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Green finance and its impact on Peruvian economic development

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Abstract

Researchers and policymakers worldwide are always searching for a solution that may give both economic growth and ecological balance. A new type of financial innovation, green finance, has been identified by the International Finance Corporation as one that may both boost the economy and benefit the environment. Although Peru's natural resources are abundant, achieving resource efficiency is a considerable challenge. The necessity to address inadequate domestic value-added in resource utilization is evident when it comes to mineral extraction. There is also a lack of water efficiency in Peru because current tariff rates do not adequately reflect the actual cost of water as a limited resource. This study attempts to address and provide various solutions to achieving economic growth through green financing by conducting correlation analysis, OLS, and robust regression analysis. From the results, the study determined a positive relationship between green financing and economic development, implying that if the government invests in green funding, the influence of government cooperation can go beyond the ability to raise money. In reality, international collaboration accounts for less than 0.25 percent of overall government spending, while environmental funding accounts for only 2.2 percent of total public expenditure on the environment. A critical mass of organizations and people is needed to support policy execution, and the ability to develop information and evidence-based policy is the most relevant influence.

Introduction

In order for the Sustainable Development Goals (SDGs) to be met by 2030, the two must coexist. Scholars, policymakers, and governments are all collaborating to discover a solution. It is a financial breakthrough that will benefit both the economy and the environment, according to International Finance Corporation (IFC). Many countries are interested in green finance (Zhang et al., 2019). Using ecologically friendly fiscal strategies, Wang and Zhi (2016) believe that environmental conservation and economic growth may be achieved. The pandemic has devastated Peru, which is now facing one of its most severe crises in the last half-century (Wang et al., 2019).

Additionally, the country incurred an economic effect of more than 20 percent of GDP (US$ 35.8 billion) in 2020, making it the world's most dangerous country to live in. We are reminded of the dangers of climate change in the wake of epic heat waves in North America and devastating floods in Europe. The climate catastrophe is predicted to cause GDP losses of 6% in Peru by 2030 and 20% in Peru by 2050 (Dabyltayeva and Rakhymzhan, 2019). Because of the coronavirus's economic impact and climate change, both can be addressed at once. According to IDB research, Peru might reap $140 billion in net benefits if it achieves carbon neutrality by 2050. Universidad del Pacifico and Universidad de Costa Rica conducted the study, funded partly by the Inter-American Development Bank and the 2050 Pathways Platform. When green funding is implemented efficiently, economic growth and environmental preservation may live happily (Zafar et al., 2019).

Regarding this type of study, there are two major schools of thought: While some argue that green finance is bad for the economy and needs improvement, others argue that it is suitable for it and needs improvement. (Wei & Jinhua, 2014; Haiyang, 2017). The second position has a more solid footing in academia. It is claimed that green money is similar to traditional finance, demonstrates environmental challenges, and contributes to economic growth in several studies, such as those by Wang et al. (2019), Chen et al. (2021), and Zhang

et al. (2019). Peruvian deforestation is primarily driven by the extension of agricultural lands in forest areas, new and expanding communities due to population growth and migration, as well as (artisanal) mining activities (Boni, A. A. 2022). New roads facilitate the transportation of agricultural products and other resources from rural areas to urban centers and markets, and drive migration from the mountain region to the rainforest in search of new lands for cultivation, leading to an expansion of urban settlements and the agricultural frontier (CIFOR). Illegal activities like as logging, mining, and coca planting, as well as ambiguous land ownership rights and inadequate law enforcement, all contribute to deforestation (Boni, A. A., & Abremski, D. 2022).

However, since 2013, Peruvian policymakers have not been able to put the green economy and green growth in particular at the forefront of their discussions. Even though a debate on green growth took place in May 2016, with representatives of the two political parties competing in the presidential runoff election, both sides agreed on the need for green growth policies (Zhao et al., 2022). Green economy and green growth were not highlighted by any political parties in June 2016, although both used the SDGs as a crucial reference point for several of their policy recommendations.

Since March 2018, when President Martin Vizcarra took office, neither the president nor prime minister directly addressed the transition to a green economy nor green growth. Many important initiatives and activities have been implemented at the highest levels of government. According to Law 30754, adopted by Vizcarra in April, the country's sensitivity to the effects of global warming would be reduced. On top of that, President Vizcarra has consistently cited the SDGs and the 2030 Agenda in his speeches at international conferences, most recently in his remarks after the 8th Summit of the Americas in April (Zhao et al., 2022).

Consequently, research has begun to support green financing to achieve the Sustainable Development Goals (Volz, 2018; Sachs et al., 2019; Nasir et al., 2019Arias, et al: 2022). According to most of this research, the public sector has made the largest contributions to green investment. The impact of green financing on economic growth is rarely examined by the study that concentrates on fiscal development and growth. Raising green funding is now more difficult than ever because of the economic and financial uncertainty caused by the COVID-19 epidemic (Taghizadeh and Yoshino, 2019). The COVID-19 epidemic has greatly impacted the world's attention to environmental concerns. In response, this study aims to shed light on the significance of green funding in the pandemic's economic development (Zhao et al., 2022).

Methods

The data used in this study was secondarily collected from the World Bank and International Monetary Fund (IMF) websites. The study used yearly panel data available from 2017 to 2022 for countries' economic growth in the context of the COVID-19 pandemic outbreak in 2020 to build the conceptual model. The sample included economies' GNI per capita, ranging from USD 1,046 to USD 12,696, with a GNI per capita of USD 1,045 or less. The World Bank Atlas approach was used to determine this classification of income. Select countries' economic growth is studied using a causal link between green spending and other variables.

The data on green expenditures was gathered from the Global Recovery Observatory, which contains information on government spending during the COVID-19 crisis. 50 leading

international economies announced COVID-19 pandemic recovery spending in the wake of the epidemic, which is included in the data. The statistics on Peruvian green financing were also examined. As a measure of the economy's health, it considers the rate of inflation, exports as a proportion of total GDP, gross capital formation, investment, and gross debt as a percentage of GDP. Explanatory and explained factors are both based on 2022 as a benchmark. The variables and their origins are listed in the following table.

<**Table 1**> Variable Description

Variables	Short name	Description
Gross Debt as % of GDP	debt	Amounts owed by the government on its debts, including both interest and principal payments.
Inflation, Consumer Prices (Annual %)	Inflation	To put it another way, it refers to the variation in the average cost per item or service for the general public
Gross capital formation (Constant 2010 USD)	GCF	It is made up of expenditures on the economy's fixed assets as well as net changes in inventory levels.
Log of GDP Per capita (Constant 2010 USD)	*GDP per capita*	It is calculated by dividing the GDP by the midyear global population.
Governments' Spending on Green Initiatives (in USD billion)	*Green gov. finance*	Amounts allotted by governments for environmentally friendly or environmentally sound development initiatives in 2020
Products and Services that are exported (percent of GDP)	*Exports*	Amount paid by the rest of the world for all products and services delivered

Note: GDP means Gross Domestic income, GCF implies Gross Capital Formation, and GN debt means Gross National Debt

Investing in environmentally friendly projects aimed at economic growth through green economy is the dependent variable, this was represented as GDP per capita (in US dollars), which includes the V and V-3 subtypes of capacity investments, clean research and development investment, electric vehicle incentives, clean transportation infrastructure investment, clean energy infrastructure investment, and infrastructure upgrades and efficiency. Using the above-listed variables, the following empirical model can be developed:

$$GDP\ per\ capita_{it} = a + b_1 Green\ financing_{it} + b_2 Export_{it} + b_3 Debt_{it} + b_4 GCF_{it} + b_5 Inf_{it} + e_{it}$$

Where a and b 1 to 5 represent the constants and e represents the error term that takes care of other factors that impact gross per capita apart from the ones used in this study.

Data analysis and interpretation

Data descriptive statistics

The table below represents the summary statistics conducted using SPSS version 28. The results distinction between the variables used in this study is shown in the table below.

<**Table 2**> Descriptive statistics

Descriptive Statistics					
Variable	**N**	**Mean**	**SD**	**Min**	**Max**
Gross Debt as % of GDP	65	9.939	1.360	6.933	11.319
Inflation, Consumer Prices (Annual %)	65	0.335	2.239	-3.605	3.021
Grosscapitalformation(Constant 2010USD)	65	4.91e+09	8.19e+11	2.23e+10	4.39e+09

Log of GDP Percapita(Constant 2010 USD)	65	99.352	30.692	32.532	155.562
Governments'Spending on Green Initiatives (in USDbillion)	65	3.169	6.939	-1.000	36.100
Productsand Servicesthatareexported (percent of GDP)	65	39.009	23.935	9.599	129.630

The result covers a sample size of 65, standard deviation (SD), minimum, maximum and mean variation. And as we can see from the result above, GCF had a mean of 4.9e+09 with a standard deviation of 8.19e+11. As shown in the table above, GDP per capita had a mean of 99.35 with a standard deviation of 30.69. The inflation on the other hand, had a mean of 0.335 with a SD of 2.239 and Gross debt had a mean of 9.94 and a SD of 1.36 as shown in the table above.

<**Table 3**> Correlation result

Variables	**1**	**2**	**3**	**4**	**5**	**6**
Inflation	1					
Log of Green financing	0.376	1				
Gross Debt as % of GDP	-0.02	0.076	1			
GCF	-0.062	0.323	0.007	1		
Log of GDP per Capita	-0.163	-0.123	-0.117	0.029	1	
Exports as % of GDP	0.539	-0.056	-0.179	-0.173	-0.27	1

There is a weak positive association between the logarithms of green spending and GDP per capita, whereas the logarithms of gross capital creation and green spending are also favorably associated (0.32). It is not surprising that exports as a percentage of GDP connect favorably with GDP per capita, indicating that exports benefit the economy. As shown in the research by Emery (1967), the energy sector's emissions will be reduced due to decarbonization, and the impact of electric mobility will rise as a result. Achieving lower emissions will require a combination of factors, including increased power and energy matrix renewability, increased energy efficiency in various activities, and the widespread use of smart grids. Minimizing the use of polluting technology will also lower operational costs and enhance health, resulting in net savings of $2 billion by the year 2050. More extensive use of renewable energy in Peru's electricity system requires continued regulatory initiatives and the creation of incentives. For inflation rates, the GDP per capita and exports as a percentage of the GDP are both negatively associated (-0.12) and (-0.27).

Regression Study result

A robust regression technique and ordinary least squares (OLS) are used to estimate the proposed model. Early model examination with the robust regression approach revealed the presence of outliers. Some diagnostic tests are employed in the OLS model to check for multicollinearity, heteroscedasticity through the use of variance inflation factor (VIF), and missing variables (via Ramsey's regression equation specification error test). Strong leverage points in the model can significantly impact the regression coefficients' estimations, which is why robust regression was used to eliminate them from the model. The third table displays the results of OLS and robust regression.

<**Table 4**> Regression result

OLS regression results				
Variables	**Coefficient**	**.S.E**	**t-value**	**p-value**
Gross Debt as % of GDP	0.35	0.097	4.15	0.000***
Inflation, Consumer Prices (Annual %)	0	0	-1.40	0.115
Gross capital formation (Constant 2010 USD)	0.001	0.005	0.1	0.945
Log of GDP Per capita (Constant 2010 USD)	-0.01	0.017	-0.73	0.475
Governments' Spending on Green Initiatives (in USD billion)	0.019	0.009	3.55	0.001***
Products and Services that are exported (percent of GDP)	9.503	0.549	13.13	0.000***
R-squared	0.51		N	65
F-test	6.112		Prob > F	0.000*

According to the research, Peruvian economy outliers have a substantial impact. For Argentina and China, Cook's distance is used to determine Cook's distances of 2.93 and 3.45, respectively. To qualify as an outlier country, a country must be at least twice as far away from the typical country in terms of distance as the average country. Cases having a more significant difference between the predicted and actual values are given 0 weights. Robust regression is then performed using the weights generated, which are weighted based on the size of the absolute residuals.

Here is a summary of the OLS and robust regression findings: Environmentally friendly public spending boosts countries' GDP per capita in a statistically meaningful and favorable way, showing that green public spending can spur economic growth, according to these findings (Jiang et al., 2020; Wang & Wang, 2020). Economic growth is positively impacted by exports as a percentage of GDP, mainly due to the enormous sums of foreign money that enter the country and improve the country's foreign exchange reserves. Numerous studies attribute the growth of a country's GDP to exports (Emery, 1967). According to our findings, inflation has a t-value of -1.81 negative effects on GDP per capita, the same result was determined by Verardi and Vermandele (2018), inflation has a negative impact on economic growth.

<**Table 5**> Robust regression results

Robust regression results				
Variables	**Coefficient**	**.S.E**	**t-value**	**p-value**
Gross Debt as % of GDP	0.119	0.111	1.69	0.011**
Inflation, Consumer Prices (Annual %)	0	0	-0.61	0.521
Gross capital formation (Constant 2010 USD)	-0.001	0.007	-0.15	0.717
Log of GDP Per capita (Constant 2010 USD)	-0.121	0.079	-1.73	0.072*
Governments' Spending on Green Initiatives (in USD billion)	0.01	0.009	1.17	0.030**

Products and Services that are exported (percent of GDP)	8.557	0.451	11.07	0.000***
R-squared	0.451		N	63
F-test	5.355		Prob > F	0.001*

For the OLS model, the diagnostic test is designed to identify non-orthogonality in the explanatory variables and model specification problems. The influence of international cooperation extends beyond the ability to raise money. In reality, international collaboration accounts for less than 0.34 percent of overall government spending, while environmental funding accounts for only 2.65 percent of total public expenditure on the environment. A critical mass of organizations and people is needed to support policy execution, and the ability to develop information and evidence-based policy is the most relevant influence. The link test results (which checks for specification errors) show that the model's variance inflation factor has a mean value of 1.21, indicating that multicollinearity does not exist. Prob>F 0.005 (indicating no omitted-variable bias) suggests the presence of an omitted variable in the Ramsey RESET. Still, the Breusch–Pagan/Weisberg test for heteroscedasticity (with a that assumes constant variance) has Prob > 0.032 and, therefore, indicates the presence of heteroscedasticity.

Conclusion

This research aims to scientifically investigate the impact of green funding on Peru's economic growth during the COVID-19 pandemic. Green funding had a beneficial effect on GDP per capita in the sample nations, in accordance with earlier research (Greco, 2018; Haiyang, 2017). As a result of this study, exports as a proportion of GDP have a favorable effect on economic growth, whereas inflation has an adverse effect. Since the beginning of this century, Peru has acknowledged the importance of a green economy transition. For starters, Peru's economy is still heavily reliant on exports of primary Peruvian goods, such as mining, fishing, and agroindustry (Haiyang, 2017). This dependence has only grown in the last decade. As one of the 17 mega biodiverse countries in the world, Peru is particularly vulnerable to environmental changes because of its high exposure and vulnerability to climate change, environmental degradation, and increasing pollution. Third, despite the apparent advances in national development indices in the 21st century, there are still considerable social and institutional development gaps. According to the model, governments should put more effort into green project funding by incorporating it into economic recovery plans, which shows that it can boost countries' economic progress.

According to this analysis, green spending is preferable to the two competing schools of thought. As a result of this research, lawmakers and government bodies can benefit from its conclusions. Achieving carbon neutrality is possible and desirable, but the study shows that the government's National Climate Change Strategy will provide more guidance on moving forward towards 2050 and provide a framework for action in each sector. A crucial part of our Vision 2025 is to help the region prosper sustainably and inclusively by working with the productive sector, supporting social progress, and building institutions at all levels of government. For this reason, Peru's National Green Growth Strategy (NGS) has been proposed to bridge this gap in conjunction with Peru's national development goals and international obligations such as SDGs and OECD participation. By providing policymakers with guidance on relevant interventions in light of NGGS and Peru's wider development landscape, this paper

provides the analytical framework necessary for crafting the NGGS on the results of Peru's Green Growth Potential Assessment (GGPA) (Jiang et al., 2020). Resource efficiency, environmental friendliness, and climatic resilience are all included while evaluating Peru's green growth performance in this study. From the analysis of these areas, Peru's priorities have been established. The appropriate national and international agencies should design a suitable green finance policy, taking into account the features of diverse countries. They should also figure out how to use green finance to help speed up green development at the country level in the wake of the COVID-19 epidemic, which has impacted the global green recovery.

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