FACTORS AFFECTING THE RATE OF CO2 EMISSIONS FROM VEHICLES OF DIFFERENT ENGINE TYPES

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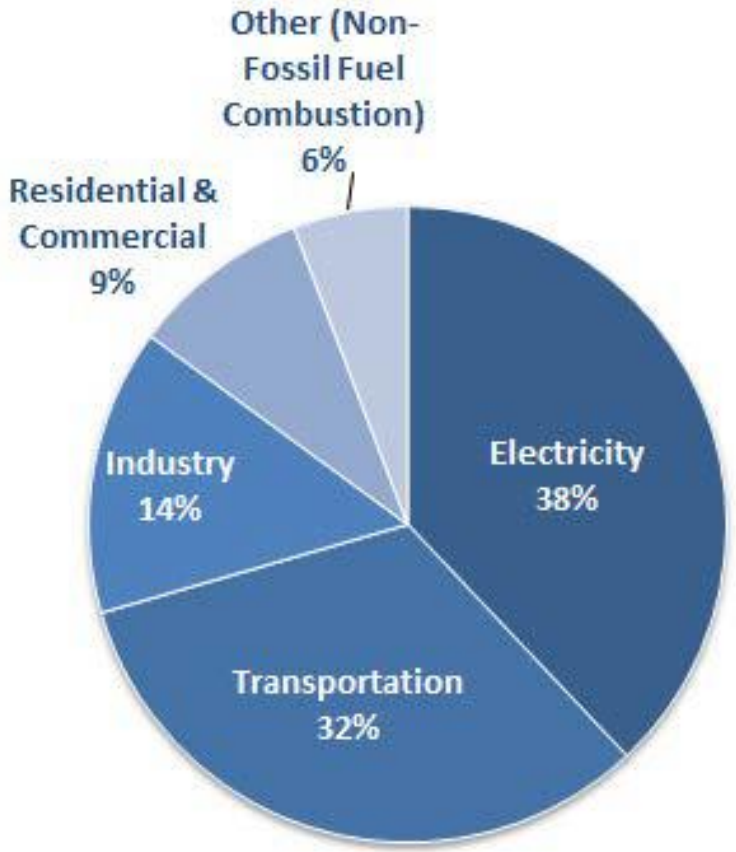
PROBLEM STATEMENT

- Which factor or factors show significant effect on the rate of carbon dioxide emissions from vehicles with various engine sizes?

BACKGROUND RESEARCH

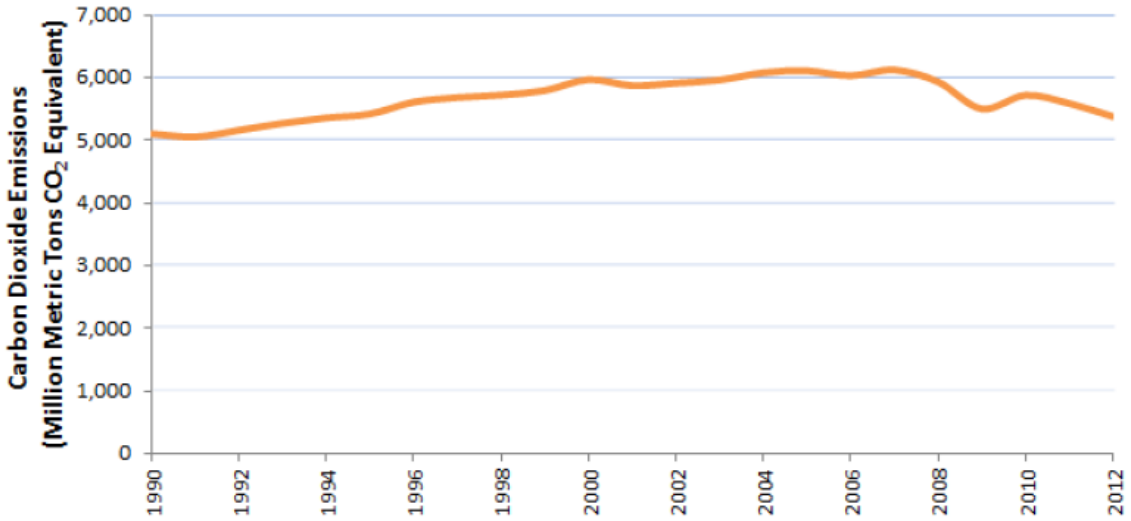
- In 2012, about 38% of the total U.S. carbon dioxide emissions came from the combustion of fossil fuels, specifically coal, to generate electricity; this is the largest source of carbon dioxide emissions in the nation.

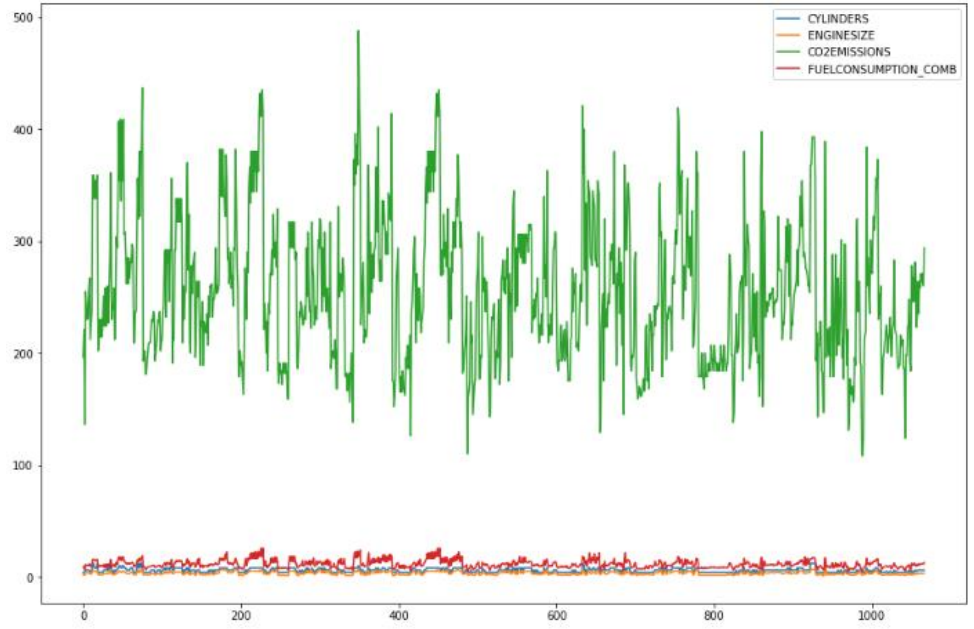


CO2 EMISSION BY CARS

- There are four major pollutants that come from cars:
- 1. A car emits carbon monoxide when the carbon in fuel doesn't burn completely.
- 2. A car's exhaust emits hydrocarbons, a toxic compound of hydrogen and carbon.
- 3. When fuel burns, nitrogen and oxygen react with each other and form nitrogen oxides (NOx).
- 4. Particulate matter -- small particles of foreign substances -- in the air contribute to atmospheric haze and can damage people's lungs.

CARBON DIOXIDE EMISSIONS





MATHEMATICAL COMPUTATION

- ***4-cylinder vehicle:***

CO2 emissions/mile = CO2 per gallon = 8,887 grams = 266.08 grams/gallon
MPG 33.4 1 mile

- ***V-6 vehicle:***

CO2 emissions/mile = CO2 per gallon = 8,887 grams = 423.19 grams/gallon
MPG 21.0 1 mile

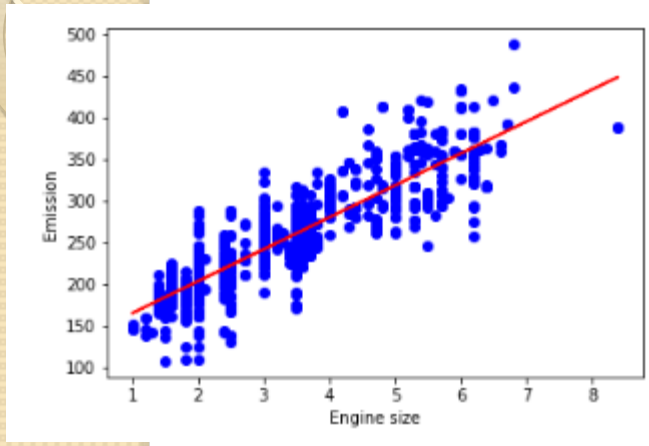
- ***V-8 vehicle:***

CO2 emissions/mile = CO2 per gallon = 8,887 grams = 444.35 grams/gallon
MPG 20.0 1 mile

- ***Diesel Engine:***

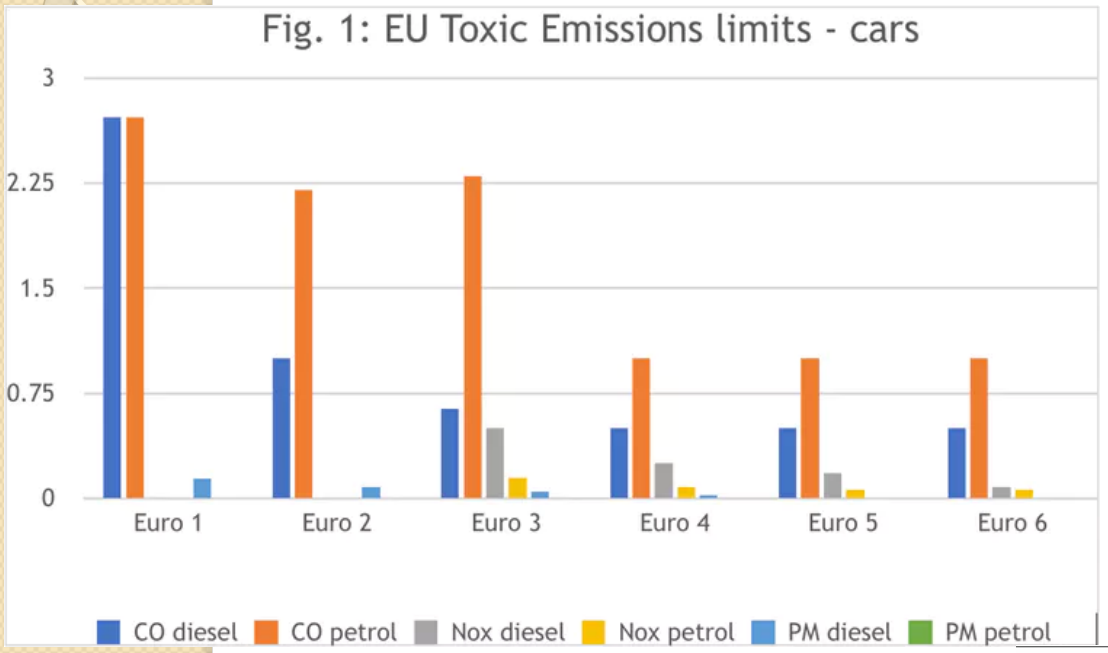
CO2 emissions/mile = CO2 per gallon = 10,220.05 grams = 730.00 grams
MPG 14.0 1 mile

CLASSIFICATION MODEL



- Mean absolute error: 23.58
- Residual sum of squares (MSE): 894.22
- R2-score: 0.67

STATISTICAL MODEL



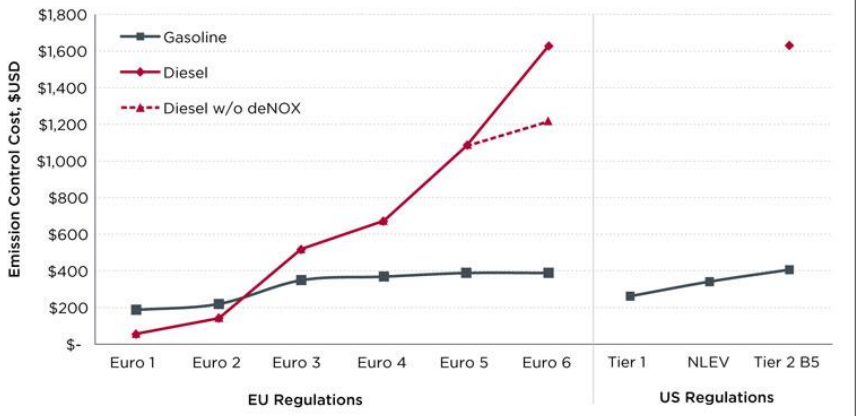
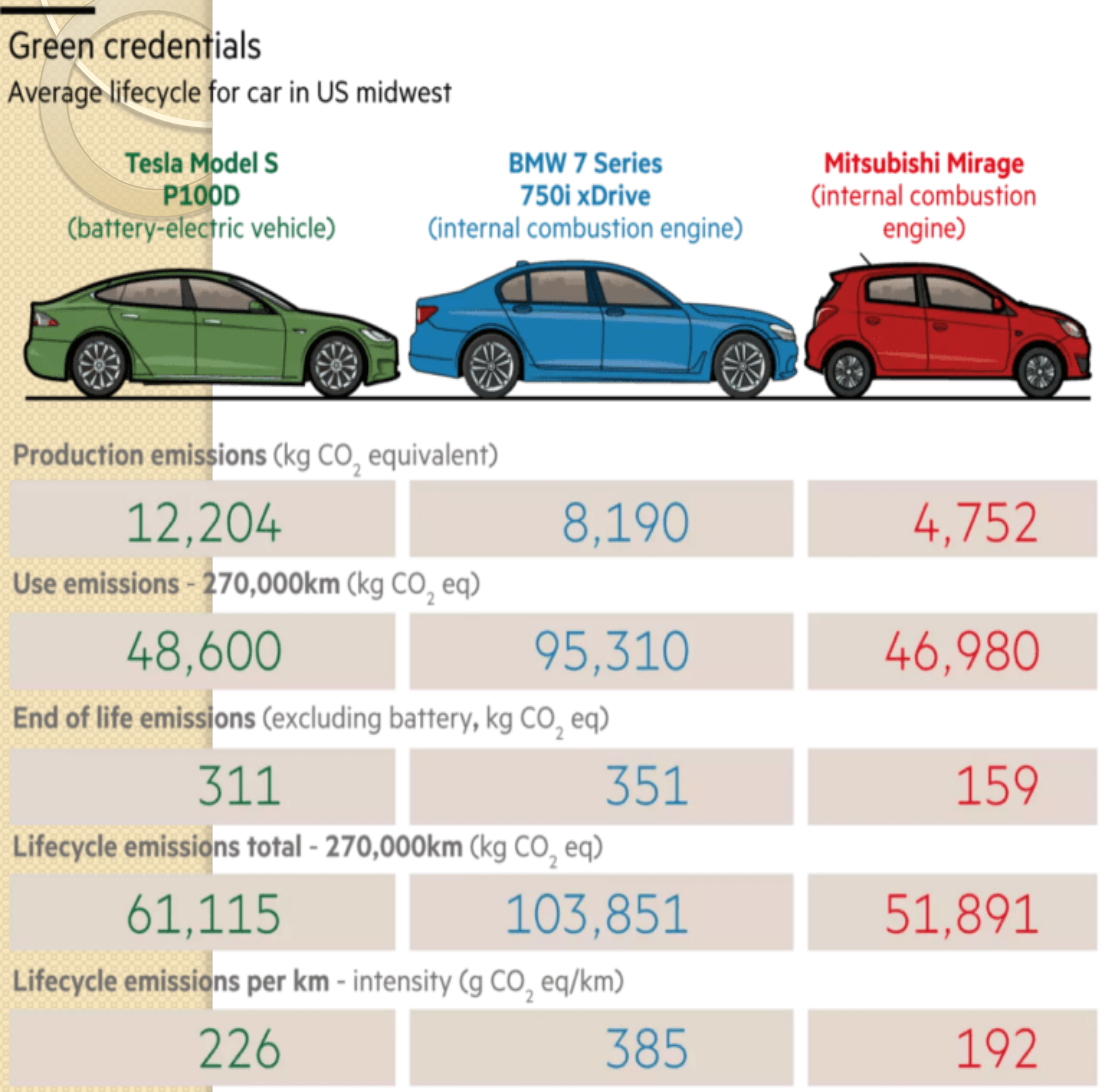


Figure ES-2 Estimated cumulative emission control technology cost for gasoline and diesel light-duty vehicles assuming a 2.0 L engine

CONCLUSION



According to research, transportation accounts for about 32% of the total carbon dioxide emissions in the United States. The combustion of gasoline in many vehicles increases the amount of carbon dioxide gas in the atmosphere. We have identified three factors that significantly increase the rate of CO2 emissions from vehicles of differing engine sizes (4-cylinder, V-6, V-8, and diesel).