Evaluating the Effect of Electric Vehicle Incentives and other Factors on EV sales

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The market for electric vehicles (EVs) has been steadily growing around the world. Specifically in the United States, national EV sales have grown from around 30,000 units per quarter in 2017 to over 300,000 units per quarter in 2023[1]. Many factors play a role when a prospective vehicle buyer makes a decision to purchase an EV, and could thus explain the rapid growth of the EV market. These factors could include cost (or financial incentives), infrastructure for EVs, as well as other demographic variables. This study will focus on these factors to evaluate the effect of each on EV adoption. The original intention of this project was to evaluate the effects of the Inflation Reduction Act on electric vehicle sales. However, since the Act was only passed last year, high-quality data regarding different parameters of interest after the Act's passage (post-treatment) remain scarce. This situation which makes establishing a meaningful comparison before and after the treatment difficult. Taking this challenge into account, I used state subsidies instead of the IRA as representation for financial incentives.

I took advantage of monthly EV sales data provided by the Atlas EV Hub database, as well as the policy dashboard from xxx. Data are recorded in a quarterly basis from Q3 2016 to Q1 2023 and include statewide data from 50 states and the District of Columbia. Sales of battery electric vehicles (BEV) and plug-in hybrid vehicles (PHEV) are also coded separately, because we have reason to believe that prospective buyers for these two categories are different, and that they may exhibit different behaviors in response to the variables of interest. To evaluate the abovementioned factors, I used a generalized difference-in-difference framework in ordinary least squares (OLS) regression. This model accounts for the time each state subsidy program went into effect while also adjusting for fixed effects with respect to time and location (or inherent characteristics that do not change in these categories).

We find that, for BEV sales, the number of charging ports, partisan leaning of the state, population density, as well as income (in some cases) to be significant – see the figure to the right. For PHEV sales, we see even fewer significant variables, which shows that BEV and PHEV buyers do behave differently, and that the latter are motivated by a set of other factors that this model does not capture. Notably, we did not detect statistical significance in the subsidy variable in either case. This suggests that, all else being equal, state subsidies do not increase overall sales of electric vehicles. In other words, the number of sales that a state subsidy generates would nevertheless take place had there not been a subsidy, although the two groups of buyers are not necessarily the same. This should prompt policymakers to consider the role of subsidies: do they have the sole purpose of increasing EV adoption, or do they have other goals? For example, many states have increased subsidies for low-income households, or limit subsidy eligibility to a certain income level. While subsidies may not increase sales *per se*, they could still be valuable if they accomplish other goals, such as creating some level of equity in the EV market – these elements should be studied in greater detail in future research.

Regression Models for BEV Sales, Robust Standard Errors

	(1)	(2)	(3)	(4)
	bevsales	bevsales	bevsales	bevsales
energyprice	-102.9	-157.5	225.4	102.4
	(-0.51)	(-0.75)	(1.15)	(0.52)
fastport	10.10***	10.13***		
	(15.48)	(15.53)		
totport			2.107***	2.129***
			(14.41)	(14.54)
partylean	114.7***	116.9***	127.2***	132.5***
	(3.62)	(3.69)	(3.50)	(3.71)
incomek	-55.21	112.1	-181.4**	217.7
	(-0.85)	(1.02)	(-2.63)	(1.93)
incomesq		-1.013*		-2.441***
		(-2.23)		(-4.03)
popden	32.18***	36.14***	44.80***	54.62***
	(4.51)	(4.90)	(5.09)	(5.75)
treatedbev*bevsubsidy	-15.89	-16.10	40.70	45.27
	(-0.09)	(-0.09)	(0.18)	(0.20)
Constant	5092.3	-828.2	11668.2**	-2384.8
	(1.29)	(-0.16)	(2.85)	(-0.47)
N	1350	1350	1350	1350
Adjusted R^2	0.9552	0.9553	0.9509	0.9517
t statistics in parentheses				
Significance:	* p<0.05	** p<0.01	*** p<0.001	

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[1] Data retrieved from Atlas EV Hub with subscription. Source: https://www.atlasevhub.com/materials/automakers-dashboard/