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GREEN GROWTH AND GREEN INFLATION-BASED MODEL IN 5G-20 COUNTRIES

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Abstract: *Promoting environmentally friendly economic growth, is practically crucial, as environmentally friendly economic growth and sustainable development complement each other. This research aims to build a panel model based on green growth and green inflation. The study uses secondary data with variables including green growth, green credit, green inflation, green bonds, green trade, macroprudential policies, green sustainable development, and green finance from January 2020 to December 2022. The objective is to develop prediction models using the Autoregressive Distributed Lag (ARDL) methodology. Panel ARDL combines autoregressive and distributed lag techniques, considering the time factor. The research findings reveal that overall, the leading indicator variable for green growth in the long run is green finance, while in the short run, there are two leading indicator variables: green finance and green inflation.*

Keywords: *Green Inflation, Green Finance, Green Growth.*

1. Introduction

During the economic crisis of 2008-2009, there was an increased focus on green economic initiatives to recover environmentally friendly growth and withstand environmental degradation (Mihai et al., 2021). Since the 1950s, rapid globalization has brought numerous challenges to humanity, such as unprecedented climate change and ecosystem degradation (Xue et al., 2022). Economic factors such as geographical patterns, energy structure, foreign direct investment, green tax policies, industrial structure, and carbon dioxide emissions contribute to the development of a green economy (Depret & Hamdouch, 2012). The majority of economies are based on the service sector, which relies on human resources. Workforces perform better when they are healthy, supportive, and environmentally friendly. Providing services efficiently can be achieved through advancements in environmentally friendly finance (Soomro & Shah, 2019).

Table 1. Annual Growth Rate on 2022-2023

Month	INA	IND	TRK	ING	CHN
Q1-22	5.03	5.2	9.7	9.7	4.3
Q2-22	5.02	4	7.8	11.3	4.8
Q3 -22	5.46	13.1	7.6	3.9	0.4
Q4-22	5.73	6.2	4.1	2.1	3.9
Q1-23	5.01	4.5	3.3	0.7	2.9
Q2-23	5.04	6.1	3.9	0.5	4.5
Q3-23	5.17	7.8	3.8	0.6	6.3

Source: Tradingeconomics

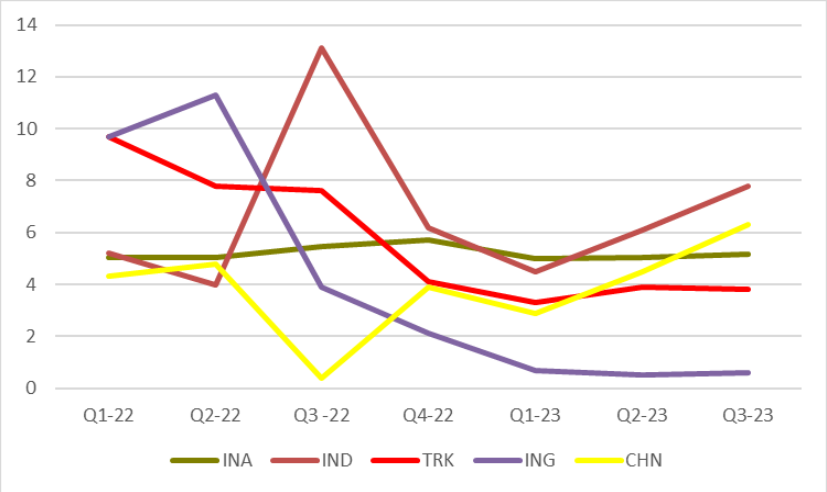

Figure 1. Annual Growth Rate Graph for the Year 2022-2023

The graph of economic growth movements above shows fluctuating trends, where India has the highest annual growth rate in Q3 of 2023 at 7.8%, followed by China (6.3%), Indonesia (5.17%), Turkey (3.8%), and the UK (0.6%). The economic growth in the UK has been continuously declining over time, and the country is currently facing concerns as the 'ghost' of recession haunts it. This concern arose after recent data indicated a 0.5% contraction in the UK's GDP in July 2023 (David & Bruce, 2023). Similarly, like India, it is observed that India's economic growth in the fourth quarter shows a significant decline (Us, 2024). So far, the decrease in India's economic growth in the fourth quarter of 2022 indicates a global economic slowdown, with increased interest rates causing a decline in consumption and investment. However, in the third quarter of 2023, the percentage reached 7.8%, following rapid economic growth in 2022-23. Economic momentum remained strong in April-June 2023, with a GDP growth rate of 7.8% (YoY) (Megatrends & Biswas, 1996). In general, the increase in energy consumption is associated with economic growth and the growing income and wealth gap (Xue et al., 2022). India's economy heavily relies on fossil fuels, leading to increased CO2 emissions. Previous studies indicate that the top 10% of urban population contributes 416 kg per person per year, while the bottom 10% of rural population only contributes 141 kg per person per year (Parikh & Gokarn, 1993). Recent research shows that the overall low per capita emissions in India are due to high emissions by the wealthy who "hide behind the poor," whose emissions are much lower (Ananthapadmanabhan et al., 2007). Deeper class-based analysis reveals emission disparities between urban/rural domestic elites and workers (Michael & Vakulabharanam, 2016).

In developing countries like India, the potential carbon emissions from economic growth can be controlled through three different ways: (i) shifting from dirtier fossil fuels like coal to other fossil fuels with lower carbon emission characteristics; (ii) improving carbon emissions through very low-energy consumption efficiency; and (iii) increasing the supply of environmentally friendly energy, including clean renewable energy (Rohit Azad and Shouvik Chakraborty, 2020).

Rapid growth in India has led to job creation and an improvement in living standards over the past decade. However, this extraordinary expansion has been hindered by ecological decline and resource depletion, necessitating significant steps towards sustainable economic practices and carbon emissions reduction. The COVID-19 pandemic has shifted consumer attention towards environmentally friendly economies, prompting brands to adopt sustainability principles. In addition to expanding renewable energy capacity, some studies suggest the

development of infrastructure and technology to enhance future energy usage efficiency, offering significant potential for further growth (Sukhatme, 2012; Pollin and Chakraborty, 2015). To address the evolving energy mix and support green energy while controlling fossil fuel demand through carbon taxes, income distribution of taxes in the form of universal energy access can make the process more egalitarian (Agrawal et al., 2023). Therefore, India requires support from the government and the business world to transition to a circular economy.

Local governments in China prioritize economic performance as it directly relates to the promotion of their officials. These governments focus on Gross Domestic Product (GDP) but often neglect environmental protection. In November 2013, the Chinese State Council released the "Sustainable Development Plan for Resource-Based Cities in China (SDPRC) (2013-2020)" (Cheng, Zhonghua, Xiang Li, 2021). Despite China's significant contribution to economic growth, it has led to considerable environmental pollution, income inequality, and other issues. Simultaneously, the international community has increasingly demanded action on China's carbon dioxide emissions due to its heavily coal-based energy consumption structure, resulting in substantial greenhouse gas emissions. With the highest energy consumption globally, China is considered the most energy-thirsty nation (Guo et al., 2020). China's fossil fuel consumption contributes approximately 25% to global annual greenhouse gas pollution (Janssens-Maenhout, 2017). Hence, China is under significant pressure to conserve energy and reduce emissions. The importance of ecosystems for the Earth's sustainability makes environmental issues significant (Han et al., 2023) (Alex Borodin, Vladislav Zaitsev, Nataliya Shash, 2023) (Dreidy, 2020). Considering the increasing importance of sustainable development in China's economy, it is clear that the current model of inclusive economic growth does not meet the requirements of sustainable economic development (Lin & Zhou, 2022). Due to the impacts of global and local environmental changes, the Chinese government recognizes the importance of promoting green growth in response to these challenges.

Forest and peatland fires in Indonesia have resulted in emissions exceeding 1 billion tons of CO2 equivalent, surpassing the annual greenhouse gas emissions of the United States, the world's largest economy, over three months from August to October (Sweetapple et al., 2015). Given the political economy of natural resources in Indonesia, especially state-business collusion, there is little likelihood that the country will expand its governance beyond what is necessary to reduce greenhouse gas emissions effectively. Nevertheless, we identify conditions needed to begin addressing the existing contradictions between Indonesia's environmental aspirations and the economic development needs. These conditions are also crucial to resolving contradictions between a country's ability to effectively implement green growth policies at all levels and the political economy where such initiatives are implemented. The emergence of reformist coalitions working across scales with state actors to steer government policies and practices towards "green" objectives and developing effective governance at various scales; The increasing rate of economic growth has brought issues of resource scarcity and environmental degradation to the forefront, shifting policymakers' focus from traditional concepts of economic growth to modern concepts of sustainable development. Unlike traditional economic growth theorists, who based their theories on laissez-faire equilibrium, advocates of sustainable development believe that attention should be focused on technological change as a catalyst (Aghion et al., n.d.), as traditional economic growth theories relying on laissez-faire equilibrium can lead to environmental degradation (Acemoglu et al., 2016). Aloysius Hari Cristianto (2020) states that green economy is an essential concept that can be applied by governments when developing sustainable policies. This was first reported by Pearce et al. and "New Supply-Friendly and Progress in Rio+20". The Rio+20 agenda recognizes "Sustainable development

through the 'green economy' and poverty eradication used as tools for sustainable development" (Luukkanen et al., 2019).

The concept of green growth and environmentally friendly practices can provide an insight into how to promote the economic growth of a country and benefit from relatively good financial performance (Desalegn & Tangl, 2022).

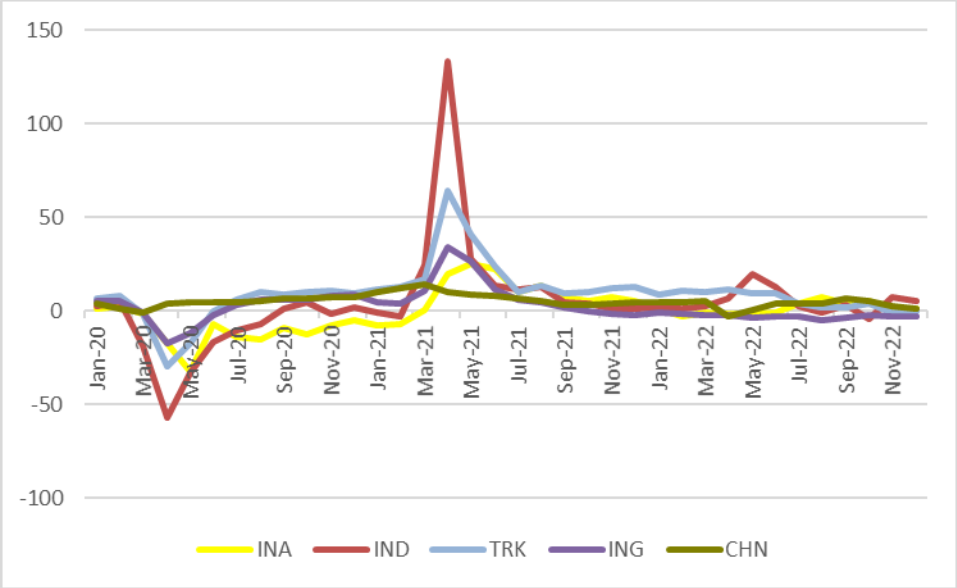

Figure 2. The percentage of Green Growth from 2020 to 2022

The data and graphs above indicate that green growth data has experienced fluctuating movements. In each country, there was an increase in April 2021, with India having the highest figure at 133,519%, followed by Turkey at 64,357%, the United Kingdom at 33.99%, Indonesia at 25,069%, and China at 9.8%. However, in April 2020, the green growth rates in each country experienced a significant decrease, reaching negative values, except for China, which had a rate of 3.9%. Environmental-friendly growth implies that environmentally friendly innovations must be utilized to control production and emissions driven by demand to contribute to "environmentally friendly production and supply chains" (Boqiang Lin, 2023). According to Mensah et al. (2019), the use of environmentally friendly technology in energy production and distribution is considered one of the main drivers of environmental economic growth. It is known that environmentally friendly economic growth can be a viable solution for energy conservation and carbon emission reduction (Guo et al., 2020). Environmental-related technology aids in achieving environmentally friendly growth in BRICS countries (Chen et al., 2023). Promoting inclusive environmental growth is a key tool for achieving sustainability (Desalegn & Tangl, 2022). Challenges related to green economy include political commitment to green economy, development of resource efficiency standards, funding for innovation and research in new technology development, and promotion of information initiatives (Udeagha & Ngepah, 2023).

2. Research Method

2.1. Econometric Model

The research approach utilizes the Panel Autoregressive Distributed Lag (Panel ARDL), which is employed to predict the long-term outcomes (Nasution et al., 2022).

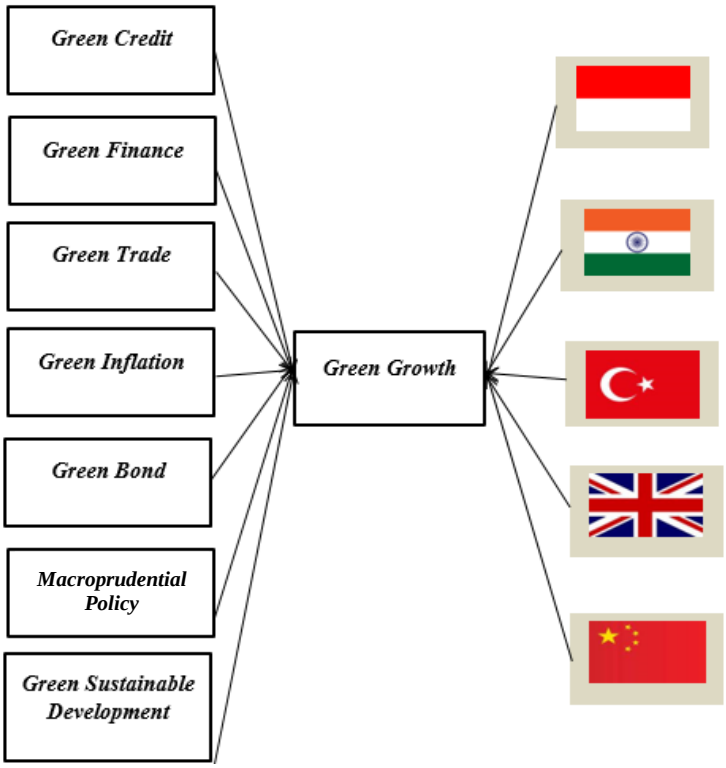

Figure 3. Conceptual Framework of ARDL Panel

Based on the conceptual framework above, the ARDL panel model uses the formula:

GGit =α+ β1GCit+β2GFit+β3GBit+ β4GIit +β5GTit+β6KMit + β7GSDit e
GGIndonesia= α+βGC it+β2GFit+β3GBit+β4GIit +β5GTit + β6KMit + β7GSDit +e
GGIndia= α+βGC it+β2GFit+β3GBit+β4GIit +β5GTit + β6KMit + β7GSDit +e
GGTurki= α+βGC it+β2GFit+β3GBit+β4GIit +β5GTit + β6KMit + β7GSDit +e
GGInggris= α+βGC it+β2GFit+β3GBit+β4GIit +β5GTit + β6KMit + β7GSDit +e
GGChina= α+βGC it+β2GFit+β3GBit+β4GIit +β5GTit + β6KMit + β7GSDit +e

Where:
GG = Green Growth
GF = Green Finance
GB = Green Bond
GI = Green Inflation
GC = Green Credit
GT = Green Trade
KM = Macroprudential Policy
GSD = Green Sustainable Development

3. Results and Discussion

3.1. Results

The results of the Panel ARDL analysis found several favorable outcomes supporting the research analysis. The following are the outputs of the Panel ARDL model analysis:

Table 2. The Results of Panel ARDL Estimation Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
GC	0.589285	0.363926	1.619245	0.1079
GF	0.003387	0.001097	3.086963	0.0025
GB	-0.167159	0.718238	-0.232735	0.8163
GI	-2.39E-05	1.11E-05	-2.161791	0.0325
GT	0.000380	0.000469	0.811001	0.4189
KM	-0.010150	0.015912	-0.637870	0.5247
GSD	0.208113	1.498495	0.138881	0.8898
Short Run Equation				
COINTEQ01	-0.649415	0.178011	-3.648179	0.0004
D(GC)	37.09475	40.47390	0.916510	0.3611
D(GF)	-0.016393	0.013338	-1.229039	0.0213
D(GB)	108.1870	106.8825	1.012205	0.3134
D(GI)	1.44E-05	0.000167	0.086584	0.9311
D(GT)	-0.287775	0.263468	-1.092257	0.2768
D(KM)	-3908.108	3191.749	-1.224441	0.2231
D(GSD)	606.6291	507.0312	1.196433	0.2338

Source : EViews 10

The results of the data analysis indicate the presence of cointegration lag, and the coefficient values show a negative slope with a confidence level of 5%. For the model acceptance assumption, the value is negative (-0.649415) and significant, with a probability value of 0.0004, less than 0.05. In conclusion, the results are acceptable and can be proceeded with. The acceptance of the model suggests that the assumption further implies that the panel stages should be conducted separately for each country.

Table 3. Summary of Panel ARDL Results

Variable	INA	IND	TRK	ING	CHN	JPJ	JPN
GC	0	0	0	1	0	0	0
GF	1	1	1	1	1	1	1
GB	0	0	0	0	0	0	0
GI	1	1	1	1	1	1	0
GT	1	0	1	1	1	0	0
KM	1	0	0	0	0	0	0
GSD	0	0	0	0	0	0	0

Source: Processed by the author, 2023

Where:
INA : Indonesia
IND : India
TRK : Turkey
ING : England
CHN : China
JPJ : Long-term

JPN : Short-term

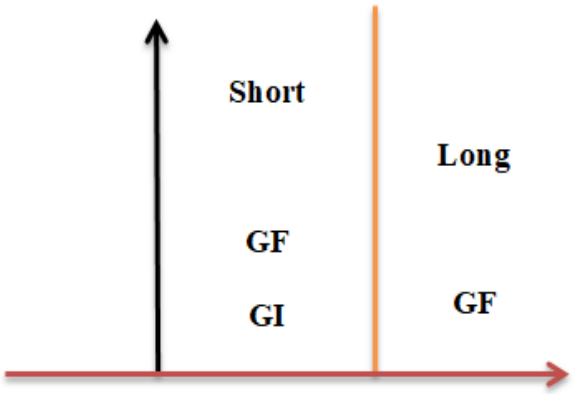

Figure 4. The Stability of Green Growth Control in 5G-20 Countries Over Time

Legend:
1 = Significant
0 = Not Significant

3.2. Discussion

Below is the summary of the long-term and short-term stability overview in the 5G-20 countries:

a. The Green Growth in the 5G-20 Countries is assessed using seven variables (green credit, green finance, green bond, green inflation, green trade, macroprudential policy, and green sustainable development). It is noted that the control of green growth in Indonesia is carried out by four variables: green finance, green inflation, green trade, and macroprudential policy. This aligns with research findings proving that despite several stages to enhance environmental remediation, most existing literature focuses more on increasing environmentally friendly finance and environmentally friendly growth (Qin et al., 2023) (Cheng, Zhonghua, Xiang Li, 2021) (Vergara & Agudo, 2021). Environmental-friendly trade contributes positively to environmentally friendly economic growth in the South Asian economy (Ahmed et al., 2022). For India, the control of green growth is done by only two variables: green finance and green inflation. In Turkey, the control of green growth is done by three variables: green finance, green inflation, and green trade. For the UK, the control of green growth is done by four variables: green credit, green finance, green inflation, and green trade. Green credit policy directly affects external financing. Ultimately, external financing has a direct impact on economic growth and an indirect impact on energy consumption through the intermediation of economic growth (Wu et al., 2023). According to Maeda et al. (2001) and Hu et al. (2011), qualitatively, it is asserted that the development of green credit can drive green economic growth. Green credit policy has a negative and significant impact on external financing for various manufacturing industries (Zhen Huang, Ning Gao, 2023b). In the case of China, the variables controlling green growth are green finance, green inflation, and green trade. Research (Sandberg et al., 2019) indicates limitations in the relationship of green trade in terms of the impact of green growth on natural resources. The use of environmentally friendly trade (green trade) and the environmentally friendly economic growth generated in recent decades remained stable until 2019, which then experienced a sharp decline due

to the economic recession caused by COVID-19 (Das, 2021; Sun et al., 2020; Umar et al., 2021).

b. In the above results, green bonds are not significant at all in controlling green growth in each country. This differs from the research conducted by (Alex Borodin, Vladislav Zaitsev, Nataliya Shash, 2023), which states that green bonds are a highly effective tool for raising funds for environmentally friendly projects. The concept of green bonds is a response to the increasing demand from investors to invest in financial products addressing global climate change and environmental protection (Zhen Huang, Ning Gao, 2023a). Furthermore, Jeuken (2001) considers environmentally friendly loans from the perspective of energy savings and emission reduction as environmentally friendly loans, promoting economic growth and sustainable finance.

c. In the short run, it is evident that only the variables of green finance and green inflation have a significant impact on green growth in the 5G-20 Countries. These findings align with the research results of (Wu et al., 2023), suggesting that financial resources will assist companies in taking strong measures to support the country's economy, with green finance emerging as the winner. Extensive research indicates that certain financial metrics can enhance economic value, and among them, green financial development is considered the most effective (Yunus et al., 2023). However, in the long run, only one variable, namely green finance, influences green growth in the 5G-20 Countries. According to (Webster et al., 2003), a commitment to green economic growth and consumption patterns driven by technology can create job opportunities and economic activities while reducing environmental impact. Green economy and green growth are essential components of the Sustainable Development Goals (SDGs) and should be implemented promptly (Paransa & Sadewo, 2019).

4. Conclusion

a. The summary of the analysis above and the discussion conducted using the Panel ARDL methodology can lead to the conclusion that the controlling variables for green growth in Indonesia are green finance, green inflation, green trade, and macroprudential policy. In India, the controlling variables for green growth are green finance and green inflation. For Turkey, the controlling variables for green growth are green credit, green finance, green inflation, and green trade. Banks provide financing options for environmentally friendly projects to achieve sustainable development goals. In the United Kingdom, the controlling variables for green growth are all variables except green bond, macroprudential policy, and green sustainable development. Meanwhile, in China, the controlling variables for green growth are only green finance, green inflation, and green trade.

b. In the long run, only the green finance variable significantly influences green growth. In the short run, there are two variables affecting green growth in 5G-20 countries: green finance and green inflation. This study concludes that environmental-friendly financing impacts both short-term and long-term environmentally friendly growth. This implies that a fundamental step in sustainable and environmentally friendly development is to limit and gradually stop funding projects that are not environmentally friendly and start funding more projects that support the "green" concept. The concept of a green economy, using green growth indicators, aims to incorporate environmental aspects into economic activities, providing a new and better hope for achieving sustainable development in the future.

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