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Technological Innovation, Renewable Energy and Green Growth: perspective of SAARC Countries

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ABSTRACT

The paper explores the significance of green growth as a model for sustainable economic development, resource utilization, and environmental conservation. Exploring the influence of technical innovation and clean energy usage on green growth in SAARC-4 nations from 1992 to 2020, the study employs panel data, conducting unit root and co-integration techniques. Results indicate that the variables under consideration become stationary after taking first difference, affirming their stability. Employing FMOLS and DOLS models, the research reveals a negative effect of technical advancement and Government quality on green growth, interestingly, economic growth is found to impede green growth in SAARC countries positively. In conclusion, the study advocates for increased emphasis on technological innovation to foster green growth, urging governments and policymakers to invest in and encourage the development of innovative renewable resources.

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INTRODUCTION

The existing body of literature on green growth primarily focuses on global and developed country applications, with limited attention given to the unique context of SAARC countries. Green growth is generally accepted as an economic growth-centric approach, emphasizing sustainable development that balances human development with the preservation of natural assets for continued resource provision and environmental services (OECD, 2013). Developing countries, particularly those in the SAARC region, are more reliant on natural resources, making them more vulnerable to environmental disasters. As per the OECD, the promotion of green growth has the potential to alleviate poverty, stimulate economic growth, decrease susceptibility

to environmental shifts and natural disasters, bolster energy security, and ensure stable livelihoods for individuals relying on natural resources.

Numerous studies (Lee, 2011; WB, 2012; ADB/ESCAP/UNEP, 2012; OECD, 2013) emphasize the essential role of green growth in attaining growth development sustainability. It's considered economically effective and crucial for the future of developing countries (World Bank, 2012; OECD, 2013). Technological innovation is identified as a pivotal factor driving green growth, facilitating effectiveness in the production sector, and reducing the use of natural resources and climate change influence. Without technological innovation, achieving genuine sustainability in development is deemed impossible (James et al., 1978). The importance of technology and innovation has been investigated by Grover, (2013) in case of India and Padilla-Perez and Gaudin, (2014) in case of Central America and suggested that technical improvement is essential for environment friendly growth.

Green growth places a strong emphasis on green production and consumption through the discovery of those technical innovations which enhance utilization of non-fossil fuel energies (Gotschol et al. 2014., Luukkanen et al. 2019). Green technology is recognized as a successful method for boosting green economic growth, with the application of cleaner technologies considerably tumbling CO2 emissions (Sohag et al., 2019b; Yin et al., 2015). Additionally, renewable or clean energy emerges as a significant driver for improving green economic growth. Renewable energy resources are considered environmentally desirable, emitting zero or reduced carbon dioxide, making them a potential solution to climate change issues (Amini et.al., 2013; Boroojeni et. al., 2016). The usage of environment friendly energy not only diminishes pollution but also generates clean energy, resulting in fewer external costs and less environmental pollution (Gu, et.al., 2019., Lin, and Zhu, 2019a, 2019b., Alam and Murad, 2020; Sarkodie and Adom, 2018).

Diverging from conventional growth theories, contemporary economic growth literature has redirected its attention towards purposeful technological advancements as a means to accomplish a sustainable and environmentally friendly transformation. (Acemoglu, et.al. 2016, 2013., Aghion, et.al., 2016). This shift is driven by the recognition that an unregulated laissez-faire equilibrium could result in ecological risks (Acemoglu et al., 2012). Environmental taxes and patents are emphasized as crucial tools to drive technological change, decrease the use of nonrenewable resources, and increase reliance on renewables for emission reduction (Agion, et. al. 2016. Acemoglu, et. al. 2016). The growing awareness of environmental issues has prompted economies to launch green growth infrastructure, particularly in relations to the green alteration (Song, et. al. 2019).

Motivated by these considerations, the study addresses three main questions: (1) Does technical spill over facilitate Green growth? (2) Does use of clean energy promote growth associated with minimum CO2 emissions? (3) If the answers are affirmative, what measures should SAARC countries adopt to leverage technological innovation and renewable energy consumption for green growth? The study integrates these factors into a unified framework, utilizing panel FMOLS and DOLS models to investigate their role in green growth.

The present research study enrich the existent literature in the following ways: First, it fills a gap by being the first to examine technological innovation, REC, and CO2 emissions specifically in SAARC nations. Second, it underscores the effectiveness of technical progress and REC as

means to shrink climate change and promote green growth. Third, the use of panel FMOLS and DOLS models addresses issues of serial correlation and endogeneity, providing unbiased, consistent, and efficient results. The findings offer valuable research insights and guidance for strengthening factors and disengaging from others in the search of global green growth.

The remainder of the paper is organized as follows: Section 2 discusses the literature review, Section 3 presents materials and methods, Section 4 contains empirical results, and Section 5 concludes with policy recommendations.

REVIEW OF LITERATURE

Rich literature is available on the influence of technical inventions, use of cleaner energy usage, and green growth. A few studies have delved into this intricate nexus, shedding light on the effects of high-tech invention and non-fossil fuel energy on green growth.

Su and Fan (2022) examined the association between innovation in renewable energy technologies, industrial structure rationalization, and green growth in China. Their findings, based on the panel of 30 cities and different provinces covering 2013-2019, highlighted that renewable energy technology innovation influence green growth positively. However, structural changes and industrial improvements showed a negative relationship with green development.

Mensah et al. (2019) focused on 28 OECD countries from 2000 to 2014, using cointegration, STIRPAT, and IPAT techniques. The outcome of their study reveals positive impression of technological innovation on sustainable growth. Similarly, Danish,et.al. (2020) discovered the importance of the use of technologies in the process of sustainable development. For BRICS countries, finding that environmental technology and renewable energy consumption promoted green growth.

Similarly, Zhang, et.al. (2017) explored the nexus between CO2 emissions and technical progress in China using SGMM model, concluding that ecological friendly technologies mitigates carbon emissions. A case study by Sohag, et.al. (2019) checked the relationship between improvement in the technical sector and non-fossil fuel energy consumption by using the ARDL model of co-integration, and concluded the both the variables impact is positive on Green growth.

Dauda, et.al. (2019) explored the influence of invention of environment friendly technologies and GDP growth on fossil gases in 18 developed and developing countries by utilizing panel data covering period 1990 to 2016. Results of their investigation indicates that innovation reduce Carbon dioxide emission in G6 countries but increased m in the MENA and BRICS nations. Another study by Yii, and Geetha, (2017) conducted a research study in Malaysia. The utilized data covering period 1971-2013, revealing a negative short-term relationship, suggesting the importance of promoting research in innovation for sustainable growth.

Bilgili, et.al. (2016) examined the dynamic influence of renewable energy consumption on carbon dioxide emissions seventeen OECD countries from 1977 to 2010, finding a negative effect on emissions. Abolhosseini,et.al. (2014) analyzed the effect of renewable energy development and technological innovation on carbon dioxide emissions in 15 European Union economies from 1995-2010, showing mitigating effects. Similar results has been obtained by Inglesi-Lotz, and Dogan, (2018) in case of Sub-Saharan Africa.

Bilan,et.al.(2019). Conducted a study on the association among cleaner energy usage growth rate on the Carbon dioxide emissions in case of European countries by utilizing data 1995- 2015, the outcome of the study indicates non-fossil fuel energy impact negatively, but growth effect is positive on fossil gas emissions. Boluk and Mert (2014) noted a 50% decrease in emissions from the consumption of energy from renewable means related to conservative means. Similar, results are obtained by Hasnisah, et.al.(2019), in 13 Asian nations from 1980-2014. Narayan, (2010), and Yue, et.al. (2013), found that growth rate of GDP trigger CO_2 emissions, emphasized that rapid economic growth is a major cause of CO_2 emissions.

In summary, the reviewed literature offers appreciated understandings into the complex relationships amid technological novelty, renewable energy depletion, and green growth. While technological innovation appears to have positive effects on green growth, renewable energy consumption demonstrates a consistent negative impact on CO2 emissions. These findings contribute to our understanding of the intricate interplay between technological advancement, energy choices, and environmental sustainability. The next section will discuss the gaps in the existing literature and the specific focus of the current study

MATERIALS AND METHODS

In the empirical examination of the influence of technological innovation, renewable energy consumption, and economic growth on green development across four SAARC countries (Bangladesh, India, Pakistan, Sri Lanka), data has been collected form World Development Indicators covering the years 1992 – 2020. CO_2 is measured in mt per capita, Patent application by resident of the countries, Renewable Energy Consumption has been measured by taking the percentage of the total. And GDP is the growth rate in precipitate unit. Conversion of data into logarithmic form was undertaken to facilitate the interpretation of coefficient estimates as elasticity of the response variable

Econometric Model

The final model used in this study to show the influence of Technology, REC growth rate on the CO_2 emissions has been developed as follow.

$$\ln CO2 = f\ (\ln TECH, \ln RE, \ln GDP, \ln CO2\ ) \text{----------} (1)$$

Equation (1) illustrates that CO_2 releases (a proxy for green growth), a commonly employed measure by researchers such as Mensah et al. (2019). Technological innovation, represented by patent data (Tang and Tan, 2013; Fei, et. Al., 2014; Albino, et. Al., 2014; Popp, et. Al., 2011; Raiser, et.al., 2017; Chen, and Lei., 2018; Mensah, et.al., 2018), REC , and per capita growth are transformed into logarithmic form. The resulting model in logarithmic form is expressed as:

$$\ln(CO2_{it}) = \beta_0 + \beta_1 \ln(RE_{it}) + \beta_2 \ln(TECH_{it}) + \beta_3 \ln(GDP_{it}) + \varepsilon_{it} \text{------- ----------} (2)$$

Here, t and *i* (1,2,3,4) denotes panel of countries, time spam (1992-2020). εit signifies the error term, while βi reveals the coefficient of long run estimates of CO_2 releases concerning Patent, REC , and growth rate per capita. The sings of $\beta 3$ is expected to be positive for the confirmation of U- Shaped Environmental Kuznets Cuve. The expected signs for $\beta 1$ and $\beta 2$ are negative, indicating a decrease in CO2 emissions.

DK And FPP Tests

To test for the order of integration this study applied Four tests, introduced by Levin, Lin, and Chut (2002)., Im, Pesaran, and Shin (2003), Dickey, and Fuller, (1979)., and Phillips, and Perron., (1988), are applied. The results in Table 4 specify that variables under consaturation of order one i.e. I(1) This is an indications to refusal of the null hypothesis of a unit root at the non-stationary level, necessitating the proceeding with panel co-integration technique.

Co-integration Technique;

For the check of co-integration in this research study we have applied Pedroni (1999, 2004), The seven test statistics in Table-5 indicate a majority of test statistics confirming the existence of cointegrating relationships among the estimated variables in Equation 2. To verify accuracy and consistency, the Kao cointegration test is also applied, further confirming the cointegrating relationship.

Panel Fully Modified OLS and Panel DOLS;

Following the confirmation of a long-run affiliation among the panel series, it is essential to determine the size and sign of these relations. FMOLS and DOLS estimators established by Pedroni.,(2000; 2001) are employed for this purpose. These estimators, being nonparametric approaches, address issues of bias and robustness in panel data estimation. The outcomes from both the tests presented in Table-6 provide insights into the positive and statistically significant relationship of scientific novelty with CO_2 productions. However, the impact of high-tech innovation on green growth is found to be detrimental for SAARC countries. In contrast, renewable energy consumption is identified as having a beneficial and statistically significant effect on green growth. A rise in REC is allied with a reduction in CO_2 emanations, emphasizing its role in promoting green growth. Additionally, Gross domestic product has significant positive influence on CO_2 releases, suggesting that economic growth may contribute to increased emissions in SAARC countries.

EXPERIENTIAL OUTCOMES

Descriptive Statistics of variables;

Table-1 presents the statistical summary of CO_2 emissions, patents, renewable energy consumption, and monetary expansion for four SAARC states, spanning a 26-year period from 1980 to 2020. The data reveals that the mean CO2 value is 0.657, with a standard deviation of 0.354 indicating the extent of deviation from the mean. The average logarithm of patents is 5.396, accompanied by a standard deviation of 1.933. Similarly, the mean logarithm for renewable energy is 3.975, with a standard deviation of 0.186, while the mean logarithm for GDP is 8.201, with a standard deviation of 0.512. Most variables exhibit positive skewness, except for renewable energy, which demonstrates negative skewness. Additionally, the skewness values for all variables conform to a normal distribution, falling within the typical range of 0 to 3 as per Gujrati, 5th Edition

Table 1: *Descriptive statistics of variables*

	CO2	LnTECH	LnRE	LnGDP
Mean	0.657800	5.396575	3.975833	8.201966
Median	0.660488	4.783308	3.966398	8.197504
Maximum	1.727671	9.698245	4.357827	9.367843
Minimum	0.133613	2.772589	3.548095	7.231287
Std. Dev.	0.354646	1.933446	0.186283	0.512271
Skewness	0.644363	0.920725	-0.171097	0.195097
Kurtosis	3.328130	2.543959	2.557823	2.689427
Jarque-Bera	7.663423	15.59527	1.354671	1.077728
Probability	0.021672	0.000411	0.507969	0.583411
Sum	68.41123	561.2438	413.4866	853.0045
Sum Sq. Dev.	12.95472	385.0361	3.574237	27.02939
Observations	**104**	**104**	**104**	**104**

Source: World Bank (2020)

Correlation matrix;

Table-2 displays the correlation matrix for the variables under examination. Numerous studies posit that assessing correlations among variables is crucial for detecting the presence of multi-Collinearity. Multi-Collinearity is the interdepended of explanatory variables upon each other's. And more likely to yield inaccurate results, potentially leading to over fitting of the model, compared to scenarios where explanatory variables are uncorrelated (Dauod, 2017). Iyoha (2004), suggests that variables are said to be multi-Collinear is the value of Correlation Coefficient exceeds 0.85. with coefficients ranging from -1 to +1; the closer to +1 or -1, the stronger the correlation (Hinton, 2014).

Table-2 reveals that all the co-efficient values are less than 0.85 indicating the absence of multi-collinearity. Further support for the absence of multi-collinearity is provided in Table 3, where the Variance Inflation Factors (VIFs) for all variables are below 10. This reinforces the conclusion that multi-collinearity is not present among the variables under consideration.

Table 2: *Correlation Matrix of Variables*

	CO2	LnTECH	LnRE	LnGDP
CO2	1.000000			
LnTECH	0.813899	1.000000		
LnRE	-0.629162	-0.403082	1.000000	
LnGDP	0.435163	0.240705	-0.078290	1.000000

Source: Author own efforts

Table 3: *VIF'S Results*

Var	C.Variance	VIF
LnTECH	0.002310	4.624027
LnRE	0.053944	4.280684

LnGDP	0.014322	6.015996

Source: Author own efforts

The scatter plots of the dependent and independent variables presented below provide additional insights into their individual relationships. These visualizations, depicted in Figures 1-3, serve to reinforce and elaborate on the findings presented in Table 4.

According to the Figure 1 CO_2 Releases is associated positively with that of technical advancement, as technical progress takes place it will lead the damage the environment.

Environmental damage is negatively correlated with clean energy utilization as indicated by the figure 2.

Figure-3 portrays a positive correlation between CO2 emissions and growth Per Capita, meaning that growth rate will trigger the fossil gas releases.

It is imperative to note that the interpretations drawn from Figures 1-3 are preliminary, as these relationships are examined on a one-to-one level. Such analyses provide insights into the impact of individual variables, but conclusive outcomes require a more comprehensive examination through regression models. Subsequently, the outcomes of the Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) models are presented below.

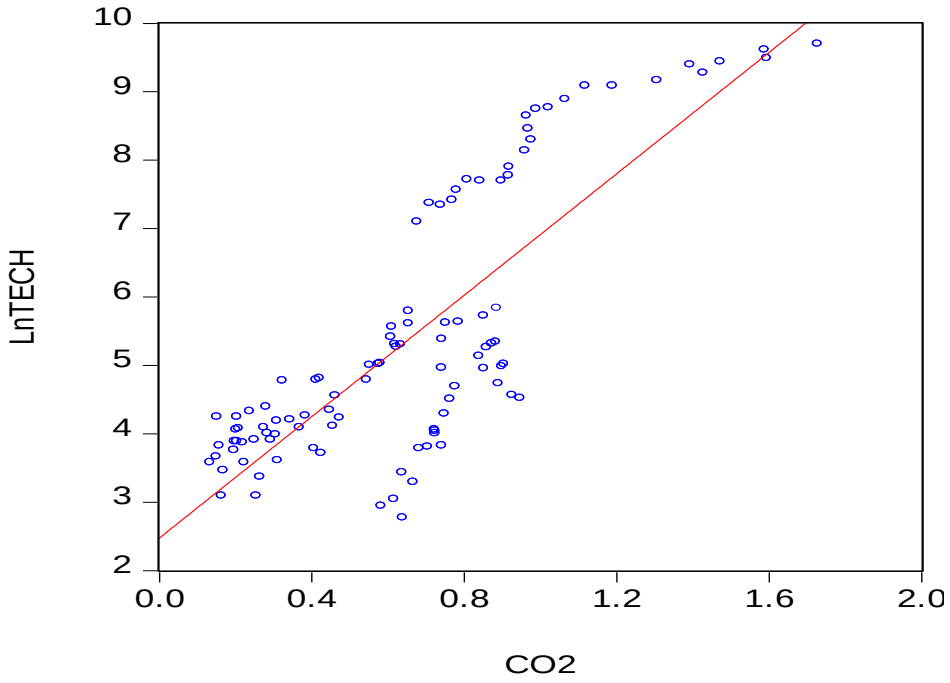

Fig 1: *Log Tech ---------- Fitted Values*

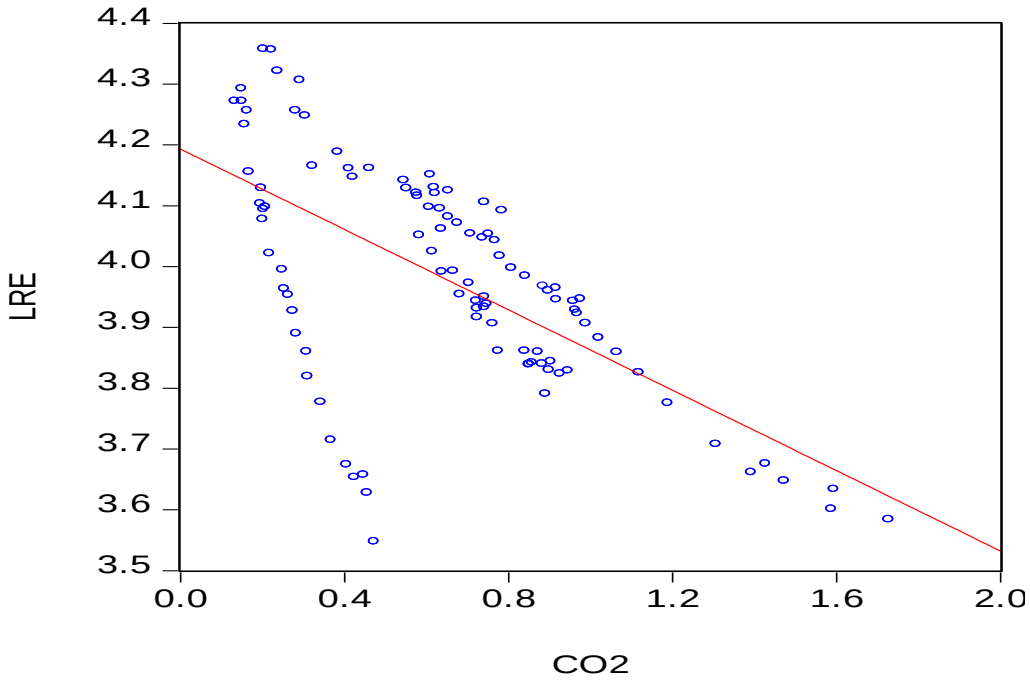

Fig 2: *Log Renewable Energy --------- Fitted Values*

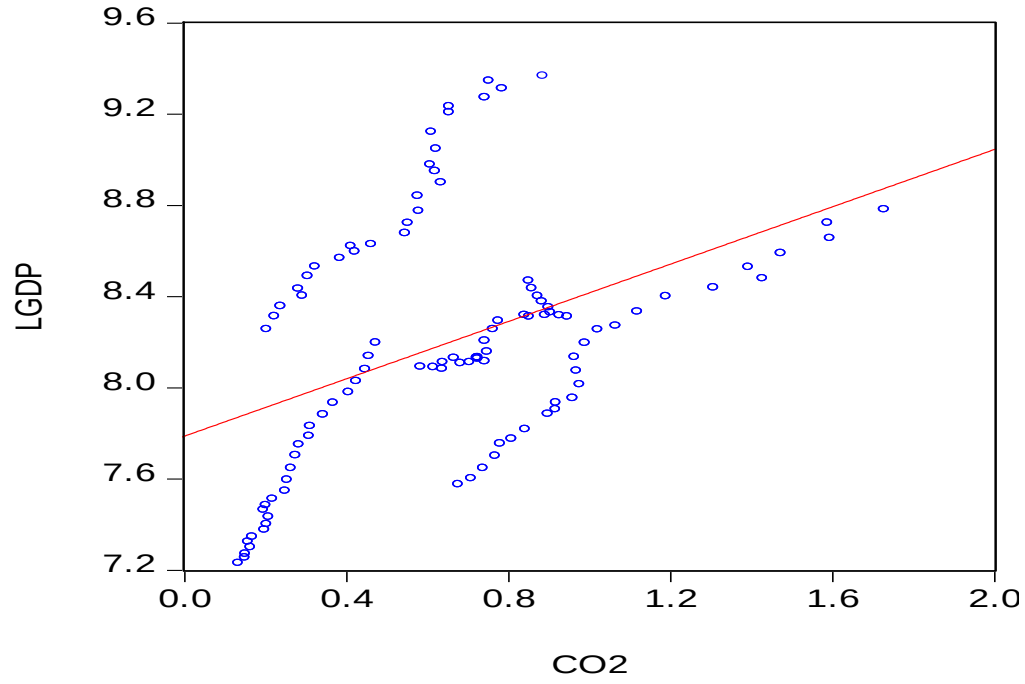

Fig 3: *Log GDP per capita ---------- Fitted Values*

Table 4: *Panel Unit root tests*

	I(0)				I(1)			
Variables	LLC	IPS	ADF	PP	LLC	IPS	ADF	PP
CO_2	3.204	4.708	1.186	2.153	5.328***	-5.553***	48.039***	58.823***
lnTECH	-1.195	1.068	8.443	14.4*	15.206**	14.406***	91.651***	80.436***
lnRE	2.3176	3.4912	2.4224	2.6809	5.181***	-6.186***	47.926***	47.167***
lnGDP	3.7118	5.7313	0.1902	0.1116	2.4778**	-3.0063**	25.7002**	25.9494**

Source: Author own efforts

Panel Pedroni co-integration

Table 5 presents the outcomes of Pedroni cointegration tests (Pedroni, 2001, 2004), divided into two categories (within-dimension and between-dimension). The null hypothesis of no co-ntegration has been refused by two out of four group statistics, with in the dimension group among the variables at both the 5% and 10% significance levels. Simultaneously, two out of three panel statistics also reject the null hypothesis. The outcome indicates a long-run association among these variables in the four SAARC countries.

To further validate and accuracy of these results, the Kao cointegration test developed by Kao (1999) is employed.

Table 5: *PP and Kao Co-integration results*

Dimension	**Test Statistics**	**Statistics**	**Prob**	**Kao Residual Cointegration Test**	
	Panel v-Statistic	1.251095	0.1054		ADF
	Panel rho-Statistic	-0.820421	0.2060	t-stat	P. value
	Panel PP-Statistic	-1.690463	0.0455	2.312211	0.0374
	Panel ADF-Statistic	0.117700	0.0468		
Within Dimension		**(Weighted Stat)**			
	Panel v-Statistic	1.945840	0.0521		
	Panel rho-Statistic	-0.300060	0.3821		
	Panel PP-Statistic	-1.064308	0.1436		
	Panel ADF-Statistic	0.250574	0.0989		
	Panel rho-Statistic	0.254255	0.6004		
Between dimension	Panel PP-Statistic	-0.948010	0.0116		

	Panel ADF-Statistic	0.676364	0.0506

Source: Author own efforts

Panel FMOLS and DOLS

The outcomes obtained from the Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) techniques effectively address endogeneity problems and serial correlation. The findings from both panel models, as presented in Table 5, reveal that patent, used as a measure of technological innovation, displays a positive and statistically substantial connection with CO_2 releases in the entire SAARC nations. This positive association suggests that an increase in climate change-related technology corresponds to an increased in CO_2 productions by 0.11% and 0.09%, individually. However, the lack of significance in the DOLS model is noteworthy, indicating that technological innovation may have a detrimental impact on green growth for SAARC states. This suggests that technical invention has not yet demonstrated a positive sign in enhancing green growth, possibly due to limitations in the use of certain energy generation technologies or their inability to effectively address climate change issues. These findings align with Martinez-Garcia, et.al., (2018), who stated that although technical invention leads to green growth but some may not .

Contrary to technological innovation, RE usage demonstrates a negative, substantial effect on CO_2 discharges, except in the FMOLS. This implies that increased RE consumption promotes sustainable growth in SAARC nations. A unit surge in RE consumption is linked with a declining in CO_2 discharges by 0.69% and 0.52%, respectively, underscoring the substantial importance of RE in fostering green growth. The study suggests that the transition to renewable energy can contribute to cleaner production, aligning with the findings of Mensah et al. (2019). The abundant market potential and overall benefits of renewable energy, including energy security, economic growth, and poverty eradication, make it a crucial element in reducing carbon dioxide discharges. This study indorses that SAARC countries actively promote the use of non-fossil fuel energy to achieve lower emissions.

As anticipated, GDP per capita demonstrates a positive and statistically significant impact on CO_2 productions. A one percent upsurge in market size give indications to a 0.18%, 0.38%, and 0.36% upswing in CO_2 releases, as indicated in Table 6. These results suggest that despite efforts to rise the use of RE, a substantial reduction in CO2 emissions remains elusive. The findings imply that fast Income per capita growth in high-emitting countries may result in increased energy consumption, particularly since nonrenewable energy still dominates the energy mix in these countries. Even with improvements in technologies used in the promoting efficiency and renewable energy utilization, the study highlights the challenges in achieving a significant reduction in emissions, consistent with the observations of Jiang et al. (2019).

Table 6: *FMOLS and DOLS Results*

	OLS		**FMOLS**		**DOLS**	
Variables						
	Co-efficient	t-stat	Co-efficient	t-stat	Co-efficient	t-stat

lnTECH	0.1107***	13.237	0.0942**	3.5705	0.0366	0.7631
lnRE	-0.6955***	-8.2278	-0.0956	-0.6027	-0.5215**	-2.2452
lnGDP	0.1808***	6.23394	0.3855**	0.8989	0.3607**	3.0144

Source: Author own efforts

CONCLUSION

This paper investigated the influence of technical improvement and renewable energy consumption on green growth in the SAARC-4 states, utilizing panel data spanning from 1992 to 2020, a timeframe selected based on data availability. Panel unit root tests and Co-integration tests were employed, with results indicating that all variables exhibits of order I(1) and long-run connections exist among the selected variables.

The outcomes obtained from FMOLS DOLS revealed a positive and statistically significant affiliation between high-tech revolution and CO_2 emissions. This suggests that scientific modernization may have a detrimental effect on green growth in SAARC countries. Conversely, the study found that renewable energy consumption positively contributes to green growth. Additionally, GDP per capita was identified as having positive effect on CO_2 discharges, indicating that economic growth may impede green growth in SAARC countries.

Based on these findings, the study proposes the following policy recommendations:

1. **Integration of Technological Innovation into Emission Reduction:**
    - Policy makers should integrate technological innovation into strategies aimed at reducing CO2 emissions, using it to facilitate waste recycling in the production process and decrease pollution.
    - Increased investment in environment friendly technologies, particularly in renewable energy, is crucial to decrease pollution and promote green growth.

2. **Transition to Renewable Energy Resources:**
    - Given that per capita growth rate inclines to increase CO_2 releases, governments should prioritize transitioning to renewable energy capitals such as solar, wind, and hydro.
    - Developing countries should improve their economic structures to effectively harness efficient and low-carbon energy sources, contributing to environmental protection.

3. **Enhancement of Data Availability and Transparency:**
    - Encourages policymakers to ensure transparency and accessibility of data related to the study's findings.
    - The statement highlights the availability of the study's data from the corresponding author upon reasonable request, promoting further research and scrutiny.

In summary, these policy recommendations aim to guide governments and stakeholders in fostering sustainable and environmentally conscious development in the SAARC-4 countries.

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Digital Marketing and Performance of Nigerian Insurance industry: Meditating role of Organizational Culture

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ABSTRACT

This study examines the mediating role of organizational culture on the relationship between digital marketing and organizational performance with specific reference to the selected insurance companies in Nigeria. A structured questionnaire was used to solicit information from 120 respondents, while path analysis was employed to analyze the data using STATA version 15. The results reveal that digital marketing and organizational culture are independently and significantly related to organizational performance. The evidence also showcases that organizational culture has an indirect effect on organizational performance through digital marketing. In other words, the positive effect of organizational culture on organizational performance is partially mediated by digital marketing. The study concludes that organizational culture serves as a platform through which digital marketing propels the performance of the Nigerian insurance sector. Therefore, Nigerian insurance companies should continue to foster a culture of innovation that can swiftly integrate digital marketing innovations such as social media advertising, content marketing, and data analytics to remain competitive and relevant in the rapidly evolving digital landscape.

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INTRODUCTION

The role of the insurance industry in supporting economic growth and stability in terms of providing individuals and businesses with financial protection against various risks and uncertainties (Pricopoaia et al., 2022; Unachukwu et al., 2020; Yosep et al., 2021). In the same vein, Appel et al. (2020) note that the insurance industry is a strong pillar of nations' economy. Evidently, Jung and Shegai, (2023) attest that the sector contributes about 17.2 billion pounds to the United Kingdom between 2020 and 2021. Yosep et al. (2021) also confirm that the insurance industry contributes about 3.1% of the United States of America's GDP. In Malaysia, the industry accounts for roughly 8.4% of the GDP. Furthermore, it is

projected that the sector's written premiums will increase from $17.6 billion in 2021 to $26.7 billion by 2026(Jung & Shegai, 2023). This connotes that the insurance industry is a strong sector that fosters sustainable development in advanced nations. Nevertheless, the industry in developing nations has encountered difficulties ever since the onset of the COVID-19 pandemic. This unfavourable situation resulted in a notable rise in insurance claims across different categories such as health, travel, and event cancellations. The heightened frequency and severity of these claims strained the financial reserves of insurance companies and had an adverse effect on their loss ratios, possibly resulting in financial challenges (Doku et al., 2021). In Nigeria, the Chartered Insurance Institute of Nigeria (CIIN) has revealed that only about 5% of Nigerian adults have any form of insurance. This means that out of Nigeria's 200 million adult population, over 190 million do not have any form of insurance. This is why Nigeria has the lowest insurance density in Africa, at US$6.2. This is attributed to the reliance on traditional physical operations and conventional marketing strategies, which have resulted in limited awareness and understanding of insurance among Nigerians (Unachukwu et al., 2020).

The convergence of technology and marketing has opened up new avenues for insurance companies to connect with their target audience, enhance customer experiences, and streamline business operations(Yosep et al., 2021). Digital marketing encompasses a wide range of online tools and techniques, including social media, search engine optimization (SEO), content marketing, email campaigns, and more. This digital marketing has become essential for insurers in Nigeria to stay competitive and relevant in an increasingly digital-driven market(Adebayo et al., 2018a; Nuseir & Aljumah, 2020; Osanaiye, 2022). Aside from digital marketing, organizational culture has been recognized as a pivotal element that influences individuals' attitudes and sentiments towards the attainment of organizational goals. According to Adebayo et al. (2018b), a culture that values innovation, adapts to change, encourages collaboration, and prioritizes customer needs is more likely to be successful in implementing digital marketing strategies and improving organizational performance.

The relationship between digital marketing and organizational performance has been extensively researched in both developed and developing countries (Appel et al., 2020; Jung & Shegai, 2023, 2023; Nuseir & Aljumah, 2020; Omar et al., 2020). However, no studies have yet examined how organizational culture mediates between digital marketing and organizational performance in the Nigerian insurance industry. Hence, this research aims to fill the gap in existing literature by investigating how organizational culture acts as a mediator between digital marketing and organizational performance within the Nigerian insurance sector. This study anticipates enhancing insurers' understanding of the significance associated with cultivating a culture that fully embraces digital marketing. This awareness is particularly crucial considering the escalating prevalence of smartphones, internet access, and social media engagement across Nigeria.

Theoretical Framework

Numerous research studies have established connections between various frameworks such as the Technology-Organization-Environment (TOE), Technology Acceptance Model (TAM), Strategic Behavior Theory (TPB), Resource-Based Theory (RBT), and Diffusion of Innovation (DOI) in the context of digital marketing's impact on organizational performance (Adebayo et al., 2018a; Alyahya, 2021; Jung & Shegai, 2023; Nuseir & Aljumah, 2020; Susanti & Astuti, 2019; Yosep et al., 2021). Despite this, no prior studies have amalgamated multiple theories to elucidate the influence of digital marketing on organizational

performance. This present study seeks to address this gap in existing literature by amalgamating the Resource-Based Theory (RBT) and the Technology Acceptance Model (TAM). These two theories are employed to expound upon the correlation between digital marketing, organizational culture, and the performance of the Nigerian insurance industry. The selection of these particular theories is predicated on the notion that RBT and TAM provide a framework for the insurance industry to cultivate a culture conducive to embracing digital marketing, thereby fostering enhanced organizational performance(Pricopoaia et al., 2022).

The Resource-Based Theory (RBT)

The Resource-Based Theory (RBT), conceived by Barney in 1991, aims to analyze an organization's resources in the context of gaining a competitive edge (Grant, 1991; Jung & Shegai, 2023). This theory posits that a company can establish a sustainable competitive advantage by skillfully leveraging its available resources and adapting to the evolving external landscape. Scholars such as Yuga and Widjaja (2020), (Grant, 1991) and (Adebayo et al., 2018b) acknowledge Resource-Based Theory (RBT) as a pivotal concept within the realm of strategic management. Additionally, (Yosep et al., 2021) highlight that RBT has gained substantial influence in the discourse on organizational innovation. In the context of the Nigerian insurance industry and its adoption of digital marketing, the RBT theory offers insights into how firms can leverage their resources to achieve a competitive advantage and improve performance in the digital age (Bodoine, n.d.; Omar et al., 2020; Tiago & Tiago, 2012).

According to (Nuseir & Aljumah, 2020), establishing a strong technological foundation is imperative for the integration of digital marketing. Consequently, Nigerian insurance companies that allocate resources towards sophisticated digital platforms, customer relationship management (CRM) systems, and adept data analytics capabilities stand to achieve a competitive advantage. These technological assets empower them to customize marketing approaches in accordance with customer inclinations and actions, ultimately resulting in enhanced customer engagement and heightened conversion rates. (Tiago & Tiago, 2012) additionally contend that the Resource-Based Theory (RBT) provides an avenue for insurance companies to proficiently exploit and dissect data, culminating in the generation of more profound customer insights. These insights, as emphasized by (Yuga & Widjaja, 2020), facilitate the creation of individualized marketing tactics, precision-targeted product propositions, and elevated customer encounters. Furthermore, (Yosep et al., 2021) affirm that enterprises possessing the prowess to translate data into tangible, actionable insights secure a marked competitive edge. This theory, therefore, suggests that insurance industry should invest in training their employees on digital marketing skills such as search engine optimization (SEO), social media management, content creation, and data analysis. This will enhance their resource pool and give them an advantage in designing and executing effective digital marketing campaigns.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a psychological theory that explains how users come to accept and adopt new technologies. It was developed by Fred Davis in 1989 and is based on the theory of reasoned action (Matikiti et al., 2018). The model suggests that the perceived usefulness and perceived ease of use of a technology are key determinants of users' intentions to adopt and use that technology (Pricopoaia et al., 2022). As per Tabiat (2022) , the Technology Acceptance Model (TAM) offers insights into users' attitudes and behaviors

regarding the adoption of novel digital tools, platforms, and technologies. This framework elucidates the manner in which digital marketing should shape user-centric websites, applications, and platforms that are both simple to navigate and employ. By comprehending users' perceptions of ease of use, marketers can guarantee that their digital resources possess an instinctive and user-friendly quality (Matikiti et al., 2018). In an alternate study, Singh, (n.d.), showcase that TAM provides a foundation for digital marketers to construct content and campaigns that effectively convey the value and advantages of their products or services to potential customers. Illustrating how a product aligns with users' requirements can amplify its perceived utility, thereby fostering its adoption. Likewise, Mathew and Soliman (2021) suggest that the Technology Acceptance Model (TAM) offers a valuable tool for marketers to pinpoint potential obstacles that could impede the adoption process. These barriers might encompass worries regarding privacy, security, or intricacy. By effectively addressing these hurdles through precise messaging and information dissemination, marketers have the opportunity to allay user apprehensions and stimulate the uptake of technology. Similarly, Matikiti et al. (2018) assert that TAM's emphasis on individual perceptions provides a guiding framework for insurance firms to comprehend the technological inclinations of distinct customer segments. This understanding can then pave the way for tailored digital remedies that align with the preferences and requirements of various customer clusters. Consequently, insurance companies should harness TAM to conceive user-friendly digital platforms that streamline insurance procurement, claims submission, and policy management. The creation of an interface perceived as user-friendly holds the potential to foster heightened adoption rates among customers. This will significantly contribute to boosting the adoption of technology and enhancing overall performance.

EMPIRICAL REVIEW AND HYPOTHESES DEVELOPMENT

Digital marketing and organizational performance

Existing research on the correlation between digital marketing and business performance was examined. For instance, Alyahya (2021) highlights that digital marketing significantly impacts organizational performance, especially in the context of the COVID-19 surge. Similarly, Appel et al. (2020) found that digital marketing serves as a robust predictor of economic sustainability, revitalizing advertising and boosting sales in the aftermath of the pandemic. Notably, the digital market has offered customers a remarkable experience worldwide during this pandemic period. Another investigation conducted by (Omar et al., 2020) underscores the significant association between dimensions of digital marketing such as social media, search engine optimization (SEO), content marketing, and email campaigns with organizational performance. Mathew and Soliman (2021) 's study further demonstrates that digital marketing tools serve as predictors of performance within the hospitality industry. Bodoine (n.d.) 's research confirms that digital marketing remains a potent instrument influencing the performance of SMEs even amid the COVID-19 pandemic.

Kiradoo (2016) adds to this understanding, suggesting that the digital realm acts as an alternative avenue to enhance the financial performance of business organizations. This is achieved by leveraging various forms of digital advertising mediums to promote brands interactively and informatively. Aligning with these insights, Tiago and Tiago (2012) 's findings also support the link between digital marketing and organizational performance. They emphasize the importance of optimizing digital mediums to attain more ambitious and innovative business standards. Tabiat (2022) illustrates how digital marketing enables businesses to connect with and captivate customers across multiple platforms, including

websites, social media, email, and search engines. This empowers them to focus on particular customer segments, tailor messages, and scrutinize customer actions. By comprehending customer requirements and inclinations, businesses can forge more pertinent and compelling marketing initiatives, ultimately fostering better customer encounters and heightened customer allegiance.

Mediating factor of Organizational Culture

Organizational culture is the set of shared beliefs, values, and norms that guide how an organization operates. It is a powerful force that can shape how an organization approaches digital marketing. Studies have shown that organizational culture has a direct link to digital marketing and organizational performance (Phuong Dung et al., 2023). According to Adebayo et al. (2018), organizational culture influences how insurance industry approach and implement digital marketing strategies. A separate investigation conducted by Herzig, and Karlsson (2017) demonstrated that enterprises prioritizing a customer-centric culture harnessed digital marketing to curate personalized customer experiences, fostering the development of trust and loyalty, subsequently translating into heightened sales. Likewise, research conducted by Odhiambo et al. (2015) uncovered that businesses fostering a culture of collaboration engaged all stakeholders in digital marketing initiatives, ensuring the synchronization of campaigns and collective alignment towards shared objectives. Kaur, and Chawla (2016) noted that organizations prioritizing a culture centered around data-driven decision-making harnessed analytics to evaluate the efficacy of digital marketing campaigns. This practice facilitated ongoing campaign enhancement and yielded superior outcomes over time. Amirul et al. (2023) also highlighted that enterprises fostering a culture of embracing digital trends displayed openness to novel concepts and a willingness to experiment with fresh digital marketing strategies. This approach facilitated their competitive edge and enabled the delivery of optimal customer experiences.

The findings from these studies underscore the substantial influence of organizational culture on digital marketing effectiveness. By nurturing an environment that fosters innovation, customer-centricity, collaboration, data-driven decision-making, and adaptability to digital trends, insurance companies can strategically position themselves for success in the digital era.

Conceptual Framework for the Study

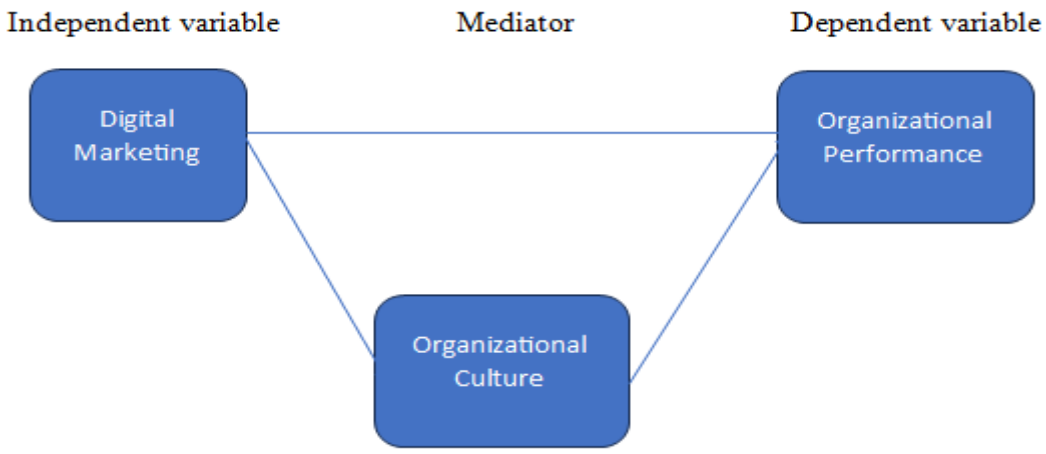


Figure 1: *Conceptual Model*

Research Hypotheses

In light of the aforementioned empirical discoveries, the subsequent hypotheses surfaced (see Figure1):

H_1: Digital marketing has no significant association with organizational performance

H_2: Digital marketing has no significant association with organizational culture

H_3: Organizational has no significant association with organizational performance

H_4: Organizational Culture does not mediate between digital marketing and organizational performance.

METHODOLOGY

A sum of 150 structured questionnaire sets was distributed among the personnel of the leading 10 insurance companies: AIICO Insurance Plc, Lead Way Assurance Company, Custodian and Allied Insurance, Cornerstone Insurance Plc, AXA Mansard Insurance, African Alliance Insurance Plc, Goldlink Insurance Plc, Continental Insurance, Industrial and General Insurance Plc, and Lasaco Assurance Plc. Every company's workforce was provided with 15 questionnaires, resulting in a total of 150 recipients. From this, 120 responses were collected, constituting 80% of the overall sample. The tools employed in this research underwent validation by a group of experts associated with the Chartered Insurance Institute of Nigeria. This panel conducted a thorough analysis of the content within each questionnaire and removed any elements that were deemed unrelated to the research objectives. Following essential adjustments, the expert panel endorsed the use of these tools for the study. The measurement scales underwent additional item analysis to assess their psychometric robustness (see Table 1). Data analysis was performed with the aid of Path analysis.

Table 1: *Validity and Reliability Results*

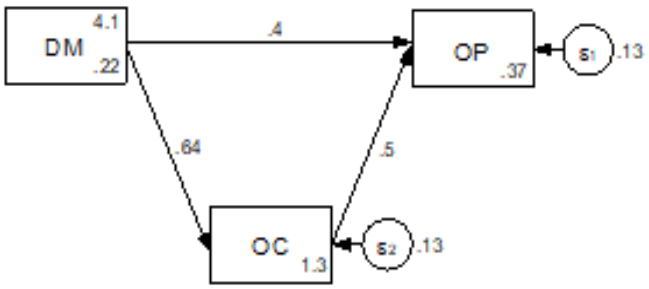
Variables	Items	Source	Average Variance Extracted (AVE)	Composite Reliability (CR)	Cronbach's Alpha Coefficient
Digital Marketing	6	Tabiat (2022)	0.79	0.89	0.813
Organizational Culture	7	Adebayo et al. (2018)	0.70	0.87	0.817
Organizational Performance	5	Mathew and Soliman (2021)	0.77	0.82	0.810

RESULTS AND DISCUSSION

Table 2: *Path Analysis without mediator (Direct effects)*

Path	Coef.	t-value	p-value	Hypothesis	Remark
OP <- OC	.4976509	6.10	0.000	H1	Supported
OP <- DM	.3976129	4.91	0.000	H2	Supported
_cons	.3691167	1.33	0.018		
OC <-DM	.6411849	10.57	0.000	H3	Supported
_cons	1.316656	5.26	0.000		

The table 2 shows the results of path analysis, which is a type of structural equation modeling that is used to investigate the relationships between latent variables. In this case, the latent variables are OP (organizational performance) and OC (organizational culture). The first row of the table shows the results of the regression of OP on OC and DM (digital marketing). The coefficient for OC is 0.497, which means that a one-unit increase in OC is associated with a 0.497-unit increase in OP. The coefficient for DM is 0.398, which means that a one-unit increase in DM is associated with a 0.398-unit increase in OP. The constant term is 0.369, which means that the predicted value of OP when OC and DM are both equal to zero is 0.369. The second row of the table shows the results of the regression of OC on DM. The coefficient for DM is 0.641, which means that a one-unit increase in DM is associated with a 0.641-unit increase in OC. The constant term is 1.317, which means that the predicted value of OC when DM is equal to zero is 1.317. Overall, the results of this analysis suggest that OC and DM are both positively associated with OP. This means that organizations that have higher levels of organizational culture and digital marketing are likely to have higher levels of organizational performance. This research affirms prior discoveries indicating that companies fostering a culture of prioritizing employee training and empowerment in digital marketing techniques tend to possess a workforce equipped with the necessary skills to adeptly navigate the digital realm. This, in turn, can result in enhanced operational performance (Yuga & Widjaja, 2020; Yosep et al., 2021; Matikiti et al., 2018; Pricopoaia et al., 2022;Tabiat, 2022) .



Fire 2: *Structural Equation Modelling (SEM)*

Table 3: *Path Analysis with mediator (Indirect effects)*

Path	Coef.	Std. Err.	t-value	p-value	[95% Conf. Interval]		Hypothesis
OP <- OC<-DM	.3190863	.0603575	5.29	0.000	.2007878	.4373847	H_4 is partially confirmed

The indirect effects as indicated in Table 3, are the effects of one latent variable on another, mediated by a third latent variable. In this case, the indirect effects are the effects of OC (organizational culture) on OP (organizational performance) mediated by DM (digital marketing). The table you have provided shows that the indirect effect of OC on OP mediated by DM is 0.319, which is statistically significant. This means that OC has an indirect effect on OP through DM. In other words, the positive effect of OC on OP is partially mediated by DM.

To put it another way, the positive effect of OC on OP is not entirely direct. Some of the positive effect of OC on OP is due to the fact that OC is positively associated with DM, and DM is positively associated with OP (see Figure 2).

The significance of these findings lies in the realization that the Nigerian insurance industry's adoption of a digital marketing culture nurtures innovation, customer-centric approaches, collaborative efforts, data-informed decision-making, the ability to adapt to digital trends, and overall performance improvements.

CONCLUSION

This study examines the mediating role of organizational culture on the relationship between digital marketing and organizational performance with specific reference to the selected insurance companies in Nigeria. A structured questionnaire was used to solicit information from 120 respondents, while path analysis was employed to analyse the data using STATA versin 15. The study establishes that digital marketing and organizational culture independently and significantly related with organizational performance. This implies that organizations that have higher levels of organizational culture and digital marketing are likely to have higher levels of organizational performance. The evidence showcases that organizational culture has an indirect effect on organizational performance through digital marketing. In other words, the positive effect of organizational culture on organizational performance is partially mediated by digital marketing. These findings imply that organizational culture serves as a platform through which digital marketing propels the performance of the Nigerian insurance sector.

Practical Implications

The intersection of organizational culture and digital marketing has significant practical implications for the performance of Nigerian insurance companies. Digital marketing efforts

can be effectively measured and optimized for better results. An organizational culture that values data-driven decision-making can encourage Nigerian insurance firms to analyze key performance indicators (KPIs), track campaign metrics, and iterate on strategies to improve digital marketing effectiveness over time. A strong organizational culture focused on customer satisfaction and engagement aligns well with the principles of digital marketing. Insurance companies in Nigeria can leverage digital platforms to enhance customer interactions, provide personalized services, and offer seamless online experiences. Also, a customer-centric culture combined with effective digital marketing strategies can lead to higher customer retention rates and improved brand loyalty. Similarly, an innovative and adaptable organizational culture promotes the adoption of new technologies and strategies, including digital marketing tools and techniques. Nigerian insurance companies that foster a culture of innovation can swiftly integrate digital marketing innovations such as social media advertising, content marketing, and data analytics to remain competitive and relevant in the rapidly evolving digital landscape.

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Manufacturing Small and Medium Enterprises in Yemen: A Theoretical Background

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ABSTRACT

Small and Medium Enterprises (SMEs) are a significant player in the growth, development and resurgence of economies whether in developed economies, emerging economies, and lower income economies. The contribution of manufacturing SMEs is more significant in lower income economies due to their role in employment, income generation and enhancing the GDP level of the country. This article adopts a qualitative descriptive research approach to explore the sector of small and medium enterprises in Yemen as a lower income economy. The article relies on secondary data publicly available about the manufacturing SMEs sector in order to gain a sufficient insight into the manufacturing SME sector in Yemen.

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INTRODUCTION

Industrialization is said to be the most significant factor contributing to the objective of globally achieving economic development. However, when it comes to the underdeveloped economies, the role of the industrial sector in the economic developed is found to be compromised due to the tremendous number of challenges faced by organizations/enterprises who are into manufacturing sector (Kniivilä, 2007; Cheremukhin, et al., 2017). Such challenges require extra effort from both

Government and Investors to create a conducive business environment that is essential to realize economic development.

Yemen being one of the underdeveloped Countries and the poorest economy in the MENA region, when compared to its neighbouring Countries, the development of the manufacturing sector still lags behind with respect to its growth, development and contribution towards the country's GDP (Saleh & Manjunath, 2021).

The SMEs in low-income countries play a significant role in creating employment and generating income. The manufacturing sector in Yemen has achieved remarkable development during the eighties of the last century due to the oil discovery and its industry. However, due to the recent economic and political instability, a significant deterioration has been observed in the industrial sector where a plethora of challenges are faced by the manufacturing enterprises, which is also hampering their business performance and growth (Saleh & Manjunath, 2022). This study presents a background about the manufacturing sector in Yemen, manufacturing SMEs in Yemen, their contribution and obstacles faced by them.

METHODOLOGY

This article is a review article in nature, it aims to describe and explain the background of the SME sector in Yemen in general and the manufacturing SMEs in particular. It relies on secondary data publicly available in many sources such as the World Bank. The article explores the history of manufacturing SMEs in Yemen, the definition of SMEs in Yemen, the ownership and spread of manufacturing SMEs in the country, and the role of the sector in the economy.

The manufacturing sector during the Ottoman empire in Yemen:

Some trace of development was observed during the Ottoman empire rule in Yemen; such as manufacturing enterprises that were mainly coal-fired power sourced units in many sectors, for instance, the Islamic factory of iron and steel in Sanaa which was into production of iron and steel, basic vehicles and different transport materials; the Islamic military factory which produced light and basic heavy guns and ammunition with manufacturing capacity of around 7 to 10 thousand shotgun bullets daily; Parts manufacturing factory which produced parts for civil and military vehicles; the electric textile factory which produced Cotton textiles, wool textiles and fancy carpets; the Islamic factory for glass which produced multiple types of plain and colored glass; Marble factories to produce many types of marbles; Milling grains factories using multiple methods such as windmills crafts – in mountainous or highland areas, watermills that existed near rivers, springs and streams, steam mills which work with the steam generated by the coal-fired power generation, mills run via animals which function by being pulled and rolled throw animal such as camels or donkeys. Carpentry factories which produced doors, windows, chairs and office furnitures. Other factories such as leather factories, soap factories, and ice factory.

Unfortunately, all these factories did not continue after the Mutawakkilite Kingdom that ruled Yemen after the Ottoman empire 1918-1962, the materials of such factories that existed were taken to the military museum in the capital Sanaa. (Altheeb, 2009; Alaraby, 2016).

Manufacturing before the establishment of Yemen as a republic:

Lacking the required electricity was the major obstacle for the growth of industry in the North Yemen before the unification of Yemen. During 1979, the first electricity power plant was implemented in Hodaidah city with a capacity of 150 kph, in 1988, their capacity increased to 400 thousand tons kph employing around 4000 workers.

The revolution of September 26th 1962 was the start for easing the establishments and development of industries whether extraction industries or processing industries. As the contribution of the industrial sector towards the country's GDP was extremely low during the sixties of the last century, where the contribution of the extraction industry accounted for 0.9% of the total GDP and around 16.4% of the total industry output. Such improvement took place during the eighties where the contribution of the extraction industries increased to become 9.5% of the country's GDP and 44.1% of the total industry output. The factors behind increase and enhancement in the role of industry in the North of Yemen was due to extraction of oil which accounted for 91% of the total extraction industry output which still implied that the role of industry in the economic growth was very low. As for the processing industries, small and medium enterprises existed where they can not be called as factories due to their small size, however, they grew and played a significant role after the revolution in the North of Yemen. The number of small and medium enterprises increased from 19 enterprises during the sixties to become 66 enterprises during 1975 and 101 enterprises during 1984. The more enhancements was observed among food processing industry and metal industry.

Similarly, in the South of Yemen, industry was basic regardless of the existence of many industrial enterprises. Except oil refining units and power supply plants, industry activities were basic and manual. However, remarkable development was realized by the industry sector in the south of Yemen during the seventies and eighties such as 65% growth in manufacturing, 25% growth in the number of workers in the industry sector, and 199% growth in employee compensations. Industrial establishment were observed in the south of Yemen in all sectors – the public, private and the cooperative sector (Abdulhabeeb, 1985; CSO, 1989; Alawadhi, 2003).

Defining small and medium enterprises:

Defining Small and medium enterprises in Yemen has three perspectives as per Social Fund for Development (SFD), Ministry of Industry and Trade (MIT), and Central Statistical Organization (CSO).

The first perspective as per Social Funds for Development which is one of the organizations dedicated for supporting and empowering SMEs, the same perspective was also adopted in the National Strategy for Micro and Small Enterprises Development. SFD classifies SMEs based on the number of employees, employees range from five to fifty employees among small and medium enterprises, where small enterprises are the enterprises who employ what ranges between five and ten employees/workers, micro enterprises are the one employing what ranges between one and four employees/workers, while medium enterprises are enterprises that their

full-time employees/workers are not more than 50 employees/workers (Aliriani, 2013; PSDP, 2011; Alnedhari, 2009).
The second perspective is adopted by the Ministry of Industry and Trade (MIT). It defines micro enterprises as the one who employ four or less employees and with an investment capital that is less than one million Yemeni Rials. It also defines small enterprises as the enterprises that employ up to ten employees/workers and investing an amount that is not more than two million Yemen Rial (YR) which is equal to 5000 USD (MIT, n.d.).

The third perspective is adopted by Central Statistical Organization (CSO), which defines micro enterprises as the enterprises employing one to four employees/workers, small enterprises are the enterprises employing five to nine employees/workers, medium enterprises are the enterprises employing ten to twenty four employees/workers while large enterprises are the enterprises employing twenty five or more employees/workers (Rashid, 2007; CSO, 2005).

It can be concluded from this discussion that until now, an official definition of SMEs that classify them according to the number of employees, investments and sales returns is still absent in Yemen (Alnedhari, 2009).

Such perspectives mentioned above, are used by such organizations for the purpose of preparing their reports and reporting their progress, rather than considering such classification to be the official classification of SMEs in Yemen.

In an empirical study, entrepreneurship and enterprising activities in Yemen were compared with similar underdeveloped economies, like the Afghani, Bangladeshi, Rwandan, and the Sudanese economies. The study output have unveiled that Yemen, when compared with other economies, is the least to adopt entrepreneurial activities, adopt reforms to boost entrepreneurship in the country, and above all, to provide clear and unique classification of SMEs in the Country. The study also revealed that the government of Rwanda and Bangladesh were found to be the best in defining and classifying SMEs as the enterprises in Rwanda are classified based on the number of employees, annual turnover, and net capital investments, while the same is adopted in Bangladesh – where enterprises are also classified based the sector as well – service and manufacturing (Saleh & Manjunath, 2021).

Taking into consideration the fact that almost all the business sectors in Yemen (95%) fall into the category of SMEs, which implies the need for a detailed and unique classification of SMEs to be adopted in Yemen; instead, as mentioned above, each official organization in Yemen adopts a different classification when reporting activities pertaining to the SMEs sector, let alone the fact that the sector of SMEs in Yemen is not supervised by a unique authority as it is in many other countries such as India – where a specific ministry is dedicated to the SMEs sector (Saleh & Manjunath, 2020a; 2020a).

Manufacturing enterprises in Yemen:

Yemen lacks a proper up to date database that is dedicated for SMEs operating in the country. Therefore, characteristics relating to SMEs are challenging to obtain/describe. The last comprehensive survey conducted regarding manufacturing enterprises was in 2010. Conducting

the survey was supported by the United Nations Development Program (UNDP) and GIZ (the German development agency). According to the results drawn from this survey, the number of manufacturing enterprises in 2010 was 27,796 enterprises.

Ownership in the manufacturing sector:

Statistics show that majority of the commercial sector in Yemen operate as small and medium enterprises (SMEs) accounting for more than 95% of firms and companies falls into the category of small and medium enterprises in Yemen (World bank, 2013). Further, majority of the commercial activities in the business sector belongs to the private sector (ILO, 2019).

Similarly, when it comes to manufacturing SMEs, the private sector is dominating the ownership in Yemen, as the ownership of majority of enterprises (98.31%) is held by the private sector, and the rest is divided among other types of ownership: 0.77% belongs to the public sector, 0.49% belongs to the cooperative sector, 0.15% belongs to the private foreign sector, 0.13% belongs to joint private sector, 0.08% belong to the Waqf sector – which is concerned with property that is charitable endowment according to the Islamic law, 0.05% belongs to mixed sector, and 0.02% belongs to non-government organization, while at the same time no ownership is held by regional or international organization (CSO, 2013).

When taking the ownership percentage into consideration, the report of the comprehensive survey reveals that the ownership differs between large enterprises and SMEs. Where the majority of large enterprises (53.52%) are owned by the private sector, 30.99% are owned by the public sector, the firms and companies owned by the joint private sector and the mixed sector account for 10.57% and 3.52% respectively, while 1.4% of large manufacturing enterprises are owned by the cooperative sector and the foreign private sector with 0.70% respectively (CSO, 2013).

However, when medium sized manufacturing enterprises are concerned, it is observed that the private sector owns the majority of the medium manufacturing enterprises in Yemen accounting for 82.30%, while 9.79% are owned by the public sector, the joint private sector owns around 3.01%, the cooperative sector and the mixed sector owns around 1.69% and 1.51% respectively; the foreign private sector and the sector of non-government organizations own around 1.32%, and 0.38% of medium-sized manufacturing enterprises respectively (CSO, 2013).

In case of small manufacturing enterprises, majority (97.46%) are owned by the domestic private sector, the public sector owns around 1.39% of the small manufacturing enterprises in Yemen, and the rest which is 1.15% of small manufacturing enterprises are owned by other sectors with different portions for each sector (CSO, 2013).

In case of micro enterprises are concerned, majority of the micro manufacturing enterprises (99.09%) are owned by the private sector, while the cooperative sector owns around 0.40%, and the rest of the micro manufacturing sector (0.41%) is owned by other sectors with a small portion with each sector (CSO, 2013).

It can be observed from the results drawn from the comprehensive survey of manufacturing enterprises that the private sector dominates the ownership of the manufacturing enterprises in Yemen. However, such dominance by the private sector is among micro, small and medium manufacturing enterprises (98.3%), and not among large manufacturing enterprises which are held by the public sector, the foreign private sector and the non-government organizations. The large scale foreign private and non-government participation is found very less in the sector of micro, small and medium enterprises (CSO, 2013).

Spread of manufacturing enterprises in Yemen:

The capital city of Sanaa'a consists of the majority of manufacturing enterprises according to the formal statistics furnished by the comprehensive survey conducted in 2010. Around 70.86% of manufacturing firms/enterprises are located in seven cities in Yemen, where Alamanah hosts the highest percentage of manufacturing enterprises (18.06%) as compared to the other cities, the second rank is held by the city of Taiz which hosts around 13.93% of manufacturing enterprises, Ibb city is ranked third in hosting manufacturing enterprises as it hosts around 12.24%. Dhamar city hosts around 8.05% of manufacturing enterprises in Yemen which makes it ranked the fourth city, Hadhramaut city is ranked fifth hosting around 7.49%, the sixth and seventh ranks are held by Hodaidah city and Sanaa city as they host around 6.88% and 4.21% respectively. Beyond the share of manufacturing enterprises host by these seven cities, the rest are distributed among the other cities with percentages less than one of the total manufacturing enterprises (CSO, 2013).

Manufacturing enterprises who are into food processing account for 43.75% of the total manufacturing enterprises, followed by metal accounting for (14.78%), the non-metallic manufacturers accounting for (11.02%), and the textile manufacturers accounting for (10.80%) and the rest of manufacturing enterprises are distributed across the industry with very low percentages (CSO, 2013).

Among large manufacturing enterprises (employing more than 50 employees), Sanaa city hosts the highest number accounting for 21.83%, Taiz city hosts the second highest number with 16.90%, followed by Hadhramaut with 14.08%, Aden is ranked fourth hosting 12.68%, Hodaidah and Ibb hosting 11.27% and 6.34% respectively, and Albaydha hosts 4.93%. It is worth mentioning here that all these seven cities host 88% of total large manufacturing enterprises in Yemen, while large scale enterprises barely exist in cities like Ma'areb and Mahweet, there is absence of any large scale enterprises in cities like Dhamar, Hajjah, Raimah and Aljawf (CSO, 2013).

In case of medium sized manufacturing enterprises (which employ between 10 to 50 employees), Alamanah hosts the highest portion of them with 28.44% of the total medium sized manufacturing enterprises. The second highest portion is hosted by Taiz city with 15.82%, Hadhramaut with 12.05%, and Hodaidah with 10.55%. These four cities represent 66.85% of medium sized manufacturing enterprises, and the rest, i.e. 33.15%, is divided among the other cities with smaller percentages (CSO, 2013).

In case of small manufacturing enterprises, Alamanah is ranked first hosting 27.25%, followed by Taiz and Hodaidah with 12.57% each, Hadhramaut with 8.46%, and Aden with 6.31%. It is worth mentioning here that these cities host more than 75% of total small manufacturing enterprises in Yemen, while the remaining cities are found to host less than 1% each.
When it comes to hosting micro manufacturing enterprises [21,801 employing up to four employees], Alamanah is found to be the number one host in case of large, medium and small manufacturing enterprises. Alamanah hosts 15.54% of the total micro manufacturing enterprises, followed by Taiz with 14.19%, Ibb with 13.53%, Dhamar with 9.25%, Hadhramout with 7.10%, Hodaidah with 5.37%, and Sanaa with 4.85% of the total micro manufacturing enterprises in Yemen. It is worth noting that around 70% of micro manufacturing enterprises are hosted by these cities while the remaining cities host less than 1% each (CSO, 2013).

It can be observed that hosting higher number of micro, small and medium sized manufacturing enterprises is relevant to the size and population of Yemeni cities, and the opposite is relevant to the cities hosting the least number of manufacturing enterprises.

The role of small and medium manufacturing enterprises in the Yemeni economy:

In this section, the literature is reviewed to present the contribution of the sector of manufacturing small and medium sector towards the economic development through the dimensions of employment, employee compensations, and value added.

Employment:

Since the sector of small businesses sector is known for employment creation and income generation, whether it is a developed, developing or a least developed economy. Similarly, the small business sector in Yemen has been a major contributor towards employment, income generation and economic development. The table below (Table 1) shows statistics relating to the role that micro, small and medium manufacturing enterprises play in regards to employment.

From the table (Table 1), the following becomes very obvious; the increase of employment among micro, small and medium manufacturing enterprises observed between 2003 and 2017 is around 35.7%, where the employment percentage of micro enterprises in 2003 was 48.5% of the total employment of the SME sector and increased to 52.1% in 2006, 52.4% in 2009. The percentage has declined after that to become 50.3% in 2012 and 44.5% in 2015 as well as 2017 (CSO, 2003, 2006, 2009, 2012, 2015, 2017).

when evaluating the contribution of small enterprises, the rate of employment to the total sector employment was 12.7% in 2003 with a very minor increase through the following years to become 17.6% in 2006, 17.9% in 2009, 18.3% in 2012, 19.5% in 2015 and 2017. Medium enterprises are the major contributor to the employment compared with other enterprises, they contribute to the total employment of the SME sector by 38.8% in 2003, however, this employment contribution has declined to become 30.3% in 2006, 29.7% in 2009 and it began increasing again to become 31.4% in 2012, 36% in 2015 and 2017 (CSO, 2003, 2006, 2009, 2012, 2015, 2017).

This indicates a moderate level of growth in the number of employed workforce among micro, small and medium enterprises without taking into consideration the other factors that cause such increase in the size of workforce. The growth in this sector significantly has an impact on the economic development of the country in general which boosts the ability of SMEs to contribute towards the GDP of Yemen. Among micro, small and medium manufacturing enterprises, micro manufacturing enterprises have been on the top employing the highest number of workforce in Yemen, this indicates that micro manufacturing enterprises are the major contributor when it comes to employment (Table 1). It is worth mentioning here that when taking the total contribution across the years, micro enterprises appear to be the major contributor with the percentage of 48.8 % of the total employment across all the years compared with small Enterprises (17.8%) and medium enterprises (33.4%) (CSO, 2003, 2006, 2009, 2012, 2015, 2017).

Further, small manufacturing enterprises are found to be the least contributor to employment generation. It is worth mentioning that small manufacturing enterprises are very less in quantity when compared to medium enterprises and micro enterprises in Yemen, this describes the variance in the employment percentage between medium enterprises on one hand and micro and medium enterprises on the other (Table 1).

Employee compensations:

Since employment has grown among micro, small and medium manufacturing enterprises, similarly, the employment compensations has also increased during the last two decades with total compensation of employment among manufacturing enterprises during 2003 was 21,688 Million Yemeni Rial has seen a major growth and stood at 55,379 Million Yemeni Rials during 2017.

Similar to the variance in employment, the compensation of employees has also been observed to be higher among medium manufacturing enterprises, and the least employee compensation is observed among small enterprises (Table 2). As observed in the table, employee compensation of micro enterprises was 12.7% to the total employment compensation of the SME sector during 2003 and 4% of the total contribution of micro enterprises across the years. This percentage has increased significantly to become 30.6% of the total sector contribution and 15.5% of the total contribution of the micro enterprises across the years.

Small Enterprises are found to be the least contributing when it comes to employee compensation where it was 9% of the total sector contribution and 4.9% of the total contribution of small enterprises across the years. This percentage has witnessed improvement through the years to become 14.4% of the total contribution of the sector and 20% of the total contribution of small enterprises across the years (CSO, 2003, 2006, 2009, 2012, 2015, 2017).

As for medium and large enterprises, their contribution to the employee compensation of the SME sector was 78.3% in 2003 and became 64.3% percent in 2017 while their share of the total contribution of medium enterprises across the years was 10.2% in 2003 and became 21.5% in 2017.

Table 1: *Employment among manufacturing SMEs in Yemen 2003 - 2017*

years Enterprises	2003		2006		2009		2012		2015		2017		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	(%)
Micro	66,258	48.50%[a]	1,20,233	52.10%[a]	96,644	52.40%[a]	86,589	50.30%[a]	87,935	44.50%[a]	82,659	44.50%[a]	5,40,318	-48.80%
		12.3%[b]		22.3%[b]		17.9%[b]		16.0%[b]		16.3%[b]		15.3%[b]		
Small	17,399	12.70%[a]	40,543	17.60%[a]	32,951	17.90%[a]	31,534	18.30%[a]	38,417	19.50%[a]	36,112	19.50%[a]	1,96,956	-17.80%
		8.8%[b]		20.6%[b]		16.7%[b]		16.0%[b]		19.5%[b]		18.3%[b]		
Medium and large	53,077	38.80%[a]	69,829	30.30%[a]	54,807	29.70%[a]	54,185	31.40%[a]	71,145	36.00%[a]	66,876	36.00%[a]	3,69,919	-33.40%
		14.3%[b]		18.9%[b]		14.8%[b]		14.6%[b]		19.2%[b]		18.1%[b]		
Total	1,36,734	-12.30%	2,30,605	-20.80%	1,84,402	-16.70%	1,72,308	-15.60%	1,97,497	-17.80%	1,85,647	-16.80%	11,07,193	-100.00%

Source: (CSO, 2003, 2006, 2009, 2012, 2015, 2017). Note: a) Percentages are calculated based on the total of each year. b) percentages in paratheses are calculated to the total of all category across all years.

Table 2: *Employment compensation among manufacturing SMEs in Yemen 2003 – 2017*

years Enterprises	2003		2006		2009		2012		2015		2017		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	(%)
Micro	2,744	12.7%[a]	10,689	30.6%[a]	15,420	33.7%[a]	15,680	27.0%[a]	12,540	21.3%[a]	11,787	21.3%[a]	68,860	25.07%
		4.0%[b]		15.5%[b]		22.4%[b]		22.8%[b]		18.2%[b]		17.1%[b]		
Small	1,960	9.0%[a]	4,935	14.1%[a]	7,775	17.0%[a]	8,855	15.3%[a]	8,507	14.4%[a]	7,997	14.4%[a]	40,029	14.57%
		4.9%[b]		12.3%[b]		19.4%[b]		22.1%[b]		21.3%[b]		20.0%[b]		
Medium and large	16,984	78.3%[a]	19,329	55.3%[a]	22,562	49.3%[a]	33,435	57.7%[a]	37,867	64.3%[a]	35,595	64.3%[a]	1,65,772	60.36%
		10.2%[b]		11.7%[b]		13.6%[b]		20.2%[b]		22.8%[b]		21.5%[b]		
Total	21,688	7.90%	34,953	12.73%	45,757	16.66%	57,970	21.11%	58,914	21.45%	55,379	20.16%	2,74,661	100.00%

Source: (CSO, 2003, 2006, 2009, 2012, 2015, 2017) Note: a) Percentages are calculated based on the total of each year. b) percentages in paratheses are calculated to the total of all category across all years.

However, Central Statistics Organization in Yemen includes large enterprises with medium enterprises, for the reason that large enterprises are very limited. This is supported by the statement of the World Bank that more than 95% of the business sector in Yemen falls into the category of small and medium enterprises (CSO, 2003, 2006, 2009, 2012, 2015, 2017).

Value added:

When considering the value added among micro, small and medium manufacturing enterprises in Yemen, a remarkable growth has been observed since 2003, from mere 130,183 Million Yemeni Rials in 2003 to 551,955 Million Yemeni Rials by 2017. When evaluating is the rate of the value added by micro enterprises, the table shows that their share of the total sector contribution was 20.5% during 2003 and became 31.5% in 2017. While their percentage of the total contribution of micro enterprises across the years was 3% in 2003 and became 19.5% in 2017 (CSO, 2003, 2006, 2009, 2012, 2015, 2017).

As for small enterprises, their share was 6.6 % of the total contribution of the sector during 2003 and became 7.5% in 2017, while their share of the total contribution of small enterprises across the years was 4.2 % in 2003 and became 20.4% in 2017.

When evaluating the contribution of medium enterprises, the table shows that they contributed to the total value add of the sector by 72.9% in 2003 and changed to 61% in 2017, while their contribution to the total value add of medium enterprises across the years was 6.6% in 2003 and changed to 23.5% in 2017 (CSO, 2003, 2006, 2009, 2012, 2015, 2017).

Similar to employment compensation, medium and large enterprises have achieved the highest value added compared with micro and small manufacturing enterprises (Table 3).

Table 3: *Value added among manufacturing SMEs in Yemen 2003 - 2017*

Enterprises/years	2003		2006		2009		2012		2015		2017		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	(%)
Micro	26,667	20.5%[a] 3.0%[b]	80,854	32.5%[a] 9.0%[b]	2,22,349	48.8%[a] 24.9%[b]	2,12,823	36.6%[a] 23.8%[b]	1,77,092	31.5%[a] 19.8%[b]	1,73,831	31.5%[a] 19.5%[b]	8,93,616	35.33%
Small	8,560	6.6%[a] 4.2%[b]	24,378	9.8%[a] 12.1%[b]	31,608	6.9%[a] 15.6%[b]	54,053	9.3%[a] 26.8%[b]	42,075	7.5%[a] 20.8%[b]	41,300	7.5%[a] 20.4%[b]	2,01,974	7.98%
Medium and large	94,956	72.9%[a] 6.6%[b]	1,43,595	57.7%[a] 10.0%[b]	2,01,374	44.2%[a] 14.0%[b]	3,14,010	54.1%[a] 21.9%[b]	3,43,142	61.0%[a] 23.9%[b]	3,36,824	61.0%[a] 23.5%[b]	14,33,901	56.69%
Total	1,30,183	5.15%	2,48,827	9.84%	4,55,331	18.00%	5,80,886	22.96%	5,62,309	22.23%	5,51,955	21.82%	25,29,491	100.00%

Source: (CSO, 2003, 2006, 2009, 2012, 2015, 2017) Note: a) Percentages are calculated based on the total of each year. b) percentages in paratheses are calculated to the total of all category across all years

CONCLUSION

The sector of SMEs shouldered the biggest hit during the instability going on in the country, where enterprises were severely impacted by partial; or complete damage, business closure, or re-location of the business operations. Research indicates that SMEs severely suffered such obstacle during the current instability (Saleh & Manjunath, 2020a). This brings on the focus about the importance of decision making practices that can be imparted/adopted among small and medium enterprises, where they would participate in reducing/avoiding the impact of the challenges/obstacles related to the instability and violent conflict going on in the country and similarly enhance the performance and growth of manufacturing SMEs in Yemen.

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In light of the current state of the economy, the question arises as to whether or not risk management committees and board characteristics contribute to the performance of companies in Saudi Arabia

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ABSTRACT

The purpose of this study was to explore the impact that corporate governance measures have on the profitability of companies that are listed on the Saudi Stock Exchange (SSE). The technique consisted of collecting data from the SSE for the financial year 2021, and the research model consisted of sixty different firms. The size of the board of directors, the number of times the board met, and the presence of risk management techniques were all independent factors that were investigated in this study. Return on assets (ROA) served as the dependent variable, and it was the performance of the corporation that was being measured. For the purpose of attractive the estimation of the association between the autonomous variables and the dependent variable, the study additionally included a control variable, which was the size of the corporation. The results of the study revealed that the performance of Saudi firms was improved when the board size was increased to a greater number of members. Furthermore, the deployment of risk management procedures and an increase in the frequency of board meetings both displayed favorable benefits on the performance of the corporation. This research makes a significant contribution by investigating the fact that the performance of SSE-listed firms is directly prejudiced by the size of the board, the frequency of board meetings, and the risk management methods that are used. The inventiveness of the study resides in the fact that it investigates these particular corporate governance systems in great detail, as well as the association between those procedures and return on assets.

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INTRODUCTION

In this age of globalization, it is essential that every organization has good Scholars, researchers, and domain experts are bound to be interested in delving into the topic of corporate governance, which means that many different theories and points of view will be explored (Alabdullah and Housian, 2023; Ahmed et al., 2023; Alabdullah & Zobun, 2023; Alabdullah & Mohamed, 2023). The agency theory stands out among other relevant frameworks. The agent and the principal are the building blocks that acknowledge the division of labor between management and the owners in the end, while also taking into account any differences that may exist between the two. A principal's best interests should always be the agent's first consideration. As Fama and Jensen pointed out, this premise presupposes the occurrence of inherent conflicts of interest (1983). Similar to what Fama and Jensen highlighted in 1983, problems emerge when executives put their own interests ahead of the maximization of shareholder value. While keeping tabs on agents' activities guarantees they're working toward the same goals as the principal, doing so can be costly in agency fees and could hurt shareholders' interests in the long term (Bruner, 2021; Alabdullah & AL-Qallaf, 2023). There needs to be strong market laws and regulatory structures to prevent executives from going against the interests of shareholders. To reduce these agency issues, strong corporate governance processes are crucial. Agency theory provides a framework for effective internal and external corporate governance, as stated by Roberts et al. in 2005. Similarly, Rasmussen and Schmidt (2012) state that in order to improve corporate governance, the board must be larger and more independent, the CEO must have fewer dual functions, and audit-related components must be strengthened. This is all in an effort to solve agency-related problems in firms. An organization's leadership, structure, and management are all aspects of corporate governance. It provides a foundation for efficient company administration based on good corporate governance practices. Strong corporate governance is based on four pillars: openness, responsibility, autonomy, and equity. Corporate governance is heavily impacted by the many stakeholders in a company's management structure, such as shareholders, investors, creditors, employees, and even government agencies. In order to maximize value for shareholders and stakeholders, effective corporate governance is expected to improve business performance (Alabdullah et al., 2019; Almashhadani, 2020; Almashhadani & Almashhadani, 2022). The fundamental elements of corporate governance are the statutes, ordinances, and policies that influence the administration and control of a business (Gritsenko & Wood, 2022). In

order to maintain honesty and openness in dealings between businesses and their shareholders, it provides a set of rules to follow. This structure accounts for agreements reached between stakeholders both inside and outside the organization, facilitating the fair allocation of roles and duties and reducing the likelihood of conflicts of interest. The examination of company governance has been heightened in light of recent bankruptcies caused by accounting mistakes and financial malfeasance. These incidents highlight the negative consequences of lax corporate governance rules, which Ioana (2014) notes can lead to biased reporting, increased personal interests, and inconsistent accounting processes. Reducing dependence on oil revenues and diversifying the Saudi Arabian economy's resource base presents both obstacles and revolutionary potential (Gribkova & Milshina, 2022). To propel economic development, encourage accountability, creativity, and resilience, strong corporate governance must be established. Recognizing the constraints of stability depending on oil, this change seeks to diversify budgetary underpinnings and strengthen them. When government policies are well-aligned with social welfare and national goals, they foster an atmosphere that is good for business. In its pursuit of economic diversification, Saudi Arabia is putting itself up for long-term success and prosperity by placing a premium on good corporate governance. As a first step toward more effective government oversight, Saudi Arabia has instituted certain noteworthy reforms (Al-Matari & Mgammal, 2019). As a consequence of this work, internal control standards were established in 2000, which Saudi enterprises are now required to structure their systems in accordance with these criteria. Consequently, in 2006, all Saudi corporations listed in the were required to adhere to corporate governance requirements (Al-Janadi et al., 2016). Public corporations in Saudi Arabia are now subject to rules governing corporate governance, following in the footsteps of Oman (Abdelqader et al., 2022). One of the primary goals of Saudi Arabia's Corporate Governance Laws was to create a standard for investor protection, especially for minority owners, by creating a worldwide framework of rules, regulations, and processes for firms listed on TADAWUL. The owners' ability to defend their rights and prevent unfair business actions by majority shareholders was another goal of these legislation. firms Law dealt with laws pertaining to the formation of both public and private firms, while the Capital Market Authority (CMA) established rules and regulations to forestall such crises in the future. Companies listed on the Saudi Stock Market were required to adhere to the CMA's mandatory corporate governance code in 2010, following the introduction of a voluntary code in 2008

(Chebbi & Ammer, 2022). In December 2009, 145 companies willingly listed on TADAWUL, highlighting the significant change in emphasis towards corporate governance. The study's overarching goal is to shed light on the relationship between board size and meeting frequency, two aspects of corporate governance, and the capacity of companies to produce profits. Organizational accountability, transparency, and agency-related challenges are some of the other topics included in the research. To better understand how corporate governance standards might drive economic growth and performance in Saudi Arabia, this study intends to offer significant insights for policymakers, executives, and investors.

LITERATURE REVIEW

All things considered, it is well-established that corporate governance mechanisms have an effect on both the performance of firms Alabdullah, 2019; Almashhadani & Almashhadani, 2023; Almashhadani, 2022) This section examines the intricate connection between the number of board meetings, the frequency of board meetings, risk management methods, and business performance, with a particular emphasis on Saudi Arabia and the economies of the Gulf Cooperation Council (GCC). Understanding the factors that influence corporate governance standards and how they touch business performance is crucial in light of the GCC region's fast economic expansion and growth.

Board of Directors Size and Firm Performance

One of the most important parts of corporate governance is the size and make-up of the board of directors. Numerous studies have looked at the correlation between board size and corporate performance, and the findings have been contradictory (Baysinger & Butler, 2019). The increased complexity of decision-making and the likelihood of conflicts are two reasons why Yermack (1996) argues that a bigger board might be bad for company performance. On the other hand, Jensen (1993) contends that firms can benefit from better supervision and governance with a bigger board. Habtoor (2022) investigated the correlation between different board traits and bank performance within the framework of Saudi corporate governance regulations. The study found that larger boards had a positive and statistically significant effect on ROA and other measures of practical bank performance. In their analysis of Saudi banking profits from 2014–2017, Almoneef & Samontaray (2019) looked at the role of corporate governance. The results

show that ROE is positively affected by larger boards, more frequent audit committee meetings, and larger banks, while it is negatively affected by independent boards. Board meeting frequency is inversely correlated with return on assets (ROA), although bank size and board size are positively correlated with ROA. More importantly, the larger and more autonomous the board is, the better off the bank will be. On the other hand, the total number of board committees is inversely related to the bank's age.

Board of Directors Meetings and Company Performance

Effective oversight and decision-making are greatly influenced by the frequency of board meetings, another important aspect of corporate governance. Board members may be able to communicate and share information more effectively if they meet more often. The importance of board meetings in strengthening the oversight function and improving firm performance was highlighted in the work of Fama and Jensen (1983). However, if there are too many meetings, productivity may suffer and decisions may become mired in minutiae rather than big picture considerations. There is a favorable correlation between the frequency of board meetings and firm performance, according to Alzead's (2017) study of Saudi Arabian companies. This is in line with the idea that more frequent board meetings improve the board's capacity to oversee and make effective decisions.

Risk Management and Firm Performance

Global businesses must implement strong risk management procedures in response to the current financial crises. In order to make sure that risk management techniques are in line with business goals, the board of directors oversees them. When it comes to risk management, Ingley & Walt (2008) stressed how important board makeup and structure are. Muralidhar (2010) looked at the Saudi Arabian and GCC business communities to see whether there was a connection between risk management strategies and financial outcomes. According to their research, there is a correlation between good risk management methods and higher profits for businesses. All of this points to the importance of boards placing an emphasis on risk oversight in creating a more stable, less unpredictable, and more resilient firm. Although previous studies have shed light on how board size, meetings, and risk management impact company performance, the complex interplay between these elements is still mostly uncharted territory. More in-depth studies are required to fully understand the cultural and economic aspects of the GCC, especially Saudi

Arabia. There is a paucity of a comprehensive examination that integrates these variables, while individual research have provided valuable insights (Alabdullah et al., 2017; Alabdullah & Asmar, 2022). Extensive research into the combined effects of these factors on company performance, particularly in the GCC setting, is required due to the intricate relationship between them. Additional study is needed to fill the gaps in the literature and provide a comprehensive understanding of the combined impacts. There is a lot of interest in studying the relationship between Saudi Arabian firms' performance and factors including board size, meeting frequency, and risk management methods in GCC states. Finding the sweet spot between these factors is crucial for optimal company success, according to the available literature.

Methodology

For the fiscal year 2021, sixty companies that were listed on the Saudi Stock Exchange (SSE) were the emphasis of this research. Businesses outside of the banking and insurance industries were considered for the analysis. Data was retrieved from these companies' financial records as part of the study's exhaustive research process, which was used to test the research hypotheses. Within the particular framework of the Saudi stock market, this method enabled a thorough investigation of the connections between corporate governance processes and company performance. The chosen companies' financial statements for the given year were combed through for pertinent financial data as part of the data collection procedure. Nelson (2022). Return on Assets (ROA), board size, board meeting frequency, and risk management methods were some of the variables that were measured using these financial statements. The research findings were confirmed to be accurate and reliable by using actual financial data. This data offered a realistic portrayal of the corporate governance policies and how they affected firm performance. The study used a variety of quantitative methods to examine the data and verify its assumptions. An overview of the variables under consideration was provided by descriptive statistics, which included the calculation of mean values and standard deviations. To further investigate the connections between corporate governance mechanisms and firm performance, we used regression analysis to account for potential confounding factors including firm age and size. The study sought to offer a concentrated analysis that accounts for the unique dynamics and challenges of this subset of firms within the Saudi stock market by selecting a single year and focusing on the nonfinancial sector. The study's relevance and applicability to the Saudi Arabian

business scene were enhanced by the specific inquiry of the influence of corporate governance structures on firm performance, made possible by this analytical approach.

RESULTS AND DISCUSSION

Descriptive Statistics

The descriptive statistics show that the dependent variable in this study, which represents the performance of the company as measured by Return on Assets (ROA), has an average ROA of 4.13 and a standard deviation of 0.32. In addition, the membership indicator of the board of directors has an average value of 4.23 and a standard deviation of 0.320. On the other hand, at 4.01 with a standard deviation of 0.69, board meetings tend to be more consistent. Instead, we have a mean of 1.83 with a standard deviation of 0.63 for the risk management parameter. One thing that stands out from the descriptive statistics is how each of these numbers follows a normal distribution. We used comprehensive descriptive statistics, which included finding the means, standard deviations, skewness, and kurtosis. The skewness values for the variable items range from -3 to +3, and the kurtosis levels are within the range of -10 to +10, according to the data in Table1. All of these results confirm that the data collecting follows a regular pattern.

This extensive statistical analysis not only provides a thorough summary of the elements being studied, but it also provides a solid basis for future research. The new research provides a solid foundation for robust statistical inferences and explanations, which strengthens the credibility and validity of the study's conclusions. The data also appear to follow a normal distribution, which is verified by this study.

Table 1: *Descriptive Statistics of Variables*

Variable.	Mean	Std	skewness	kurtosis
Board size	3.9300	.4500	2.0010	.87590
Board meetings	4.0100	.6910	1.3300	2.1900
Risk manag	1.8200	.7590	0.0530	0.9310
ROA	3.8300	.2368	0.9753	2.1386

4.1.2. Eliminating Discrimination Within the framework of Partial Least Squares (PLS), specific criteria are used to evaluate discriminant validity. Each construct's square root of the average variance extracted (AVE) should show a strong association with the AVEs of other constructs. Fornell and Larcker (1981) propose looking at the square root of the AVE for a specific construct and how it relates to all the other constructs in the model to solve the problem of discriminant validity. Using this method, we can be sure that we've thoroughly tested how differentiable different constructs are within the analytical framework. Possible intersections and overlaps are assessed by comparing the AVE square root with associations involving other constructs. If we want to know how each construct contributed to the model as a whole and if our construct measurements were accurate, we need to follow this procedure. Ultimately, these approaches provide a methodical strategy that extends beyond simple statistical studies to bolster the credibility and understanding of the PLS model's output. Researchers can ensure that the model remains robust by following these rules, which in turn leads to analytical conclusions that are both exact and insightful. As shown in Table 2, the PLS analysis is able to provide reliable results and useful implications by paying close attention to the uniqueness of the constructs and carefully studying their interactions.

Table 2: *Discriminant Validity Result*

Formative Construct	BDZ	BM	RM	ROA
BDZ	0.7540			
BM	0.9868	0.2764		
RM	0.9537	0.7643	0.9864	
ROA	0.9864	0.3468	0.4678	0.9864

After the structural design met all specifications and the measurement model was reviewed, it was considered complete. The theoretical framework confirms the R2 coefficient of determination. The effects of board size, frequency of board meetings, and risk management on company performance were examined in this study. This study's internal factors—board of directors' size, board meetings, and risk management—had an observed coefficient of variance (R2) of 0.21, suggesting that the variables predicting corporate performance (ROA) might account for some of the observed variation in ROA.

Testing Hypotheses through Regression Analysis.

The results of the hypothesis tests are displayed in Table 3. Just as there is a strong association between board meetings and firm performance, the findings of the regression coefficients show that there is a significant correlation between the size of the board of directors and company performance (Coefficient Estimated > 0.001). There is a strong relationship between risk management and a company's bottom line, as shown by these findings.

Table 3: *Regression Coefficients*

Regression Path	Co-efficient (Estimation)	Significant P value	Result
BDZ--ROA	0.3459	0.0005	Accepted
BM--ROA	0.9754	0.0010	Accepted
RM-- ROA	0.1346	0.0046	Accepted

DISCUSSION

This study's findings shed light on the complex relationship between Saudi Arabian listed businesses' performance and corporate governance measures. Nevertheless, it is essential to acknowledge the limitations that may influence future research endeavors. At first glance, the data collected in 2021 may not provide a complete picture of the ever-changing dynamics of company plans, markets, and finances. More comprehensive understanding of the impact of corporate governance procedures on profitability under different market conditions may be possible with future multi-year longitudinal studies. The study does make a valuable contribution, but it overlooks certain important criteria including audit quality and executive compensation in favor of a narrow focus on board size, meeting frequency, and risk management in corporate governance. To provide a more complex picture of the impact of corporate governance variables on business success, future studies could include a wider range of these factors. The study also only looked at listed companies in Saudi Arabia, which means its results might not apply to other places with different cultural norms, regulations, and economies. The generalizability of the findings could be better understood if the study included businesses from a

wider range of geographical locations. Remember that even when you use regression analysis to look for relationships, correlation does not mean causality. The known links between good corporate governance and financial success might be impacted by extraneous, unobserved variables. Future study could benefit from the use of advanced causal inference methods like propensity score matching or instrumental variable analysis to further establish causal relationships. Several recommendations for future research can be derived from these constraints. To begin, in order to capture the ever-changing nature of corporate governance's impact on profitability, researchers should use longitudinal designs that extend over several years. Second, the effects of sociocultural and regulatory differences on the governance-performance link should be better understood through cross-regional research including enterprises from diverse contexts. Third, the ownership structure, audit quality, and CEO compensation should all be part of the broader governance processes. Fourth, the processes underpinning the observed relationships could be better understood by investigating possible mediating or moderating variables. Ultimately, this study adds to our knowledge of how corporate governance affects Saudi Arabian company performance, but it also paves the way for future research that will be more thorough and expansive, which will improve both the field's understanding and its practical ramifications.

CONCLUSION

This research provides useful insights into the intricate relationship between the financial success of Saudi listed firms and their adherence to corporate governance principles. In conclusion, this research offers valuable insights into the relationship. The empirical findings of this study corroborate the positive impact that particular governance elements, such as board size, board meetings, and risk management, have on the profitability of a company. This finding is in line with the consensus that exists in the existing body of literature, which emphasizes the pivotal role that robust governance practices play in enhancing organizational transparency and decision-making processes. The confirmation of these connections highlights the vital relevance of efficient corporate governance frameworks in the process of creating long-term success for businesses. A substantial number of board members assures a wide variety of perspectives and areas of competence, which contributes to the making of well-informed decisions. Meetings of the board of directors on a regular basis make proactive governance supervision and strategic

planning possible, and careful risk management techniques protect businesses from potential financial hazards.

Nevertheless, it is of the utmost importance to examine these findings with a critical eye, while also appreciating the inherent limitations of the study. It is possible that temporal limits will be introduced as a result of the reliance on a one-year data collection window, which will also limit the ability to extrapolate results over a longer period of time. A more thorough study that takes into account a wider range of governance indicators is required not just because of the exclusive focus on particular governance variables, but also because of the fact that this focus is exclusive.A further factor that should be taken into account is whether or not the findings of the study can be generalized to other financial markets because the scope of the study was limited to the Saudi stock exchange. There are a variety of factors that could potentially alter the observed connections between governance practices and financial success. These factors include different legal frameworks, cultural dynamics, and economic conditions that are common in various markets. Because of this, it is important to use caution when extending these conclusions to situations that go outside the specific parameters of the Saudi stock exchange.

In spite of these methodological constraints, the study makes a substantial contribution to our knowledge of the key role that corporate governance plays in generating organizational performance. It acts as a catalyst for subsequent research endeavors, enabling researchers and practitioners to delve deeper into the complex intricacies of governance dynamics with the purpose of furthering their understanding of these dynamics. This study lays the framework for future investigations that may investigate additional governance characteristics, evaluate how they interact with one another, and provide a more comprehensive perspective on the multiple nature of corporate governance.In essence, the findings of this research highlight the everlasting significance of sound governance practices in the process of establishing resilient, prosperous businesses that are able to maintain their capacity for long-term existence. This study not only contributes to the existing body of knowledge by shedding light on the specific governance factors that contribute positively to financial performance, but it also highlights the necessity for businesses to prioritize and continuously improve their governance frameworks in order to achieve long-term success in a business environment that is constantly changing.

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Factors affecting Renewable Energy Consumption: A Panel Data Analysis In ASIAN Countries

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ABSTRACT

The present research article has been to conducted to explore the link between non-fossil energy usage and its determinants namely cross border trade (TO), foreign direct investment (FDI), urbanization, CO2 releases, and institutions effectiveness quality (QGOV) in a panel of Asian nations i.e China, India, Japan, Pakistan, and Sri Lanka. The data has been collected from different data provider sources and covering time spam 1996 to 2020. Two different econometric techniques are applied in the present research article i.e Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS). As indicated by both of the models urbanization, FDI, and the governance quality contribute positively to the REC. Conversely, trade openness and CO2 releases exhibit a negative impact,that will lead to a decline in REC. The findings underscore the significance of government policies aimed at augmenting the supply of RE from contemporary sources, thereby encouraging the conversion from outdated to up-to-date clean energy sources.

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INTRODUCTION

Government policies are shifting towards the development of low-carbon economies and improved energy efficiency, environmental changes, and global heating. The anticipated advantages of enhanced energy efficiency include reduced costs related to energy sector for consumers and decreased CO_2 discharges. Consequently, RE is gaining prominence as a crucial alternative energy source. Given its significance in discussions about the future of reliable and sustainable energy, understanding the main factors of renewable energy and drawing policy is essential.

As the consumption of from non-fossil fuel sources took an upsurge during the last few years that encourage economists and researchers to examined the scenario, but there still need to investigate it in order for further future predictions as developing nations like Pakistan and other countries included in the study, are not utilizing renewable energy sources as it would be. The fast increase in population and economical in South Asian countries, including India, have led to a surge in energy demand. To address this, these countries are actively transitioning to alternative energy sources, particularly RE, to shrink the reliance on fossil energy sources.

A very rich debate is available the factors contributing to fossil fuel energy usage, but there is limited knowledge about the determinants of REC. in the present study we will try to fill this gap by expanding the current literature on energy consumption by including renewable energy in case of 5- Asian Countries. By keeping in view the scarcity and global warming and other factors that damage the environment, the importance of clean energy production and consumption is crucial to understand. As it is clear from the literature that in future most of economies will be relying renewable energy consumption and this source of energy will be fast growing sector until 2030.

The study's objective is to empirically analyze determinants such as cross border trade, FDI, urbanization, CO_2 discharges, and governance quality on non-fossil energy utilization in five Asian countries. The inclusion of the governance variable has important in addressing issues related to government transparency and the potential misuse of funds for renewable energy for illegal purposes. The study employs FMOLS and DOLS techniques that address the problems like endogeneity and auto-correlation in co-integration regressions, ensuring unbiased parameter estimation.

The structure of the remaining paper includes a reviews of the existing literature in section-2, methodology in section-3, empirical results and conclusions in sections 4 and section 5 includes for the Policy implications.

LITERATURE REVIEW

Rich literature is available on the non-fossil fuel energy usage and its determinants both in time series and panel data analysis. For instance, a research study by Omri and Nguyen (2014), for 64 Countries on renewable energy usage. In their study they has utilized the data covering time span 1990 - 2011, by applying panel GMM model, And positive association among REC , cross border trade and CO_2 releases. Similarly, REC determinants has been explored by Sadorsky (2009) for G-7 nations and found the same results. Another study conducted by Apergis and Pyne (2014) for 7 American states covering period 1980 – 2010. Their results show invers relation between CO_2 emissions and REC. Chen (2018) examined urbanization, CO2 emissions, growth rate of GDP, and foreign trade on non-fossil energy usage in 30 Chinese provinces for the time span 1996- 2013, with outcomes indicating positive substantial effects.

On the other side of the story, there are some investigations that revealed inverse connection between REC and CO_2 productions. Mehrara, et.al.(2015), conducted a research study in case of ECO Countries for the time span of 192 to 2011, by applying BMA. modle of ec-integration. Their study indicate REC has negative impact on growth rate of CO_2 releases. Ackah and Kizys (2015) explored non-fossil fuel energy in case of African states that producing Oil, for the time span 1985 - 2010, concluding that CO2 emissions have a negative

and statistically insignificant influence on RE utilization. Similar study by Olarewaju, et. al. (2019), for African nations concluded that negative ling exists between the two variable.

Sbia, et.al. (2014),and Polat, (2018) conducted research studies on the determinants of REC in UAE Countries, covering the period 1975Q1-2011Q4, and 85 advanced and developing nations covering time span 2002-2014. Both the studies shown invers connection between cross border trade, FDI and growth rate on REC. Hagert and Marton (2017) evaluated the effect of FDI on REC in middle-income states from 1990 - 2010, by a panel data Fixed effect modeling technique, reporting a negative relationship between FDI and cross border trade with the share of non-fossil fuel energy consumption. Paramati, et.al. (2016), also put efforts to examine FDI and REC relationship for 20 emerging countries by using panel co-integration for the time span 1991-2012 and found positive link between the two variables.

Some empirical investigation tried to show the exact scenario between government quality in energy sector policy and renewable energy deployment. For example, in an article by Fredriksson,et. al. (2004), in case of in 12 OECD countries from 1982- 1996. Concluded that weak policy regulations can reduce or collapse the energy sector. Cadoret, and Padovano, (2016), analyzed political drivers of RE deployment in European nations, finding that the quality of governance indicator (i.e., corruption) positively influences renewable energy deployment. Sekrafi, and Sghaier (2016), and Bellakhal,et. al. (2016), discovered vital factors of renewable energy consumption in the MENA region from 2000-2013, and 1984-2012. Their studies confirmed that corruption will increase clean energy usage.

METHODOLOGY AND DATA PERIOD

In our investigation, we have employed yearly statistics covering the years 1996-2020 for 5 Asian nations panel. The variables under scrutiny encompass the total RE utilization , Additionally, we examined CO_2, (mt per capita), along with Urbanization, is the total of resident living in cities. 2017). Furthermore, information on corruption, used as a proxy for governance quality, was acquired from the International Country Risk Guide (ICRG). Trade openness was evaluated by the sum of exports and imports as a percentage of GDP. The data set estimated in our study for the variables has been collected form the well-known data providers source, World Bank (WDI, This extensive dataset facilitated our exploration of the dynamic relationships among these key variables across the chosen Asian countries throughout the specified timeframe.

Experimental Model

In this study we have adapted the following model by keeping in view the studies conducted by Omri,et.al(2014), Sadorsky (2009a), and Salim,et.al (2012):

$$RE = f(TO, FDI, CO2, URB, QGOV) \quad \text{---------- (1)}$$

Where:

In our model RE which the controlled variable of our study signifies the renewable energy usage taken as a percentage of total energy consumption.Where in the list of independent variables like TO indicates cross border trade, FDI, the total foreign direct investment inflow, CO2 releases, URB is the total population living in the urban areas, and the final variable

QGOV is the quality of government which indicates the effectiveness of government policies in regulating the public sectors. The final econometrics model can be express as follow.

$$RE_{it} = \beta 0 + \beta 1TO_{it} + \beta 2FDI_{it} + \beta 3CO2_{it} + \beta 4URB_{it} + \beta 5QGOV_{it} + \mu_{it} \text{ ----------(2)}$$

Here, βj (j=1,2,3,…,5) denotes the coefficients of the long run estimations for all the control variables, "*i"* panel of countries, and "*t*" represents period.

The study proceeds with panel unit root tests to assess the stationarity of the series. Levin,et.al. (2002), and Im,et.al. (2003), unit root test for panel data is employed. Subsequently, in this research article we have Pedroni, (1999, 2004), to check for the co-integration among the variables. We tested the null and Alternate hypothesis of co-integration,

FMOLS And DOLS

Pedroni introduced the Fully Modified Ordinary Least Squares (FMOLS) procedure to address the problem of heterogeneity in analyzing vibrant co-integrated panels. This method incorporates individual intercepts and allows for variations in auto-correlation possessions among the error procedures across particular adherents of the panel. It is particularly designed to handle alterations in individuals mean values and variations in their responses to short-run turbulences from co-integrating equilibrium.

On the other hand, the Dynamic Ordinary Least Squares (DOLS) procedure, initially proposed by Kao and Chiang (2001), extends the DOLS method to panel investigations. This estimator is designed to address endogeneity in the model and provides finite sample properties for Ordinary Least Squares (OLS), DOLS, and Pedroni's FMOLS. In panel data analysis, the DOLS estimator can be derived by including lagged difference in the regression that can control for the endogeneity problem:

$$y_{i,t} = \beta_i' x_{i,} + \Sigma^{q}_{g=-p} \eta_{ij} \Delta x_{i,t} + j + \gamma_{li}' D_{li} + \varepsilon_{i,} \text{ ..... (4)}$$

The parameter q in the DOLS estimator represents the number of lags, and its selection is typically determined is based on AIC or BIC information critaria. These criteria help choose the appropriate number of lags that balance the trade-off between model fit and complexity.

Monte Carlo simulations, which involve creating computer models to mimic real-world scenarios through random sampling, have been employed to assess the performance of different econometric estimators in restricted samples. In the case of the DOLS estimator, Monte Carlo simulations have led to the conclusion that it outperforms both OLS and FMOLS in terms of unbiased estimation when dealing with limited sample sizes.

The prime benefit of DOLS estimator is its capability to control endogeneity effectively. By incorporating lead and lagged differences of the regressors, the DOLS method mitigates endogenous feedback issues, providing a robust correction for endogeneity in the explanatory variables. This feature enhances the reliability of the estimation process and contributes to the method's appeal in empirical research. Researchers, such as Lean and Smyth (2010) and Afonso and Jalles (2012), have highlighted the robustness and efficacy of the DOLS method in handling endogeneity concerns in econometric models.

EXPERIENTIAL RESULTS

The summary statistics for the data are reported in the bellow table. The mean value for RE

consumption is 47.24, the cross border trade has a mean 41.1. The average Foreign Direct Investment 1.47, CO_2 discharges is 3.20. while, urbanization is possess a mean of 40.6, the final variable corruption has a mean of 2.77. in the bellow table we has observed that standard deviation is high in case of Urbanization which is 23.0304 while the lowest is recorded for the government regulations which is 0.984.

Table 1: *Summary Statistics*

	RE	TO	FDI	CO2	URB	QGON
Mean	47.24095	41.05665	1.476804	3.201006	40.57545	2.773333
Median	50.84280	35.55468	1.070660	0.991030	32.09200	2.500000
Maximum	78.08724	88.63644	6.186882	9.909203	91.30400	5.000000
Minimum	11.69580	15.67452	-0.052908	0.223240	18.19600	1.000000
Std. Dev.	14.92583	18.67798	1.433159	3.494991	23.03333	0.983972
Skewness	-0.655930	0.784946	1.225687	1.012740	1.137275	0.731715
Kurtosis	3.136193	2.659942	3.730870	2.283729	2.863926	2.764724
Jarque-Bera	9.060023	13.43855	34.08023	24.03967	27.04214	11.44261
Probability	0.010781	0.001207	0.000000	0.000006	0.000001	0.003275
Sum	5905.119	5132.081	184.6005	400.1258	5071.931	346.6667
Sum Sq. Dev.	27654.76	43459.48	257.6892	1514.655	65786.24	120.0569
Observations	125	125	125	125	125	125

Author's own calculation

To check for the multicollinearity amongst the variables we have utilized the Correlation matrix and reported n table-2. As it is clear for the bellow results there is no multi-collinearity problem is our data set. Generally, we observed no correlation among the variables . All the values are lower than 8.5 so no problem in the data set.

Table 2: *Correlation Matrix*

	RE	TO	FDI	CO2	URB	QGON
RE	1.000000					
TO	0.159256	1.000000				
FDI	-0.632315	0.304215	1.000000			
CO2	-0.345457	-0.414125	-0.165464	1.000000		
URB	-0.266222	-0.522910	-0.289695	0.839306	1.000000	
QGON	0.238905	-0.095934	-0.307781	0.465004	0.428986	1.000000

Author's own calculation

Tests for the order of integration

As it is important to note for the order of integration amongst the variable in advance of the co-integration so we have used the two well-known test namely, Levin *et.al*, (2002) and Im *et.al*,(2003) the outcomes of the tests are reported in the table -3 bellow. All the variables exhibit unit root at level but no unit root at first difference.

Table 3: *Unite root tests*

	At Level		At First Difference	
Variables	**LLC**	**IPS**	**LLC**	**IPS**
RE	-1.36255	-0.42188	-5.84823***	-5.90020***
CO_2	0.75589	2.26584	-4.26755***	-5.09484***
FDI	4.15700	-1.15169	-8.60160***	-9.56044***
TO	-0.35095	0.85539	-5.26001***	-4.73663***
QGOV	-1.05243	-1.80315	-5.89181***	-4.79897***

URB	0.09198	2.39129	-3.88599**	-2.90446*

Note: *,**,*** are shows significance level at 1,5, and 10 percent separately. Author's own calculation

Table-4 presents the outcomes of Pedroni cointegration tests (Pedroni, 2001, 2004), The null hypothesis of no co-ntegration has been refused by two out of four group statistics, with in the dimension. Simultaneously, two out of three panel statistics also reject the null hypothesis. The outcome indicates a co-integration among these variables in the four SAARC countries.

To further validate and accuracy of these results, the Kao cointegration test established by Kao (1999) is employed.

Table 4: *Co-integration results*

(within-dimension)				
			Weighted	
	S.t	**P**	**S.t**	**P**
Panel v-stat	-0.490785	0.6882	-0.757527	0.7756
Panel rho-stat	1.519828	0.9357	1.172710	0.8795
Panel PP-stat	0.492011	0.0000**	-0.292106	0.0000**
Panel ADF-stat	-0.757340	0.0000**	-0.952437	0.0000**
(between-dimension)				
	Stat	Prob		
Group rho-stat	2.050707	0.9799		
Group PP-stat	0.556754	0.0001**		
Group ADF-stat	0.107041	0.0010**		

*Author's own calculation. Note: ** shows significant at 5%.*

Long Run Results

Table no 5 presents the long-run outcomes obtained from OLS, FMOLS, and DOLS methods. The differences between the three methods are not substantial in relations of magnitude, symbol, and implication. Examining the assessed coefficients:

1. **Trade Openness:** the invers relation testified by FMOLS and DOLS approaches, suggesting that an upsurge in trade openness cuts RE utilization. A 1% upsurge in openness of trade leads to a 0.55% and 0.66% decrease in RE consumption, respectively. This outcomes bring into line with the findings of previous studies (Hagert and Marton, 2017; Lau et al., 2018).

2. **FDI (Foreign Direct Investment inflows):** adverse link has been noted by our study between FDI and RE ingestion. As a 1% rise in FDI reduces RE consumption by 7.05% and 2.34% , as given by the two estimation methods FMOLS and DOLS, respectively. This suggests that FDI discourages the use of RE, possibly because foreign firms, despite being more energy-efficient, may still prioritize non-renewable sources.

3. **Urbanization:** the effect of Urbanization on RE consumption is positive, suggesting that a 1% increase in urbanization will give an upsurge to RE consumption by 9.24%. This suggests that urban areas prioritize energy-efficient technologies, such as solar power, in housing and office projects.

4. **Quality of Governance (Corruption Proxy):** The coefficient for corruption, used as a proxy for quality of governance will bring efficiency in the use of RE consumption. If there is 1% improvement in governance quality it will results in a 4.37%, 0.59%, and 1.69% increase in RE consumption according to OLS, FMOLS, and DOLS models, respectively. This indicates that nations with better governance tend to promote transparent and corruption-free developmental projects.

5. **CO_2 Discharges:** the final and most important and contributor to damage environment is the CO_2 gas releases, that can be control by shifting from nonrenewable sources to that of renewable energy sources. As according to our study findings there is inverse link between the CO_2 emissions and RE consumption. As indicated by our models 2.45%, 9.78%, and 3.31% increase in RE usage will occur if there is a one percent reduction in CO_2 releases. The finding of this study is coinciding with (Olarewaju et al., 2019; Mehrara et al., 2015; Ackah and Kizys, 2015).

Table 5: *Present OLS, FMOLS and DOLS.*

D .Variable: Renewable Energy Consumption						
	OLS		**FMOLS**		**DOLS**	
Variable	**C.f**	**t.s**	**C.f**	**t.s**	**C.f**	**t.s**
TO	0.150396	2.99666**	-0.53075	-0.966382	-0.663192	3.27212***
FDI	-7.05678	-11.1897***	-2.343325	-3.673298**	4.853121	2.092239**
CO_2	-2.451528	-2.703913**	-9.785568	-6.07176***	-3.314245	-9.6135***
URB	0.040743	0.282572	9.242121	4.350141***	-0.774351	-4.01697**
QGOV	4.374319	4.813145***	0.594814	-2.862666**	1.699705	3.60383**
R-sq	0.708881		0.950427		0.992490	
Adj R-sq	0.656649		0.946371		0.967258	

*Author's own calculation. Note: **, *** show significant at 5% and 1%.*

CONCLUSION AND POLICY RECOMMENDATION

This aims to explore the effect of diverse control variable i.e. openness, CO_2 discharges, foreign direct investment inflow, regularity quality, and Urbanization, on the controlled variable Renewable energy usage, across a panel of 5 ASEAN nations for the time span of 1980- 2018. This panel data set is particularly noteworthy due to the rapid energy consumption growth in these ASEAN countries.

Based on the outcomes of all the three estimation techniques, trade liberalization and CO_2 releases impacts the non-fossil energy consumption in negative in the long run. Conversely, urbanization, FDI, and quality of governance exhibit optimistic and noteworthy effect on RE consumption.

Despite ongoing efforts to formulate policies related to renewable energy consumption, implementation remains in the early stages. Challenges, particularly in financing renewable energy projects, persist due to the substantial financial investments required. Recommendations include integrating RE policies into overall development plans, such as encouraging smart cities, developing solar energy infrastructure, and implementing water conservation measures.

The study concludes that enhanced governance positively correlates with increased renewable energy consumption. Therefore, it emphasizes the importance of leaders being informed about renewable energy to implement effective policies. Informed and conscientious leaders can contribute to quality governance in resource management. This study serves as a valuable

guide for policymaking in RE consumption and highlights the positive impact of trade openness on promoting renewable energy consumption.

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