

# PROJECT \_ EC

## CONTENT

- 
- 01 Questions
  - 02 Data sources
  - 03 Data exploration /cleanup
  - 04 Analysis process
  - 05 Conclusions
  - 06 Implications of findings
-

# Interesting questions

## WHICH STATE HAS A STEEPER TENDENCY OF HYBRID AND ELECTRIC CARS USAGE?

Is there a correlation between electric car buying and demographic characteristics of the population suchs as:

- education level
- mean income
- age?

Is there a correlation between electric car buying and political factors such as:

- fuel state tax
- political preference
- state incentives?

Is there a correlation between electric car buying and charging stations availability?

# Where did we find the data?

[www.census.gov](http://www.census.gov)  
**US Census**  
API / Datasets

[afdc.energy.gov](http://afdc.energy.gov)  
**US Department  
of Energy**  
API / Datasets

[www.eia.gov](http://www.eia.gov)  
**US Energy  
Information  
Administration**  
Datasets

[dataverse.harvard.edu](http://dataverse.harvard.edu)  
**Harvard  
Dataverse**  
Datasets

[igentax.com](http://igentax.com)  
**IGEN**  
Datasets

## DATA

- Data by age
- Education data
- Income data

- Cars registered by type
- Incentives per state (alternative vehicles)
- Charging stations per state

## EXPLORATION

- Historical gas price per region (US)

- Presidential elections results (1976-2020)

- Gas taxes by state

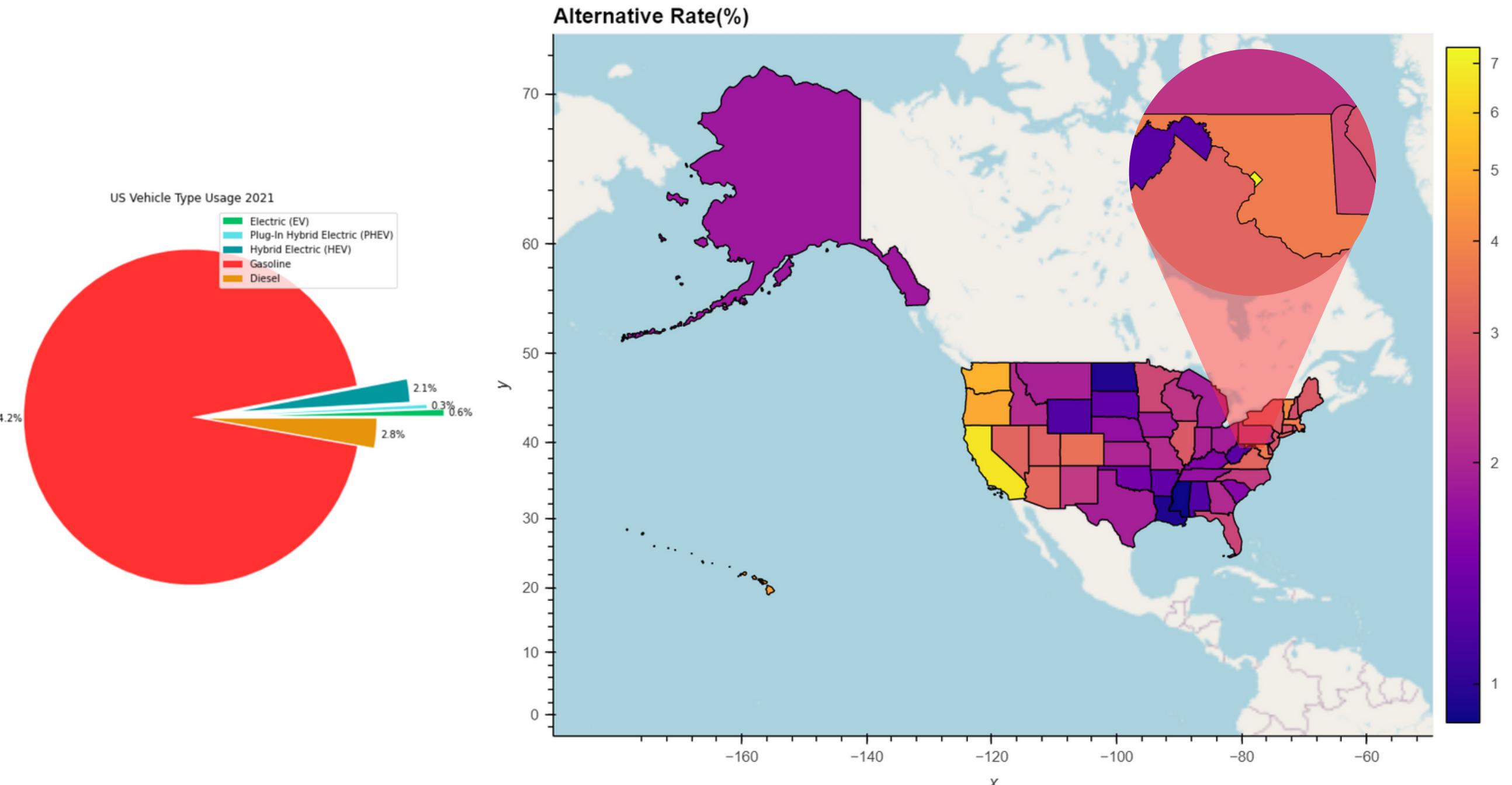
# Analysis

DATA FROM 2021  
VEHICLE TYPE  
OWNERSHIP PER STATE  
AND COMPARED IT TO:

- DEMOGRAPHIC
- POLITICAL
- AVAILABILITY FACTORS.

## WHAT ANALYSIS DID WE DO?

- Grouped Electric and Hybrid Electric vehicles into "Alternative vehicles"
- Grouped Diesel and Gasoline vehicles into "Fuel vehicles"
- Measured state proportion of Alternative vehicles over Total vehicles.



We will explore the correlation between this data and other factors

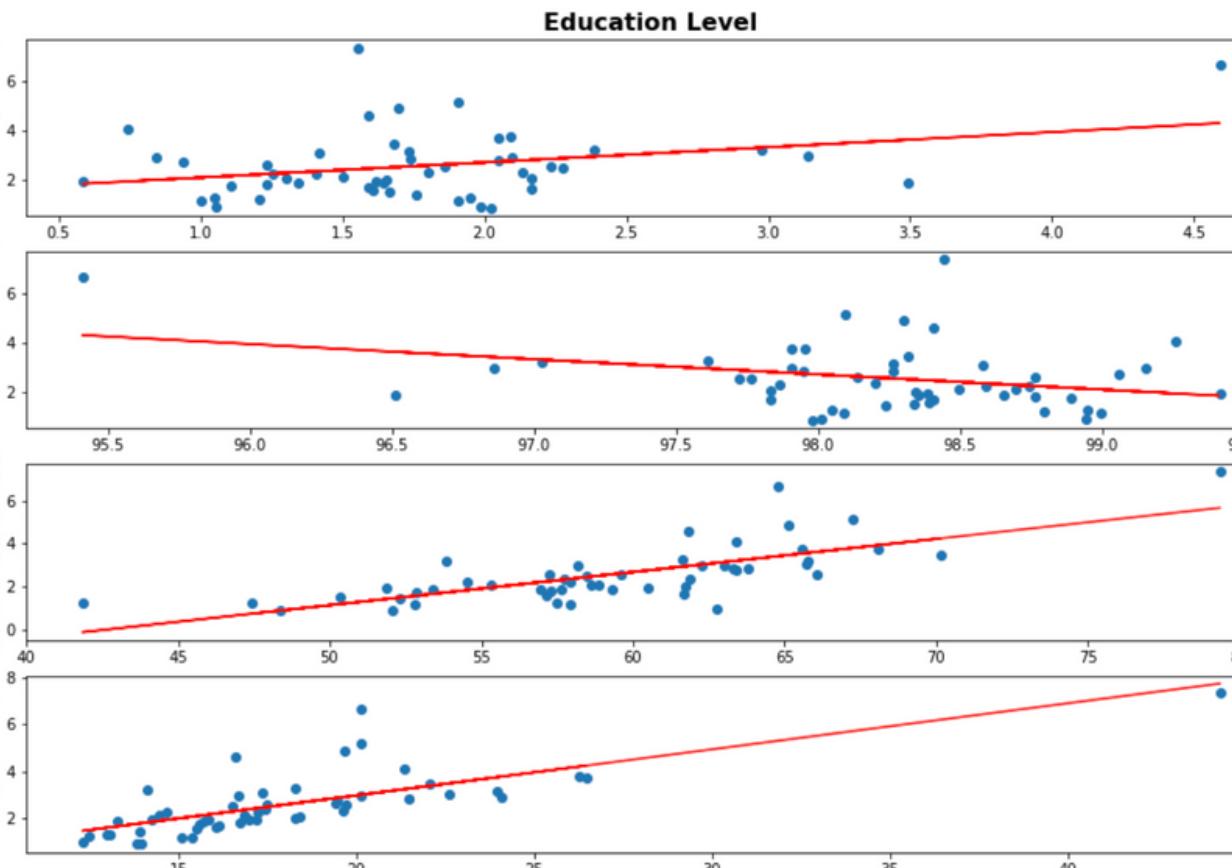
# Analysis

IS THERE A CORRELATION  
BETWEEN ELECTRIC CAR BUYING  
AND DEMOGRAPHIC  
CHARACTERISTICS OF THE  
POPULATION SUCHS AS:

- EDUCATION LEVEL
- MEAN INCOME
- AGE?

## WHAT ANALYSIS DID WE DO?

- Linear regressions
- Higher education level rates of states is **correlated** with electric car buying



## EDUCATION VS ALTERNATIVE VEHICLE USAGE (CORRELATIONS)

- Unfinished High School (%) 0.32  
High School (%) -0.32  
Grad School (%) 0.73  
Post-grad School (%) 0.74

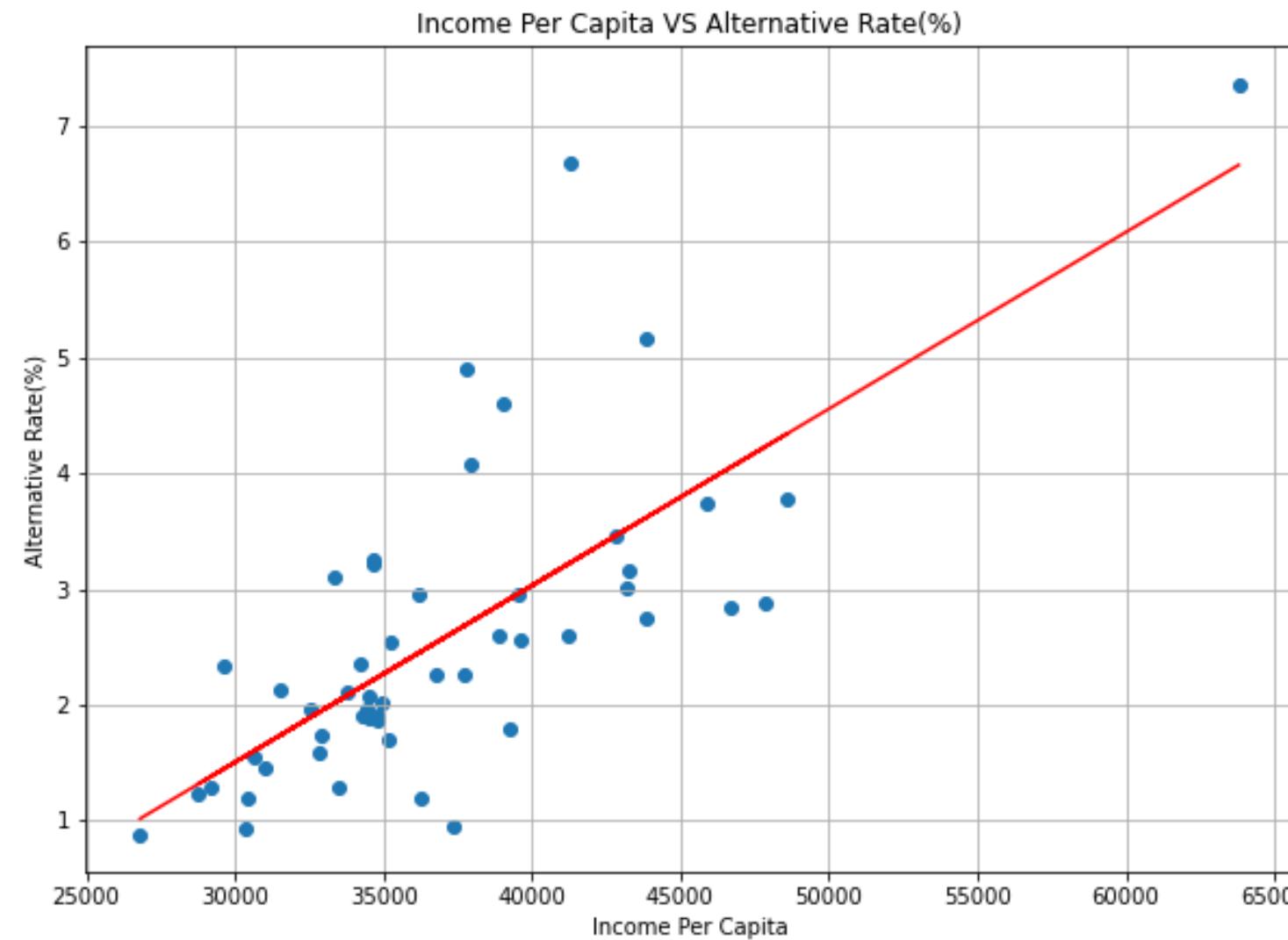
- States with higher rate of grad school and post-grad tend to have more % of Electric Cars

# WHAT ANALYSIS DID WE DO?

- Linear regressions
- ANOVA
- Income per capita of states **are correlated** with electric car buying:

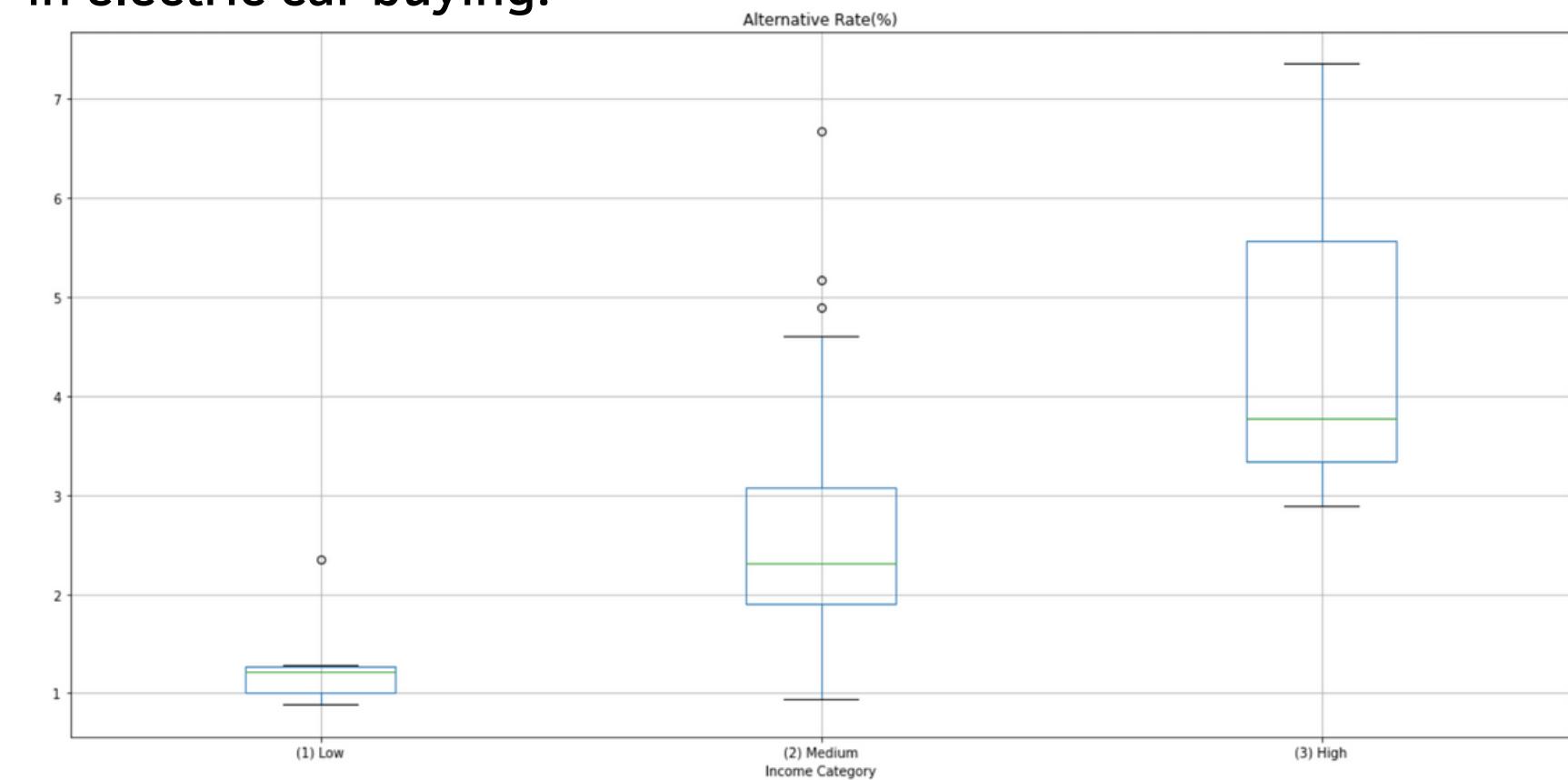
The correlation between Income per Capita and Alternative Rate (%) is .73 with a p-value of 1.580506370637526e-09

The r-squared value of the linear regression model is 0.53



## INCOME CATEGORY ANOVA

- 99.91% certainty that the different IpC groups **have an effect** in electric car buying.



p-value: 0.000920529748

- States with High income per capita tend to have more % of Electric Cars

# Analysis

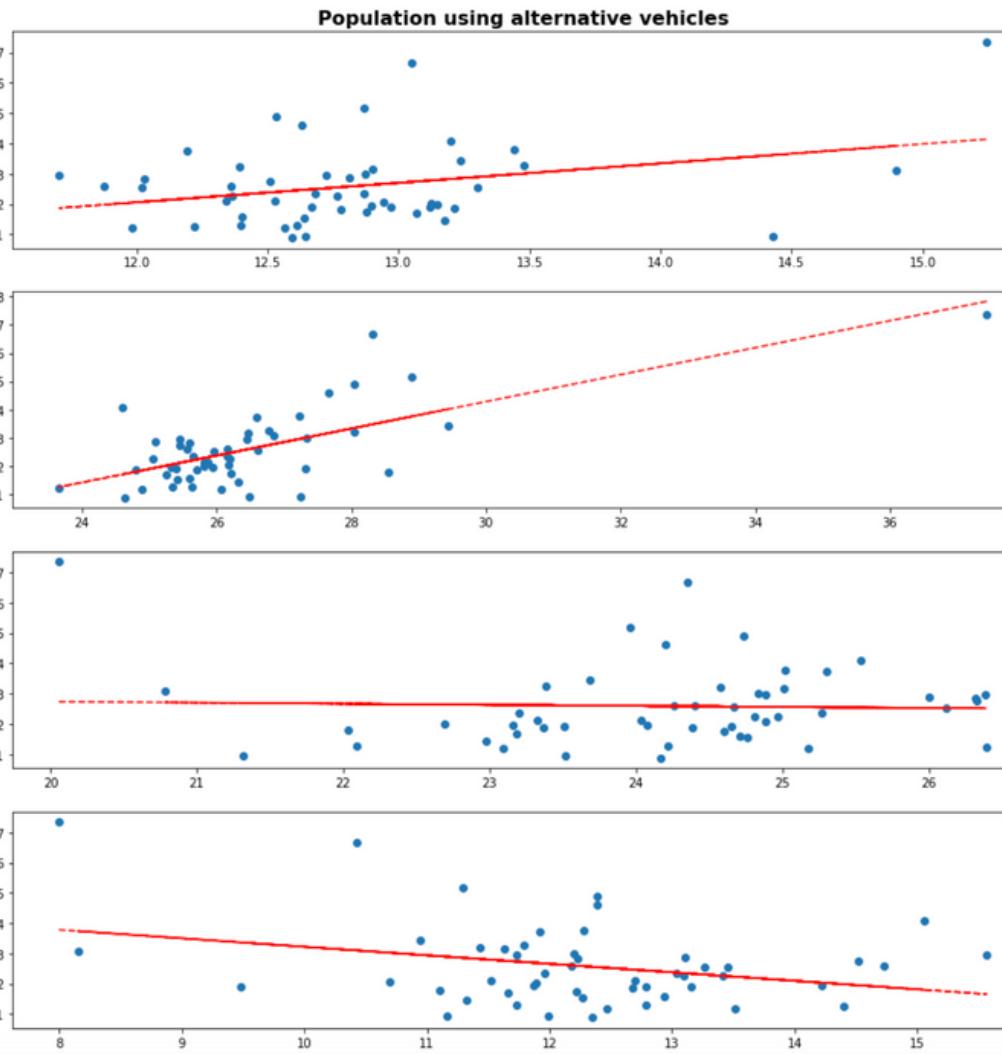
IS THERE A CORRELATION BETWEEN ELECTRIC CAR BUYING AND DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION SUCHS AS:

- EDUCATION LEVEL
- MEAN INCOME
- AGE?

## AGE GROUP VS ALTERNATIVE CARE USAGE (CORRELATION)

- Linear regression
- ANOVA

### RESULTS Age Group



$$21-30 == 0.31$$

$$31-50 == 0.69$$

$$51-70 == -0.04$$

$$71+ == -0.30$$

## LIMITATIONS

- Data limitations due to the privacy of dataset. There is no public data about who exactly is the owner of each car (no way to know the vehicle type by age). Though, we made a generalized analysis and had good findings despite the data limitations.
- ANOVA isn't exact due to the lack of data but there was 85% certainty of difference between the groups.

- Larger population between 31-50 years have a correlation to states buying more % of Electric Cars

# Analysis

IS THERE A CORRELATION  
BETWEEN ELECTRIC CAR BUYING  
AND POLITICAL FACTORS SUCHS  
AS:

- **FUEL STATE TAX**

- **POLITICAL PREFERENCE**

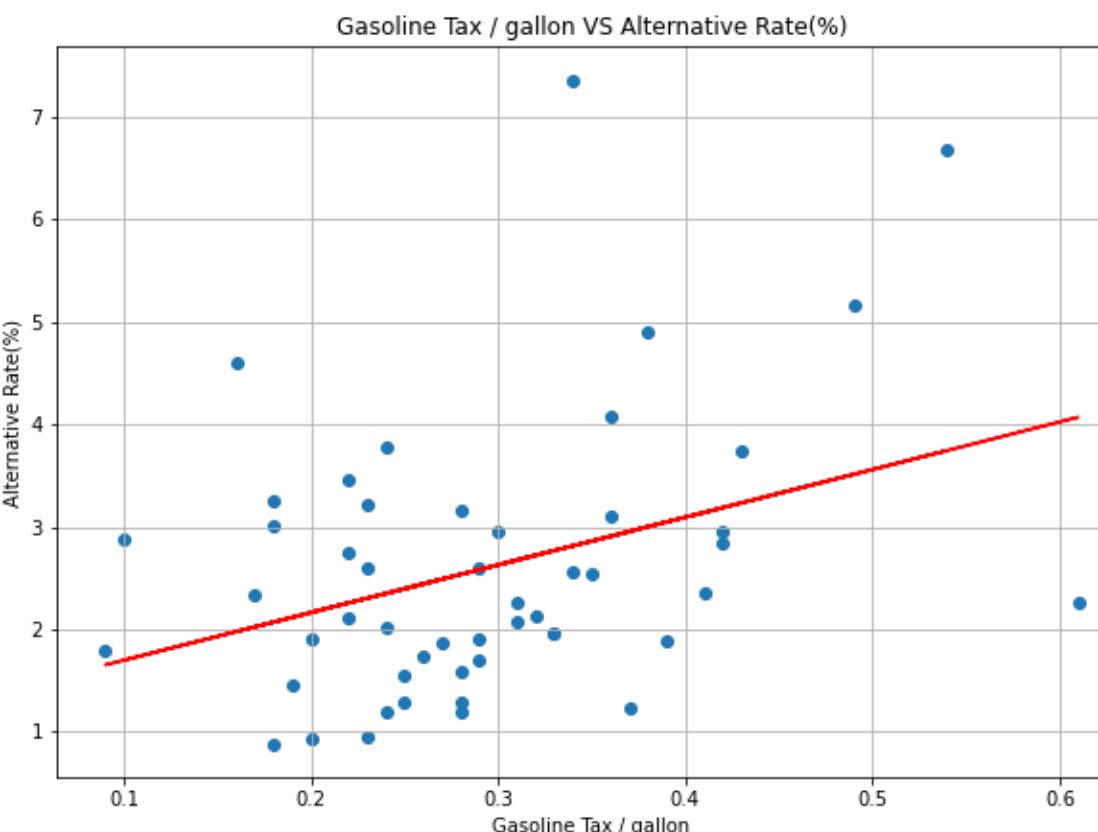
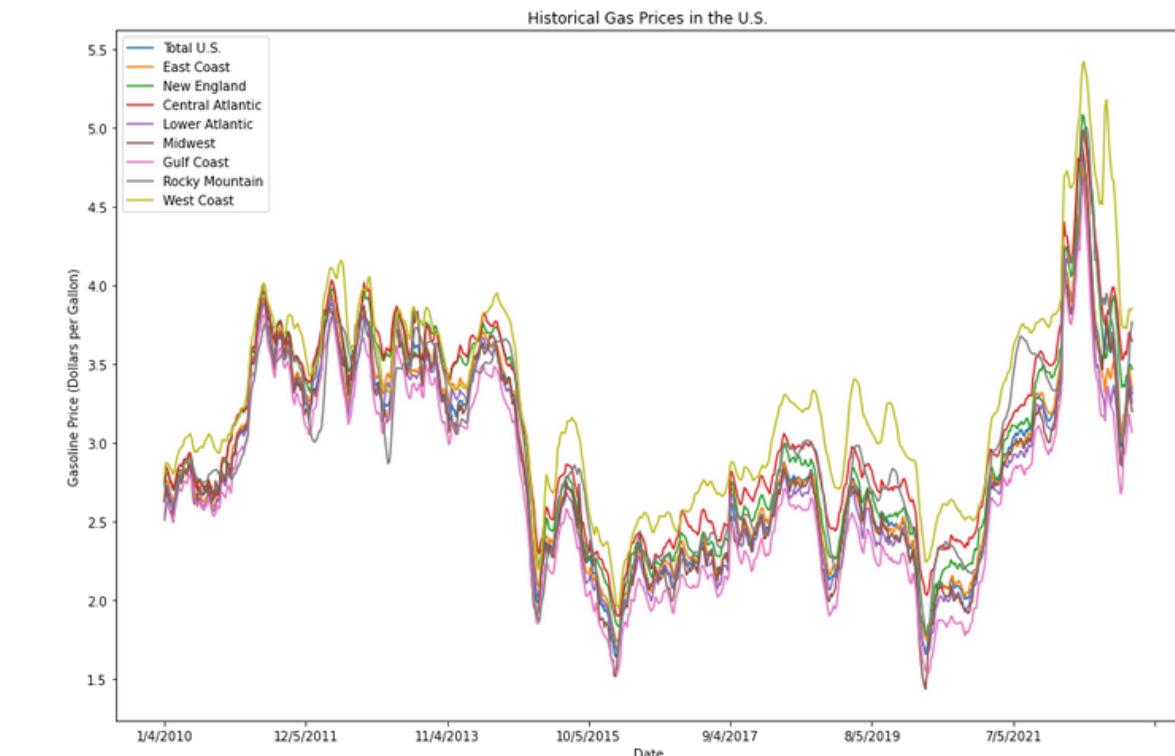
- **STATE INCENTIVES?**

## WHAT ANALYSIS DID WE DO?

- Linear regressions
- Constant upward trends on Gasoline Prices

## LIMITATIONS

- Data limitations due to the privacy of dataset. There is no public data about historical gasoline prices by state.



The correlation between Gasoline Tax / gallon and Alternative Rate(%) is 0.36 with a p-value of 0.01

The r-squared value of the linear regression model is 0.13

- States with higher fuel taxes **are not correlated** with a higher rate of car buying

# Analysis

IS THERE A CORRELATION  
BETWEEN ELECTRIC CAR BUYING  
AND POLITICAL FACTORS SUCHS  
AS:

- FUEL STATE TAX
- POLITICAL PREFERENCE
- STATE INCENTIVES?

## WHAT ANALYSIS DID WE DO?

- Linear regressions
- T-test

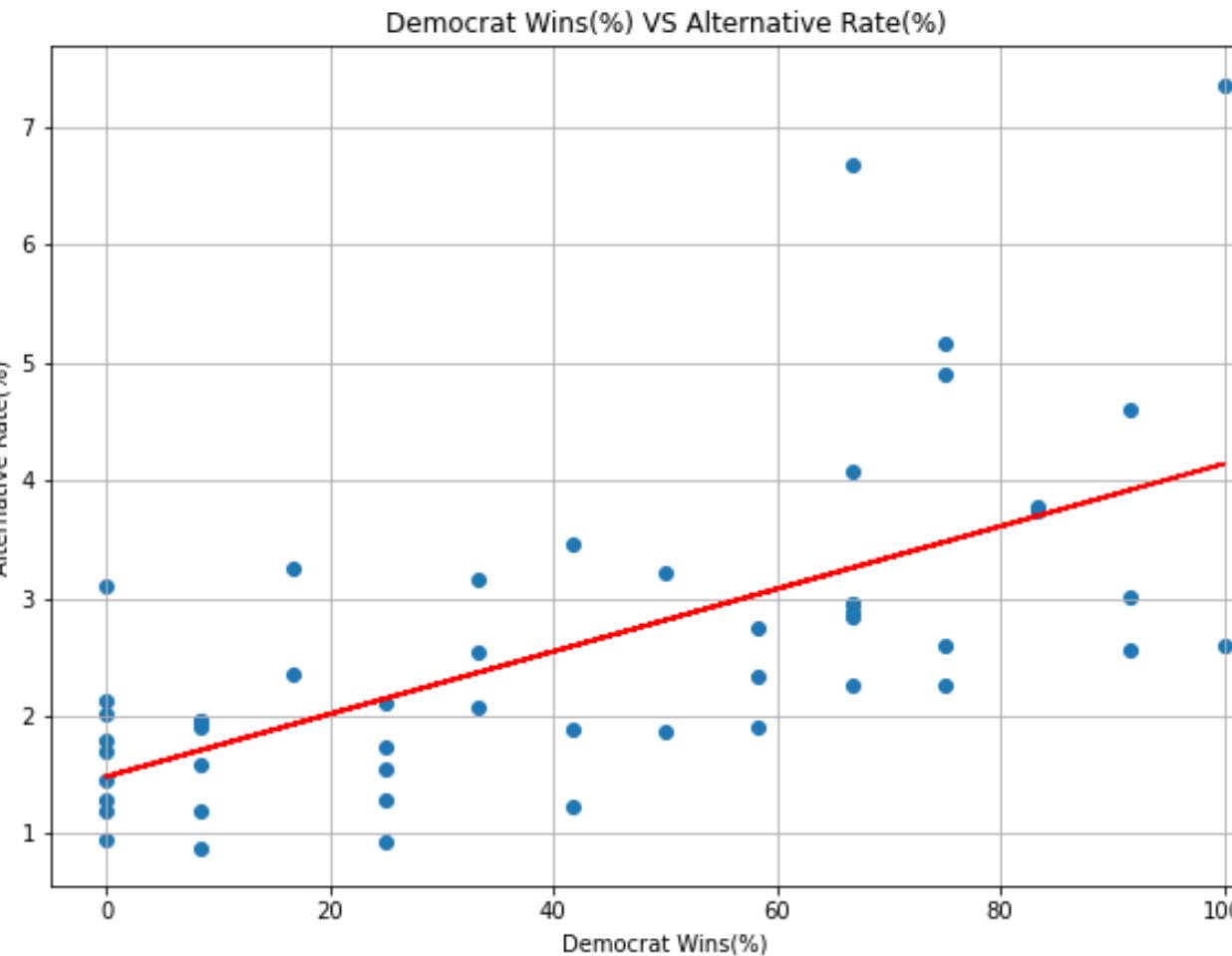
% Alternative rate means for Political Preference Samples:

Republican Sample: 1.84

Democrat Sample: 3.73

T-Test Result: (statistic=-5.036026493630137, pvalue=4.853783005218271e-05)

Alpha > p-value => Reject null hypothesis (The means are statistically different)



The correlation between Political Preference and Alternative Rate (%) is 0.64 with a p-value of 0.00

The r-squared value of the linear regression model is 0.41

- States with Democrat preferences tend to have more % of Electric Cars

# Analysis

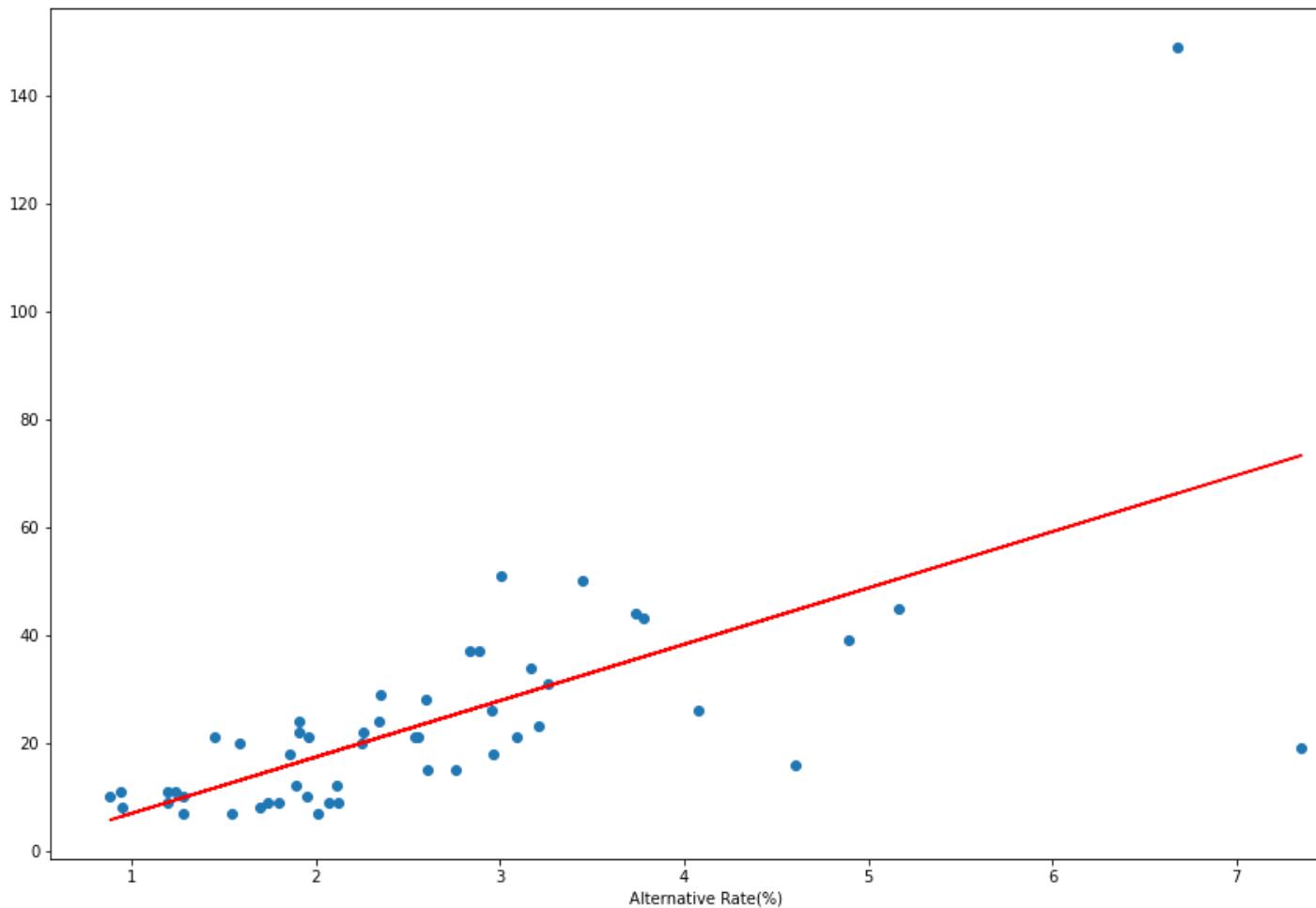
IS THERE A CORRELATION  
BETWEEN ELECTRIC CAR BUYING  
AND POLITICAL FACTORS SUCHS  
AS:

- FUEL STATE TAX
- POLITICAL PREFERENCE
- STATE INCENTIVES?

## WHAT ANALYSIS DID WE DO?

- Linear regressions
- STATE INCENTIVES of states **are correlated** with electric car buying:

The correlation between Alternative Rate(%) and Total incentives is 0.65 with a p-value of 0.00  
The r-squared value of the linear regression model is 0.42



- States with higher levels of incentives tend to have more % of Electric Cars

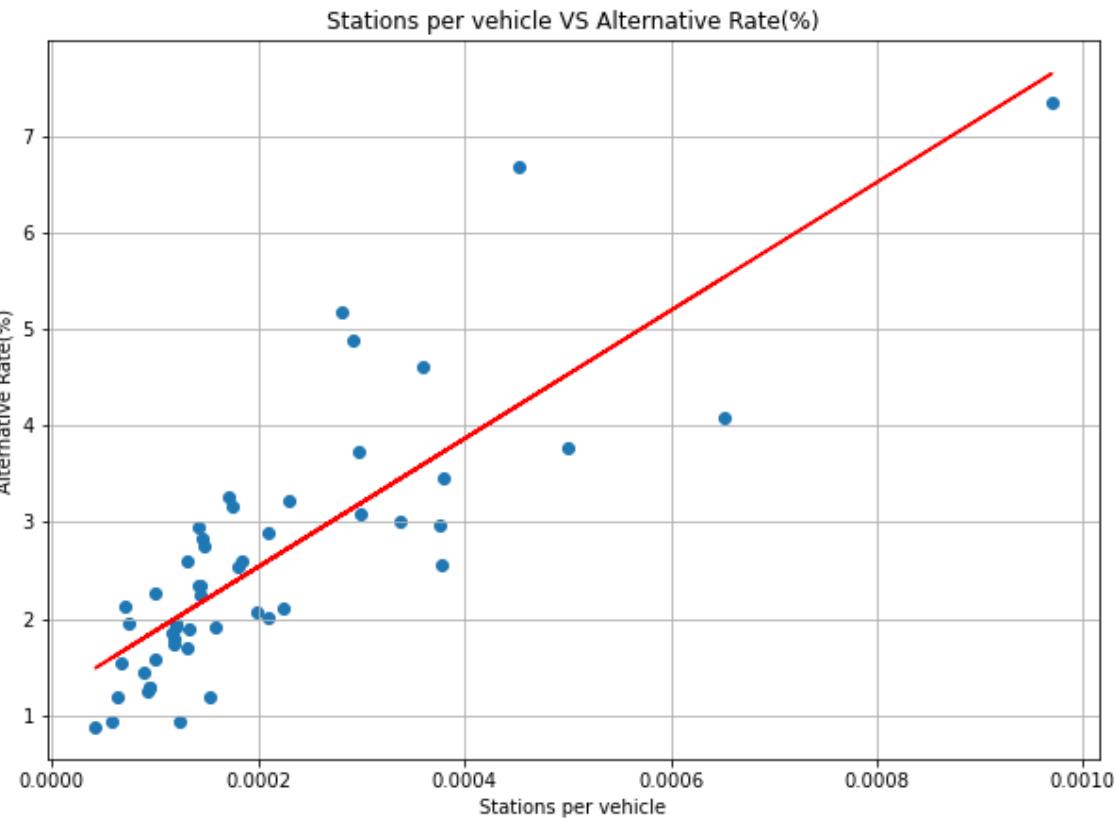
# Analysis

IS THERE A CORRELATION  
BETWEEN CHARGING STATIONS  
AVAILABILITY AND CAR  
PREFERENCE?

Business items

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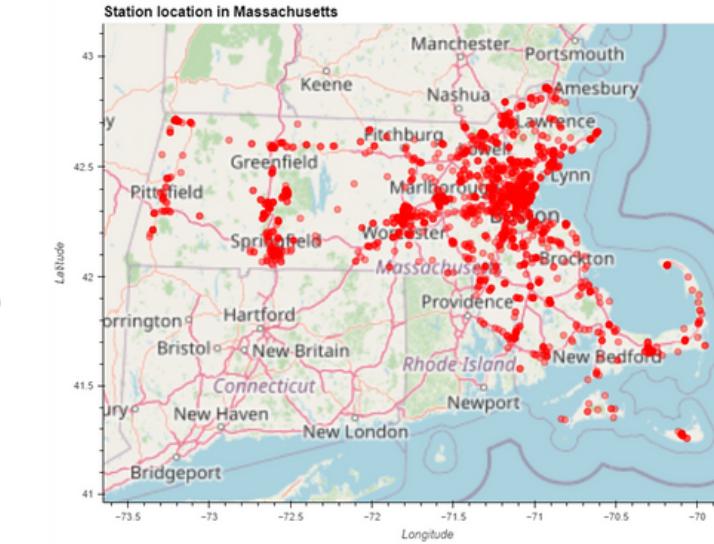
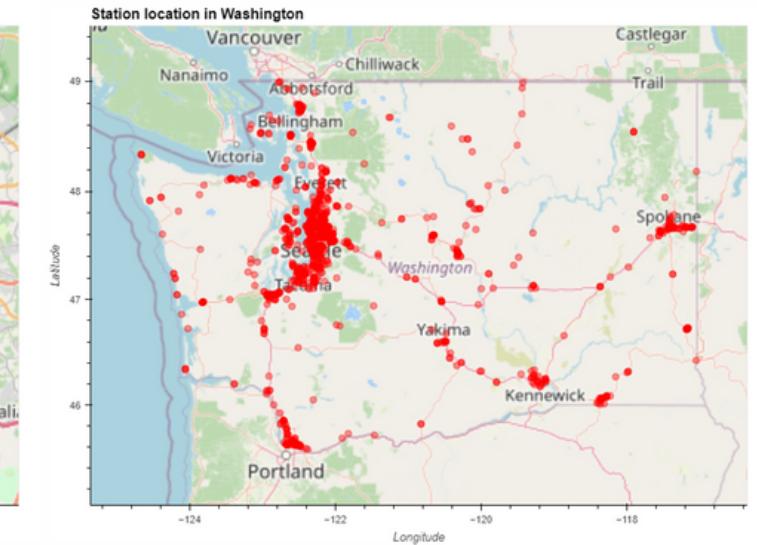
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## WHAT ANALYSIS DID WE DO?

- Obtained geographic data of charging stations across the US
- Linear regression
- Map display (all states available)
- Charging stations over total vehicles in a state are correlated with electric car buying:

The correlation between Stations per vehicle and Alternative Rate(%) is 0.82 with a p-value of 1.716e-13

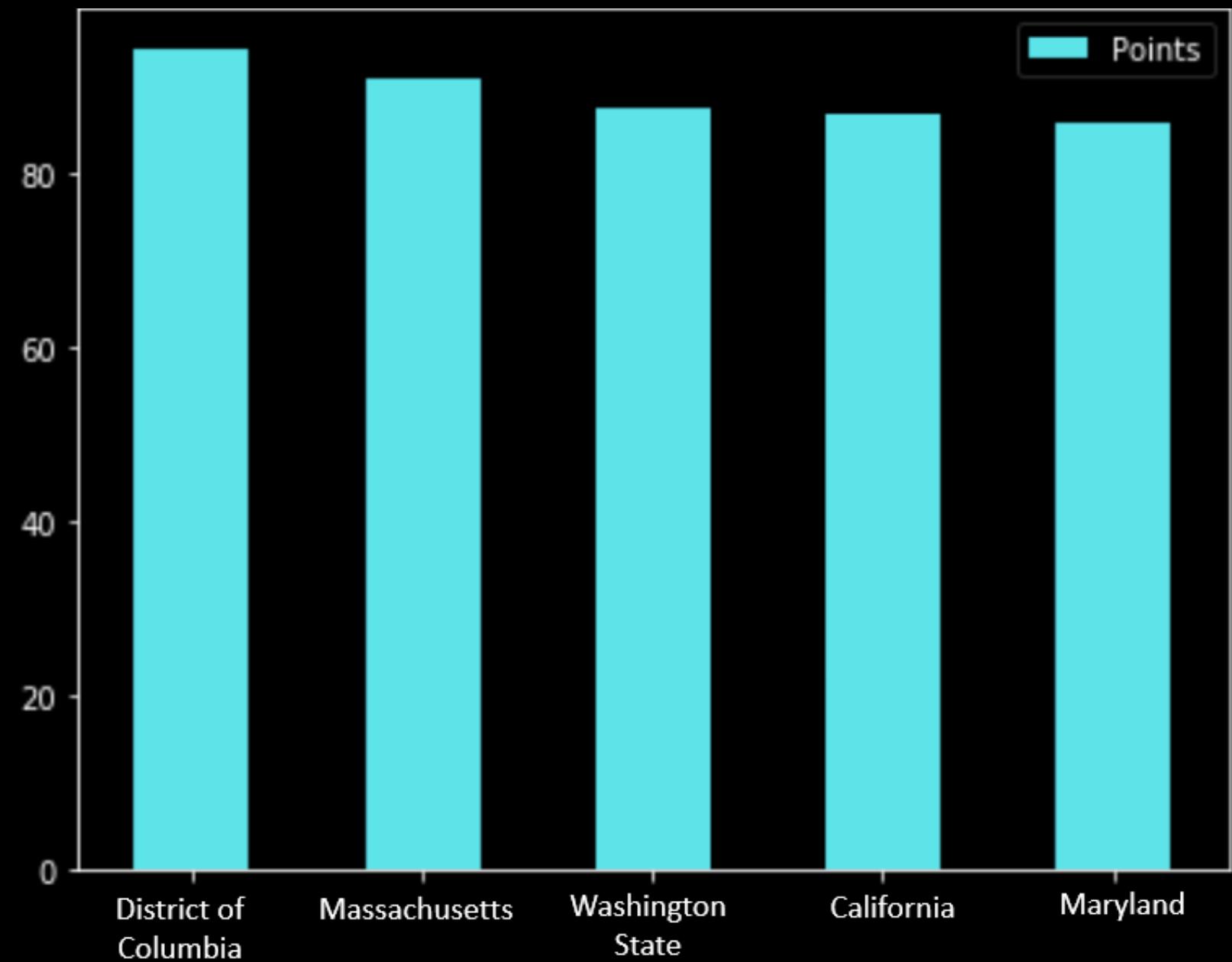


- States with more availability of stations tend to have more % of Electric Cars

# CONCLUSIONS

Using the found correlations,  
we weighted an average to rate  
the states (100 points max)

Correlation	
Highest Alternative Rate(%)	1.000000
Grad School finished(%)	0.734000
Post-Grad School finished(%)	0.742000
Highest income per capita	0.727000
Highest population in the range 31-50	0.694000
Most Incentives	0.647169
Charging stations per vehicle	0.820519
Political affiliation	0.640722



Which state has a steeper tendency of hybrid and electric car usage?  
**DC, Massachusetts and Washington**



**Thank you!**