# Module\_7\_Project

Project Title:

Socioeconomic impact on EV Market Penetration in Australia

Hypothesis to be tested:

We are testing if education, income or both play a major factor in the willingness of Australian's to purchase and own electric vehicles, moving away from petrol/diesel cars.

Data acquisition:

The majority of data used in this project was acquired from the ABS website, using their new table builder interface. Income and education data were taken from the “2021 Census – employment, income and education” database, and were manually formatted to provide data split by postcode.

Vehicle Fuel type data was also obtained using the same method, from the vehicle statistics database.

Data cleaning process:

Once data was received exported in CSV’ format, some minor manual cleaning was done to remove redundant information and to ensure it was formatted in a way that would be compatible with the pandas library for python. This involved removing additional government information from the top and bottom of the csv, and having data formatted with simple headers for columns. Rows containing additional data for “totals” which didn’t reflect any individual postcode, but a count of postcodes, for example were also removed.

Data preparation:

* CSV data was imported into a jupyter notebook as pandas dataframes, and functions were created for cleaning headers into a consistent format

def clean\_headers(df):

    df.columns = df.columns.str.replace(" ", "\_")

    return df

def reshape\_df(df):

    return df.pivot\_table(index = ['Vehicle\_type', 'Postcode'],

                          columns = 'Fuel\_type',

                          values = 'Count').reset\_index().rename\_axis(None, axis=1)

* The Education, and Income dataframes were merged with Fuel type information on Postcode.
* CSV data was obtained from MatthewProctor.com regarding the classification of postcodes on a basis of Rural and Metro, so that rural postcodes can be analysed separately if needed. This is also due to the fact that a large number of rural postcodes have so few datapoints, that they have a tendency to produce misleading results when interpreting the data.
* In order to make a fair comparison between postcodes with vastly different populations, income, duration and fuel type data, where converted into percentages of the total number of residents.
* The data for both income and education comes from the ABS split into multiple different bins, so in order to rank suburbs based on Education and Income, rather than just taking the highest percentage in the highest bracket which would provide potentially misleading conclusions, each bracket was given a weighting, and the percentages of residents in each bin were multiplied by these weightings. Once done the sum of the weighted Education and Income data were added together to provide an Income and Education “score” for each postcode.
* These scores were then graphed along side the percentage of electric vehicles located in a given postcode, to see if there are any correlations to support our hypothesis.

Income analysis:

Analysing income data for all postcodes (rural and metro) produced an r-value of 0.06, showing little if any correlation at all. Rural and metro data were then analysed separately for suburbs with over 5000 vehicles, in order to remove small postcodes with very little data, which was found to skew the data due to many values having 0 EV’s present. Doing this yielded a correlation oof 0.23 and 0.2 for metro and rural respectively, suggesting that although slightly correlated, income doesn’t appear to be a major factor in peoples willingness to purchase electric vehicles as opposed to petrol or diesel.

Chart, scatter chart

Description automatically generated

Figure : Scatter plot showing calculated income score on the x axis, plotted with the percentage of Electric vehicles out of total vehicles in each postcode for Metro area.

Chart, scatter chart

Description automatically generated

Figure : Scatter plot showing calculated income score on the x axis, plotted with the percentage of Electric vehicles out of total vehicles in each postcode for Metro area.

Education analysis:

Analysing the income of postcodes, produced a correlation of 0.27 when looking at all postcodes, however, like with income, many values were plotting along 0% on the y axis, due to the number of small postcodes with very few total vehicles which generally had no EV’s at all. Once data was filtered for postcodes with >5000 vehicles, metro areas showed a correlation of 0.63, and 0.67 for rural. Interestingly this seems to suggest that the overall education of a given area seems to be quite a good predictor for peoples willingness to purchase an EV.

Chart, scatter chart

Description automatically generated

Figure : Scatter plot showing education score on the x axis, plotted with the percentage of Electric vehicles out of total vehicles in each postcode for Metro area.

Chart, scatter chart

Description automatically generated

Figure : Scatter plot showing calculated education score on the x axis, plotted with the percentage of Electric vehicles out of total vehicles in each postcode for Metro area.

Notes:

It is also important to note that when filtering for >5000 vehicles, it is likely that due to a relatively high population density, these areas may also have more infrastructure in place such as charging stations and EV dealerships, contributing to relatively higher percentage of EV’s present.

However, when looking at total number of EVs as a percentage of all vehicles registered within that postcode, Derrimut and Laverton North come out on top, with EVs making up 2.74 per cent of the total number of cars in that locale.

While the list does not reveal owners, it's no coincidence the postcode is across the road from Toyota's former manufacturing plant, now the location of its hydrogen refueling facility.

It's believed many of the hydrogen-powered Toyota Mirai sedans found homes in the local area under the company's trial program, allowing drivers to easily fill up the cars at Toyota's refueling station nearby.

But the results are skewed. Halfway down the list is the postcode of 3170: home to the headquarters of Nissan, Mazda, BMW, and Mercedes-Benz, all of which boast EVs among their model line-ups.

It's unknown whether electric airport ground vehicles are included in the count, with Melbourne Airport's suburb of Tullamarine taking out the number eight spot.

Conclusions: