GDP and its Effects on Renewable Energy

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Introduction

12% of global energy production is provided by wind and solar. In order to be on track to a zero-carbon world, the IEA (International Energy Agency) outlines that we must be at a level of 41% renewable energy by 2030 (WRI, 2023). In order to reach this goal, all countries must utilize their resources effectively to increase their renewable energy generation and consumption. The purpose of this analysis is to determine what factors effect the rise of consumption/generation of renewable energy, and the magnitude of said effects. By looking at these factors, countries will be better informed as to how they should legislate and focus their resources on.

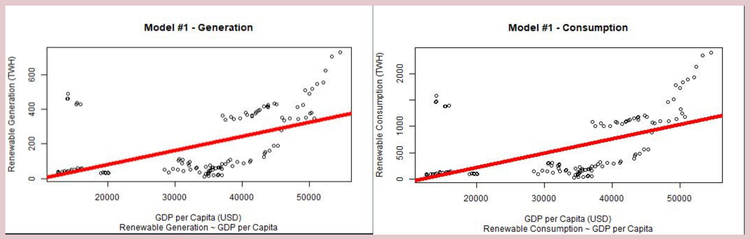
Methods

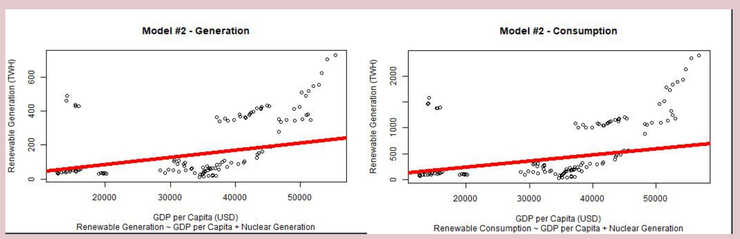
- Data Set
  - Energy from Tidy Tuesday
  - 21890 Observations over 129 variables
- Data Cleaning / Manipulation
  - Remove all observations containing N/A or NULL
  - Create new variable, GDP per Capita
  - left with 122 Observations over 130 variables
- GDP per Capita
  - Main explanatory variable
  - Minimizes country population size on analysis
- Models (Linear Regression)
  - Generation
    - Renewable Generation ~ GDP per Capita
    - Renewable Generation ~ GDP per Capita + Nuclear Generation
    - Renewable Generation ~ GDP per Capita * Nuclear Generation
  - Consumption
    - Renewable Consumption ~ GDP per Capita
    - Renewable Consumption ~ GDP per Capita + Nuclear Consumption
    - Renewable Consumption ~ GDP per Capita * Nuclear Consumption

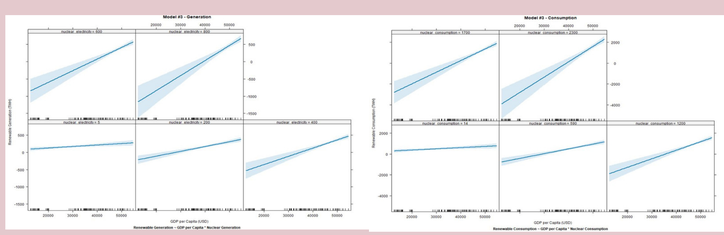
Question & Hypothesis

- Question #1
  - Does GDP have a positive effect on renewable energy generation/consumption?
- Question #2
  - Does Nuclear energy generation/consumption affect renewabole energy and GDP per capita's effect?
- Hypothesis #1
  - Null: GDP per Capita has no effect on renewable generation/consumption
  - Alternative: As GDP per Capita increases, renewable generation/consumption increases
- Hypothesis #2
  - Null: Nuclear consumption/generation has no effect on renewable generation/consumption
  - Alternative: Nuclear consumption/generation has a positive effect on renewable consumption/generation

Results







Discussion

- GDP Per Capita
  - Generation
    - As GDP per Capita increases, so does renewable energy generation (Coef = 0.008)
    - Statistically Significant (p-value = 0.001)
  - Consumption
    - Consumption shows similar results
    - Coef = 0.027, p-value = 0.004
- GDP Per Capita + Nuclear
  - Generation
    - The addition of Nuclear energy has the same relationship with GDP per Capita
      - Coef = 0.004, p-value =0.258
    - Nuclear generation shows positive relationship with generation
      - Coef = 0.258 , p-value = 0.067
  - Consumption
    - presents similar results
    - GDP Per Capita
      - Coef = 0.012, p-value = 0.005
    - Nuclear consumption
      - Coef = 0.356, p-value = 0.074
- GDP Per Capita * Nuclear
  - In both cases, as nuclear consumption/generation increases, it's negative effect on GDP per Capita's effect on renewable consumption/generation increases

Conclusions

- Hypothesis #1
  - Reject the null hypothesis
  - Hypothesis is correct only taking GDP per Capita into account in model
- Hypothesis #2
  - Reject the null hypothesis
  - Hypothesis is correct. Nuclear has positive relationship and effect on renewable energy

References

- Data Set:
  - https://github.com/rfordatascience/tidytuesday/tree/master/data/2023/2023-06-06
  - Article(s):
- https://www.wri.org/insights/countries-scaling-renewable-energy-fastest