The Effect of Energy Consumption on Life Expectancy

By

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Problem Statement

Is there a measurable effect of energy consumption on life expectancy?

We aim to explore the relationship between these two factors, with the goal of adding urgency to conversations around global warming and sustainable development.

Data Sources

World Bank:

- Life Expectancy

U.S. Energy Information Administration

- GDP (in 2015 USD)
- Population
- Energy Intensity
- Production/Consumption
- Import/Export
- Emissions

Production/Consumption Sources:

- Coal
- Natural Gas
- Petroleum and Other Liquids
- Nuclear, Renewables, and Other

Import/Export:

- Crude Oil
- Coal
- Natural Gas
- Electricity

Emissions:

- Coal
- CO2
- Natural Gas
- Petroleum and Other Liquids

Units of Measurement

Life Expectancy:

years

GDP:

In 2015 USD Purchasing Power Parity

Population:

In thousands of people

Energy Intensity:

Consumption per capita (millions of British thermal units per person, amount of heat required to increase temperature of one pound of water by one degree Farenheit)

Production / Consumption:

expressed in quadrillion British thermal units

Import / Export:

crude oil (thousands of barrels per day)
natural gas (billions of cubic feet)
coal (million short ton)
petroleum (thousands of barrels per day)
electricity (billion kilowatt-hour)

Emissions:

Expressed in millions of tons of CO^2

A Panel Data Analysis

We have been used to looking cross-sectional and/or time-series data. Our data is a combination of both, typical in econometric analysis.

Presents in pandas as multi-index dataframe.

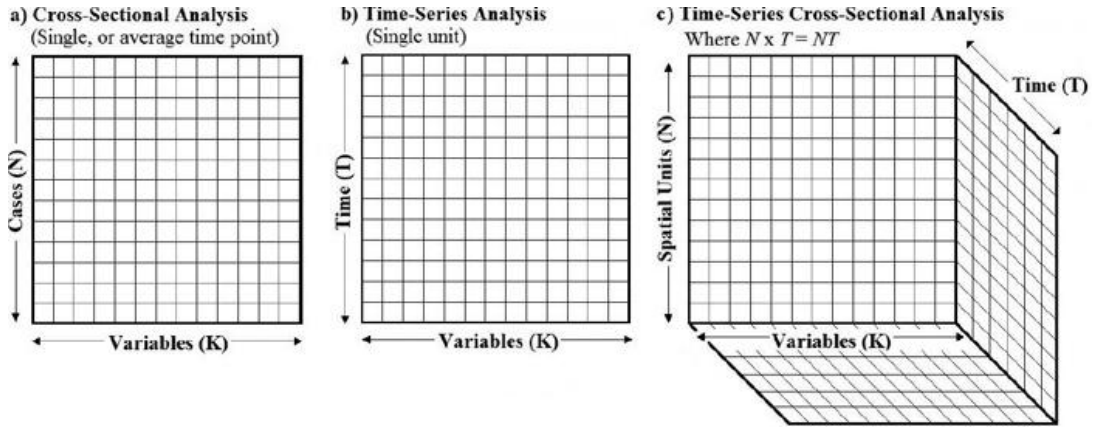
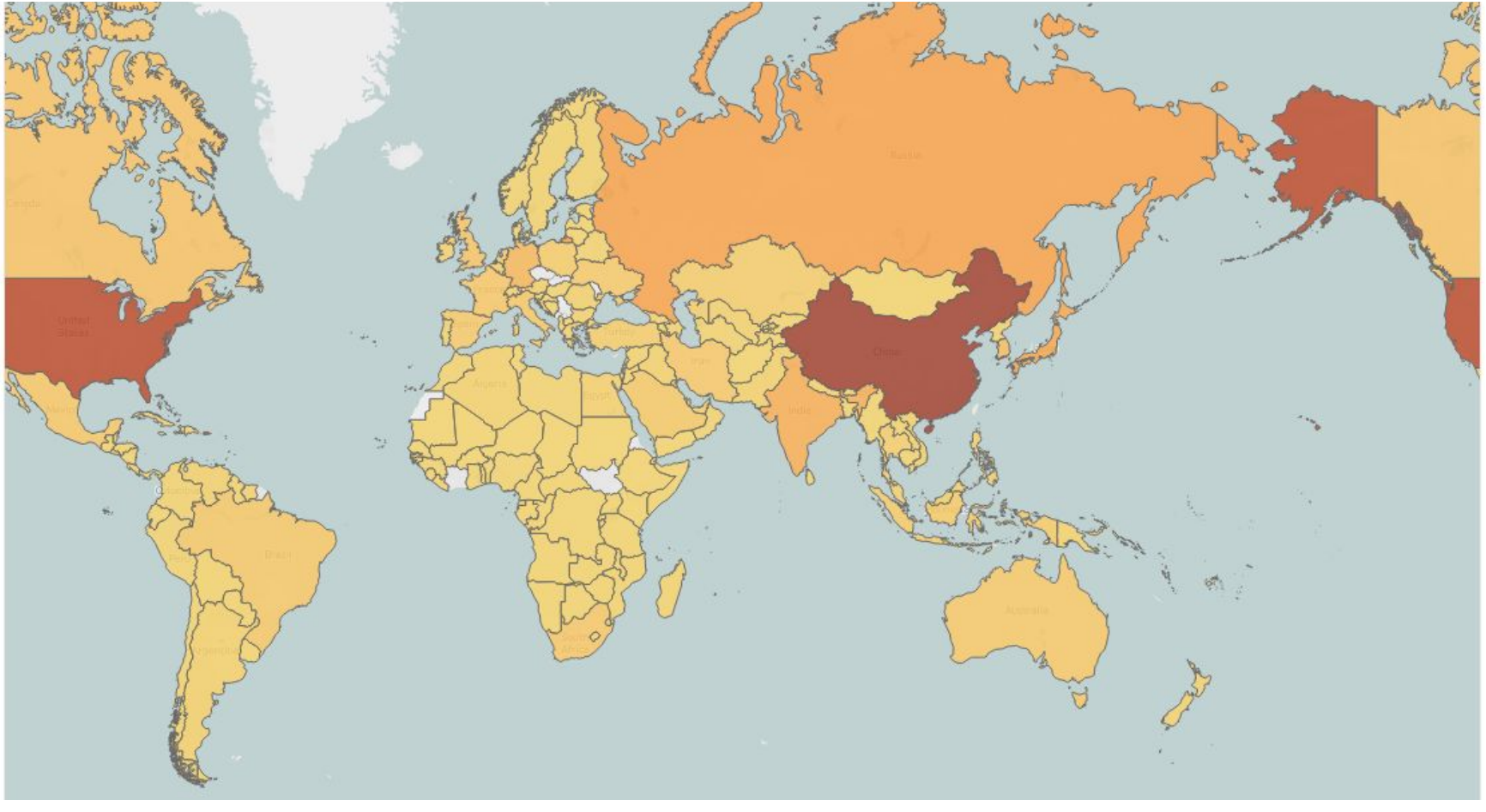
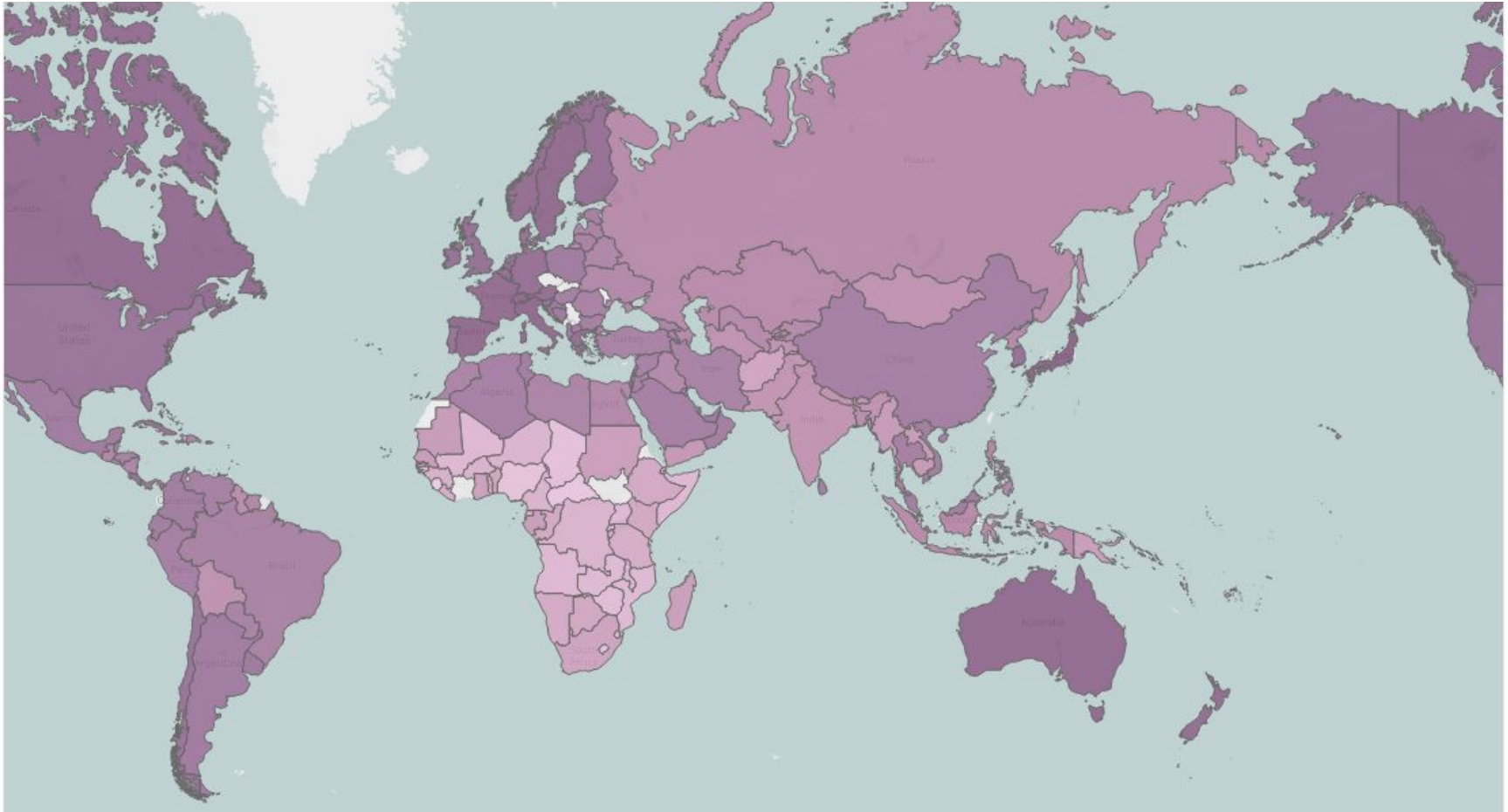


Image retrieved from google search. Originally from: SAGE Research Methods

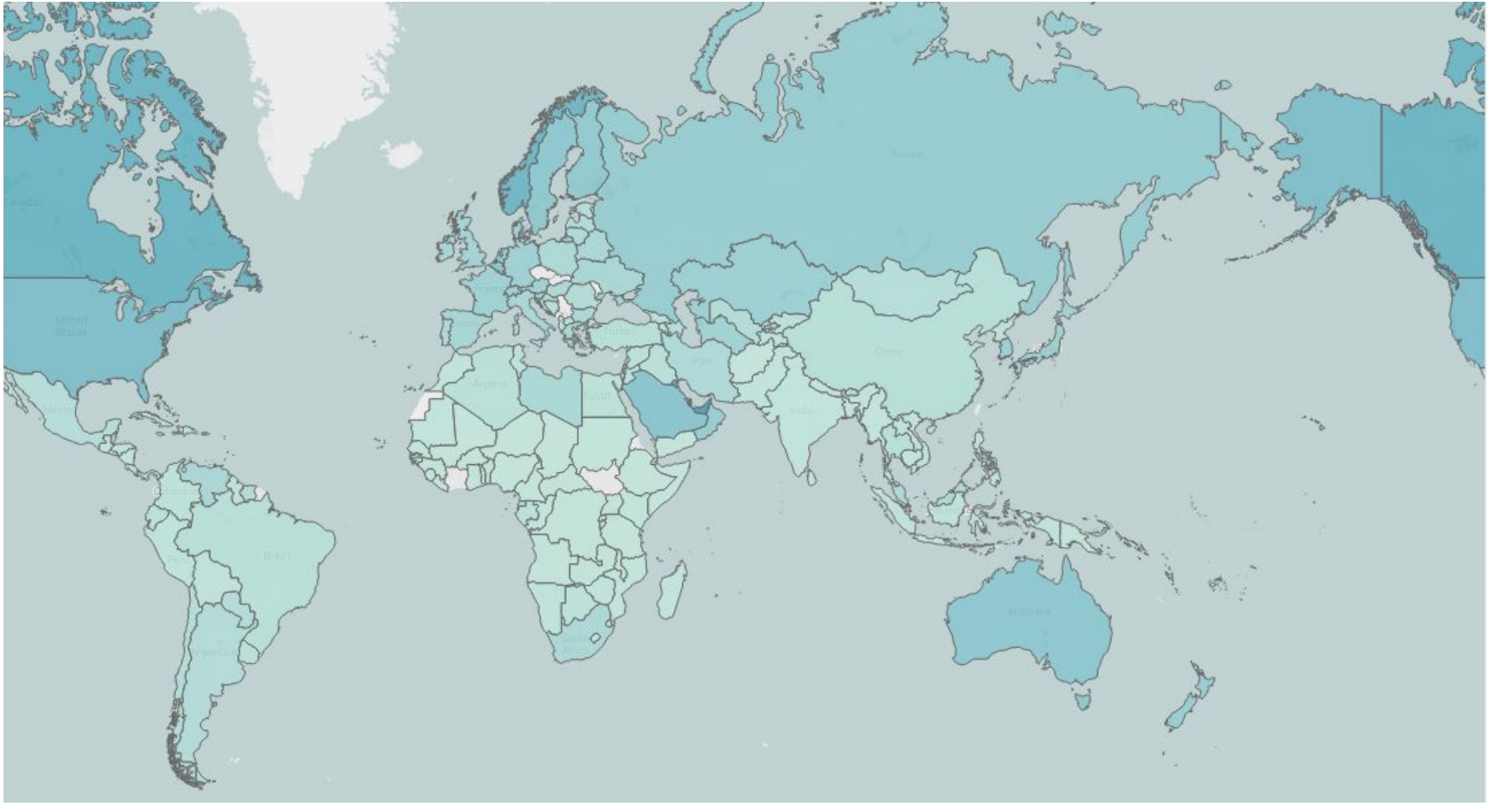
Total Emissions, 1992-2018, by Country



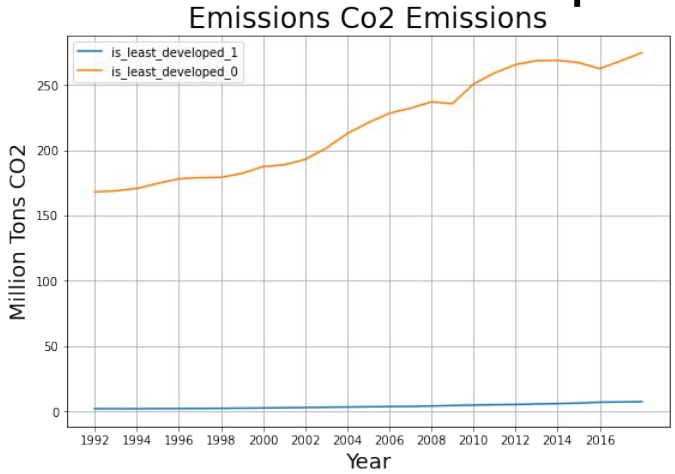
Average Life Expectancy, 1992-2018, by Country

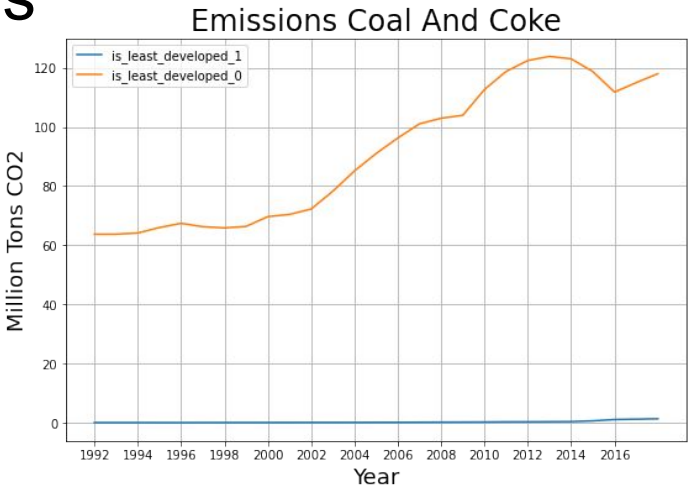


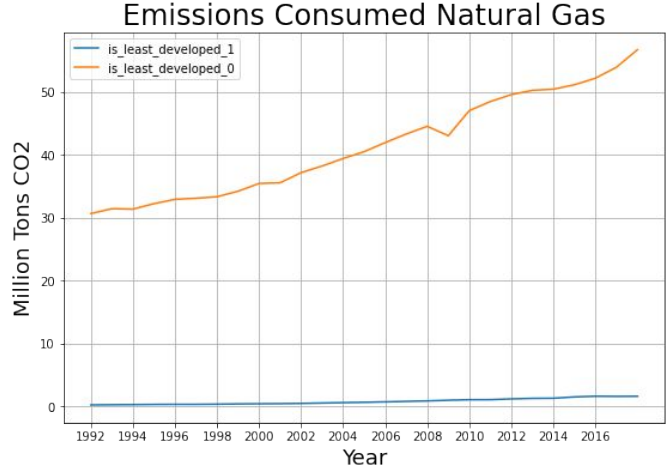
Mean Energy Consumption per capita, 1992-2018

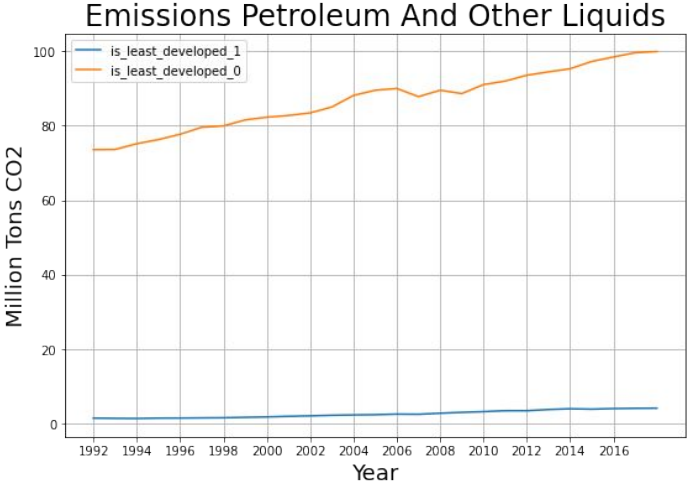


EDA - Least Developed Countries









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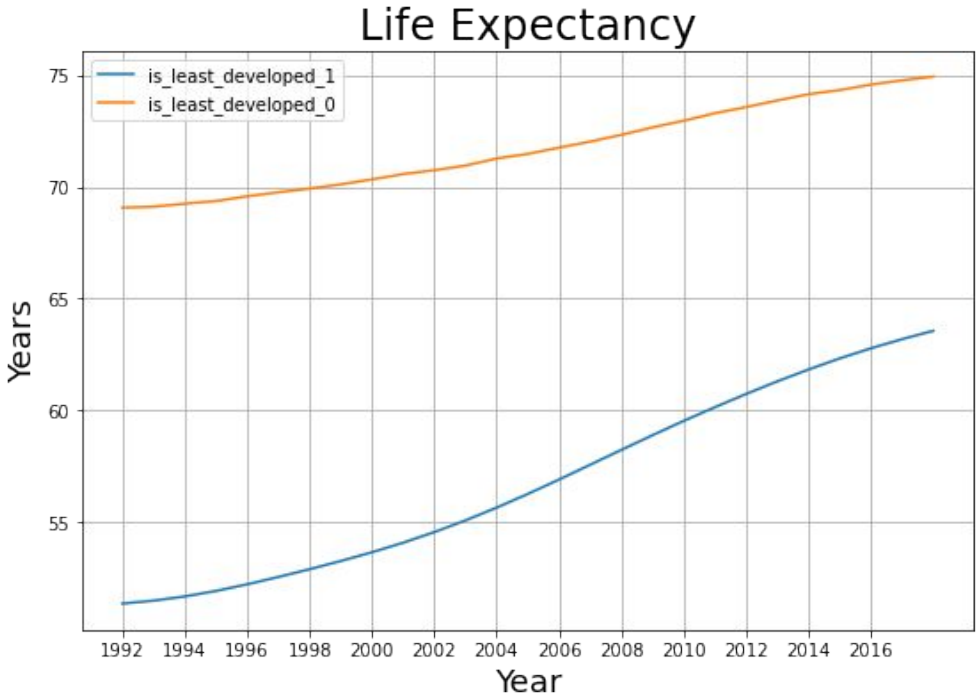
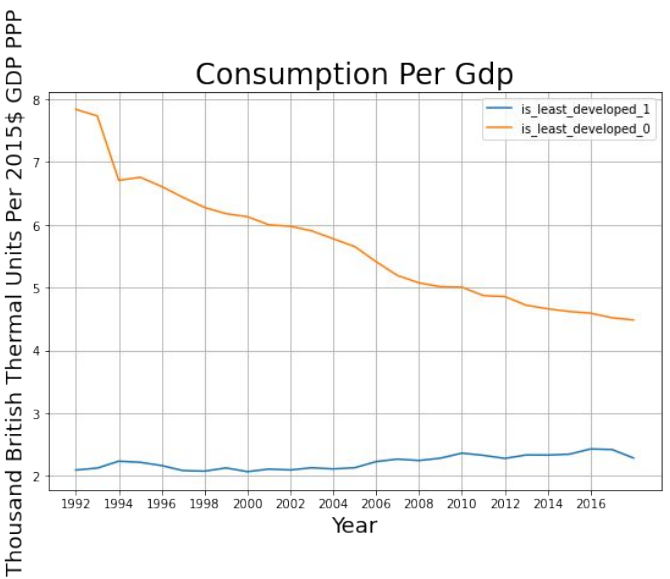
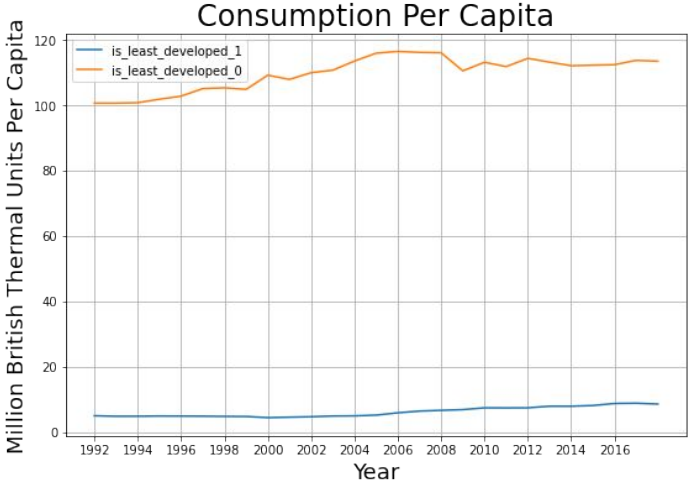
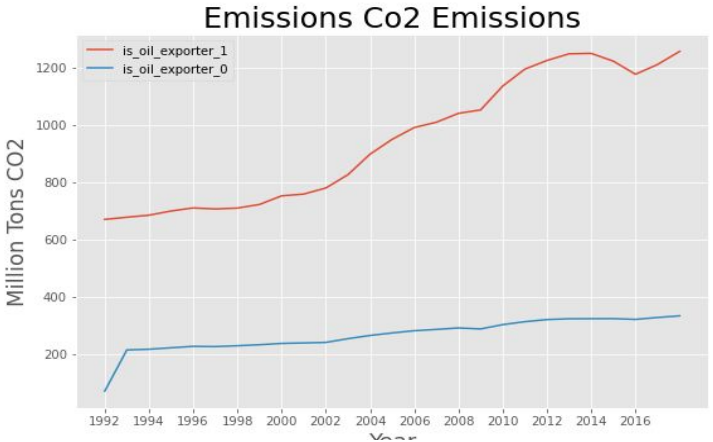
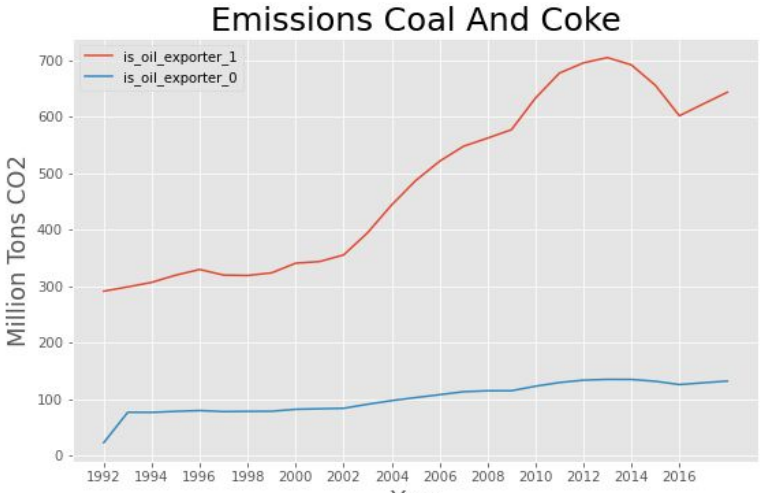


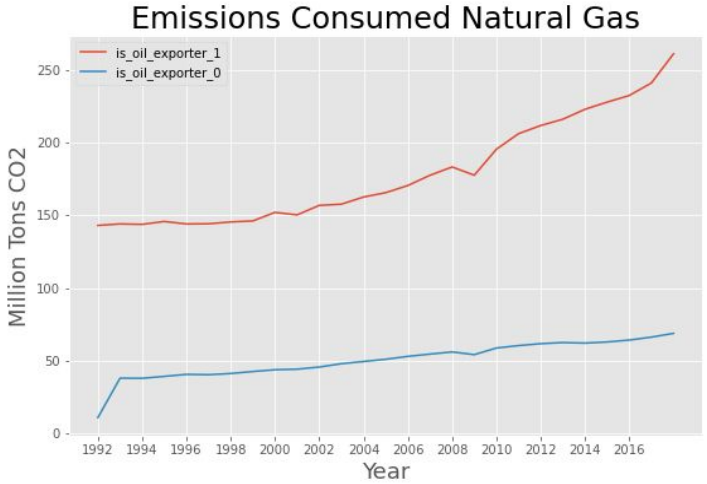


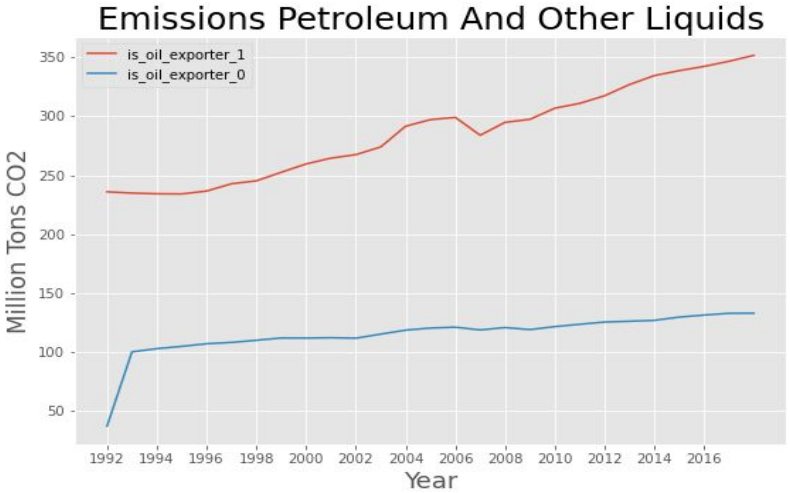


EDA - Oil Exporting Countries

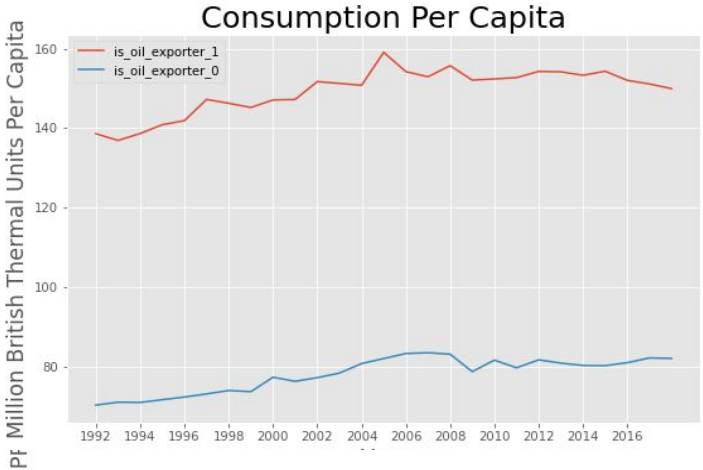


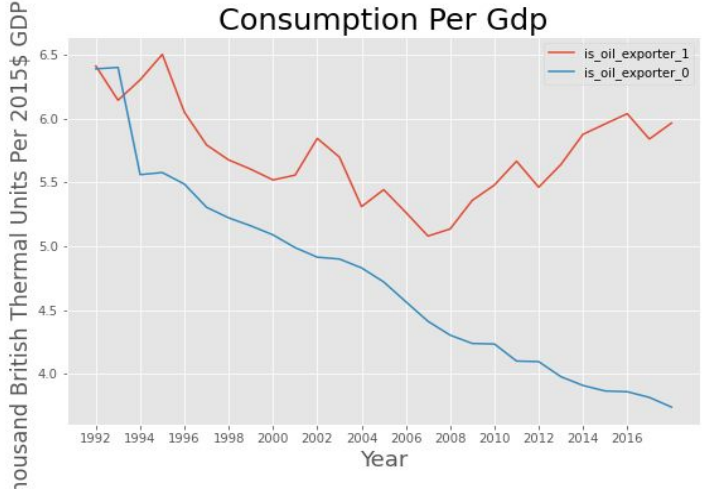


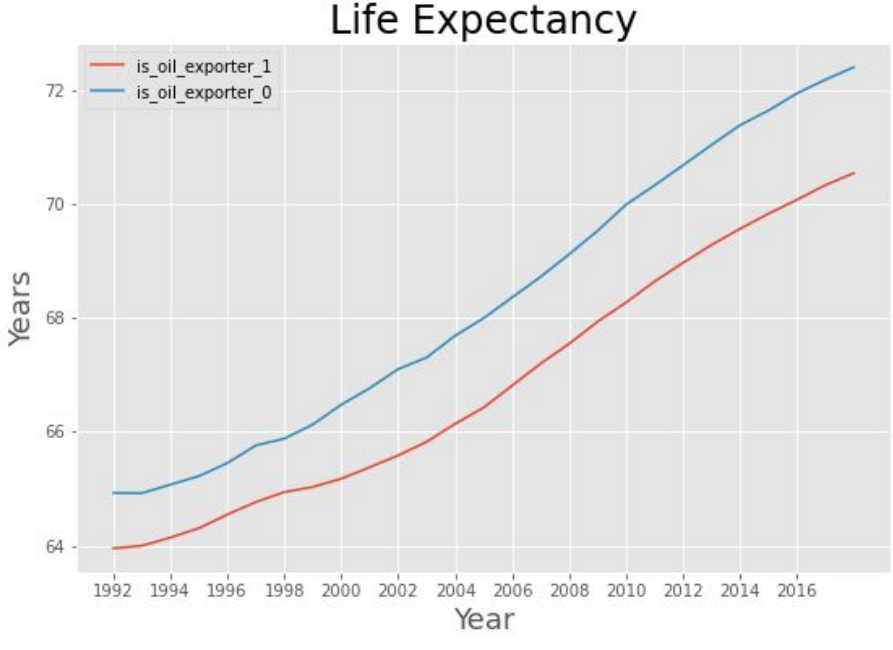




EDA - Oil Exporting Countries (2)







Modeling - VAR

- VAR is in the same family as ARIMA so it has the same parameters
- Suited to data where the variables may have an effect on each other
- Full panel data was not completely stationary with $d = 3$
- Neither full panel nor subset of the data could calculate AIC due to negative values in the conversion matrix
- Without p and q values could not model with VAR

Modeling - Fixed Effects/ Random Effects

H0: Energy consumption has no effect on life expectancy.

H1: Energy consumption has an effect on life expectancy.

	World **(Fixed Effects)**	Oil Exporters **(Fixed Effects)**	LDCs **(Random Effects)**
CO2	0.0228***	0.0152***	-0.0157
Coal / Coke	-0.0246***	-0.0158***	0.0556
Petrol & other liquids	-0.0127***	-0.0112***	1.0592***
Energy consumption per capita	0.0120***	0.0050	0.1368***
R squared (Overall)	**8%**	**5%**	**13%**

*** denotes significance at 1% level of significance.

Conclusion

- Yes, energy consumption does affect life expectancy.
- We explored the relationship between energy consumption and life expectancy for 172 countries from 1992-2018.
- Emissions from petroleum and coal/coke were found to have a significant, negative effect on life expectancy, although not the case in LDCs.
- CO2 emissions showed a significant, negative relationship with life expectancy in LDCs.
- Energy consumption per capita showed a significant positive effect on life expectancy.

Recommendations

- Further areas of study: get more granular data, more features which explain life expectancy, longer time span to better understand impacts of energy consumption/efficiency on life expectancy.
- More research into use of coal/coke and petroleum in LDCs. How can we get these countries to move towards cleaner forms of energy?

Thank you!