Who's Driving the Shift to EVs?

By Nataniel Moreau

Introduction

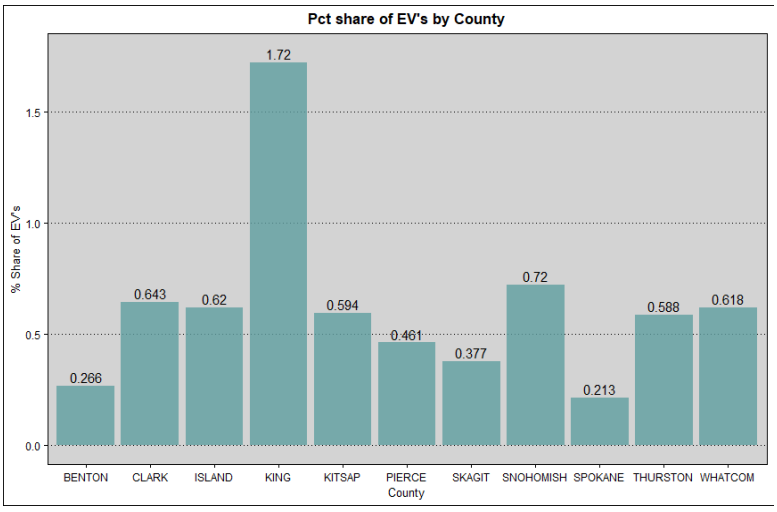
In the race against climate change, decreasing our independence on natural gas and oil production is a must. The transportation Industry is one of the most reliant on crude oil in the US; 69% of oil production goes towards transportation which accounts for 90% of its energy needs (EIA). While not a perfect solution, shifting from gas to electric-fueled transportation can help to stem the negative externalities created by the current age of transportation. In this blog, I will be looking at the use of EVs in Washington State. Particularly examining who is driving the shift to electric vehicles, both on the manufacturing and consumption sides. At no point in the blog is any kind of causality trying to be inferred. I will simply be examining the key characteristics in the distribution of EVs across counties and how they relate to each other.

Methods

My data came from two main sources, data.gov which level has data for every EV registered in the State of Washington as well as the Washington State Dep. of Licensing which has the aggregate data by county and vehicle type. To prepare the data for analysis, data was limited to only vehicles registered in Washington, and EV type was limited to only Battery Electric Vehicles as hybrids were not classified in the county-aggregate data. For the same reason, vehicles registered in 2022 have not been included. An indicator variable: party was added to record the political affiliation of each county in the State; party equals 1 if Democrats won a majority in that county for the 2020 presidential election. The other variables of interest to this post include descriptors about the EVs such as year, model, and manufacturer (make). The driving range and whether the car is eligible to be classified as a Clean Fuel Alternative vehicle will also be relevant. Manufacturers were limited to only those that have more than the median amount (260) of registered vehicles within the data set. The dataset is heavily skewed to the right with 2-3 manufacturers providing most of the vehicles. I still decided to include those above the median value as I felt a cutoff at the mean would be a little too restrictive. The point of the cutoff is to focus the analysis on the “real players” with a decent share of the market.

To answer the question of who is buying EVs and if they share anything in common, in my first equation I regressed the indicator for being in a Democratic County on the indicator for having a clean-alternative car (which can be thought of as a measure of the quality/efficiency of the car) and controlled for the max range of the vehicle. Given that the data only contains information on the car itself, there are few avenues to learn about the people who are buying the cars. Therefore, I am left to draw assumptions simply from the political leanings of the county where the car was purchased. This is some merit to this, as climate change has unfortunately become a political issue, so there could be something fundamentally different in the way people in different counties value EVs and their quality. In my second and third equations, I wanted to know how discriminatory people are in assessing the quality of the EVs they are buying, given that the market is dominated by a few key players. To examine this, I regressed the manufacturer on the measure for quality and compared this with the manufacturer's share of the market.

Analysis

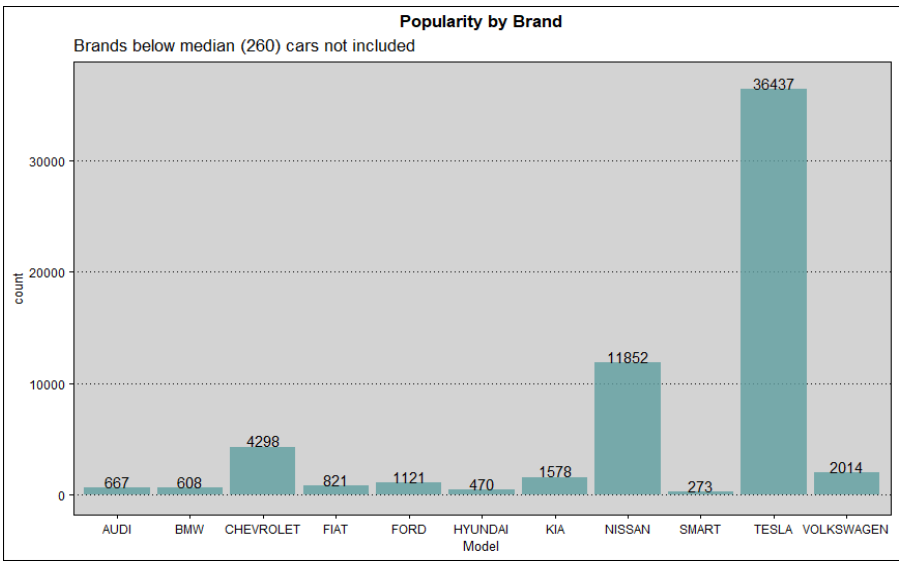


Firstly, I will look at the distribution of EVs across the State of Washington. Looking at Fig. 1, the first thing that stood out was how small the percentages of electric vehicles are, with the highest county only reaching 1.7% of all vehicles. This is a kind of depressing revelation but does make sense. Electric vehicles have only started gaining traction in the past few years. Every year new vehicles make up a small percentage of cars on the road, so it follows that there will be a delay as people wait for their current cars to break down. King County also happens to be the largest county as it includes Seattle, it is not hard to reason why a metropolitan area would have the largest concentration of EVs as cities are usually democratic. Only counties with more than 500 EVs were included, as the percentages for those counties were essentially 0.

	In democratic County
Eligible Clean Fuel Alter.	.035
Range	-0.000
Model.Year	.004
Constant	-6.262
	(13.084)
Observations	61,471
F Statistic	10.490^{***} (df = 3; 61467)
Notes:	$^{*}P < .05$
	$^{**}P < .01$
	$^{***}P < .001$

Turning now to my first regression, there are no significant differences in the types of EVs present in Democratic or Republican counties. While the coefficients are insignificant the directions of the effects are consistent with my thought process. Those adopting EVs are presumably the most environmentally friendly individuals, irrespective of their political affiliation. That being said, I would still expect the level of interest in a clean fuel alternative vehicle to be more prevalent in democratic counties; I find a 3.5pp increase in the chance of the vehicle being a clean alternative in democratic counties. It would follow that these clean-fuel cars are most likely newer models resulting in a positive Model.Year coefficient.

Moving on to the distribution of EVs across manufacturers, we can see in Fig. 3 that the market for EVs in Washington is not very competitive. Tesla sells 3x as many cars as its next closest competitor. While data on the owners of the vehicles is not available, Teslas are expensive cars, it follows that most owners of electric vehicles are towards the higher end of the income distribution. As for why Tesla's so popular, we must acknowledge that at least some part must be attributed to the social appeal of owning a Tesla as one of the first major brands. That is not to say that Tesla does not deserve to be among the most popular models; Tesla consistently manufactures cars with the longest ranges which is an extremely important factor while charging infrastructure remains inadequate through much of the US. My final regression looks at how different makes affect the probability of the EV being a clean alternative. While only the baseline prob of 70% for Tesla is significant, the F-stat does have three stars. It could be that the coefficients just explain too much of the same thing. That being said, ignoring significance for a second (blasphemy I know), among the top three producers of EVs Tesla has the lowest probability of being a "high" quality car. What this signals to me is that people do not care about the marginal differences in quality as much as they do presentation and notoriety. The SmartCar has an extremely small market share with only 270 vehicles, I still included it as it boasts a 100% clean alternative rate which just further goes to show that sustainability and efficiency are not the sole or primary motivators for obtaining an EV. This result also helps to explain the lack of significance in the first regression, as it's possible people don't care enough for there to be a difference across parties.



	Prob. Clean Fuel Alter.
Chevrolet	.246
SmartCar	.301
Nissan	.195
Tesla (c)	.699***
	(.002)
Observations	52,860
Residual Std. Error	.406 (df = 52856)
F Statistic	1,271.901*** (df = 3; 52856)
Notes:	*P < .05
	**P < .01
	***P < .001

Conclusion

In conclusion, I didn't find all the results I was expecting. Using robust SEs removed all significance from my estimates which was disappointing but not the end of the world. I still find the results to be informative concerning the rationale behind people's shift to EVs. It makes sense that the largest gains would come from moving oil fueled to EVs. Beyond that, it would

seem that consumers are not particularly concerned with the efficiency of their vehicles, but rather other amities like the ability to set a custom horn, which is admittedly cool. Despite that, I hope to see this change in the future. The production of EVs has its share of environmental problems and the more efficient we can get as a society and species, the better.

Sources:

"U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *U.S. Energy Facts Explained - Consumption and Production - U.S. Energy Information Administration (EIA)*, https://www.eia.gov/energyexplained/us-energy-facts/.

County level data: https://fortress.wa.gov/dol/vsd/vsdFeeDistribution/ReportList.aspx

Individual data: https://catalog.data.gov/dataset/electric-vehicle-population-data