

Renewable Energy Consumption, GDP and GHG Emission. The Moderating Effect of Regulatory Quality: Evidence of a Dynamic Panel Estimation from EU and BRICS

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Motivation

- ❖ Effective industrial policies in mitigating CO₂ emissions in the EU and BRICS economies.
- ❖ The invitation of 6 new countries to join BRICS.
- ❖ Stricter regulatory policies a catalytic agent in reducing CO₂ emissions.
- ❖ Regulatory Quality at the level of institutions must foster effective implementation.

Research Questions

- ❖ Does regulatory quality matter in mitigating CO₂ emissions in BRICS and EU countries?
- ❖ Is there a link between CO₂ emissions and economic growth in BRICS and EU countries?
- ❖ What role does renewable energy consumption and economic growth play in mitigating CO₂ emissions in BRICS and EU countries?

Renewable energy resources and CO₂ emissions

- ❖ Integrating RE into the energy mix can contribute to a decline in emissions.
- ❖ Minimises the dependence on fossil fuel and foster cleaner environment.

Sources: Sarkodie and Adams (2018); Acheampong *et al.* (2019); De La Peña *et al.* (2022)

H1a: RE consumption is negatively related to GHGe such that the effect is stronger for EU economies than the BRICS.

H1b: The negative effect of RE on GHGe is reinforced by regulatory quality such that weak RQ positively increases GHGe and strong regulatory quality decreases GHGe.

Economic Growth and CO₂ emissions

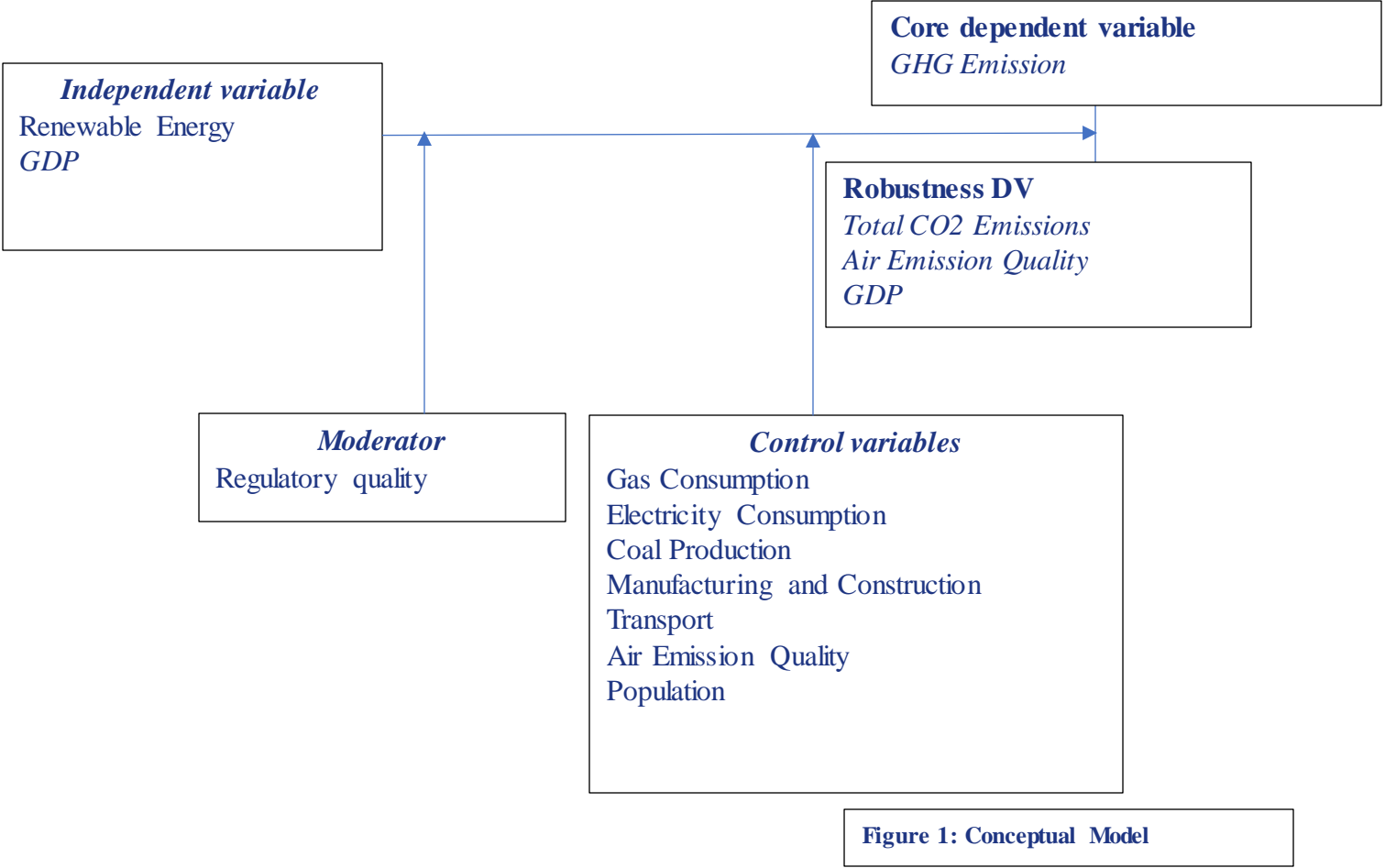
- ❖ Morden industrialisation.
- ❖ Infrastructure development, and population growth.
- ❖ Increased consumption of fossil fuel.

Sources: Aust *et al.* (2020); Osadume (2021)

H2a: GDP is positively related to GHGe such that the effect is likely to be stronger in EU economies than the BRICS.

H2b: The positive effect of GDP on GHGe is reinforced by RQ such that weak Regulatory Quality positively increases GHGe and strong regulatory quality decreases GHGe.

Conceptual Model



Variable description and data sources

Variable	Symbols	Measurement	Source
Green House Gas Emission	GHGe	Total CO ₂ emissions (metric tonnes)	IEA,2020 EDGAR v5.0 d
Growth Domestic Product	GDP	GDP per capita (constant 2015 US\$). GDP on the basis of percentage growth of GDP for each particular country.	WDI
Regulatory quality index	RQ	It encapsulates the impressions regarding the government's capacity to create and execute effective policies and regulations that enable and encourage the growth of the private sector.	WDI, 2022
Renewable energy consumption	REC	Renewable energy consumption (% of total final energy consumption)	IEA,2020 WDI,2022
Population	POP	Total population (millions)	WDI, 2022 and EDGAR v5.0 d
Coal Production	CP	Total primary coal production (Coal includes anthracite, sub anthracite, bituminous, subbituminous, lignite, brown coal, and oil shale.)	IEA, 2020
Electricity Consumption	EC	Total Electricity Net Consumption = total net electricity generation + electricity imports - electricity exports – electricity transmission and distribution losses. Net consumption excludes the energy consumed by the generating units.	IEA, 2020 and EDGAR v5.0 d
Gas Consumption	GC	Gasoline production includes production of: conventional gasoline; all types of oxygenated gasoline, including gasohol; and reformulated gasoline; but excludes production of aviation gasoline.	WDI,2022 IEA, 2020 and EDGAR
Coal Production	CP	Total primary coal production (Coal includes anthracite, subanthracite, bituminous, subbituminous, lignite, brown coal, and oil shale.	IEA, 2020
Air Emission/Quality	AEQ	Air emissions encompass the discharge of gases, particles, and various contaminants into the air. Typically stemming from human endeavors like transportation, industry, energy generation, and agriculture, these emissions can yield adverse consequences for both the environment and human well-being. They play a role in climate change progression, trigger respiratory and cardiovascular ailments, and wreak havoc on ecosystems. Conversely, air quality pertains to the density and makeup of pollutants present in the air that individuals inhale.	IEA, 2020 EDGAR v5.0 d

Findings

- ❖ Renewable energy consumption has heterogeneous effects on greenhouse gas emissions.
- ❖ The effects of renewable energy consumption outweigh the effects of regulatory quality.
- ❖ The interaction between renewable energy, regulatory quality and GDP have synergistic effects in reducing greenhouse gas emissions.
- ❖ We provide insights into this nexus to inform both EU and BRICS governments through our predictive margins.

Predictive Margins

Fig. 2: Predictive Margins for Full Sample

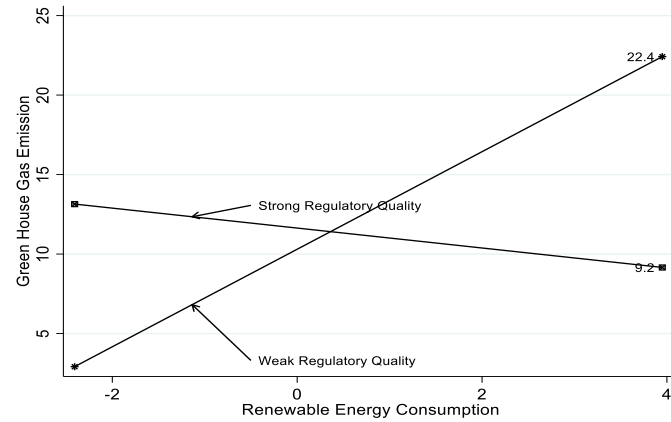


Fig. 3: Predictive Margins for BRICS Countries

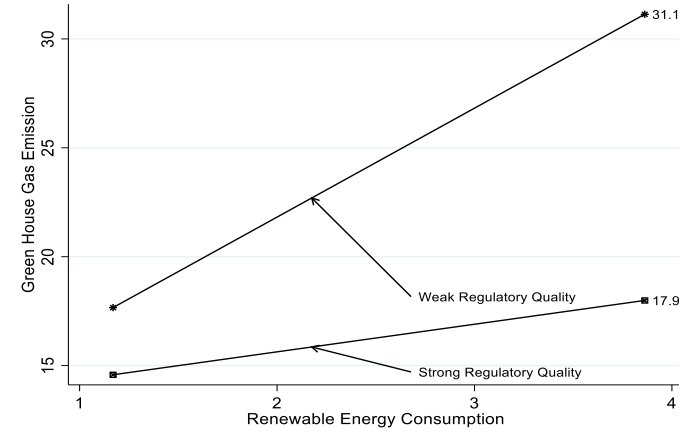
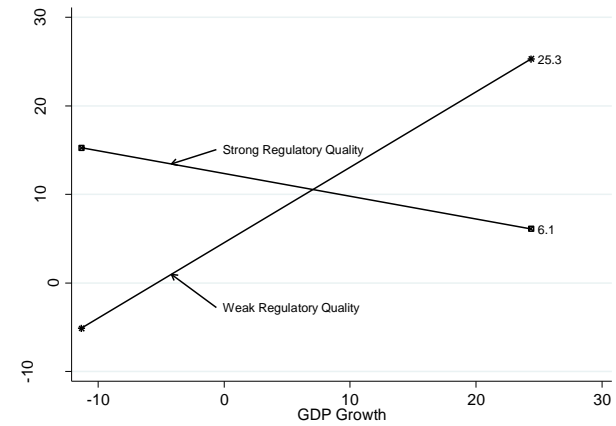
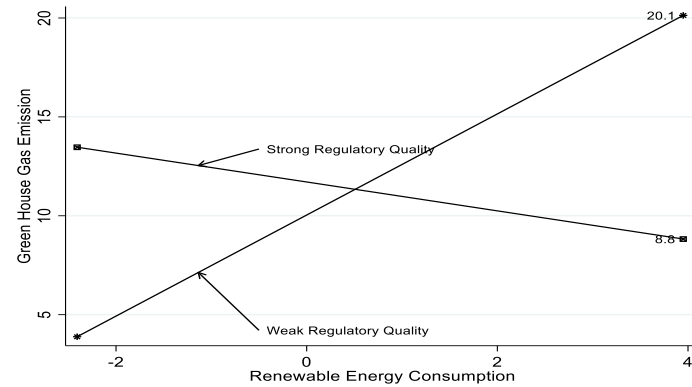


Fig. 4: Predictive Margins for EU Countries



Findings continued.....

Hypothesis Tested	Hypothesis Supported
H1a	Supported (but stronger for BRICs)
H1b	Supported
H2a	Supported, not to the magnitude
H2b	Supported

H1a: RE consumption is negatively related to GHGe such that the effect is stronger for EU economies than the BRICS.

H1b: The negative effect of RE on GHGe is reinforced by regulatory quality such that weak RQ positively increases GHGe and strong regulatory quality decreases GHGe.

H2a: GDP is positively related to GHGe such that the effect is likely to be stronger in EU economies than the BRICS.

H2b: The positive effect of GDP on GHGe is reinforced by RQ such that weak Regulatory Quality positively increases GHGe and strong regulatory quality decreases GHGe.

Conclusion

- ❖ A substantial gap exists between the vision for renewable energy consumption, and the reality of strict enforcement of regulatory quality to achieve the goal of curbing GHG emissions.
- ❖ Global renewable energy consumption is projected to increase in the future, and effective enforcement of regulation is key to ensuring its quality.

Thank you

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