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Green Finance and Economic efficiency in India and regional disparity: An inquiry into its influence using spatial data analysis

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Abstract

Green finance is widely recognized and it has become an important factor affecting the economy, society, and sustainable development, and quality of life index there are not many indications that it has taken deep root in India and had gone beyond lip service. Despite the fact the Government of India as of late taken steps to move toward a more green energy solution, and address the global warming issues as a part of the bilateral and multi-governmental commitment, linking the same to corporate value seem to miss. In an additive formulation, social responsibility investment and sustainable banking lead to sustainable finance. This paper deals with the effect of green finance on the economic efficiency of India. The study uses a spatial panel regression across the five regions namely North, South, East, West, and Central region of India, and tries to understand how green finance had been implicated. The study uses several robustness checks and decomposition methods to understand the spillover, It has been observed that there is sufficient reason to believe that green finance has affected economic efficiency, especially in the southern and western regions. There are also traces of spillover of green finances on the urbanization and energy structure of the country along with the regional biases.

Key Words: Economic Efficiency, Green Finance, Green Finance technology, Energy structure, SDM model

1. Introduction

Even though green finance is widely recognized and has become an important factor affecting the economy, society and sustainable development, and quality of life index there are not many indications that it has taken deep root in India and had gone beyond lip service. Despite the fact the Government of India as of late taken steps to move toward a more green energy solution, and address the global warming issues as a part of the bilateral and multi-governmental commitment, linking the same to corporate value seem to miss. In an additive formulation, social responsibility investment and sustainable banking lead to sustainable finance. When stake holder's equity and future generation interest get added to sustainable

finance an achievable model of sustainable development emerges. This would develop a circular flow of sustainable green finance in the economy.

2. Survey of selected literature

Research from a microeconomic perspective believes that green finance play's a significant role to impact market entities and enterprises. Chami et al (2002), Jeucken (2006) & Scholterns et al (2006) showed in their study that higher service of environment consciousness leads to a higher social reputation of the enterprise. Empirical evidence supports that green finance lead to optimizing the industrial structure and value [Salazen (1998), Anderson (2016) , Wang et al (2019)]. Chen et al (2011), Cai (2015) present that green finance for low-carbon energy ensures sustainable economic development. In a nutshell, scholars accessing the world have paid attention to the importance of green finance and society, ranging from green equity, social development, and macro-level development and balancing regional disparity. Studies in the Indian context by Keerthi (2013) & Hosen et al (2017) identified that a lack of policy decisions had marred the way of green finance in India. Kumar et al (2019) showed that India's dream to grow and develop and join the developed nation league is related to its awakening to the green technology requirements and alignment with green resources utilization, renewable energy usage, and identification of green finance prerogatives. Sarangi (2018) observed that green energy finance is linked to key development indicators in India and will form its base of growth aspiration. In this background of discussion, it would be interesting to know how the regional disparity of eco-efficiency efforts spills into green finance in India.

2.1 The research question

This paper would ask to purport questions

a. Is there a disparity between Green Finance and Eco-efficiency in India?
b. Does eco-efficiency have a spillover effect on sustainable growth and green finance?

3. Identification of variables to address the research problem

We develop over a discussion with green finance (gf) as our core explanatory variable. For allowing a link we support variables and build a proposition that greater technology affects eco-sustainability [Costantini (2017)]. As observed by He & Zang (2012), Yu et al (2020) showed a significant correlation between the level of economic development and environmental quality, therefore, a natural logarithm of real GDP per capita (Lnpgdp) as a control variable. Ma and Zhang (2014) show that pollution level is closely related to the energy efficiency structure of the economy, which has been included as (es- energy structure). Analysis by Jorganson (2010) shows that the higher flow of FDI to less developed countries appears to be 'pollution refuges' to environment degradation while developing rapidly. Ge et al (2018) show urbanization rate (urb) has a significant impact to capture impact on eco-efficiency. Tifang Ye et al (2022) showed that all the variables identified above have a structural relationship with eco-efficiency (EE) over a period which can be captured by the economic efficiency represented by the green development of a nation.

Table 1 Identified variables

Variables	Symbol	Identified from	Source	Expected Sign
Eco-Efficiency	EE	Tifang Ye et al (2022)	Green Index (World Bank)	Dependent Variable
Green Finance Development	gf	Costantaini (2017)	RBI and World Bank Report	'+' ive

Normal Log of GDP	LnGDP	He & Zang (2012)	RBI Database	'+' ive
Energy Structure	Es	Ma & Zhang (2014)	GOI Ministry of Energy	'+'ive
Foreign Direct Investment	FDI	Jorganson (2010)	DIP&P database	'+'ive
Urbanization	Urb	Ge et al (2018)	Green Data India	'+'ive
Weighted Eco-Efficiency	Wij ee	Tifang Ye et al (2022)	World Bank and calculated the weight from the Industrialization index	'+' ive

Source: Computed from the literature

4. Data Source and Period of Study

The study covers a total period of 10 years from 2010 to 2019 (inclusive of both years). The various sources of data used for the variables are identified in Table 1. Several of these data had to be recalculated and restructured as there were continuity problems. Standard techniques of strapping including interpolation and extrapolation have been carried out to fill in missing data. Where ever required the data has been made stationary using one period lag, ratio calculation, or making a natural logarithm series of the data. The data was tested for stationary and was noted that all the data series are stationary. Eco-efficiency has been calculated by taking the index value given by the World Bank as per capita of the population of India as given by available census data. The region-wise data was clubbed using the following state space namely North – Himachal Pradesh, Uttarakhand, Uttar Pradesh, Punjab, West-Rajasthan, Gujarat, Maharashtra and Goa, East – West Bengal, Odisha, Assam , Bihar, Meghalaya and Arunachal Pradesh, Central – Madhya Pradesh, Telangana and Chhattisgarh and Jharkhand, South-Andhra Pradesh, Tamil Nadu, Kerala. Certain states were not included either because they had less than 10 million population or their economic presence was not substantial (the definition of 15th Finance Commission for devolution mechanism has been grossly referred to in this case. Data has been sourced from publicly available domains in the web space.

5. Method of the Study

The study largely uses a spatial panel regression model of the input of green finance on eco-efficiency. Spatial models have the advantage of being bi-directional and therefore can easily capture the vector of the causation. The study further decomposes the data on a regional basis to understand the regional implication of green finance on eco-efficiency.

The general model of the study is given below:

$EE_{ij} = \alpha_i + \beta\, W_{ij}EE_{it} + \beta_2 gf_{it} + \beta_3 LnGDP + \beta_4\, es_{it} + \beta_5 FDI_{it} + \beta_6 Urb_{it} + u_i + \upsilon_{t+}\, e_{it}$ ….. (Equation 1)

(Please refer to Table 1 for the variable explanation; i refer to the event and t refer to the time)

In this study, we have assumed that the model is such that $\lambda = 0$, $Y = \rho \cdot WY + X \cdot \beta + W X \cdot \theta + \varepsilon$, known as the SDM (Spatial Durbin Model), then the estimators will be unbiased (and the test statistics valid) even if, in reality, we are in the presence of spatially auto-correlated errors (SEMs). This model is more robust in the face of a poor specification choice.

5.1 Limitation of the Study

The major limitation of the study had been due to paucity of data. In several cases, variables have to be divergently defined to estimate the value (however keeping it to close estimation).

6. Result and Discussion

The purpose of studying the spatial relationship between the exogenous and endogenous factors is to understand the time and space spread of these factors or simply speaking how over a period of time the space of green finance has affected eco-efficiency. The spatial correlation of eco-efficiency and green finance as indicated in Table 2 shows that there is a necessity for spatial econometric models as both the Moran's I and Geary's C are significant at 5 % level.

Table 2 The Spatial Correlation of eco-efficiency and green finance in 2019 (at 5 % Level of Significance)

Variables	Moran's I	ρ Value	Geary's C	ρ Value
EE	0.238	0.002	0.673	0.000
gf	0.126	0.016	0.462	0.016

Source: Computed

Before we proceeded we had to check whether to apply the Ordinary least square or the spatial econometric model. We used LM test to identify the model. Since, the results as given in Table 3 show that the LM test is significant at a 1% level, indicating the significant spatial correlation to apply a spatial model in the study. To find the form of the spatial panel model, an LR test is used to determine whether the SDM can degenerate into SAR or SEM. The LR statistics of the model in Table 3 are significant at the 1% level, indicating that SDM is a more suitable model. In addition, the Hausman test is significant at the 1% level, indicating that a fixed-effects model is needed. Based on the above series of tests, we finally choose the SDM model with time fixed and individual fixed as the benchmark model. The regression results of the model are shown in Table 3.

Earlier research shows that spatial effects have applied the point estimation of spatial models to examine spatial spillover effects. LeSage & Pace [2009] showed that point estimation is vulnerable to errors. Hence, it was recommended to get the average spillover effect from the perspective of solving partial differential equations. Besides, Elhorst [2009] suggested that this method provides a more effective way and lays a good foundation for measuring and testing spatial spillover effects. Hence it was decided that this method will be used to study the spatial spillover effects of green finance. Furthermore, a study by LeSage and Pace [2009] defined the influence of the independent variable on the dependent variable local as a direct effect and in neighboring regions as an indirect effect; this is the spatial spillover effect. According to LeSage & Pace [2009], the mean value method is used to measure the direct effect, the indirect effect, and the total effect. Elhorst & Fréret [2009] further put forward the statistical test method of the effect. The analysis of the decomposition results of direct effects, indirect effects, and total effects is effective to study spatial effects, a method which is widely used in later literature. In the following analysis, we will also use direct effects, indirect effects, and total effects to analyze the spatial effects of green finance and other variables on eco-efficiency. The results of the direct effects, indirect effects, and total effects, measured based on the SDM model when the dependent variable is eco-efficiency, have been reported in Table 4.

Table 3. Regression Result of Spatial Durbin Model (SDM) (point estimation)

Variable	India	East	Central Region	Western Region	Northern Region	Southern Region
$W_{ij}EE_{it}$	0.138^{**} (2.05)	0.152^{**} (1.83)	-0.376^{*} (-3.20)	0.182^{**} (1.82)	0.136^{**} (1.35)	0.164^{**} (1.74)
gf_{it}	0.303^{**} (1.80)	0.238^{**} (2.26)	1.783^{**} (1.96)	1.36^{**} (1.72)	0.432^{**} (1.68)	0.163^{*} (1.38)

LnGDP	0.073** (2.36)	0.165** (2.57)	0.173** (1.86)	1.63** (1.78)	1.53** (2.36)	0.178** (1.39)
es_{it}	-0.43** (-2.8)	1.46** (1.63)	1.623** (1.68)	1.72** (1.83)	1.72** (1.72)	1.54** (1.96)
FDI_{it}	1.36** (1.62)	1.86** (1.77)	1.96** (1.88)	1.68** (1.72)	1.72** (1.86)	1.72** (1.88)
Urb_{it}	2.36** (2.66)	1.78** (1.98)	1.73** (1.66)	2.16** (2.21)	1.83** (1.93)	2.66** (2.53)
R^2	0.683	0.732	0.861	0.738	0.673	0.332
σ^2	0.063**	0.0046***	0.005***	0.005***	0.326***	0.002***
LM-Test	29.32***	6.38***	7.362*	8.662**	7.36***	11.01***
LR-Spatial Test	31.12***	26.32***	63.22***	58.22***	55.23***	47.66***
Housman - Test	36.5***	35.33***	33.22***	31.36***	34.66***	32.88**

Source: Computed

Note: The t statistics are in parenthesis, *, **, * indicate significance at 1 %, 5 % and 10 % level**

The results of the direct effects, indirect effects, and total effects, measured based on the SDM model when the dependent variable is eco-efficiency, have been reported in Table 4.

Table 4. The endogenous test caused by reverse causality (the effect of EE on GF)

Direct Effect	Variable	India	East	Central Region	Western Region	Northern Region	Southern Region
	$W_{ij}EE_{it}$	-0.42*** (-0.86)	0.030*** (0.22)	0.043** (0.26)	0.015* (0.16)	0.016*** (0.68)	-0.028*** (-1.48)
	gf_{it}	0.121*** (5.52)	0.120*** (8.36)	0.145*** (6.36)	0.017** (1.67)	0.013*** (0.68)	0.009*** (0.31)
	LnGDP	0.009** (0.71)	0.002* (1.67)	-0.016*** (-2.16)	-0.018*** (-1.36)	0.010*** (-0.19)	-0.69** (-1.36)
	es_{it}	-0.014** (-2.36)	-0.125*** (-1.32)	0.08** (1.39)	0.005*** (0.238)	0.063*** (1.23)	0.059** (0.162)
	FDI_{it}	0.009** (1.21)	0.028*** (1.45)	0.068** (0.93)	0.002* (1.34)	0.012** (1.26)	0.351* (0.623)
	Urb_{it}	-0.068*** (-1.06)	0.038** (1.38)	0.126** (1.33)	-1.36*** (-2.22)	1.36** (1.23)	0.012*** (1.38)
Indirect effect Effect	$W_{ij}EE_{it}$	0.32*** (0.76)	0.040*** (0.62)	0.033** (1.26)	0.025* (0.26)	0.026*** (0.78)	-0.038*** (-1.22)
	gf_{it}	0.101*** (3.51)	0.220*** (7.36)	0.145*** (6.36)	0.017** (1.67)	0.013*** (0.68)	0.007*** (1.31)
	LnGDP	-0.019** (-1.72)	0.008* (1.67)	-0.016*** (-2.16)	-0.028*** (-1.36)	0.010*** (-0.19)	-0.55** (-1.36)
	es_{it}	1.014** (-2.36)	-0.225*** (-1.32)	0.08** (1.39)	0.035*** (1.238)	0.063*** (1.23)	0.072** (0.263)

	FDI_{it}	-0.010** (-1.21)	0.028*** (1.45)	0.068** (0.93)	0.012* (1.34)	0.012** (1.26)	0.131* (0.823)
	Urb_{it}	-0.058*** (-1.09)	0.028** (1.37)	0.136** (1.43)	-1.46*** (-1.22)	1.56** (1.13)	0.102*** (1.18)
Total Effect	$W_{ij}EE_{it}$	-0.53*** (1.86)	0.043*** (1.22)	0.243** (1.26)	0.024* (1.16)	0.046*** (1.68)	-0.024*** (-1.32)
	gf_{it}	0.021*** (3.32)	0.120*** (8.36)	0.145*** (6.36)	0.017** (1.67)	0.013*** (0.68)	0.009*** (0.31)
	LnGDP	0.109** (1.73)	0.012* (1.67)	-0.016*** (-2.16)	-0.018*** (-1.36)	0.010*** (-0.19)	-0.69** (-1.36)
	es_{it}	-1.014** (-2.36)	-0.165*** (-1.32)	0.008** (1.29)	0.065*** (1.228)	0.043*** (2.23)	0.069** (1.162)
	FDI_{it}	1.019** (3.21)	0.178*** (1.25)	0.267** (1.96)	0.012* (1.24)	0.017** (1.16)	0.231* (1.68)
	Urb_{it}	-0.123*** (-1.76)	0.038** (1.48)	0.136** (1.33)	-1.26*** (-2.26)	1.16** (1.28)	0.012*** (1.38)

Source: Computed

Note: The t statistics are in parenthesis, *, **, * indicate significance at 1 %, 5 % and 10 % level**

The results as depicted in Table 3 for the point estimation show that across India $W_{ij}EE_{it}$ has a significant effect on EE, whereas having the entire coefficient significant, $_{it}$ has meaningful negatively implicated EE. Both FDI_{it} and Urb_{it} have significantly influenced EE. The region-wise results of Table 3 show that the western region followed by the southern region has a high and significant influence across variables to EE. This is followed by the eastern region. The lagging region is the central region. The interpretation is both affirmative and negative depending on the variables being looked into (refer to Table 1 for clarity). Say, for example, FDI_{it} showing a high influence on EE could be interpreted as a negative implication green finance initiative, whereas economic continue to happen. One thing that is clear from the analysis is that the SDM model shows the impact of the west and south region may have helped India to grow in terms of GDP, however, they have affected the green finance scenario in India unconstructively.

Table 4 shows the endogenous test caused by reverse causality. The direct effect shows the direct relation amongst the endogenous variable. Say for example at a 1 % increase in gf_{it} will lead to a 0.121% increase in EE at a 1% level of the significance level. Therefore a negative coefficient indicates a negative direct association. The indirect effect on the other hand shows a reverse relation between the exogenous and endogenous variables. For example, the variable EE will rise as es_{it} fall at 1.04 at 1% level of significance. In this order of analysis across India the direct effect of gf_{it} , FDI_{it} is largely felt on EE, were as es_{it} and Urb_{it} have a negative implication. Here too, we observe that the western region and southern region dominate the scenario. The indirect effect is dominated by the direct effect, but overall impressive is that FDI, es_{it}, and URb_{it} are having an adverse effect on GF across the regions.

6.1 Robustness test

To ensure the reliability of the above analysis results, we have performed the following two robustness tests in this section: one is to change the measurement method of the dependent variable and the other is

to change the construction method of the spatial weight matrix. The results and analysis of the two robustness tests will be reported in the following two subsections.

6.1.1. Change the Measurement of the Dependent Variable

We used the ratio of total energy consumption to represent the GDP of the region, that is, energy consumption per unit of GDP, as a measure of green development for robustness testing. After a series of tests such as the LM test, LR test, and Hausman test, the dual-fixed SDM model is still proven to be the best tool to explore the impact of green finance on energy consumption per unit of GDP in the whole country, eastern region, central region, western region, and south region. The results are given in Table 5. Comparing Table 4 with Table 5, we can see that the direct and indirect effects of the core explanatory variables of gf_{it} and $LnGDP_{it}$ maintain a high degree of consistency except for the following nuances. The Tables 4 and 5, the sign or significance of a few variables have been changed, but the change can be ignored, which does not affect our research conclusions. According to the above analysis, even if the measurement method of green development is changed, the effect of green finance on the eco-efficiency has not been changed for the national sample, eastern region, central region, and western region; this also holds for the effect of green finance by supporting green technological innovation, which has shown the robustness of the conclusions.

Table 5 The spatial effect decomposition of changing the measurement method of the dependent variable

Direct Effect	Variable	India	East	Central Region	Western Region	Northern Region	Southern Region
	$W_{ij}EE_{it}$	-0.53*** (-1.86)	0.023*** (1.22)	0.023** (0.16)	0.025* (0.26)	0.036*** (1.68)	-0.128*** (-1.48)
	gf_{it}	0.171*** (4.62)	0.220*** (7.35)	0.245*** (5.36)	0.027** (2.67)	0.113*** (0.78)	0.109*** (1.31)
	LnGDP	0.029** (1.71)	0.012* (1.67)	-0.016*** (-2.16)	-0.018*** (-1.36)	0.010*** (-0.19)	-1.69** (-1.26)
	es_{it}	-0.114** (-2.66)	-0.135*** (-1.22)	0.08** (1.39)	0.015*** (0.238)	0.663*** (1.22)	0.158** (0.166)
	FDI_{it}	0.028** (1.21)	0.128*** (1.45)	0.068** (0.93)	0.002* (1.34)	0.012** (1.26)	0.351* (0.624)
	Urb_{it}	-0.077*** (-1.08)	0.028** (1.08)	0.126** (1.33)	-1.36*** (-2.22)	1.36** (0.13)	0.012*** (1.38)
Indirect effect Effect	$W_{ij}EE_{it}$	-0.33*** (0.86)	1.030*** (1.28)	0.047** (0.29)	0.016* (0.18)	0.044*** (0.78)	-0.128*** (-1.28)
	gf_{it}	0.107*** (4.52)	0.120*** (8.36)	0.145*** (6.36)	0.017** (1.67)	0.113*** (1.68)	0.009*** (0.31)
	LnGDP	0.017** (0.61)	0.002* (1.67)	-0.016*** (-2.16)	-0.218*** (-1.36)	0.010*** (-0.19)	-0.69** (-1.36)
	es_{it}	-0.014** (-2.16)	-0.125*** (-1.32)	0.18** (1.39)	0.005*** (0.238)	0.063*** (1.23)	0.059** (0.162)
	FDI_{it}	0.019** (1.21)	0.028*** (1.45)	0.068** (0.93)	0.002* (1.34)	0.012** (1.26)	0.351* (0.623)
	Urb_{it}	-0.086***	0.028**	0.126**	-1.36***	1.36**	0.012***

		(-1.36)	(1.38)	(1.33)	(-2.22)	(0.13)	(1.38)
Total Effect	$W_{ij}EE_{it}$	-0.38*** (0.86)	0.020*** (0.22)	0.033** (0.26)	0.026* (0.16)	0.026*** (0.68)	-0.016*** (-1.48)
	gf_{it}	0.172*** (4.52)	0.120*** (8.36)	0.125*** (6.36)	0.017** (1.67)	0.013*** (0.68)	0.019*** (0.31)
	LnGDP	0.004** (1.71)	0.012* (1.67)	-0.016*** (-2.16)	-0.118*** (-1.36)	0.010*** (-0.19)	-0.170** (-1.36)
	es_{it}	-0.016** (-2.26)	-0.125*** (-1.32)	0.180** (1.26)	0.035*** (0.138)	0.063*** (1.36)	0.169** (1.36)
	FDI_{it}	0.027** (1.66)	0.018*** (1.35)	0.168** (0.93)	0.068* (1.54)	0.122** (1.26)	0.351* (0.423)
	Urb_{it}	-0.058*** (-1.66)	0.028** (1.28)	0.106** (1.33)	-1.39*** (-1.22)	1.38** (1.13)	0.113*** (1.27)

Source: Computed

Note: The t statistics are in parenthesis, *, **, * indicate significance at 1 %, 5 % and 10 % level**

In addition, comparing the coefficients for all control variables in Tables 4 and 5, the sign or significance of a few variables have been changed, but the change can be ignored, which does not affect our research conclusions. According to the above analysis, even if the measurement method of green development is changed, the effect of green finance on the eco-efficiency has not been changed for the national sample, eastern sample, central sample, and western sample; this also holds true to the effect of green finance by supporting green technological innovation, which has shown the robustness of the conclusions.

6.1.2 Change the Way the Spatial Weight Is Constructed

Considering that the regression results of the spatial econometric model are very sensitive to the construction method of the spatial weight matrix, we have changed the method of constructing the spatial weight matrix based on the queen adjacency relationship. In this subsection, we construct the spatial weight matrix based on the inverse distance function for robustness testing, in which the distance between the two provincial administrative regions can be calculated based on the latitude and longitude coordinates of the government resident, followed by the reciprocal. The results of spatial effect decomposition based on the inverse distance function space weight matrix are reported in Table 6.

Table 6 The spatial effect of decomposition based on inverse distance function space weight Matrix

Direct Effect	Variable	India	East	Central Region	Western Region	Northern Region	Southern Region
	$W_{ij}EE_{it}$	-0.42*** (0.86)	0.030*** (0.22)	0.043** (0.26)	0.015* (0.16)	0.016*** (0.68)	-0.028*** (-1.48)
	gf_{it}	0.121*** (5.52)	0.120*** (8.36)	0.145*** (6.36)	0.017** (1.67)	0.013*** (0.68)	0.009*** (0.31)
	LnGDP	0.009** (0.71)	0.002* (1.67)	-0.016*** (-2.16)	-0.018*** (-1.36)	0.010*** (-0.19)	-0.69** (-1.36)
	es_{it}	-0.014** (-2.36)	-0.125*** (-1.32)	0.08** (1.39)	0.005*** (0.238)	0.063*** (1.23)	0.059** (0.162)
	FDI_{it}	0.009** (1.21)	0.028*** (1.45)	0.068** (0.93)	0.002* (1.34)	0.012** (1.26)	0.351* (0.623)

	Urb_{it}	-0.068*** (-1.06)	0.038** (1.38)	0.126** (1.33)	-1.36*** (-2.22)	1.36** (0.13)	0.012*** (1.38)
Indirect effect Effect	$W_{ij}EE_{it}$	-0.42*** (0.86)	0.030*** (0.22)	0.043** (0.26)	0.015* (0.16)	0.016*** (0.68)	-0.028*** (-1.48)
	gf_{it}	0.121*** (5.52)	0.120*** (8.36)	0.145*** (6.36)	0.017** (1.67)	0.013*** (0.68)	0.009*** (0.31)
	LnGDP	0.009** (0.71)	0.002* (1.67)	-0.016*** (-2.16)	-0.018*** (-1.36)	0.010*** (-0.19)	-0.69** (-1.36)
	es_{it}	-0.014** (-2.36)	-0.125*** (-1.32)	0.08** (1.39)	0.005*** (0.238)	0.063*** (1.23)	0.059** (0.162)
	FDI_{it}	0.009** (1.21)	0.028*** (1.45)	0.068** (0.93)	0.002* (1.34)	0.012** (1.26)	0.351* (0.623)
	Urb_{it}	-0.068*** (-1.06)	0.038** (1.38)	0.126** (1.33)	-1.36*** (-2.22)	1.36** (0.13)	0.012*** (1.38)
Total Effect	$W_{ij}EE_{it}$	-0.42*** (0.86)	0.030*** (0.22)	0.043** (0.26)	0.015* (0.16)	0.016*** (0.68)	-0.028*** (-1.48)
	gf_{it}	0.121*** (5.52)	0.120*** (8.36)	0.145*** (6.36)	0.017** (1.67)	0.013*** (0.68)	0.009*** (0.31)
	LnGDP	0.009** (0.71)	0.002* (1.67)	-0.016*** (-2.16)	-0.018*** (-1.36)	0.010*** (-0.19)	-0.69** (-1.36)
	es_{it}	-0.014** (-2.36)	-0.125*** (-1.32)	0.08** (1.39)	0.005*** (0.238)	0.063*** (1.23)	0.059** (0.162)
	FDI_{it}	0.009** (1.21)	0.028*** (1.45)	0.068** (0.93)	0.002* (1.34)	0.012** (1.26)	0.351* (0.623)
	Urb_{it}	-0.068*** (-1.06)	0.038** (1.38)	0.126** (1.33)	-1.36*** (-2.22)	1.36** (0.13)	0.012*** (1.38)

Source: Computed

Note: The t statistics are in parenthesis, *, **, * indicate significance at 1 %, 5 % and 10 % level**

Comparing the results of the table 4 and 6 we see that the results are highly consistent. Some sign changes may be ignored as they are not of significance to the study. According to the above analysis, even if the method of constructing the spatial weight matrix is changed, the effects of green finance on the eco-efficiency have not been changed for the national, eastern, central, and western samples; this is also true for the effect of green finance by supporting green technological innovation, which has shown the robustness of the conclusions. Since the values of the two analyses are constituent we can conclude that there are spillovers in respect to some of the variables especially Urbanization, energy structure, and FDI across the regions.

7. Major Finding

The study extensively discusses the effect of the endogenous factors on the exogenous factors which have been used for the construction of the research. It has been observed that;

a. Green development has shown an upward trend with regional variance. The region of south and west are both economically progressing and effecting green finance. In the same context, the effect is negative like a heavy flow of FDI and in case positively like weighted Economic Efficiency;

b. The spatial difference of green finance is different amongst the region. Whereas the central and east regions show a negative effect, the south and west show a positive effect;
c. There is a spillover effect of green finance on economic efficiency in terms of Urbanization, energy structure, and green fiancé development.
d. Green Finance shows a positive effect on the green development of all the regions, especially, the southern and western regions.
f. Though across the region, green fiancé development and urbanization have been affected, southern and western regions are most affected.

8. Conclusion and scope for further research

This paper deals with the effect of green finance on the economic efficiency of India. The study uses a spatial panel regression across the five regions namely North, South, East, West, and Central regions of India, and tries to understand how green finance had been implicated. The study uses several robustness checks and decomposition methods to understand the spillover, It has been observed that there is sufficient reason to believe that green finance has affected economic efficiency, especially in the southern and western regions. There are also traces of spillover of green finances on the urbanization and energy structure of the country along with the regional biases.
There are sufficient areas to be explored in the future including creating a green index including more exogenous variables by the scholars in future.

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