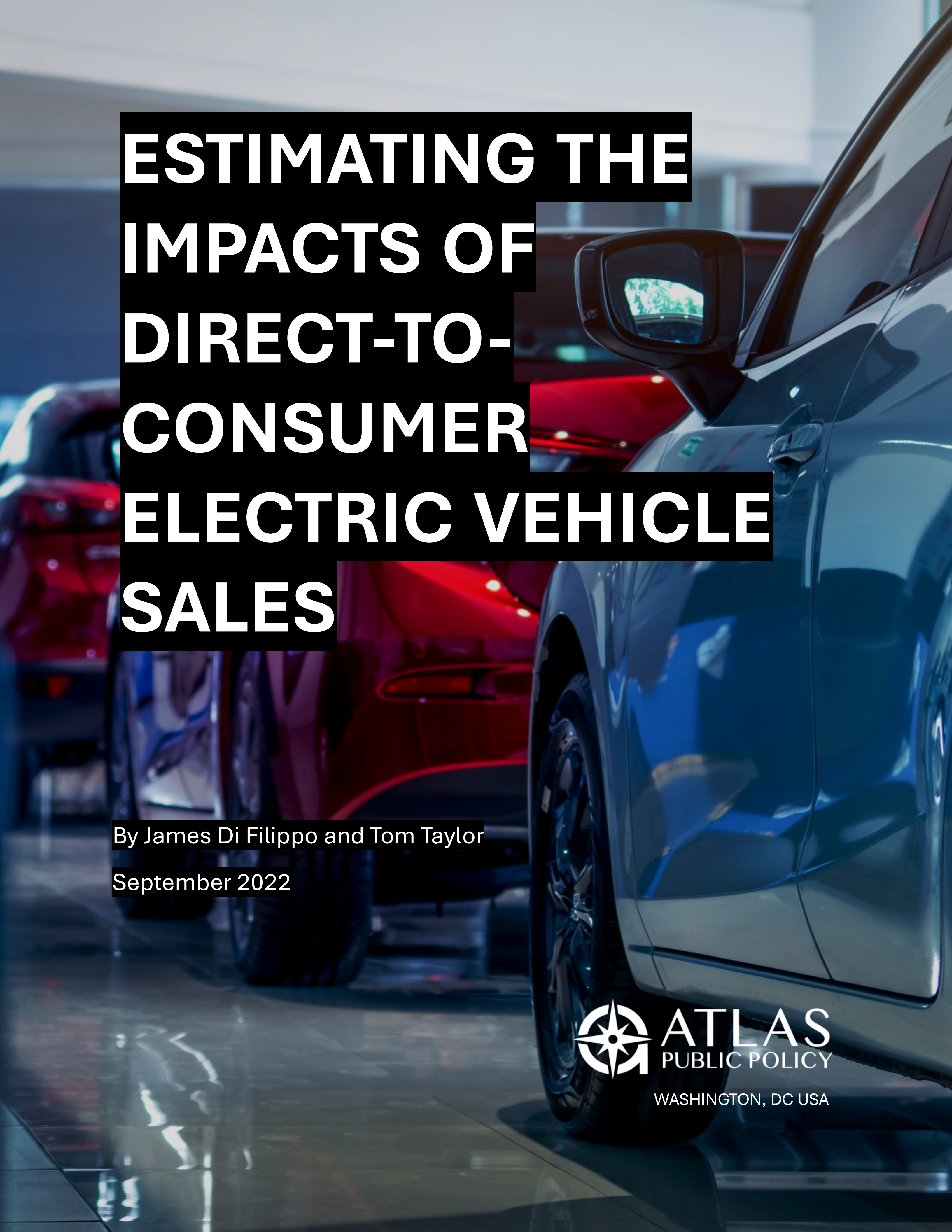

ESTIMATING THE IMPACTS OF DIRECT-TO-CONSUMER ELECTRIC VEHICLE SALES

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Executive Summary

New vehicles in the United States are almost exclusively sold by franchised auto dealers due to franchise laws that prohibit direct-to-consumer sales. These state laws have been revisited across the country in the last decade as new electric-vehicle-only automakers have entered the market with the intent to sell their vehicles primarily, if not exclusively, through direct-to-consumer channels. However, these electric-vehicle-only automakers are still barred from selling in many states, and historically franchised automakers are still required to sell through dealerships. Though electric vehicle (EV) sales are expanding rapidly, they may still be impeded by franchise dealer laws, reducing consumer choice and hindering energy security and environmental benefits of mass EV adoption.

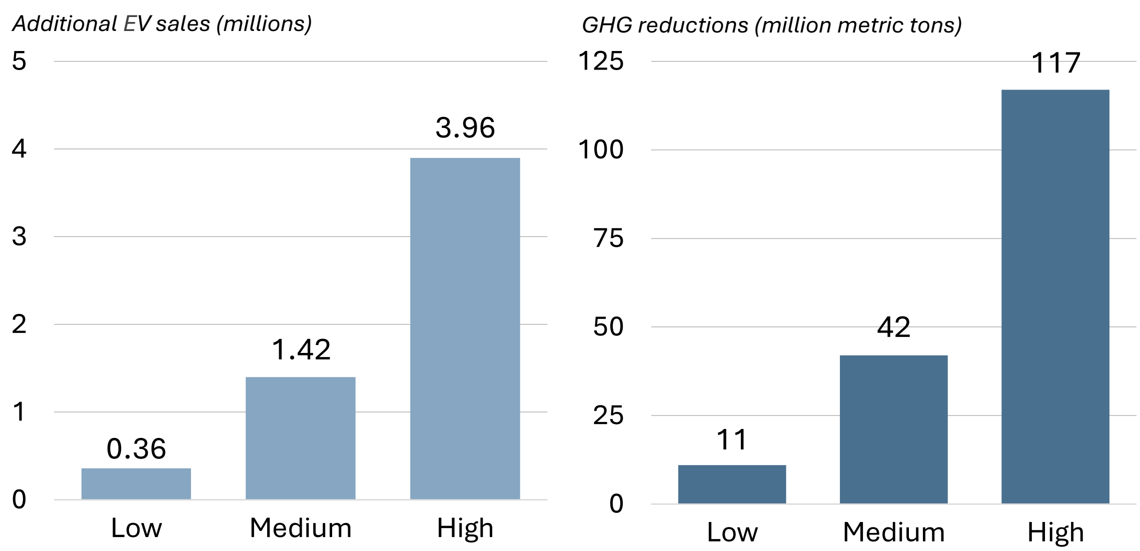
While limited, literature on EV direct-to-consumer sales demonstrates how the franchise dealer model impacts consumer choices and shapes EV adoption. Findings from the literature can be summarized in four main themes: 1) Consumers have poor EV buying experiences at dealerships, 2) dealers are incentivized to sell gas cars and trucks instead of EVs due to future service needs and the requirements of gasoline vehicles, 3) dealer franchise laws add costs for consumers, and 4) the direct-to-consumer sales model makes consumers and manufacturers better off.

While there is some available research on the impact of direct-to-consumer sales models on EV buying experiences, the impacts of direct-to-consumer sales laws on EV sales and greenhouse gas (GHG) emissions are understudied. This study examines a narrow policy case where the laws mandating vehicle sales through the dealer model are removed nationwide, but only for EV sales—gasoline vehicles must still be sold through dealerships. This policy approach selectively reduces EV prices relative to gasoline vehicles, causing an effective subsidy by eliminating dealer distribution costs for EVs. We estimate the additional EV sales and associated GHG emissions reductions attributable to this policy change.

We employed a simple integrated economic and emissions model to simulate the impact of a nationwide legalization of direct-to-consumer sales for EVs on sales and greenhouse gas emissions between 2023 and 2030. The tool estimates the vehicle price reduction associated with direct-to-consumer sales and then estimates how many additional EV sales might result from those price decreases. Those additional sales are then used to model emissions reductions attributable to the policy change.

We find that an EV-only direct-to-consumer sales policy could **potentially increase EV adoption between 2023 and 2030 by between 360,000 and 3.9 million units (1-13% increase)** with a medium case increase of about **1.4 million (5% increase)**. That translates to a **cumulative GHG reduction benefit between 11 and 117 million metric tons of CO_2e** with a medium case of 42 million metric tons.

Figure ES-1: Cumulative modeled EV sales and GHG reductions across main scenarios



Even small changes in individual model parameters interact with each other to produce larger, combined effects on results. This behavior explains the wide spread of forecasted outcomes between low and high scenarios. Individually, results are most sensitive to varying parameter estimates of the impact that direct-to-consumer sales will have on the cost of a vehicle previously sold through a dealer franchise and the effect of changes in vehicle price on the demand for vehicles.

It is unclear whether franchised automakers will be willing and able to set up direct-to-consumer sales channels. To test a scenario where franchised dealers do not commence direct sales operations, we simulate the effects of policy where only current EV-only manufacturers expand their sales and distribution footprint to currently prohibited states. Within our limited model of the vehicle market, this scenario yields 90 percent fewer EV sales and GHG emissions reductions than the medium case—about 129,000 additional sales and about 4 MMT CO_2e reduction in emissions.

While this research addresses the potential price impacts on the adoption of nationwide legalization of EV direct-to-consumer sales, there is a need for further research that addresses the broader, unmonetized impacts that dealer franchise laws might have on EV sales. Given the current contentious policy environment surrounding direct-to-consumer sales, empirical research that quantify what, if any, impacts dealership experiences have on EV sales is needed. In addition, better research on the impact of EV sales on dealer profitability would add to understanding of the long-term sustainability of the current dealer profit model in the face of rapid electrification. Furthermore, rigorous empirical study of potential efficiency gains and consumer benefits of direct-to-consumer automobile sales would not only improve this analysis but also contribute to the broader debate about dealer franchise law reform.

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Disclaimer

The analysis presented is that of the authors and does not necessarily reflect the views of the Electrification Coalition. While Atlas Public Policy appreciates the contributions of advisory panel members and their organizations, their review of this work does not imply any endorsement of this report's content or conclusions. Any mistakes or errors are solely attributable to the authors.

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Introduction

Dealer franchise laws that require new vehicles to be sold through third-party franchised dealerships have been revisited in the last decade as new electric-vehicle-only automakers have entered the market with the intent to sell their vehicles primarily, if not exclusively, through direct-to-consumer sales models. Franchise dealers and EV automakers (namely Tesla) have engaged in legislative and legal fights over the right to sell directly to customers. Advocates for legalized direct-to-consumer sales laws argue that franchised dealer laws may be impeding EV sales, reducing consumer choice, and hindering national energy security and environmental goals.

Advocacy groups have argued that dealers are not doing enough to support EV uptake. Sierra Club released *Rev Up Electric Vehicles – A Nationwide Study of the Electric Vehicle Shopping Experience* in 2019 which sent volunteers to dealers around the country to understand how dealers spoke about electric vehicles [1]. They argue that EVs were often not available to consumers and that dealers did not actively promote EVs. Tesla has argued that the business model for electric vehicles is different from that for dealers, undermining incentives for dealers to promote EVs [2]. Meanwhile, dealers have argued that direct-to-consumer sales will impact state revenue and jobs. The Connecticut Automotive Retailers Association commissioned a report in May 2021, *The Economic Significance of Connecticut Automotive Dealers,* arguing that direct-to-consumer sales in the state could eliminate tens of thousands of jobs by 2040 [3]. The National Automobile Dealers Association has also said it is “all-in on EVs” and that dealers are “absolutely essential to the widespread adoption of EVs” [4].

Existing research is limited to evaluations of consumer experiences at dealerships, inquiries into structural factors that might incentivize dealers to deprioritize or even discourage EV sales, legal critique of franchise dealer laws, and analyses of potential efficiency gains from direct-to-consumer vehicle sales. To date, there has been no research done to investigate the potential environmental impacts of dealer franchise law reform. This study contributes to this research by modeling the specific impact of a nationwide legalization of direct-to-consumer sales, limited to just electric vehicles (meaning that non-EVs must still be sold through franchised dealers). The analysis estimates the number of additional EV sales and associated environmental benefits that could be generated if EV prices decrease due to direct-to-consumer sales legalization.

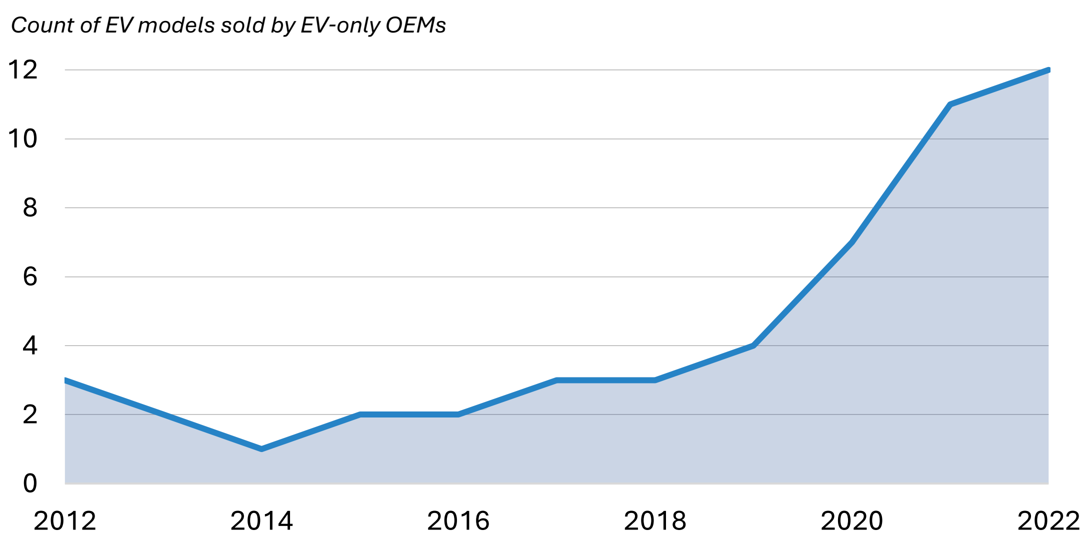
Auto sales models in the United States

New vehicles in the United States are almost exclusively sold by a franchised auto dealer that carries vehicles from a single manufacturer. The franchise dealer system has been in place since at least the 1920s when it was advantageous for automakers to outsource their retail operations to local businesses [5]. In the early days of the market when there were few automakers, dealers complained that the Big Three[1] automakers used their market power to force unfavorable terms on dealers. Some dealers accused manufacturers of forcing them to accept vehicles even if they could not be sold.

The Automobile Dealers' Day in Court Act of 1956 marked the beginning in a power shift to the dealers [6]. The Act allowed dealers to bring a federal suit against manufacturers for failing to comply with terms of a franchise agreement or terminating/not renewing a franchise agreement. In years since, dealers have won further protections at the state level [5]. States have passed laws including limiting the opening of new franchises in a range of existing dealerships, preventing dealers from having to accept vehicles from manufacturers, and importantly, prohibiting direct-to-consumer sales, meaning that vehicles may only be sold to consumers by dealers [7]. At the same time, the market fragmented with the entry of foreign competitors , reducing the influence of the Big Three.

New market entrants and direct-to-consumer sales

Figure 1: Number of EV Models sold by EV-only Manufacturers (2012-2022)

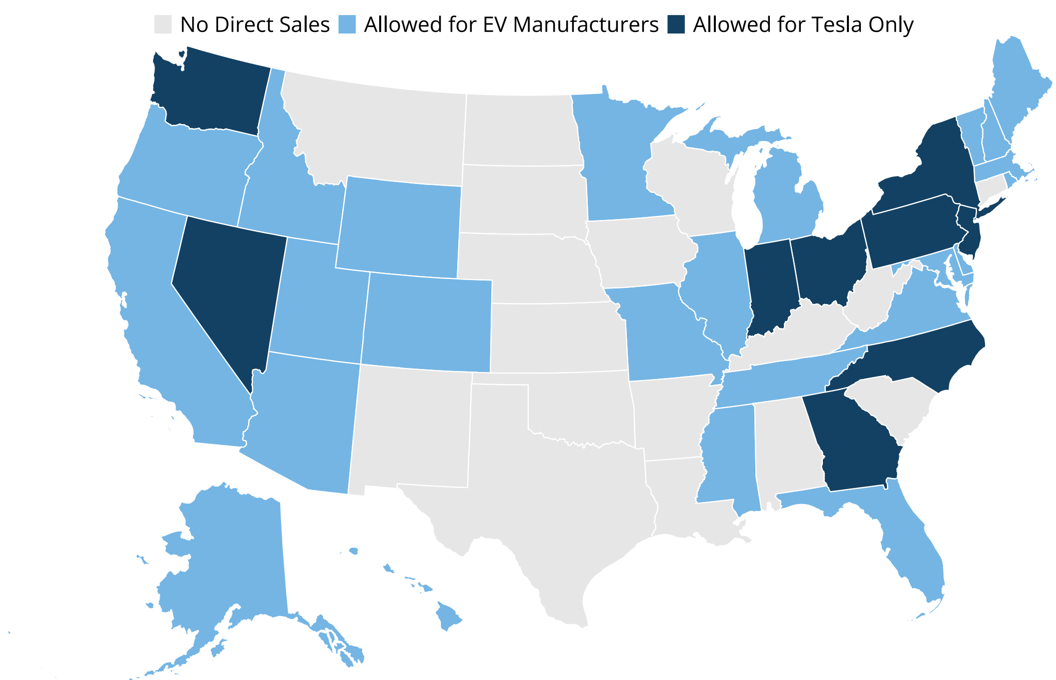


[1] Ford, Chrysler, and General Motors

As the EV transition has taken hold, many new companies have formed, challenging the status quo, both with a sole focus on building electric vehicles, and a strategy to sell directly to consumers. In the past decade, the number of distinct models available from these EV-only companies has increased substantially. As of 2022, twelve models are available from EV-only manufacturers (Figure 1). However, these manufacturers all face barriers to accessing markets in a broad swath of U.S. states.

Tesla Motors brought the debate over the direct sales of electric vehicles to the fore. In May 2008, the electric vehicle company opened its first store and sold vehicles directly to consumers rather than through a franchise dealer network [2]. As a result of a years-long, state-by-state push, Tesla has earned carve-outs for EV-only manufacturer direct-to-consumer sales across the country [8], [9]. These carve-outs have enabled the company to open a limited number of stores to sell directly to consumers. The company has been involved in public appeals, litigation, and lobbying to push back on restrictions on direct-to-consumer sales [9], [10].

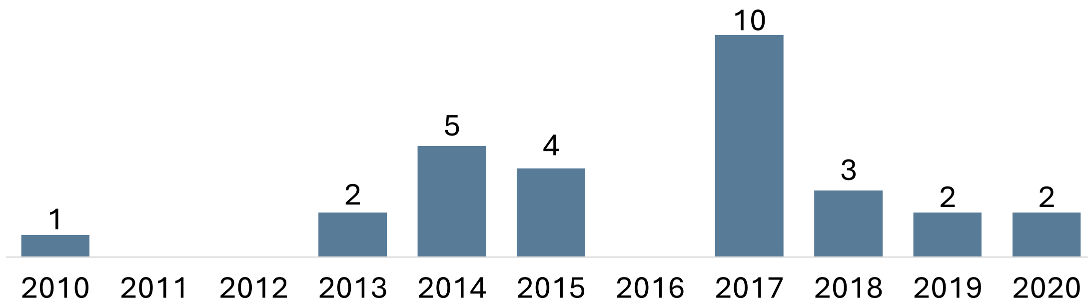
Figure 2: States that allow some form of EV direct-to-consumer sales



This map shows the states that allow some form of EV direct-to-consumer sales. The map differentiates between those states that only allow Tesla to sell directly and those that allow for any EV-only manufacturer to sell directly to consumers.

Source: Atlas EV Hub State Policy Dashboard

Figure 3: State-level implementations of direct-to-consumer sales policy by year (2010-2020)



Note: Four states implemented direct-to-consumer sales policies before 2010
Source: Atlas EV Hub State Policy Dashboard

Direct-to-consumer sales for EV-only automakers are allowed in 33 states, though nine of those allow for direct-to-consumer sales for Tesla only (Figure 2: States that allow some form of EV direct-to-consumer sales. In 2017, there was a flurry of activity during which direct-to-consumer sales for Tesla or EV-only manufacturers became legal in 10 states. These included states such as Arizona, where a judge ruled that Tesla could sell directly because it did not have any associated dealers with which it would compete. In the same year, Wyoming passed legislation that allowed manufacturers without a dealer in the state to sell directly to consumers (Figure 3).

Review of Literature

The literature on EV direct-to-consumer sales is limited. There is, however, some important research that helps demonstrate the ways in which the franchise dealer model impacts consumer choices and ultimately shapes the uptake of electric vehicles and any corresponding environmental impacts. The four main themes outlined in this literature review include:

1. Consumers have a poor EV buying experience at dealerships
2. Dealers have incentives to continue selling gasoline vehicles
3. Dealer franchise laws cost consumers
4. Direct-to-consumer sales models makes consumers and manufacturers better off

Poor EV buying experience at dealers

Cahill et al. (2014) noted the challenges California car buyers face accessing electric vehicles. [11] The working paper drew on buyer satisfaction survey data of more than 29,000 car owners, 43 interviews with dealers and automakers, and data on California EV buyers. Buyers were asked to rate their satisfaction with the facility, salesperson, deal negotiation, delivery, and overall customer experience. EV buyers rated their experience lower than gasoline vehicle buyers at dealers, but Tesla buyers, experiencing the direct-to-consumer sales model, rated their experience highest of all. The study found that "only 20 percent of PEV [plug-in electric vehicles] buyers stated they would *definitely* buy from the same make again, compared to 32 percent of conventional vehicle buyers." Buyers noted that dealers did not understand EVs.

Both Zarazua de Rubens et al. (2018) and Matthews et al. (2017) conducted consumer experience studies that used mystery shoppers to evaluate the EV buying experience at dealerships. [12], [13] Zarazua de Rubens analyzed 126 shopping experiences at 82 car dealerships across Denmark, Finland, Iceland, Norway, and Sweden, and Mathews investigated consumer experience at 24 dealerships in Ontario, Canada.

Zarazua de Rubens found that, most commonly, dealers were dismissive of EVs, misinformed the customer, and neglected to mention EVs. Moreover, 77 percent of the time, dealers that had EVs did not mention them to the prospective buyer. Like Zarazua de Rubens, Mathews et al. documented concerns about staff knowledge and misinformation, with 1-in-3 sales staff providing misinformation about EV rebates. In addition, half of the dealers in the Mathews study did not have an EV model during visits. While shoppers reported more positive interactions with sales staff than negative, one third of sales staff first attempted to sell the shopper a non-EV despite those shoppers' stated interest in buying an EV. In eight of the recorded shopping experience sales, staff continued to attempt to sell the shopper a hybrid or other non-EV despite shoppers' insistence that they wished to buy an EV.

Mathews et al. also surveyed their mystery shoppers after they had completed their shopping trips and asked them whether they would be interested in purchasing an EV. Results from that survey show the importance of dealers in helping customers make up their minds. A positive attitude as well as the availability of EVs onsite were the most crucial factors in influencing a prospective buyer.

Dealers have incentives to continue selling gasoline vehicles

The research points to the ways in which dealers are geared towards a certain business model, which is less compatible with electric vehicles. In a legal opinion on the history and function of the dealer franchise model, Stolze (2015) noted the Tesla claim that the business model is different for electric vehicles compared with gasoline or diesel vehicles, leading to less incentive for dealers to sell EVs. [2] Tesla cited several reasons including the fact that electric vehicles require very little maintenance (meaning the business model for sale by dealers is different). Tesla also notes the ways in which electric vehicle sales require consumer education and familiarization, which is "directly at odds" with the high-volume sales approach of the existing model for gasoline vehicles.

The centrality of maintenance to the business case for dealers was outlined in a case study by Saloner et al. (2000) [14]. Saloner et al. produced a business case on disintermediation in the auto industry amidst the rise in e-commerce. The authors note that the dealer business is not principally reliant on new vehicle sales, as finance, insurance, and parts/service made up 60 percent of the dealership's net income. Bodisch (2009), in a paper for the U.S. Department of Justice on direct-to-consumer sales, agrees with this finding, noting that in the mid-2000s dealers even suffered small losses on new vehicle sales but saw increasing service and parts profits in the same period. [7] The fact that electric vehicles require significantly less maintenance undermines the dealer model and so undermines any incentive for dealers to sell EVs, which may explain in part the poor experience of buyers documented above.

Zarazua de Rubens et al. provide evidence that dealers steered consumers away from EVs due to the lower revenue potential in EV sales. The authors argue that for dealers the EV is harder to sell but also critically that "EVs were seen to negatively affect dealer profitability" and that "EVs would lead to a decreased need for maintenance and other services and consequent reductions in dealer revenue." [12] The authors note that dealer sales models are in tension with the objective of selling more electric vehicles. Cahill et al. also find evidence to support this conclusion, pointing to challenges for dealers, for instance, the perception that they do not make as much money on electric vehicles compared with gasoline vehicles. Even if this is not necessarily true, dealers seem to expect that there were “few opportunities for back-end profit” [11] selling EVs.

Franchise laws cost consumers

Crane (2016) argues that dealer franchise laws amount to economic protectionism in his case study on Tesla, dealers, and direct-to-consumer sales [9]. Crane argues that Tesla’s entry into the auto market as a new player exposes the “capture and rent extraction” [2] [9] in the current system. As a result of political capture, there are higher prices for consumers, and new technologies and innovations are inhibited from entering the marketplace. Crane rebutted the most common talking points in defense of the dealer franchise model, including the idea of intra-brand price competition, arguing that the dealer model does not reduce prices for consumers as claimed. Instead, vertical integration resulting from direct-to-consumer sales would lead to lower prices for consumers as it eliminates “double marginalization.”[3] [9]

In a legal analysis, Stolze (2015) outlined the history of state-by-state decision-making to carve out Tesla direct-to-consumer sales exceptions [2]. Stolze expounded upon the tight relationship between dealers and state governments, noting that dealers “generate nearly 18 percent of all sales tax revenue.” [2] Stolze called the legal restrictions on direct-to-consumer sales an “anti-competitive mandate” that has led to both economic costs for consumers and not allowed for the e-commerce-linked disruption seen in other economies. Stolze argued that the Tesla complaints demonstrate a “perversion of the original intent and purpose” [2] of dealer franchise laws. Both Crane and Stolze explained the ways in which dealers rely on legal protections to control vehicle sales as well ways in which Tesla has and continues to challenge the status quo.

[2] Crane describes this process as “business interests can capture regulatory processes to generate economic rents at the expense of consumers.”

[3] Crane defines double marginalization as a process “in which each successive link in a vertical chain of firms with market power sets prices above marginal costs in a way that reduces the profits of the manufacturer and reduces consumer welfare.”

Direct-to-consumer sales model makes consumers and manufacturers better off

The literature on the economic efficiency of direct-to-consumer sales is limited. In a business case for Stanford Business School, Saloner et al. (2000) found that distribution costs make up around 30 percent of vehicle costs, half of which is attributable to dealers. [14] However, the case does not estimate how much of those costs could be eliminated in a direct-to-consumer sales channel. In an investment briefing for Goldman Sachs, Lapidus (2000) projected the impact of the internet on vehicle sales and anticipated the savings to manufacturers and consumers resulting from internet disruption [15]. Lapidus estimated that internet-driven efficiencies will reduce vehicle costs by 14 percent. Of that, direct-to-consumer sales account for about a four percent reduction in cost. In a more recent analysis, Hasenberg (2021) forecast a six-to-eight percent reduction in vehicle costs attributable to switching from a franchised dealer model to a centralized sales model where manufacturers sell directly to consumers and the dealer role is reduced to sales agent. [16]

Economic Effects of State Bans on Direct Manufacturer Sales to Car Buyers by Bodisch (2009) is one of the most cited papers in support of direct-to-consumer sales. The paper was prepared for the Antitrust Division at the U.S. Department of Justice. The author draws on case studies and cites the Saloner and the Lapidus analyses to demonstrate the significant cost increase dealers add. Bodisch argues that by removing bans on direct-to-consumer sales, automakers could reduce inventory and distribution costs. [7]

Lessons from the literature

Literature on vehicle direct-to-consumer sales and how it may impact EVs is limited. Studies and analyses are mostly older, not based on the U.S. market, or do not account for electric vehicles. EV-specific research has focused on customer experience at dealerships and dealer incentives to discourage EV sales. There is no empirical research on the impact of dealer franchise laws on EV adoption or environmental outcomes.

The research that exists however paints a portrait of dealers that do not actively promote electric vehicles in the selling process. There is evidence to suggest that this is in part the result of the business model for dealers, which relies on maintenance and servicing. Given that EVs do not have the same need for maintenance, this may explain the reluctance of dealers to promote EVs. The reader should note that the evidence of dealer reluctance is from very early in the market and thus conditions may change as the market matures.

Parallel research on the enforced franchise dealer model itself suggests that it is a form of political capture and rent extraction, meaning that dealer franchise laws are benefiting dealers at the expense of consumers. While limited, literature also provides estimates of the premium consumers pay because of the inefficiencies of the dealer franchise model.

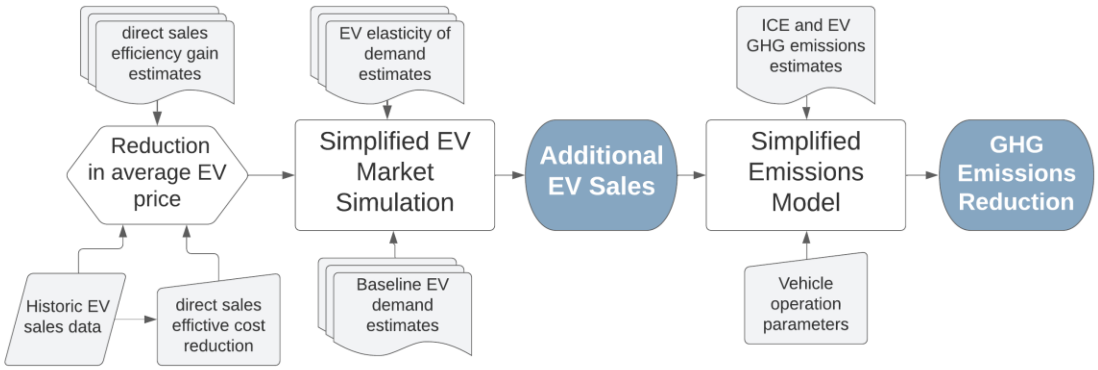
The potential impacts of EV direct-to-consumer sales

The literature on EVs and direct-to-consumer sales suggests that non-price impacts of the dealer model, such as vehicle availability and salesperson knowledge, impede EV sales. However, research on the numerical effect on EV sales is nonexistent. However, there is evidence that the legally mandated dealership model is needlessly inefficient, increasing costs for vehicle buyers. To provide an estimate of the GHG impacts of the relaxation of direct-to-consumer sales prohibitions, we examine a narrow case where the laws mandating distribution through the dealer model are removed (for franchised and non-franchised automakers alike). The reform is nationwide but only for EV sales—gasoline vehicle sales would still be required to be sold through dealerships. This policy approach leverages the status quo to selectively reduce EV prices relative to gasoline vehicles. In effect, EV buyers receive a subsidy because they are freed from the costly dealer sales requirements imposed on gasoline vehicles. We model the impacts of this implicit subsidy on GHG emissions between 2023 and 2030 by estimating how many additional EVs might be purchased under this policy and the associated GHG emissions reductions of those EV sales.

Modeling the effects of EV-only direct-to-consumer sales

We employed a simple integrated economic and emissions model to simulate the impact of EV-only direct-to-consumer sales on EV sales and greenhouse gas emissions between 2023 and 2030. The tool (which is outlined in Figure 4) estimates the cost reduction associated with legalized direct-to-consumer sales and then estimates the consumer response to reduced prices through additional EV sales. Additional EV sales are used as an input in an activity-based emissions model that compares GHG emissions between an EV and the gasoline vehicle it replaces. The difference between the sum of EV and gasoline vehicle emissions is output as the GHG emissions savings resultant from direct-to-consumer sales legalization. See Appendix A for a full description of the tool methodology.

Figure 4: Direct-to-consumer sales emissions projection tool process diagram



Key assumptions

The direct-to-consumer sales impact model relies on several strong assumptions about how automakers and dealers would respond to policy changes and how consumers respond to changes in price. These assumptions, related uncertainties, and potential impacts on results are described in Table 1.

Table 1: Key assumptions and uncertainties

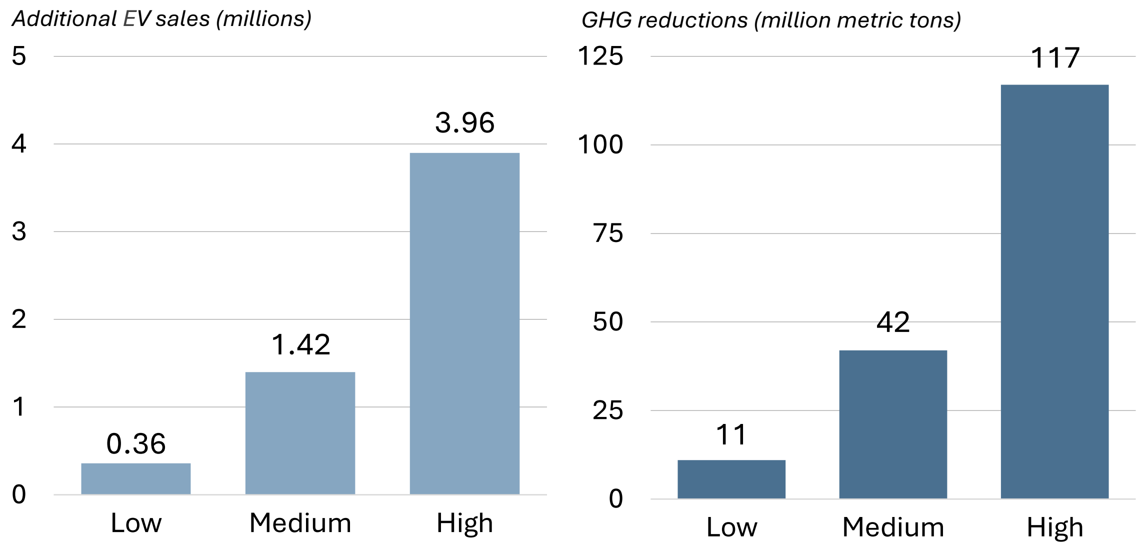
Assumption	Uncertainty	Impact on findings
Cost reductions result from direct-to-consumer sales model	Evidence for potential cost reductions resulting from direct-to-consumer sales are not empirically based. While studies suggest cost reductions are likely, significant uncertainty remains, especially about the potential magnitude of those cost reductions.	Price reductions are the key mechanism driving the model. If costs are not controlled relative to current dealership sales, policy impacts will be small.
All franchised automakers immediately develop direct-to-consumer sales channel for EVs	It is not a given that all automakers will be interested in developing a direct-to-consumer sales channel for their EV offerings, particularly in early years where EVs are a small portion of overall sales.	If some or all automakers with many EV offerings do not set up direct-to-consumer sales channels that yield price reductions for EVs, policy impacts could be significantly decreased.

Assumption	Uncertainty	Impact on findings
Cost savings from direct-to-consumer sales distribution are passed on to customers as price reductions	While available research suggests that cost reductions get passed on to consumers, that research did not consider an environment where direct-to-consumer sales only applied to EVs, nor did it anticipate the transitory supply shocks caused by impacts from the COVID-19 pandemic.	Price reductions are the key mechanism driving the model. If cost reductions are not passed on to consumers, policy impacts will be small.
Price elasticity estimates only hold under the assumption that all else remain equal.	There is no way to predict exactly how the vehicle market will respond to the selective removal of direct-to-consumer sales prohibitions for EV sales. Dealers facing new competition may find ways to reduce costs of selling gasoline vehicles or otherwise find new ways to compete with direct-sales automakers.	Reduced costs for substitute goods (gasoline vehicles) will change the relationship between price and demand for EVs, possibly reducing the impact of reduced EV prices.
Additional EV sales displace gasoline vehicles on a 1:1 basis	While most EV purchases are likely to displace gasoline vehicles, additional EV purchases induced by reduced prices might instead be an added vehicle that either displaces other mobility modes or causes additional driving.	In the unlikely event that a significant fraction of additional EVs do not directly displace gasoline vehicle use, GHG benefits could be reduced.

GHG reduction impacts of EV-only direct-to-consumer sales legalization

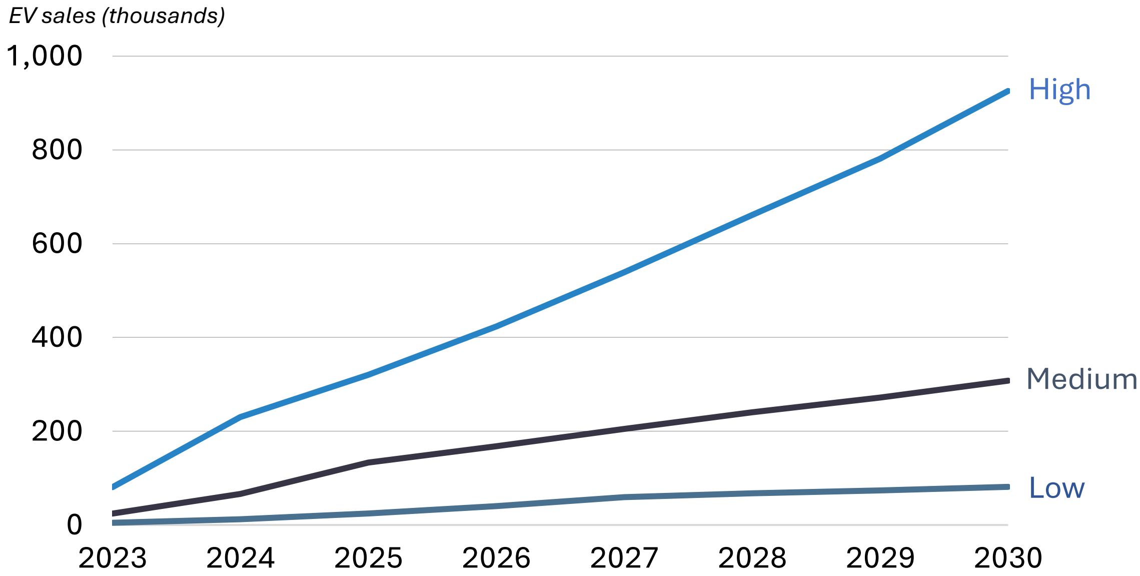
We find that EV-only direct-to-consumer sales policy could potentially increase EV adoption between 2023 and 2030 by between 360,000 and 3.9 million units (1-13% increase) with a medium case increase of about 1.4 million (5% increase) additional EV sales. That translates to a cumulative GHG reduction benefit between 11 and 117 million metric tons of CO_2e with a medium case of 42 million metric tons. Figure 5 shows the yearly impact of EV adoption resulting from direct-to-consumer sales legalization across the three main scenarios from 2023 to 2030.

Figure 5: Cumulative modeled EV sales and GHG reductions across main scenarios



The three main scenarios capture high, medium, and low cases of: 1) impact of direct-to-consumer sales channels on EV prices, 2) impact of prices on sales (price elasticity), 3) speed of adoption of direct-to-consumer sales channels by franchise automakers, and 4) growth of franchise automaker EV market share. In addition to our main scenarios, we run two separate *sensitivity* scenarios which capture the model's sensitivity to significant alternate assumptions on two key parameters: franchise automaker direct-to-consumer sales cost savings and baseline EV adoption rates. The two sensitivity analysis scenarios test: a) no impact of direct-to-consumer sales legality on franchise automakers' operations and b) an alternative baseline EV demand input.

Figure 6: Annual incremental EV sales across scenarios



High Case: This scenario employs upper-end estimates and assumptions across model parameters. This includes:

- The highest estimate of direct-to-consumer sales impacts on EV prices (eight percent) estimated by a Roland Berger analysis of agent-based sales models in Europe [16]
- The highest estimate of price elasticity (-3.2) in the literature, sourced from a study of low-income EV rebates in California [17]
- An aggressive target of full establishment of direct-to-consumer sales channels by the end of 2024
- A higher assumption (60%) of franchised automaker share of the EV market by 2030

In the high case, an **additional 3.9 million EVs** are sold between 2023 and 2030 resulting in a **117 million metric tons (MMT) carbon dioxide equivalent (CO_2e) reduction** in cumulative GHG emissions over the operating lives of additional EVs.

Medium Case: This scenario employs central and median estimates and assumptions across model parameters. This includes:

- The mid-case estimate of direct-to-consumer sales impacts on EV prices (6%)) estimated by a Roland Berger analysis of agent-based sales models in Europe [16]
- The median point estimate of price elasticity (-2.5) across cited literature (see Table in Appendix A)

- An aggressive target of full establishment of direct-to-consumer sales channels by the end of 2025
- A modest growth assumption (40%) of franchised automaker share of the EV market by 2030

In the medium case, an **additional 1.4 million EVs** are sold between 2023 and 2030 resulting in a **42 MMT CO_2e reduction** in cumulative GHG emissions over the operating lives of additional EVs.

Low Case: This scenario employs the lowest estimates and assumptions across model parameters. This includes:

- The estimate of direct-to-consumer sales impacts on EV prices (4%) estimated by a Goldman Sachs analysis of the impact of internet-based direct-to-consumer sales on manufacturer costs to deliver vehicles [15]
- The lowest point estimate of price elasticity (-0.817) across cited literature [18]
- A slow target of full establishment of direct-to-consumer sales channels by the end of 2027
- No growth assumption (30%) of franchised automaker share of the EV market by 2030

In the low case, an **additional 360,000 EVs** are sold between 2023 and 2030 resulting in a **11 MMT CO_2e reduction** in cumulative GHG emissions over the operating lives of additional EVs.

Sensitivity analysis

Because the model parameters interact with each other multiplicatively rather than additively, multiple higher parameter values compound to yield comparatively large differences in outcome between scenarios. Across the parameters varied in the three main scenarios, the model is most sensitive to estimates of the impact that direct-to-consumer sales will have on the cost of a vehicle previously sold through a dealer franchise. Because it acts as a multiplier on how price reduction translates to additional sales, the price elasticity parameter also has a large impact on model results. Of secondary importance is the assumption of what fraction of the EV market will be made up of franchised automakers. Because automakers that already sell through direct-to-consumer sales channels have little opportunity to gain efficiency with direct-to-consumer sales legalization, the market share parameter acts as a modifier on the average cost reduction across the EV market.

The parameter with the lowest impact across the range of values modeled is the lag on price reduction that represents the pace at which automakers can deploy direct-to-consumer sales channels. This parameter sets a target year at which franchised automakers will have fully deployed their direct-to-consumer sales programs and thus will be able to fully realize efficiency gains. Because this parameter acts earlier in the study period when demand for EVs is lower, it has a less pronounced impact on modeled outcomes.

Because there is considerable uncertainty around franchise automakers' capability and willingness to set up direct-to-consumer sales channels, and whether those sales channels would translate to savings to consumers, we ran a scenario in which franchise automaker customers do not realize savings from direct-to-consumer sales legalization. In this scenario, we model only the impact of apparent price reductions realized by automakers that follow a direct-sales-only model. For those automakers, additional efficiency gains are unlikely. However, because those automakers are prohibited from selling in many states, customers in prohibition states must import their vehicles from states where direct-to-consumer sales are legal. Removing that import cost creates an effective price reduction for those buyers, which is included in the model. Because the effective "discount" is much smaller in the case of direct-to-consumer sales automakers, this scenario yields 90 percent fewer EV sales and GHG emissions reductions—about 129,000 additional sales and about 4 MMT CO_2e reduction in emissions—compared to the medium case.

There is also significant uncertainty over the trajectory of baseline EV demand in the next decade. While our main scenarios use EV demand forecasts from the Energy Institute Energy Policy Simulator [19], we also consider the U.S. Energy Information Agency (EIA) EV demand forecast from the 2021 Annual Energy Outlook. [20] The EIA forecast has historically underestimated EV adoption and so serves as a much more conservative estimate of EV demand. Because the baseline demand for vehicles is considerably lower, this scenario results in 54 percent fewer sales and GHG emissions reductions—about 641,000 additional sales and a 19 MMT CO_2e reduction in emissions—compared to the medium case.

Conclusion

Nearly all new automobile sales are transacted through a franchised dealership, a system that is enshrined in state laws across the country. Consumer research conducted in this early part of the EV market demonstrates varying levels of dealer knowledge of and enthusiasm for selling EVs, though the consumer experience has generally been less than positive for EV buyers at franchised dealerships. On the other hand, EV buyers are much more satisfied purchasing their vehicle directly from manufacturers. Though these problems can be at least partially explained by general knowledge gaps, there is evidence that dealers may see the reduced maintenance requirements of EVs as a threat to their profitable service center business and therefore have an incentive to deprioritize EV sales. Unfortunately, there is no research that directly quantifies the impact of franchise dealer laws on EV sales.

While not necessarily directly related to EVs per-se, there is extensive literature examining the consumer impacts of dealer franchise laws. This research, mostly confined to legal scholarship, suggests that those laws are protecting dealer profits and business models at the expense of consumers. Two analyses have provided quantitative estimates of cost reductions that automakers might realize if they switched to a direct-to-consumer sales model.

We leverage those estimates of savings resulting from direct-to-consumer sales to analyze a narrow scenario of national direct-to-consumer sales legalization for EV sales only and estimate additional EV sales and resulting GHG emissions reductions. We model the cost reductions for EVs as an implicit subsidy, using estimates of price elasticity estimated in economics literature focused on EV incentive policy**. We find that a direct-to-consumer sales legalization policy applied to EVs nationwide could result in between 360,000 and 3.9 million (1-13%) additional EV sales by 2030 if the policy went into effect in 2023. Those additional EV sales would result in between 11 and 117 million metric tons of cumulative GHG reductions.**

Future research

While this research addresses the potential of a very narrow policy scenario of nationwide legalization of EV direct-to-consumer sales, there is a need for further research that addresses any of the broader and non-monetary impacts that dealer franchise laws might have on EV sales. There is a notable lack of empirical economic research that quantifies what, if any, impacts dealership experiences have on EV sales. Given the contentious policy environment brought on by conflicts between EV-only automakers and franchise dealers, additional evidence on the impacts of those laws would be an invaluable contribution to ongoing debate.

Furthermore, the analysis in this report is based on analyses of potential cost savings of direct-to-consumer sales which were sourced from consultant and investment advisory reports that do not share detail about methodology nor data sources underlying their findings. While rigorous empirical study of differing business practices is difficult given the proprietary and competitive nature of the topic, such research would not only make analyses such as ours more precise and reliable, but also contribute to the broader debate around reforms in franchise dealer laws.

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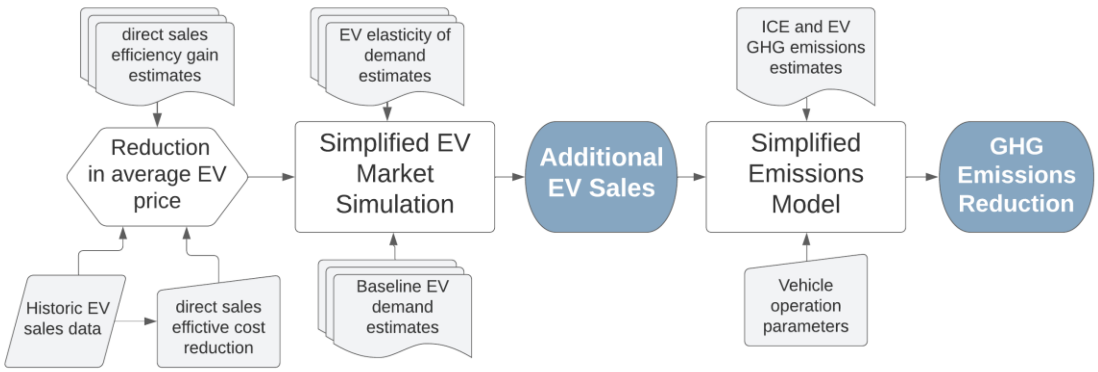
Appendix A: Direct-to-consumer sales tool methods

Figure A1-1: Model Process Diagram



Reduction in Average EV Price

In the first step, we estimate the market-wide average reduction in EV prices resulting from direct-to-consumer sales legalization. For existing franchised automakers, we take efficiency-related cost savings projected by prior studies [15], [16] as inputs for the expected savings. These savings are applied to all EV sales across the franchise automaker market share. Because franchised dealers will need to set up entirely new sales channels, there will be a lag between policy enactment and full cost savings. We represent this by scaling the discount linearly between 2023 and a target full implementation year. The pace at which automakers would be able to implement a direct-to-consumer sales channel is uncertain and so we assume different speeds and adjust this parameter in scenario analyses.

Automakers that already employ a direct-to-consumer sales model will not experience any efficiency gains from direct-to-consumer sales legalization. However, they will gain the ability to sell in states that currently do not allow for direct-to-consumer sales. In states where direct-to-consumer sales are prohibited, consumers must import vehicles sold by direct-to-consumer-only automakers in from other states, which adds incremental cost to those vehicles. With legalized direct-to-consumer sales, those costs are eliminated. To estimate savings for direct-to-consumer sales automaker vehicles, we multiply estimated average import cost by the share of new car sales that occur in non-direct-to-consumer sales states. This approximates the average cost reduction for direct-to-consumer sales automaker vehicles across the market.

Equation A1-1

$$discount_t = reduction_{ft} \times marketshare_{ft} + reduction_{dt} \times marketshare_{dt}$$

Where:

1. *discount*$_t$ = the market-wide average price reduction (percent) for EVs in time t
2. *reduction* = the cost reduction (percent) for franchise (f) and direct-to-consumer sales (d) automakers in time t
3. *marketshare* = the market share (percent) for franchise (f) and direct-to-consumer sales (d) automakers in time t

The market-wide cost reduction (Equation A1) is the average cost reduction across franchise and non-franchised automakers weighted by market share. Starting market share is defined by the sales split of franchised and non-franchised automaker sales in 2021 and then scaled linearly to a second market share input in 2030. Market share in 2030 is uncertain, so this input is varied for scenario analyses.

EV Market Simulation

We employ a simplified simulation of the EV market using the reduction in average EV price estimated in step one, along with estimates of the price elasticity of demand for EVs provided in the literature and estimates of baseline EV adoption between 2023 and 2030. The market simulation is described in Equation A1-2.

Equation A1-2

$$addsales_t = discount_t \times elasticity \times basedemand_t$$

Where:

1. *addsales*$_t$ = additional EV sales in time t
2. *discount*$_t$ = market-wide cost reduction in time t estimated in Equation A1
3. *elasticity* = the ratio between changes in price and changes in demand
4. *basedemand*$_t$ = baseline demand for EVs in year t

Price elasticity is a measure of the relationship between consumer demand and price. Elasticities are expressed as the ratio of percent change in price to the percent change in demand, where (all else equal) a decrease in price causes an increase in demand or vice versa. For example, if the price elasticity of demand for EVs is -2, then a five percent reduction in EV price would result in a ten percent increase in demand. If demand for EVs is

100 vehicles, then the price reduction would cause EV sales to increase by ten. Sources of price elasticity of demand used in the model are listed in Table.

Table A1-1: Price elasticity estimates from literature

Source	Estimate
Springel, Katalin. *Network Externality and Subsidy Structure in Two-Sided Markets: Evidence from Electric Vehicle Incentives*. American Economic Journal: Economic Policy, Forthcoming.	-1.5 to -2.1
Xing, Jianwei, Leard, Benjamin, and Li, Shanjun. *What Does an Electric Vehicle Replace?*. Journal of Environmental Economics and Management. 2021.	-2.751
Muehlegger, Erich and Rapson, David. *Subsidizing Mass Adoption of Electric Vehicle: Quasi-experimental Evidence from California*. Working Paper. 2019.	-3.3
Zhou, Yiyi and Li, Shanjun *Technology Adoption and Critical Mass: The Case of the U.S. Electric Vehicle Market*. The Journal of Industrial Economics. 2018.	-1.024
Li, Shanjun, Tong, Lang, Xing, Jianwei, and Zhou, Yiyi. *The Market for Electric Vehicles: Indirect Network Effects and Policy Impacts.* Journal of the Association of Environmental and Resource Economists. 2017	-0.817 to -1.378
Li, Jing. *Compatibility and Investment in the U.S. Electric Vehicle Market*. Working Paper. 2016.	-2.7

The market simulation relies on an externally defined forecast of baseline EV demand that represents the demand for EVs absent direct-to-consumer sales policy change. We use two different forecasts for EV demand between 2023 and 2030. The first is from the Energy Institute's Energy Policy Simulator [19] and the second is taken from the Energy Information Agency 2021 Annual Energy Outlook [20]. Baseline demand from 2023 to 2030 is shown in Table A1-2.

Table A1-2: Baseline EV demand (vehicle sales per year)

Year	Energy Policy Simulator	Annual Energy Outlook 2021
2023	1,660,430	174,914
2024	2,203,980	190,061
2025	2,857,600	202,791
2026	3,513,470	217,359
2027	4,158,150	233,334
2028	4,741,040	262,359

Year	Energy Policy Simulator	Annual Energy Outlook 2021
2029	5,201,650	297,181
2030	5,724,560	343,106

Emissions Model

We model emissions using a simple activity-based emissions model that takes lifecycle per-mile emission factor estimates generated by Argonne National Laboratory's GREET 2021 Model [21] for an average gasoline and electric vehicle and multiply those by average vehicle lifetime miles (172,500). The difference between the lifetime emissions of the gasoline vehicle and the lifetime emissions of an EV is the lifetime GHG savings coefficient of an additional EV. The emissions model is shown in Equation A1-3.

Equation A1-3

$$GHGsavings = \sum_{t=0}^{7} addsales \times 172{,}500(ICEfactor - EVfactor)$$

Where:

5. *GHGsavings* = cumulative lifetime GHG emission savings caused by direct-to-consumer sales policy
6. *addsales* = vector of additional EV sales from 2023-2030 estimated by Equation A1-2
7. *ICEfactor* = per-mile GHG emissions of a standard gasoline vehicle
8. *EVfactor* = per-mile GHG emissions of a standard electric vehicle

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