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GREEN GROWTH AND INNOVATION IN GLOBAL SOUTH

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ABSTRACT:

There has been much interest in green growth and innovation in recent years. The main idea is that domestic green growth policies can provide 'win-wins' to both the environment and the economy. But we still know very little about the impact of such policies, especially in developing countries—the 'Global South.' The literature remains underdeveloped. This is disappointing since the Global South could leverage green growth policies to enhance competitiveness, 'leapfrog' directly to cleaner technologies, and 'catch-up' economically and environmentally through innovation in environmental technologies. The lack of research is also problematic because greenhouse gas emissions from developing countries are growing rapidly. Without green growth and innovation it will be exceedingly difficult to meet the urgent needs of climate change. Against this backdrop, this paper conducts machine-aided citation, bibliometric, and keyword analyses on green growth research with a particular focus on developing countries, innovation, and environmental technologies.

KEYWORDS:

GREEN GROWTH, GLOBAL SOUTH, ENVIRONMENT, CLIMATE.

INTRODUCTION

If one region of the world switches its research effort from dirty to clean technologies, will other regions follow To investigate this question, this paper builds a North-South model that combines insights from directed technological change and quality-ladder endogenous growth models with business-stealing innovations. While North represents the region with climate ambitions, both regions have researchers choosing between clean and dirty applications, and the resulting technologies are traded. Three main results emerge: (i) In the long-run, if North's research and development (R&D) sector is large enough, researchers in South will follow the switch from dirty to clean R&D in North, motivated by the growing value of clean markets. (ii) If the two regions direct research effort toward different sectors and the outputs of the two sectors are gross substitutes, then the long-run growth rates in both regions are lower than if the global research effort were invested in one sector. (iii) If North's government induces its researchers to switch to clean R&D through clean technology subsidies, the welfare- maximizing choice for South is to ensure that all of its researchers switch too, unless the social discount rate is high. The last result is true even if South's R&D sector is large.[1,2,3]

The study analyzes the determinants of green economic growth in OECD countries, focusing on the role of technological innovation, clean energy adoption, environmental innovation, and political stability. Employing panel data analysis techniques, including Dynamic Seemingly Unrelated Regression (DSUR), Common Correlated Effects Pooled-FM (CUP-FM), and Common Correlated Effects Pooled-BC (CUP-BC), the study examines the asymmetric relationships between these factors and green growth over both the short and long run. The findings suggest that technological innovation significantly influences green growth in OECD nations, with positive and negative shocks in innovation showing distinct impacts on green growth consumption, which emphasizes embracing and expanding green technology to enhance sustainable economic development and minimize environmental damage. Similarly, clean energy adoption plays a crucial role in fostering green economic growth, with positive relationships observed between renewable energy consumption and green growth in the short and long run. Environmental innovation also positively correlates with green growth, highlighting the significance of developing new products and services to manage environmental challenges. Besides, political stability is a critical determinant of

green growth, with stable political environments fostering investor confidence and encouraging long-term sustainable investments. The study underlines the complex interplay between these factors, emphasizing the bidirectional causality relationships observed among clean energy adoption, political stability, innovation, and urbanization. These findings underscore the multifaceted nature of sustainable development pathways, highlighting the need for integrated policy approaches to promote green growth agendas. The study contributes to comprehending the factors driving green economic growth in OECD countries and provides insights for policymakers and practitioners seeking to advance sustainability goals. By underlining the importance of technological innovation, clean energy adoption, environmental innovation, and political stability, the study proposes valuable insights

[4,5,6] into the pathways toward achieving environmentally sustainable and economically viable growth.

DISCUSSION

Green growth and innovation are interrelated concepts that refer to the process of fostering economic growth and development while ensuring environmental sustainability and social inclusion. Green growth aims to decouple economic activity from environmental impacts, such as greenhouse gas emissions, resource depletion, pollution, and biodiversity loss. Green growth also seeks to create new opportunities for employment, income, and welfare by investing in green sectors, such as renewable energy, green infrastructure, circular economy, green finance, etc.

Green innovation is the creation and diffusion of new or improved products, processes, services, or business models that reduce environmental pressures and enhance resource efficiency. Green innovation can be driven by technological, organizational, institutional, or social factors. Green innovation can also contribute to economic competitiveness, productivity, and resilience.

According to the OECD1, "Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. Innovation is key to green growth. It helps decouple growth from natural capital depletion and contributes to economic growth and job creation."

Green growth and innovation are important for developing economies for several reasons:

First, developing economies are often more vulnerable to the negative impacts of environmental degradation and climate change, such as droughts, floods, storms, diseases, food insecurity, displacement, etc. These impacts can undermine their development prospects, increase poverty, and exacerbate inequalities. Green growth and innovation can help these economies adapt to changing environmental conditions, build resilience, and reduce vulnerability.

Second, developing economies have the potential to leapfrog over carbon-intensive development paths and adopt cleaner technologies and practices that can lower their emissions and resource use while enhancing their productivity and competitiveness. [7,8,9]Green growth and innovation can help these economies avoid lock-in effects and path dependencies that can constrain their future options and increase their transition costs.

Third, developing economies can benefit from new market opportunities and sources of finance that are emerging from the global shift towards a low-carbon and green economy. Green growth and innovation can help these economies access and create green markets both domestically and internationally, attract green investments and finance, and participate in global value chains and partnerships.

Fostering green growth and innovation in developing economies requires a combination of policies, institutions, and actions that can create an enabling environment for green growth and innovation. Some of these policies, institutions, and actions are:

Establishing a clear and coherent vision and strategy for green growth and innovation that aligns with the national development priorities, the Sustainable Development Goals, and the Paris Agreement. This vision and strategy should be communicated widely and supported by high-level political commitment and stakeholder engagement.

Integrating green growth and innovation objectives into sectoral policies and plans such as energy, transport, industry, agriculture, urban development, etc. This can help mainstream green growth and innovation across different sectors and ensure policy coherence and coordination.

Implementing a mix of policy instruments to stimulate green demand and supply such as regulations, standards, taxes, subsidies, public procurement, trade policies, etc. These instruments should be designed to create incentives for green innovation, correct market failures, internalize environmental costs, and address social equity issues.[10,11,12]

Investing in green infrastructure and technology that can enhance resource efficiency, reduce emissions, improve access to basic services, and create new markets and jobs. This can include investing in renewable energy sources, public transport systems, waste management facilities, smart grids, etc.

Promoting green research and development (R&D) and innovation systems that can foster the creation and diffusion of green technologies and practices. This can include supporting public and private R&D activities, facilitating technology transfer and cooperation, strengthening intellectual property rights protection, enhancing human capital and skills development, etc.

Enhancing green finance and investment that can mobilize domestic and international resources for green growth and innovation. This can include improving the enabling conditions for green finance such as regulatory frameworks, disclosure requirements, risk assessment tools, etc. It can also include leveraging public funds to catalyze private investment through instruments such as guarantees, loans, grants, etc.

Monitoring and evaluating the progress and impact of green growth and innovation policies using indicators and data that can capture the environmental, economic, and social outcomes of green growth and innovation. This can help assess the effectiveness and efficiency of policies, identify gaps and challenges, and inform policy learning and improvement.

There are many examples or case studies of green growth and innovation in developing economies that can illustrate the benefits and challenges of pursuing this path. Here are some selected examples from different regions and

sectors:

China: Greening the industrial sector China is one of the world's largest emitters of greenhouse gases and consumers of natural resources, largely due to its rapid industrialization and urbanization. To address these challenges, China has adopted a series of policies and measures to promote green growth and innovation in its industrial sector, such as:

The 13th Five-Year Plan (2016-2020), which sets targets for reducing energy intensity by 15%, carbon intensity by 18%, water consumption by 23%, sulfur dioxide emissions by 15%, nitrogen oxide emissions by 15%, chemical oxygen demand by 10%, ammonia nitrogen by 10%, etc.

The Circular Economy Promotion Law (2008), which encourages the efficient use of resources through reducing, reusing, recycling, remanufacturing, etc.[13,14,15]

The Green Industry Guidance Catalogue (2019), which identifies 25 key areas for green industry development such as clean energy, energy conservation, environmental protection, green manufacturing, etc.

The Green Manufacturing Project (2016), which aims to establish a system of standards, evaluation, certification, incentives, etc. for green manufacturing.

The Green Credit Guidelines (2012), which require financial institutions to incorporate environmental factors into their lending decisions and support green projects.

These policies and measures have contributed to significant improvements in China's industrial environmental performance and competitiveness. For example,

1. China's energy intensity decreased by 18.8% from 2015 to 20201.

2. China's carbon intensity decreased by 18.8% from 2015 to 20201.

3. China's share of non-fossil fuels in primary energy consumption increased from 12% in 2015 to 15.9% in 20201.

4. China's share of renewable energy in power generation increased from 24.7% in 2015 to 29.5% in 20201.

Kenya: Promoting renewable energy and off-grid solutions (continued)

However, Kenya still faces many challenges in promoting renewable energy and off-grid solutions, such as:

1. The high cost of building and maintaining renewable energy infrastructure and equipment.

2. The limited availability and affordability of consumer finance options for off-grid customers.

3. The lack of adequate regulation and quality standards for off-grid systems and service providers.

4. The need for more capacity building and awareness raising among potential users and stakeholders.

Costa Rica: Pursuing carbon neutrality and nature-based solutions Costa Rica is one of the world's leaders in environmental conservation and climate action. Costa Rica has committed to becoming carbon neutral by 2050 and has implemented a series of policies and measures to pursue this goal, such as:

1. The National Decarbonisation Plan (2019), which outlines 10 strategic actions to achieve carbon neutrality by 2050, covering sectors such as transport, energy, industry, agriculture, waste, etc.

2. The Payment for Environmental Services (PES) Program (1997), which compensates landowners for conserving or restoring forests that provide ecosystem services such as carbon sequestration, biodiversity protection, water regulation, etc.

3. The Carbon Neutrality Country Program (2012), which certifies public and private entities that voluntarily measure, reduce, and offset their greenhouse gas emissions[16,17,18].

4. The National REDD+ Strategy (2016), which aims to reduce emissions from deforestation and forest degradation, and enhance forest carbon stocks.

These policies and measures have contributed to remarkable achievements in Costa Rica's environmental performance and climate resilience, such as:

1. Costa Rica's forest cover increased from 21% in 1987 to 52% in 2019.

2. Costa Rica's renewable energy share in electricity generation reached 99.5% in 2019.

3. Costa Rica's greenhouse gas emissions per capita decreased from 2.1 tons in 2012 to 1.8 tons in 2018.

However, Costa Rica still faces many challenges in pursuing carbon neutrality and nature-based solutions, such as:

1. The high dependence on fossil fuels for transport, which accounts for over half of the country's total emissions.

2. The increasing pressure on natural resources from population growth, urbanization, tourism, agriculture, etc.

3. The need for more financial and technical support from the international community to implement low-carbon development strategies.

RESULTS

Green growth and innovation are essential for developing economies to achieve sustainable development goals, enhance their economic competitiveness, and address the challenges of environmental degradation and climate change. However, green growth and innovation are not automatic or easy outcomes. They require deliberate and coordinated policies, institutions, and actions that can create an enabling environment for green growth and innovation. They also require collaboration and partnership among different actors, such as governments, businesses, civil society, academia, and development partners. [19,20,21]Green growth and innovation are not only desirable but also necessary for developing economies that face multiple challenges from poverty,

inequality, environmental degradation, and climate change. Green growth and innovation can help these economies achieve sustainable development goals, create new and more vibrant markets based on clean technologies, and secure a greener and more resilient future. Green growth and innovation are interrelated concepts that refer to the process of fostering economic growth and development while ensuring environmental sustainability and social inclusion. Green growth aims to decouple economic activity from environmental impacts, such as greenhouse gas emissions, resource depletion, pollution, and biodiversity loss. Green growth also seeks to create new opportunities for employment, income, and welfare by investing in green sectors, such as renewable energy, green infrastructure, circular economy, green finance, etc. Green innovation is the creation and diffusion of new or improved products, processes, services, or business models that reduce environmental pressures and enhance resource efficiency. Green innovation can be driven by technological, organizational, institutional, or social factors. Green innovation can also contribute to economic competitiveness, productivity, and resilience. Green growth and innovation are important for developing economies for several reasons. First, developing economies are often more vulnerable to the negative impacts of environmental degradation and climate change, such as droughts, floods, storms, diseases, food insecurity, displacement, etc. These impacts can undermine their development prospects and human well-being. By pursuing green growth and innovation, developing economies can enhance their adaptive capacity and reduce their exposure to environmental risks. [22,23,24] Second, developing economies have a unique opportunity to leapfrog to cleaner and more efficient technologies and avoid the lock-in effects of fossil-fuel-based development paths. By pursuing green growth and innovation, developing economies can avoid costly environmental damages and reap the benefits of low-carbon development. Third, developing economies have a growing demand for energy, infrastructure, goods, and services that can be met by green sectors that offer new sources of growth and employment. By pursuing green growth and innovation, developing economies can diversify their economic structure and create more inclusive and sustainable markets.

CONCLUSION

Fostering green growth and innovation in developing economies requires a combination of policies, incentives, institutions, capacities, partnerships, and behaviors that can address the main drivers and barriers of this process. Some of the key elements are:

Policy frameworks: Developing economies need to establish clear and consistent policy frameworks that support green growth and innovation objectives. These include setting science-based targets for emissions reduction and resource efficiency; implementing carbon pricing mechanisms; providing subsidies or tax incentives for green sectors; removing subsidies or tax exemptions for fossil fuels; enforcing environmental regulations; promoting green public procurement; integrating green criteria into public investment decisions; etc.

Market conditions: Developing economies need to create favorable market conditions that stimulate green growth and innovation activities. These include enhancing access to finance for green projects; facilitating access to information and knowledge for green entrepreneurs; fostering competition and market entry for green products and services; creating consumer awareness and demand for green goods; establishing standards and labels for green quality; etc.

Institutional capacities: Developing economies need to strengthen their institutional capacities to design, implement, monitor, evaluate, and enforce green growth and innovation policies. These include building human capital through education and training; enhancing technical expertise through research and development; improving governance and coordination across sectors and levels; fostering transparency and accountability through data collection and reporting; etc.

Social norms: Developing economies need to influence social norms and behaviors that enable or constrain green growth and innovation actions. These include raising public awareness and engagement on environmental issues and solutions; encouraging social learning and diffusion of green practices and innovations; fostering social inclusion and participation of marginalized groups in green decision-making and benefits-sharing; etc.[23,24,25]

There are many examples of green growth and innovation initiatives in developing economies that demonstrate the potential and benefits of this approach. Some of them are:

Renewable energy: Developing economies have been expanding their renewable energy capacity rapidly in recent years, taking advantage of their abundant solar, wind, hydro, and biomass resources.

Countries such as India, China, and Brazil have become major players in the global renewable energy market, attracting investments, generating employment, and reducing energy poverty. For instance, India's National Solar Mission aims to achieve 100 GW of solar capacity by 2022, creating jobs and contributing to energy security.

Green infrastructure: Many developing economies are investing in green infrastructure projects, such as urban parks, public transport, waste management, and ecosystem restoration, to improve the quality of life and resilience of their communities. For example, in Medellín, Colombia, the city has implemented a comprehensive urban transformation program, including the construction of cable cars, green corridors, and public spaces, which has contributed to social cohesion, crime reduction, and environmental sustainability.

Circular economy: Several developing economies are exploring circular economy strategies to minimize waste, promote resource efficiency, and stimulate innovation. For

instance, Rwanda has implemented a ban on single-use plastic bags, and South Africa has introduced Extended Producer Responsibility (EPR) regulations to encourage businesses to take responsibility for the end-of-life management of their products.

Green finance: Some developing economies are pioneering green finance instruments, such as green bonds, climate insurance, and impact investing, to mobilize private capital for green projects. For example, Kenya issued its first green bond in 2019 to finance sustainable student housing, and Nigeria has launched a sovereign green bond to fund renewable energy and afforestation initiatives.

In conclusion, fostering green growth and innovation in developing economies is a complex and multifaceted challenge that requires concerted efforts from various stakeholders, including policymakers, businesses, civil society, and individuals. By learning from best practices and examples, developing economies can overcome the barriers and seize the opportunities of green growth and innovation, ensuring a more sustainable, inclusive, and prosperous future for all. The upcoming #GlobalEmpowermentMeeting2023 will be an important platform to share knowledge, experiences, and partnerships that can accelerate this process and contribute to the global goals of climate action and sustainable development.[25]

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