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Department of Commerce
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Editorial

‘Business Studies’, a UGC-CARE listed, double-blind, peer-reviewed and refereed journal of the Commerce Department, Calcutta University, presents both descriptive and empirical articles in the field of finance, accounting, taxation, marketing, entrepreneurship, economics and other allied areas of management within the periphery of commerce and business. Accordingly, this second issue of 45th volume of *Business Studies* puts forth before the readers thirteen insightful papers on diverse micro and macro issues such as online relationship marketing and influencer marketing, asset-liability management of banks, women empowerment, employee engagement and psychological empowerment, intricacies of equity and foreign exchange markets, impact of GST on petro products, effect of Covid-19 pandemic on food processing industry and stock market, ecotourism and circular economy, to mention a few. The papers have been arranged in view of the perceived link in their contents so as to retain the universal appeal of the research volume. The first paper examines the interrelationship and causality between Indian and American stock markets both in the short run and long run, while the second, fourth, eighth and ninth articles evaluate the effect of pandemic on equity stock market integration, nexus between Sensex and systemic risk, food processing industry, and online relationship marketing performance respectively. In the third paper, the authors analyze the asset-liability management practices of Indian commercial banks using Data Envelopment Analysis, while the fifth paper examines the exchange rate fluctuations on currency valuations, trade patterns, macroeconomic conditions, and policy frameworks of seven member countries of BIMSTEC. The sixth paper explores the likely revenue impact of including petro products under the GST umbrella. Using structural equation modeling with Smart PLS 4 program, the seventh paper examines the mediating effect of employee engagement on the relationship between nurses' psychological empowerment levels and their affective commitment. Based on a systematic literature review of ‘sustainable entrepreneurship’, the tenth article investigates the impact of technology and innovation, along with entrepreneurial challenges and opportunities, on fostering a circular economy. The eleventh paper identifies the factors affecting women entrepreneurship in West Bengal through a comparison of SHG vs. non SHG members. In another interesting study, the twelfth paper investigates the effect of cosmetic influencers in social media on consumer purchase intentions, and finally, the thirteenth paper explores the role of ecotourism in creating sustainable employment in tourist destinations of North Bengal using Exploratory Factor Analysis and Structural Equation Modeling.

We sincerely hope that all the articles published in this edition of the Departmental journal will be of keen interest to our valued readers, and will enrich their knowledge base and stimulate their intellect. We would also encourage you to participate in the ongoing debate on the above and other related research themes in the field of accounting, finance, taxation, economics, environmental sustainability and management by contributing your research work to this journal.

Prof. Tanupa Chakraborty
Editor, Business Studies

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CONTENTS

Page No.

1.	The Interdependency Between Indian Stock Market and American Stock Market – An Econometric Analysis <i>Shubham Sah and Dr. Amit Kundu</i>	1-11
2.	Assessing the Impact of COVID-19 Pandemic in Determining Equity Stock Market Integration: An Empirical Exploration of BRICS Countries <i>Dr. Anandaraj Saha</i>	12-26
3.	Management of Assets and Liabilities in Indian Commercial Banks – An Empirical Study <i>Khushboo Thakker and Prof. Tanupa Chakraborty</i>	27-39
4.	Sensex and Systemic Risk Nexus: The Interaction Effect of Covid Pandemic <i>Dr. Abhijit Biswas and Dr. Arindam Das</i>	40-47
5.	Impact of Exchange Rate on the Trade of BIMSTEC Countries <i>Dr. Soheli Ghose, Mr. Subham Saha and Ms. Ushoshi Dey</i>	48-67
6.	Integrating selected Petro Products under GST and its impact on revenue generation and retail selling prices – with a special reference towards major Metropolitan cities in India <i>Tonoy Dey and Ayan Banerjee</i>	68-84
7.	Employee Engagement and Psychological Empowerment: How Workplace Resources Contribute to Affective Commitment? <i>George George P and Dr. A. M. A. Jenita</i>	85-97
8.	Effect of Pandemic on the Food Processing Industries in West Bengal- A Study <i>Sankar Das and Dr. Bappaditya Biswas</i>	98-112
9.	Online Relationship Marketing Performance During Pre-Covid (Before 2020) & Post Covid <i>Dr. K.Tamilselvi and U. S. Arkeeynikkitha</i>	113-120
10.	Innovative Pathways to a Circular Economy: Entrepreneurship & Sustainability <i>Dr. Richa Jain, Dr Madhu Thakur, Ms Sneha Motlnai and Ms Sneha Choudhary</i>	121-137
11.	Role of Ecotourism in Creating Sustainable Employment in the Remote Tourist Destinations of North Bengal: An Empirical Study <i>Debarati Deb and Dr. Debabrata Mitra</i>	138-149
12.	Factors Affecting Women Entrepreneurship in West Bengal: Comparison of SHG members with non SHG members <i>Dr. Susmita Chatterjee and Purbasha Bhattacharyya</i>	150-168
13.	Effect of Social Media Cosmetic Influencer Marketing on Consumer Purchase Intentions: Credibility and Product Knowledge as a Factor in Purchase Intentions <i>Shadma Tamanna and Altaf Khan</i>	169-190

The Interdependency between Indian Stock Market and American stock Market – An Econometric Analysis

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Abstract

This study aims to examine interdependency between Indian and American stock markets. It considers daily data of Nifty 50 Index and S&P 500 Index from 2008-2024. Utilizing advanced econometric tests, a long-run relationship between both markets has been found with unidirectional causality running from American to Indian market. The shocks are transmitted from one market to another in long run, but there is no integration and asymmetry effect in both markets in short-run. So, investors and portfolio managers can avail the benefits of global portfolio diversification in short-run by investing in their respective foreign countries.

Keywords: Indian Stock Market, American Stock Market, Volatility Spillover

1. Introduction

The stock market is an imperative economic pillar in every nation. It serves as a platform for fund mobilization using various financial instruments and its effect on the economies of different nations may vary. Cross-border transactions are on the rise after liberalization, significant technological advancements and increasing money flows between nations, which contributes to the convergence of the global financial sector. Hence, it becomes crucial for investors as well as portfolio managers, financial institutions, policymakers, and governments to comprehend the nature and degree of interconnections between various financial markets.

Current stock markets have grown more independent and tightly correlated throughout time with growing market integration. According to Markowitz (1952), it might be advantageous for investors to have a low or negative correlation in order to minimize risk by diversifying their holdings across global markets. The opportunities for fund managers to diversify are hindered due to the substantial volatility spillovers and highly coordinated swings across various stock markets. Portfolio managers are continuously searching for the global markets to avail the benefit of global portfolio diversification. Thus, it becomes essential to understand the interdependency or linkage among various stock markets.

Indian stock market caught huge attention all around the world, being one of the fastest emerging stock markets. Over the past few decades, the global financial panorama has seen unparalleled modifications, with international stock markets playing a crucial role in determining the dynamics of

the global economy. Thus, it would be worthwhile to look into the interdependency between Indian stock market and one of the most developed stock markets i.e., American stock market, which provides investors with diversified options. The New York Stock Exchange (NYSE) of America and the National Stock Exchange (NSE) of India are two of the most widely recognized financial markets. Both exchanges have grown significantly and have become important economic drivers in their respective countries. A great attention has been paid by academics, investors, politicians, and financial experts to the interdependency between these two exchanges.

2. Literature Review

In this vast area of research, some of the important studies are considered for this paper. Gilmore and McManus (2003) explored weak-form efficiency in Central European transition economies' equity markets from July 1995 to September 2000, revealing evidence of random walk behaviour in stock prices. Subsequent research by Chelley Steeley (2005) and Kearney and Poti (2006) provided evidence supporting the presence of a structural break in the integration process of European markets. In a comprehensive study, Padhan (2007) analysed the relationship and volatility between Middle Eastern and developed markets, identifying the Egyptian market as having a significant price discovery role. Bhar and Hamori (2008) observed co-movement among four major European equity markets over nearly 30 years. Menon et al. (2009) using the granger causality test found that Indian markets are interconnected with various global markets. Arouri and Nguyen (2010) concluded that co-movements within the Gulf region are minimal and have little significance in relation to the world market.

Huang et al. (2012) used time-varying cointegration tests and found that emerging stock markets in India, China, South Korea, and Taiwan are increasingly aligning with the US market over the long term. In a similar study by Lamba (2005) using multivariate cointegration framework and vector error-correction modelling to investigate the short as well as long-run linkage, he found that Indian market is influenced by the US, UK and Japan, but Pakistan and Sri Lanka stock markets were relatively isolated. Also, India, Pakistan, and Sri Lankan markets are becoming integrated.

Jeyanthi (2010) in his research found existence of long-run association between BRIC countries and the US & Japan and in short-run US market dominates Indian stock market whereas Russian stock market is dominated by Japanese stock market. Marimuthu (2010) discovered that Malaysia and India Granger cause each other and in short-run shocks in one country might have an effect in other countries in Asia.

Khalil et al. (2017) have found bidirectional volatility spillover between Pakistan & India in pre-crisis period of 2007, whereas there was a spillover between Sri Lanka and Pakistan stock markets in the post-crisis period. Mukherjee and Mishra (2010) in their research paper focused on finding the linkage between India with Korea, Hong Kong, Singapore, and Thailand. They found significant and bi-directional linkages between India with its major counterparts. Mikhaylov (2018) found one-direction volatility spillover in emerging markets of Brazil, India, Russia, and China. Whereas Madhavan and Ray (2019) investigated the relationship between the prices and volatility of global custodial receipts traded in London and their corresponding shares on the Bombay Stock Exchange (BSE) in India. Their study revealed a strong dynamic correlation between these price movements and volatility.

From the previous literature, it has been observed that a lot of work have been this in this area. But still a comprehensive study that focuses on the various aspects of Indian and American stock market that includes their interdependency, linkage and transmission of shocks over the substantial time span from 2008-2024 remained untouched as per the best of authors' knowledge. So, this study aims to address this gap by examining the interdependency between the Indian and American stock markets.

3. Objective, Data & Methodology

This research is an attempt to provide a comprehensive study of relationship between India and American stock market over the period of 2008-2024. The prime focus of this research is to study the interdependency and transmission of shocks between these two financial markets.

The investigation utilizes data of Nifty 50 index (N_t) and S&P 500 index (S_t), sourced from official website of NSE and NYSE. It encompasses daily data for both indices spanning substantial time frame from 2008 to 2024, thereby capturing a significant range from the Global Economic Crisis through the Post-COVID-19 period and includes the most recent market conditions.

The research starts with unit-root tests and correlogram analysis for examining the stationarity of the data series. Johansen Cointegration test is used to investigate the degree of cointegration between these two stock markets. For long-run dynamics the VAR model has been used, followed by Variance Decomposition to track the transmission of variations in concerned variables. Granger Causality test has been used to investigate the causal relationship and finally DCC- MGARCH model has been applied to assess the volatility and co-volatility dynamics between the concerned variables.

4. Empirical Analysis & Results

4.1. Stationarity Test:

The data series should be stationary before further proceeding to analyse the long-run association and interdependence between the concerned variables. The stationarity of the variables is examined through Augmented Dickey-Fuller (ADF) test, Phillips-Perron Unit Root (PP) test and by studying the correlograms.

Table 1: Unit Roots (ADF & PP) Test of Nifty 50 Index

Augmented Dickey-Fuller Test			Phillips-Perron Test		
H_0 : Nifty 50 has a unit root			H_0 : Nifty 50 has a unit root		
	At Level	At 1 st Difference		At Level	At 1 st Difference
t-Statistic	0.69	-13.51	Adj. t-Stat	0.84	-13.52
Prob.	0.99	0.00	Prob.	0.99	0.00
Test critical values:			Test critical values:		
1% level	-3.46	-3.47	1% level	-3.47	-3.46
5% level	-2.88	-2.88	5% level	-2.88	-2.87
10% level	-2.56	-2.57	10% level	-2.58	-2.57

Source: Authors' estimation

Table 2: Unit Roots (ADF & PP) Test of S&P 500 Index

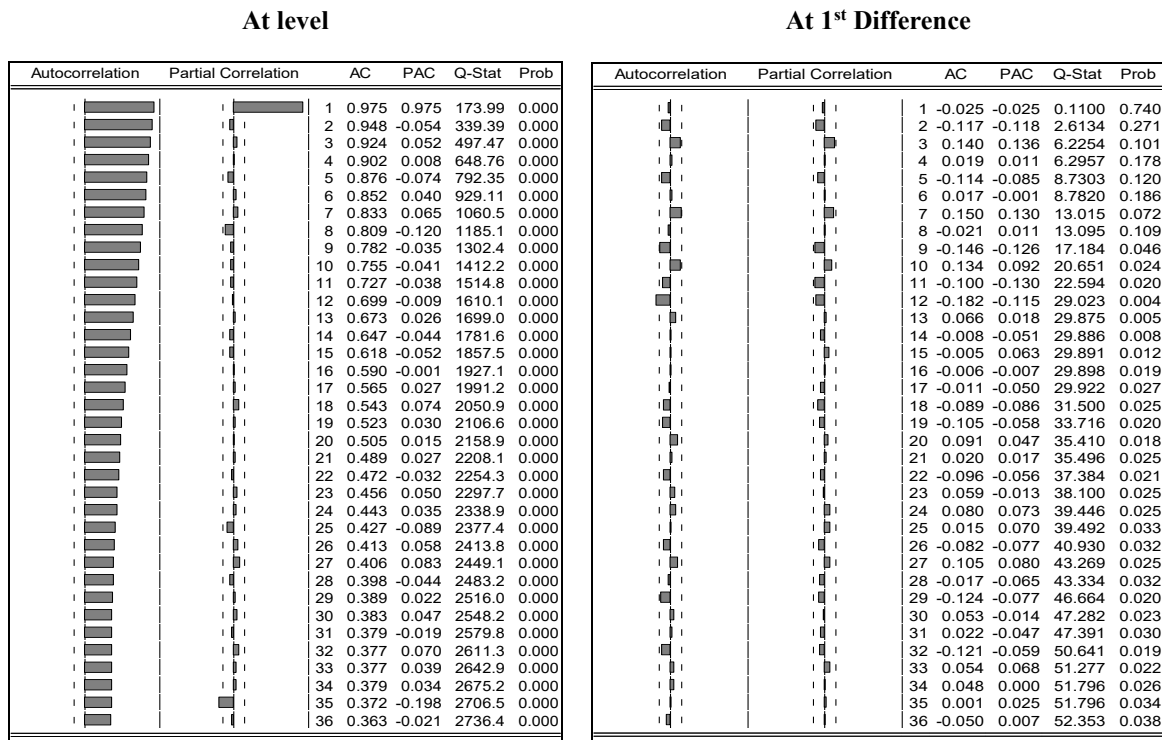
Augmented Dickey-Fuller Test			Phillips-Perron Test		
H_0 : S&P 500 has a unit root			H_0 : S&P 500 has a unit root		
	At Level	At 1 st Difference		At Level	At 1 st Difference
t-Statistic	0.032	-15.21	Adj. t-Stat	-0.04	-15.20
Prob.	0.96	0.00	Prob.	0.96	0.00

Test critical values:			Test critical values:		
1% level	-3.46	-3.46	1% level	-3.47	-3.46
5% level	-2.87	-2.88	5% level	-2.88	-2.88
10% level	-2.57	-2.58	10% level	-2.58	-2.57

Source: Authors' estimation

It has been observed from table 1 that for Nifty 50 at level, the ADF and PP t-statistics (0.69 and 0.84) are higher than their respective critical values with p-values of 0.99, which indicates that it is not free from unit-root at level. However, at 1st difference, the ADF and PP t-statistics (-13.51 and -13.52) are significantly lower than the 1% critical value, which strongly rejects the null hypothesis of a unit root and the series becomes stationary at 1st difference. Similarly, from table 2 it is found that for S&P 500 at level, the ADF and PP t-statistics (0.032 and -0.04) are higher than the corresponding critical values with p-values of 0.96, implying null hypothesis of a unit-root cannot be rejected. Whereas, at 1st difference the ADF and PP t-statistics (-15.21 and -15.20) are significantly lower than the critical values at all significance levels (1%, 5%, and 10%), confirming the series' stationarity at 1st difference. Therefore, both series are not free from the unit-roots at level but become stationary at 1st difference. So, both the series i.e., N_t and S_t are integrated of order one $[I(1)]$, following a random walk behaviour. This makes the series suitable for further econometric analysis through cointegration and causality testing to explore the long-run and short-run dynamics.

Figure 1: Correlogram of Nifty 50 Index

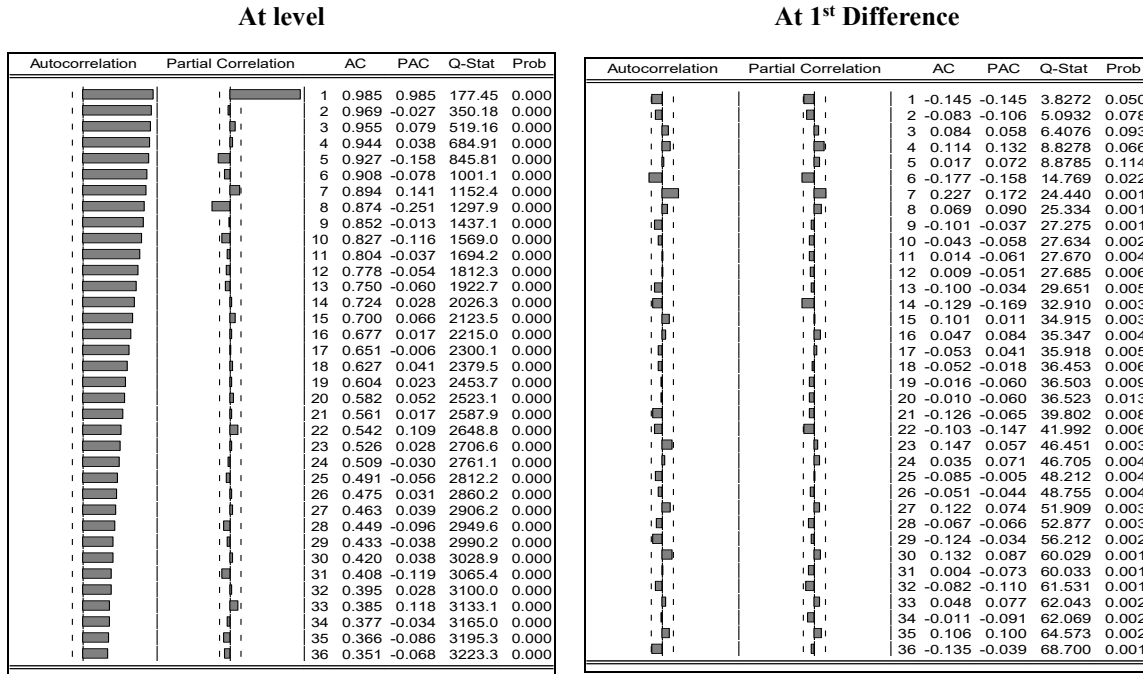


Source: Authors' estimation

Additionally, study of correlograms (depicted in figure 1 & 2) revealed that for both the series the corresponding ACFs are not free from dying out pattern of spike, whereas the corresponding PACFs

are marked by the presence of a singularly significant spike at lag one; which testify the both variables' stationarity at lag one.

Figure 2: Correlogram of S&P 500 Index



Source: Authors' estimation

4.2. Cointegration Test:

Johansen cointegration test has been used to investigate the long-run association between the concerned variables.

Table 3: Johansen Co-Integration Test (Linear Deterministic Trend)

Trend assumption: Linear deterministic trend				
Series: SP500 NIFTY 50				
Lags interval (in first differences): 1 to 8				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None*	0.19744	43.7629	25.8721	0.00011
At Most 1*	0.03533	6.15138	12.51798	0.4413
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None*	0.19744	37.6115	19.38704	4.66018
At Most 1	0.03533	6.15138	12.51798	0.4413
Trace test indicates 1 cointegrating eqn (s) at the 0.05 level				
Max-eigenvalue Test indicates 1 cointegrating eqn (s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
** MacKinnon-Haug-Michelis (1999) p-values				

Source: Authors' estimation

Table 4: Johansen Co-Integration Test (Quadratic Deterministic Trend)

Trend assumption: Quadratic Deterministic Trend				
Series: SP500 NIFTY 50				
Lags interval (in first differences): 1 to 8				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None*	0.19742	43.541	18.3977	5.1474
At Most 1*	0.0341	5.933	3.8414	0.0148
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None*	0.19742	37.608	17.1476	1.6408
At Most 1*	0.0341	5.933	3.8414	0.0148
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
Max-eigenvalue Test indicates 2 cointegrating eqn (s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
** MacKinnon-Haug-Michelis (1999) p-values				

Source: Authors' estimation

Based on Trace test and Eigen value test, it has been discovered from table 3 and 4 that

- under Linear Deterministic Trend, both the Trace ($43.76 > 25.87$, $p = 0.0001$) and Maximum Eigenvalue ($37.61 > 19.38$, $p = 0.0046$) tests indicate one co-integrating equation at the 5% level; indicating long-run relationship between N_t and S_t .
- under Quadratic Deterministic Trend, the Trace ($43.54 > 18.39$, $p = 0.0051$) and Maximum Eigenvalue ($37.61 > 17.15$, $p = 0.0016$) tests reveal two co-integrating equations; implying long-run association between the concerned variables.

Therefore, Johansen Cointegration test concludes that both the series N_t and S_t are cointegrated. They exhibit a long-run relationship, and their dynamics be combined in a linear fashion.

4.3. Vector Autoregression (VAR) Model:

It is necessary to determine an appropriate lag-length before estimating the VAR model. After studying the 'Selection Criteria' such as AIC, SIC, HQIC, etc., lag three (3) is chosen for the endogenous variables in their autoregressive and distributed Lag pattern.

VAR Equation:

$$\Delta N_t = 0.027 \Delta N_{t-1} + (-0.002) \Delta N_{t-2} + (-0.007) \Delta N_{t-3} + 0.051 \Delta S_{t-1} + 0.032 \Delta S_{t-2} + 0.031 \Delta S_{t-3} + 0.0001$$

$$\Delta S_t = (-0.131) \Delta S_{t-1} + (-9.29) \Delta S_{t-2} + 0.021 \Delta S_{t-3} + (-0.068) \Delta N_{t-1} + 0.012 \Delta N_{t-2} + 0.018 \Delta N_{t-3} + 0.00012$$

The VAR model has been used to find out the long-run dynamics between the concerned variables.

Table 5: Result of Vector Autoregression (VAR) Model

Vector Autoregression Estimates				
Dependent Variable	Independent Variable	Coefficient	Standard Errors	't' Statistics
ΔN_t	ΔN_{t-1}	0.027	-0.016	1.6503
	ΔN_{t-2}	-0.0020	-0.016	-0.1221
	ΔN_{t-3}	-0.0076	-0.016	-0.4653
	ΔS_{t-1}	0.0507	-0.017	2.9446
	ΔS_{t-2}	0.0325	-0.017	1.8715

	ΔS_{t-3}	0.0308	-0.017	1.7937	
	Constant	0.0001	-9.700	1.1202	
Dependent Variable	Independent Variable	Coefficient	Standard Errors	't' Statistics	
ΔS_t	ΔS_{t-1}	-0.131	-0.0164	-7.969	
	ΔS_{t-2}	-9.290	-0.0165	-0.0056	
	ΔS_{t-3}	0.0209	-0.0164	1.2784	
	ΔN_{t-1}	-0.0681	-0.0156	-4.3547	
	ΔN_{t-2}	0.0119	-0.0157	0.76393	
	ΔN_{t-3}	0.0184	-0.0156	1.1777	
	Constant	0.00012	-9.300	1.3758	
Dependent Variable	ΔN_t	ΔS_t	Dependent Variable	ΔN_t	ΔS_t
R-squared	0.00460	0.0234	Log likelihood	13760.14	13938.77
Adj. R-squared	0.0029	0.0218	Akaike AIC	-7.4160	-7.512
Sum sq. resids	0.1301	0.118	Schwarz SC	-7.4043	-7.5006
S.E. equation	0.0059	0.005	Mean dependent	0.0001	0.00011
F-statistic	2.852	14.804	S.D. dependent	0.0059	0.00571
Determinant resid covariance		1.12E-09	Akaike information criterion		-14.929
Log likelihood		27699.93	Schwarz criterion		-14.905

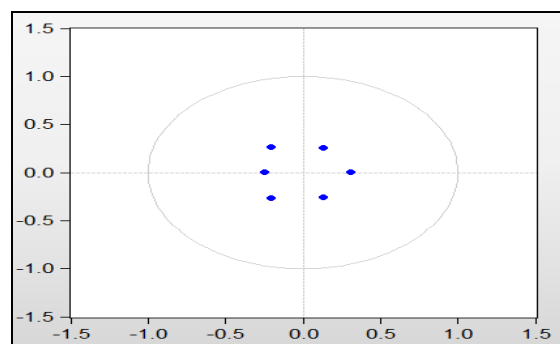
Source: Authors' estimation

It has been discovered from the results of table 5 that for the Nifty 50 equation, the coefficients of the lagged S&P 500 returns, particularly at lag 1 (0.0507, $t = 2.94$) and lag 2 (0.0325, $t = 1.87$), are positive and statistically significant, suggesting that past period values of S&P 500 return series have a notable impact on current changes in the Nifty 50. Conversely, the lagged Nifty coefficients are mostly insignificant, implying a weaker self-dependence in the short run. In case of the S&P 500 equation, the lagged Nifty 50 return at lag 1 (-0.0681, $t = -4.35$) is significantly negative, indicating a mild feedback effect from the Indian market to the American market. The model shows moderate explanatory power ($R^2 = 0.0046$ for N_t and 0.0234 for S_t), consistent with the nature of financial time series. Therefore, it is found that N_t is Granger caused by S_t at lag 1 & 2, while S_t is not Granger caused by N_t . Consequently, there is a '*Uni-directional Causality*' running from S_t to N_t .

4.4. Stability of VAR model:

The stability of VAR model has been confirmed with Inverse Roots of AR Characteristic Polynomials (given in figure 3), that lie with-in the unit-circle and testify for the stability of model.

Figure 3: Inverse Roots of AR Characteristic Polynomial



Source: Authors' estimation

4.5. Variance Decomposition:

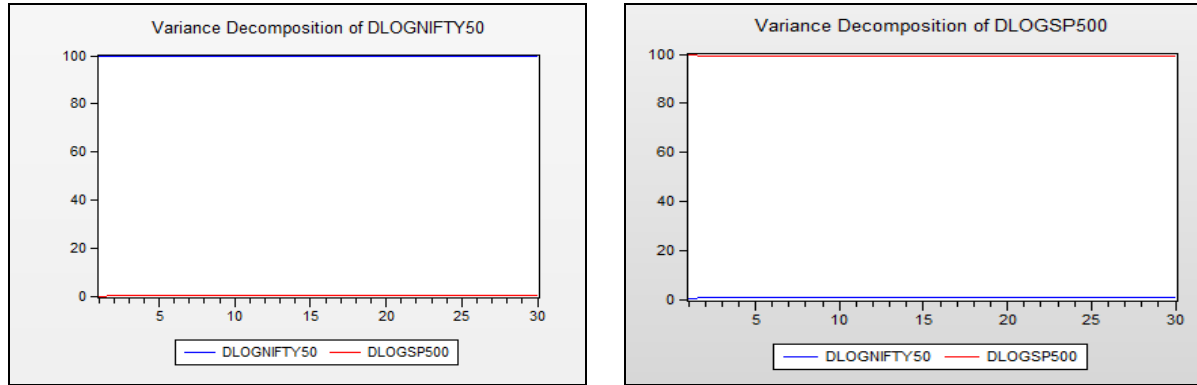
Variance Decomposition is used to evaluate how the variation in the variable is caused by its own shocks as opposed to the shocks from other variables.

By employing a 20 period ahead estimation, it has been discovered from figure 4 that

- short run variations in Nifty 50 return and S&P 500 return were mainly due to shocks transmitted through their own channels, and
- contribution of other variable for movement in the variable remained very low and negligible.

Therefore, it is clear that variables' own shocks are more important in accounting for short-run variations in the concerned variables.

Figure 4: Variance Decomposition Graph of Nifty 50 and S&P 500



Source: Authors' estimation

4.6. Granger Causality Test:

Clive Granger argued that a series of tests might be interpreted to reveal information about causality. Thus, in order to look into the causal relationship between the concerned variables, Granger Causality test has been performed.

Table 6: Outcomes of Granger Causality Test

	Variable	Coefficient	Std. Error	t-Statistic	Prob.
DN_t	DN_{t-1}	0.031	0.016	1.871	0.041
	DS_{t-1}	-0.064	0.017	-3.691	0.000
	DS_{t-2}	-0.037	0.017	-2.132	0.033
	C	0.000	0.000	1.370	0.171
DS_t	DS_{t-1}	-0.132	0.016	-8.083	0.000
	DN_{t-1}	-0.016	0.016	-1.034	0.301
	DN_{t-2}	-0.003	0.016	-0.162	0.871
	C	0.000	0.000	1.390	0.165
Pairwise Granger Causality Tests					
Null Hypothesis:				F-Statistic	Prob.
LOGS&P does not Granger Cause LOG Nifty				11.817	0.0006
LOG Nifty does not Granger Cause LOGS &P				1.0822	0.2983

Source: Authors' estimation

It has been observed from results of table 6 that

- in the Nifty 50 equation, the lagged S&P 500 coefficients ($DS_{t-1} = -0.064$, $t = -3.69$, $p = 0.000$; $DS_{t-2} = -0.037$, $t = -2.13$, $p = 0.033$) have low p-values (<0.05) and relatively large t-statistics, indicating a statistically significant impact of past S&P 500 movements on current Nifty 50 returns.
- the lagged Nifty return ($DN_{t-1} = -0.016$, $p = 0.301$; $DN_{t-2} = -0.003$, $p = 0.871$) show high p-values (>0.05) and small t-values, confirming no significant influence on the S&P 500.

- (iii) pairwise Granger causality results further validate this direction, as the null hypothesis of “ DS_t does not Granger cause DN_t ” is rejected ($F = 11.817$, $p = 0.0006$), whereas the opposite is not ($F = 1.082$, $p = 0.2983$).

This shows that S&P 500 return series ‘*Granger Caused*’ Nifty 50 return series, while Nifty 50 return *failed to ‘Granger Cause*’ S&P 500 return over the considered study period. These discoveries clearly point that a ‘**Uni-directional Causality**’ is running from S&P 500 return series to Nifty 50 return series and supports the findings from VAR.

4.6. Volatility Spillover [DCC-MGARCH]:

The volatility and co-volatility dynamics of the concerned variables have been analyzed using the Dynamic Conditional Correlation (DCC) MGARCH model.

Table 7: Volatility Spillover from India to America

Variables	Estimate	Std. Error	t value	Pr(> t)
[rNifty].mu	0.009	0.003	2.996	0.003
[rNifty].omega	0.000	0.000	0.065	0.287
[rNifty].alpha1	0.119	0.053	2.246	0.025
[rNifty].beta1	0.834	0.072	11.564	0.000
[rSP].mu	0.008	0.002	4.281	0.000
[rSP].omega	0.000	0.000	1.610	0.107
[rSP].alpha1	0.201	0.061	3.284	0.001
[rSP].beta1	0.775	0.071	10.870	0.000
[Joint]dccal	0.043	0.072	0.600	0.548
[Joint]dccbl	0.945	0.118	8.013	0.000
Information Criteria				
Akaike	-6.2765	Bayes	-6.1631	
Shibata	-6.2781	Hannan-Quinn	-6.2315	

Source: Authors’ estimation

Table 8: Volatility Spillover from America to India

Variables	Estimate	Std. Error	t value	Pr(> t)
[rSP].mu	0.008	0.002	4.281	0.000
[rSP].omega	0.000	0.000	1.610	0.107
[rSP].alpha1	0.201	0.061	3.284	0.001
[rSP].beta1	0.775	0.071	10.870	0.000
[rNifty].mu	0.009	0.003	2.996	0.003
[rNifty].omega	0.000	0.000	1.065	0.287
[rNifty].alpha1	0.119	0.053	2.246	0.025
[rNifty].beta1	0.834	0.072	11.564	0.000
[Joint]dccal	0.043	0.072	0.600	0.548
[Joint]dccbl	0.945	0.118	8.016	0.000
Information Criteria				
Akaike	-6.2765	Bayes	-6.1631	
Shibata	-6.2781	Hannan-Quinn	-6.2315	

Source: Authors’ estimation

It has been discovered from results of table 7 & 8 that

- i) for both directions, the mean parameters ($[rNifty].\mu = 0.009$, $t = 2.996$, $p = 0.003$; $[rSP].\mu = 0.008$, $t = 4.281$, $p = 0.000$) are statistically significant, indicating positive average returns. The conditional variance parameters, alpha (α_1) and beta (β_1), are also highly significant for

both markets ($[rNifty].\alpha_1 = 0.119$, $p = 0.025$; $[rNifty].\beta_1 = 0.834$, $p = 0.000$; $[rSP].\alpha_1 = 0.201$, $p = 0.001$; $[rSP].\beta_1 = 0.775$, $p = 0.000$), confirming strong volatility persistence and clustering effects within each market.

- ii) the joint DCC parameters further show that $dccb_1$ (0.945, $t = 8.013$, $p = 0.000$) is statistically significant, while $dcca_1$ (0.043, $p = 0.548$) is not, implying that the conditional correlation between the two markets adjusts slowly but remains stable over time.

Therefore, the relatively higher significance of the S&P 500 parameters suggests that volatility shocks originating in the American market have a more pronounced impact on the Indian market than the reverse. Overall, the findings confirm that there is no integration and asymmetric effect between markets in the short term. But there is dynamic conditional correlation or the transmission of shocks from one market to other in the long run.

5. Conclusion

In this study the interdependency between Indian and American stock market has been investigated over the period of 2008-2024. After analyzing the data series with appropriate econometric tests, it is found that they exhibit a long-run association, and their dynamics can be combined in a linear fashion. In an effort to reap the benefits of global diversification among varied markets, portfolio managers are constantly searching for foreign stock markets that are not integrated with each other. The aim of this research is to examine the interdependency, linkage and transmission of shocks between Indian and American stock market, so that investors and portfolio managers can diversify their investments in foreign nations. Bases on our analysis, it has been found that both the markets are integrated in long-run, and short-run variation are transmitted through their own channels. Furthermore, Granger Causality test clearly point that a Uni-directional Causality is running from American market to Indian market, which indicates dependency of Indian stock market on American stock market. Finally, examination of volatility spillover using DCC–MGARCH model revealed that there is no integration and asymmetric effect from India to America or vice-versa in the short-run but both the markets are integrated in long run. Hence, conclusion can be drawn in such a way that investors and portfolio managers may benefited from global portfolio diversification by investing in their respective foreign stock markets in the short run.

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Assessing the Impact of COVID-19 Pandemic in Determining Equity Stock Market Integration: An Empirical Exploration of BRICS Countries

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Abstract

The paper examines the extent of linkages among the stock markets of BRICS with special emphasis on COVID-19 pandemic period. Long-run integrating relationship and short-run dynamic associations among the stock markets of the BRICS have been explored using different econometric tests. The findings suggest that the COVID-19 pandemic has significant impact on the stock markets of the BRICS, especially in Brazil and China.

Keywords: BRICS, COVID-19, Causal relationship, Cointegration Modeling, Pandemic

1. Introduction

Since the last few decades, there has been an embryonic proclivity of integration of global economies, financial systems, stock and commodity markets. Such assimilations stem from various economic, political, technological and cultural reasons. Of course, globalisation, liberalisation, free movement of capital, relaxation of entry restrictions etc. coupled with the tremendous advancement in information technology bring about worldwide integration of economies and stock markets. History has also exhibited the other possibilities of financial integration which often started with financial, political and health-related crises. Umpteen historical evidence can be cited when financial irregularities, distresses and crises bind the stock markets and economies of several countries with mild to severe bad impacts and their contagious effects spread like a sea wave from one market to another and so on. Therefore, financial crises have also ignited the idea of integration of the stock markets worldwide.

Health crises pose significantly greater risks than financial crises as they snatch away the lives of human beings too and are responsible for unimaginable suffering to mankind in addition to mammoth economic loss. History has witnessed several epidemics and pandemics, which also call for great recession and depression in the economy and financial systems. The majority of the health hazards are influenza, plague and like diseases which have probably occurred since the last four centuries of documented history. Since the beginning of twentieth century, the world has witnessed three significant global influenza pandemics. The first one in 1918-20 Spanish flu, which killed approximately 2% of the global population, impacted significantly the stock market. It caused a significant, though short-lived, adverse effect on US stock returns and the overall economy (Angel *et al.* 2023). During the first and second waves of the Spanish flu, the US equity markets rose steadily but dropped about 20% during the third and fourth waves in 1919 and 1920 respectively (Deutsche Bank). It was so severe that the mortality rate ranged from 1% to 5% of the global population (Jinjarak *et al.* 2022). The other two flu outbreaks considered pandemics in the twentieth century occurred in 1957 known as the Asian flu and the Hong Kong flu of 1968 shattered the economic systems and markets. The US equities lost almost 20% during a steady four-month decline in consequence of 1957 flu pandemic caused by the H2N2 virus and it was devastating in terms of heavy infection with more than 40% of the global population (World Bank, 2020). The H3N2 influenza pandemic of 1968 was associated with a substantial decline in output,

productivity, consumption and investments in addition to aftermath negative impacts (Jinjarak *et al.* 2022).

Numerous epidemic outbreaks have occurred in the early twenty-first century. These include Severe Acute Respiratory Syndrome (SARS) of 2002-2003, Swine Flu of 2009-2010, Middle East Respiratory Syndrome (MERS) of 2012, Ebola virus of 2014-16 and Zika virus (ZIKV) of 2016. The outbreak of the Coronavirus (referred to as SARS-CoV-2) was initially reported in November 2019 in Wuhan; a central city located in China. The first global warning of COVID-19 was issued by the World Health Organisation (WHO) on 30th January, 2020 and subsequently, a global emergency was declared on 20th February, 2020 based on the trajectory of spread and scale. The WHO declared it a global pandemic on 11th March, 2020; by that time, it had already spread across Germany, France, Spain, Italy, UK and US. As per report of WHO, 23,97216 confirmed infection cases were identified and 1,62,956 deaths across the world were reported as of 21st April, 2020, the majority of which were from China and G7 countries. The primary effect of COVID-19 on the stock markets was very severe and the major stock markets witnessed a decline in double figures with Dow Jones Industrial Average (DJIA) and S&P 500 indices dropped by 33% and 29% respectively on 20th March, 2020 as compared to 31st December, 2019, when the WHO reported the initial confirmed cases of infection. DJIA had faced the largest third (12.93% drop) and sixth (9.99% drop) daily drops as of 16th March and 12th March, 2020 (World Economic Forum, 2020, Ali *et al.* 2020). FTSE100, the main index of the UK, experienced the most difficult quarter since 1987 with a record fall of 24.80% (The Guardian, 2020). Japan faced over 20% decrease from the peak in December 2019 (Bloomberg, 2020). The global stock markets were also impacted by human behavioural issues due to fear and uncertainty and in consequence, it erased about US\$ 6 trillion in wealth in one week from 24th to 28th February, 2020. The S&P 500 index lost over US\$ 5 trillion in value in the same week in the US and the ten largest companies of the S&P 500 index experienced a combined loss of over US\$ 1.4 trillion (Peterson & Thankom, 2020). On 24th March, 2020, the International Monetary Fund (IMF) stated that it expected a global recession that would be at least as bad as the decline during the worldwide financial crisis (2007-08), followed by a recovery in 2021 (Martin & Bloomberg, 2020). The COVID-19 crisis is unique from other epidemics and pandemics in terms of its high rate of infection and global spread. The COVID-19 pandemic, caused by a novel strain of Coronavirus from the SARS species, bears striking semblance with the 1918 Spanish flu pandemic in terms of biological features (both are respiratory diseases and spread through contacts and droplets); widespread coverage of transmission (the 1918 influenza spread to about one-third of the global populace, while COVID-19 touched almost ten million infections before the conclusion of June 2020) and health response (such as quarantine, use of disinfectants, isolations, breaking of infection chain through lockdown, restriction on public gatherings and travels etc.) (Salisu, *et al.* 2020; Gupta *et al.* 2021). The financial turmoil resulting from the recent pandemic COVID-19 differs from the earlier economic crises, such as the Great Depression of the 1930s and the Great Recession of 2007-09 due to the subprime lending crisis of the US, concerning the fact that it involves multiple uncertain economic links (Hatmanu & Cautisanu, 2021).

The COVID-19 pandemic affected dramatically all sectors and economies worldwide and its devastating effects are highly observed especially in emerging countries due to weaker institutional and legal environments and higher levels of financial and social risks (Bretas & Alon, 2020; Hevia & Neumeyer, 2020). As a result of panic selling and falling stock index prices worldwide, the stock markets experienced trade halts and frequent circuit breaks in March and April 2020 (Rajput & Sufiya, 2022). Therefore, during the COVID-19 pandemic, most stock markets around the world experienced aggressive and worrisome reactions. As an emerging bloc, BRICS countries were no exception in facing the downturns. For this reason, the present study aims to explore the impacts of COVID-19 on the BRICS countries. The rationale behind selecting BRICS countries is that they account for a large global

share of the world's GDP and population. BRICS is a geopolitical, economic collection of five emerging countries, viz., Brazil, Russia, India, China and South Africa. These are considered the most promising emerging market group (Saha, 2018; Bretas & Alon, 2020). Owing to increasing economic ties within the bloc and with the mature markets of major industrialised nations, the lead-lag hypothesis amongst the respective economies is under scanner (Singh & Singh, 2016; Jareño *et al.*, 2023). With 26% of the planet's land mass, together BRICS is home to 41.42% of the world's population and generated 24.10% of global GDP, with a 16.25 share of global exports (BRICS Policy Centre, 2019). BRICS member nations' population growth rate fell by 3.20% between 2010 and 2019, but their aggregate GDP as a proportion of GDP climbed up by 34.04%, with an average yearly growth of 3.80% (The World Bank, 2021).

In this background, the present study aims to empirically investigate the long-term and short-term linkages among the selected equity markets of the BRICS countries with special reference to the COVID-19 pandemic period.

2. Review of Empirical Literature

The idea of integration of economies and stock markets started getting much global attention in the 1980s, but the studies applying empirical methodologies have mostly been done on this topic during the 1990s. Previous studies employing simple methodology are found in the papers of Hamao *et al.* (1990), Kansas (1998), Chen *et al.* (2002), Mukhopadhyay (2009) etc., whereas, the studies of Masih & Masih (1997), Chang & Nieh (2001), Ahmad *et al.* (2013), Alotaibi & Mishra (2015) etc. applied advanced econometric techniques. Umpteen literature studied and identified several major events which affected the stock market returns. These include environmental (Alsaifi *et al.*, 2020; Guo *et al.*, 2020), disasters (Kowalewski & Śpięwanowski, 2020), news (Li, 2018), political events (Bash & Alsaifi, 2019; Shanaev & Ghimire, 2019), financial distress (Masih & Masih, 1997; Chatterjee, 2003; Majid & Kassim, 2009; Huyghebaert & Wang, 2010; Rose, 2012; Gangadharan & Yoonus, 2012; Wang, 2014; Srivasatava *et al.*, 2015) etc. Stock markets also respond to epidemic and pandemic diseases such as the SARS outbreak (Nippani & Washer, 2004; Chen *et al.*, 2007; Chen, *et al.*, 2009). On the basis of above, the literature has been categorised into two main groups i.e. impacts of the COVID-19 pandemic and integration of BRICS.

2.1. Impacts of COVID-19 Pandemic on Economies and Stock Markets:

The COVID-19 crisis has negatively impacted the stock returns in both developed and emerging markets across the world. Al-Awadhi *et al.* (2020) investigated the impacts of COVID-19 on the Chinese stock market and observed that both the daily growth in confirmed cases and total death cases had significant impacts on the stock returns. Ali *et al.* (2020) examined the responses of the financial markets concerning downturn and volatility as the epicentre of coronavirus shifted from China to Europe and later to the US. Their research uncovered that the initial Chinese epicentre had steadied while worldwide markets plunged, particularly during the final stage of the outbreak. Kumar *et al.* (2021) studied the response of prominent stock markets in BRICS nations amid the COVID-19 pandemic and compared the same with the 2008 financial crisis. They found that the US crisis of 2008 caused more stock volatility in India and Russia, whereas, China, Brazil and South Africa faced more volatility during the COVID-19 pandemic. Akhtaruzzaman *et al.* (2021) examined how financial contagion occurred through financial and non-financial firms in China and G7 countries during COVID-19. Their results revealed that listed firms across the countries experienced a significant increase in conditional correlations between their stock returns during the pandemic. Rajput & Sufiya (2022) revealed that the stock indices of BRICS countries were not cointegrated prior to the pandemic except for China and South Africa, yet the interdependence increased during the pandemic indicating that

COVID-19 strengthened the cointegration or connections of BRICS. **Mishra & Mishra (2022)** empirically analysed the impact of the COVID-19 health crisis on the market performance and degree of integration of markets in BRICS bloc. Their findings supported the increased opportunities for international portfolio diversification on one hand and on the other hand, they suggested controlling the macroeconomic uncertainties during the global health crisis.

2.2. Integration of economies and stock markets of BRICS:

The connectedness of BRICS has been studied by many. **Haifeng & Shigeyuki (2012)** investigated the dynamic linkages between the BRICS countries and the US and found that the international transmission of stock prices weakened in both the mean and variance due to the 2008-09 US financial crisis. **Saha (2018)** investigated the interlinkages and causal relationships between BRICS and the US equity markets. The study found the fading away of the US supremacy over the global financial markets in the context of changing market dynamics and time-varying integration among the stock markets of BRICS. **Nguyen et al. (2021)** investigated the impact of Chinese and US equity markets on global equity markets during COVID-19 and found evidence of significant contagion effects from China and the US to other markets during the pandemic. **Ameer et al. (2023)** examined the response of the BRICS and MSCI emerging stock market indices to COVID-19. Their results revealed the negative impact of COVID-19 on the performance of all indices, although inefficiency in the Chinese market unexpectedly improved. **Sayed & Charteris (2024)** studied the time and frequency-varying integration of the BRICS stock markets including new BRICS + members. Indian and Russian markets were found most integrated with other markets in the bloc, whereas Chinese and South African markets were identified as distinct from others.

3. Objectives of the Study

This study aims to focus on the following aspects:

- (i) To make a brief statistical overview of the selected equity markets of BRICS.
- (ii) To examine the presence of long-run integration and short-run linkages, if any, among the selected equity markets of the BRICS with special reference to the COVID-19 pandemic period.
- (iii) To analyse the dynamic relationship of the equity markets of BRICS and to make necessary conclusions.

4. Research Methodology

4.1. Sources of Data: Secondary data has been obtained from various websites of representative stock markets of BRICS which include Yahoo Finance and Investing.com.

4.2. Variables Selected: Based on the review of literature, the proxy equity indices of the BRICS countries have been selected as variables and they are shown in Table 1.

Table 1: Stock Market Indices of the BRICS

BRICS Countries	Stock Markets	Representative Indices
Brazil	The Bolsa de Valores de São Paulo	IBovespa
Russia	Moscow Exchange	MOEX Russia
India	National Stock Exchange	CNX NIFTY 50
China	Shanghai Stock Exchange	SSE Composite
South Africa	Johannesburg Stock Exchange	FTSE JSE All Share

4.3. Time Frame: The study uses daily closing equity indices (comprising 5 days in a week) of the five stock markets of the BRICS countries for the period from 1st January, 2019 to 28th June, 2024, comprising 1,438 observations. This time frame is considered as full sample period. For exploring the dynamic linkages among the countries during COVID-19 pandemic, the pandemic period has been taken from 11th March, 2020 to 30th June, 2020 (comprising 79 observations) following the former studies of Nguyen *et al.*, 2021; Gupta *et al.*, 2021; Verma, 2024.

4.4. Data Mining: To overcome missing observations due to stock exchange holidays, this study adopts a procedure to match the daily data of the selected indices and finally reaches 1,438 observations. First, the daily closing indices are transformed into natural logarithm forms and daily returns have been computed taking the first difference of the logarithmic indices. Therefore Return (R_t) = $\ln(P_t / P_{t-1}) = \ln P_t - \ln P_{t-1}$.

4.5. Econometrics Models Used:

The integrating relationships of BRICS countries has been investigated using the Autoregressive Distributed Lag (ARDL) bound test model suggested by Pesaran *et al.* (2001). The logic behind using this test is that it is more effective and robust in handling limited time series datasets as compared to other cointegration tests. Secondly, The ARDL bound test can be applied when the variables are either I(0) or I(1) or a combination of both I(0) and I(1), but not I(2). Therefore, checking the unit root of the variables is required only to confirm the existence of any variable of I(2). The Augmented Dickey-Fuller (ADF) and Philip-Perron (PP) Unit Root tests are conducted to test the existence of unit roots in the data series. The Toda-Yamamoto Granger Causality Block Exogeneity test has been conducted to explore short-run dynamic relationships among the BRICS countries.

5. Empirical Analysis and Discussion

5.1. Summary Statistics

Table 2: Summary Statistics (Daily Log Indices)

Particulars	Brazil	Russia	India	China	Africa (S)
Full Sample Period (1st January, 2019- 28th June, 2024)					
Mean	11.60038	7.972337	9.625042	8.061113	11.08321
Standard Deviation	0.115072	0.181615	0.254330	0.079987	0.143635
Skewness	-0.959523	0.018582	-0.289989	-0.176145	-0.523662
Kurtosis	4.795318	2.250659	2.008126	2.576824	2.498198
Jarque-Bera	413.7789*	33.72669*	79.10130*	18.16588*	80.80908*
COVID-19 Pandemic Period (11th March, 2020- 30th June, 2020)					
Mean	11.31405	7.868333	9.135977	7.957763	10.79801
Standard Deviation	0.106747	0.064333	0.073489	0.027889	0.092728
Skewness	0.014293	-1.202237	-0.357048	0.019478	-1.015023
Kurtosis	2.213716	3.933942	2.702600	2.923955	3.393378
Jarque-Bera	2.037737	21.90192*	1.969670	0.024031	14.07461*

Source: Author's Computation Using EViews.

*Significant at 1% level.

At first, the statistical properties of the variables have been tested through summary statistics (shown in Table 2). Considering full sample period, all BRICS countries have positive mean values considering log indices. Brazil shows the highest mean log index (11.60) followed by South Africa (11.08). China has the lowest mean index value i.e. 8.06. All BRICS countries except Russia are negatively skewed. None of the values of Kurtosis are close to 3 required for a series to follow a normal distribution. The Jarque-Bera test further confirms it rejecting the normality of all the selected indices at 1% level of significance. However, the departures from normal distribution may not seriously affect the test of cointegration (Ali *et. al.* 2011).

However, during the COVID-19 pandemic period, Russia has the lowest mean index value i.e. 7.87 among all the BRICS nations. Brazil shares the highest volatility shown by S.D., whereas, China shares the least volatility during this pandemic period. The Jarque-Bera test shows that the null hypothesis of normal distribution of the indices is rejected at 1% level of significance for Russia and South Africa.

5.2. Unit Root Test Results:

For stationarity analysis, Augmented Dicky-Fuller (ADF) (1979, 1981) and Philip-Perron (PP) (1988) tests have been conducted. Table 3 suggests that considering the full sample period, all the BRICS countries except Brazil are integrated of order one i.e. I(1) using both the tests. But all the selected equity indices (except Russia using the PP test) are integrated of order zero i.e. I(0) in both the tests during the pandemic period. Therefore, there is a mixture of I(0) and I(1) variables considering full sample period, whereas, all variables are I(0) during the pandemic period. In both periods, none of the variables is integrated of order 2 i.e. I(2). This opens the doors for using the ARDL bound test for examining the integration among the variables.

Table 3: Unit Root Test

Country	At Levels		At First Differences	
	ADF	PP	ADF	PP
	Model: Intercept + Trend		Model: No Intercept & Trend	
Full Sample Period (1 st January, 2019- 28 th June, 2024)				
Brazil	-3.531862** [13] (0.0364)	-3.584008** [18] (0.0315)	-9.894101* [12] (0.0000)	-44.16905* [16] (0.0001)
Russia	-1.926895 [4] (0.6398)	-1.918540 [7] (0.6442)	-17.62585* [3] (0.0000)	-42.40990* [8] (0.0001)
India	-2.535194 [9] (0.3109)	-2.349014 [8] (0.4065)	-11.25780* [8] (0.0000)	-40.00285* [8] (0.0000)
China	-3.055623 [0] (0.1176)	-3.019490 [12] (0.1271)	-37.97137* [0] (0.0000)	-37.99704* [14] (0.0000)
South Africa	-2.920271 [20] (0.1562)	-3.246672 [7] (0.0759)	-9.232746* [19] (0.0000)	-39.24493* [4] (0.0000)
COVID-19 Pandemic Period (11 th March, 2020- 30 ^h June, 2020)				

Brazil	-5.211099* [1] (0.0003)	-6.050784* [1] (0.0000)	-4.336314* [2] (0.0000)	-12.50766* [2] (0.0000)
Russia	-4.809951* [4] (0.0010)	-3.360786 [4] (0.0642)	-4.393899* [5] (0.0000)	-10.65000* [3] (0.0000)
India	-3.790104** [6] (0.0222)	-4.253708* [1] (0.0060)	-3.597370* [5] (0.0005)	-10.58308* [3] (0.0000)
China	-4.379759* [5] (0.0041)	-4.256952* [2] (0.0059)	-2.559539** [4] (0.0110)	-9.046686* [4] (0.0000)
South Africa	-4.355122* [7] (0.0044)	-4.141250* [4] (0.0083)	-3.842615* [5] (0.0002)	-10.99311* [4] (0.0000)

Source: Author's Computation Using EViews.

Note:

- Figures in [] represent Lag Lengths based on AIC in case of ADF Test and Bandwidth based on Newey-West,
- *, ** Indicate the statistical significance levels of 1% and 5% respectively; Figures () represent MacKinnon (1996) one sided p values.

5.3. Long-run Linkages and Causal Relationships using ARDL Bound Test of Cointegration:

The ARDL bound test proposed by Pesaran *et al.* (2001) has been applied to examine the long-run linkages among equity market indices of the BRICS countries. For application of ARDL, error term should be free from serial correlation. Therefore, the lag order p of the underlying ARDL model should be chosen very carefully. The lag order of the distributed lag of the dependent variable and the regressors is selected based on Schwarz Criterion (SC) using the automatic lag selection method. SC is preferable to Akaike Information Criterion (AIC) as it gives a parsimonious model that selects the smallest possible lag length than AIC (Pesaran & Shin, 1995).

Full Sample Period (1st January, 2019- 28th June, 2024)

Table 4 displays China and South Africa are individually cointegrated in long-run with remaining countries of the BRICS in full period. Considering Brazil and India as dependent variables, the respective ARDL bound tests show inconclusive results about the existence of long-run cointegrating relationships between the dependent country and the rest of the countries of BRICS, as the calculated F statistics are lying somewhere between the upper bound and lower bound critical values at 5% level of significance. Russia shows no cointegrating relationship in the long-run with rest of the countries in BRICS during this period.

Table 4: Results from ARDL Bound Test (Full Sample Period)

Sl. No.	Equation	Trend Specification	F Stat.	Inference
1.	F(Brazil Russia, India, China, South Africa)	[3]	2.44	Inconclusive
2.	F(Russia Brazil, India, China, South Africa)	[3]	1.72	Not cointegrated

3.	F(India Brazil, Russia, China, South Africa)	[1]	3.54	Inconclusive
4.	F(China Brazil, Russia, India, South Africa)	[3]	3.33***	Cointegrated
5.	F(South Africa Brazil, Russia, India, China)	[2]	5.50*	Cointegrated

<i>Critical Values</i>	With Constant & Trend [1]		With Constant [2]		None [3]	
	<i>Lower Bound</i>	<i>Upper Bound</i>	<i>Lower Bound</i>	<i>Upper Bound</i>	<i>Lower Bound</i>	<i>Upper Bound</i>
1% level of significance	4.4	5.72	3.74	5.06	3.07	4.44
5% level of significance	3.47	4.57	2.86	4.01	2.26	3.48
10% level of significance	3.03	4.06	2.45	3.52	1.9	3.01

Source: Author's Computation Using EViews.

Notes:

1. *, **, *** indicate significance at 1%, 5% and 10% level respectively.
2. Critical values (asymptotic) are taken from Pesaran *et al.* (2001) and Lag selection is based on Schwarz Criterion (SC).
3. No. of regressors (k) is 4 and the variables are at log level.
4. Trend specification is indicated by [] and is based on the statistical significance of constant and trend.
5. All the ARDL models satisfy the required diagnostic tests.

The existence of long-run relationships indicated by the equations using China and South Africa individually as dependent variables creates a ground for the construction of an error correction model (ECM). Table 5 shows that both China and South Africa share long-run causal relationships with the remaining BRICS countries. The significance of the coefficient of error correction term (ECT) for China (i.e. -0.01468) at 1% level implies that any deviation in the short-run is corrected by China at a speed of adjustment of 1.47% daily to restore the long-run equilibrium relationships. South Africa makes correction to disequilibrium at a daily speed of adjustment of 2.69% for maintaining the long-run equilibrium relationships.

Table 5: Long-run Causality using Error Correction Model (ECM) of ARDL (Full Sample Period)

	← Dependent Country →	
	China	South Africa
	ARDL (1, 0, 0, 1, 2)	ARDL (2, 3, 2, 1, 1)
Coefficient of ECT (-1) (Probability)	-0.014680 (0.0000)	-0.026920 (0.0000)

Source: Author's Computation Using EViews.

☐ COVID-19 Pandemic Period (11th March, 2020- 30th June, 2020)

Table 6 reports a completely interesting scenario about long-run integrating relationships of countries in BRICS during the COVID-19 period. It shows that Russia, India and South Africa are cointegrated

in the long-run. During the same period, using Brazil and China as dependent variables individually, the ARDL bound test models are inconclusive about the existence of any long-run integration between the dependent country and the rest of the BRICS countries. The result is very significant as Brazil and China were the most severely COVID-19-affected countries in the first phase of the pandemic.

Table 6: Results from ARDL Bound Test (COVID-19 Pandemic Period)

Sl. No.	Equation	Trend Specification	F Stat.	Inference
1.	F(Brazil Russia, India, China, South Africa)	[3]	2.88	Inconclusive
2.	F(Russia Brazil, India, China, South Africa)	[1]	5.43*	Cointegrated
3.	F(India Brazil, Russia, China, South Africa)	[3]	4.17**	Cointegrated
4.	F(China Brazil, Russia, India, South Africa)	[2]	3.28	Inconclusive
5.	F(South Africa Brazil, Russia, India, China)	[2]	14.29*	Cointegrated

Critical Values	With Constant & Trend [1]		With Constant [2]		None [3]	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
1% level of significance	4.4	5.72	3.74	5.06	3.07	4.44
5% level of significance	3.47	4.57	2.86	4.01	2.26	3.48
10% level of significance	3.03	4.06	2.45	3.52	1.9	3.01

Source: Author's Computation Using EViews.

Notes:

1. *, **, *** indicate significance at 1%, 5% and 10% level respectively.
2. Critical values (asymptotic) are taken from Pesaran *et al.* (2001) and Lag selection is based on Schwarz Criterion (SC).
3. No. of regressors (k) is 4 and the variables are at log level.
4. Trend specification is indicated by [] and is based on the statistical significance of constant and trend.
5. All the ARDL models satisfy the required diagnostic tests.

The presence of long-run integrating relationships of Russia, India and South Africa requires the construction of the Error Correction Models for these countries. These three countries share long-run causality as the coefficients of lagged ECT (known as the speed of adjustment) are found negative and statistically significant. It implies that any divergence from long-run relationships will be corrected by Russia, India and South Africa in the short-run with a daily speed of adjustment of 38.10%, 36.79% and 46.22% respectively. The rate of correction is very high and significant.

Table 7: Long-run Causality using Error Correction Model (ECM) of ARDL (COVID-19 Pandemic Period)

	← Dependent Country →		
	Russia	India	South Africa
	ARDL (1, 0, 1, 0, 1)	ARDL (1, 0, 0, 1, 4)	ARDL (1, 1, 0, 0, 0)
	Coefficient of ECT (-1) (Probability)	-0.381095 (0.0000)	-0.367912 (0.0000)
		-0.462286 (0.0000)	

Source: Author's Computation Using EViews.

5.4. Short-run Causality using Toda-Yamamoto (TY) Granger Causality Test and VAR-Based Granger Causality:

The unit root test results confirm that all the variables are integrated of a different order, in full sample period. However, all the variables are $I(0)$ in the COVID-19 pandemic period. In both the study periods, few of the variables are integrated in the long-run. Hence short-run dynamic causal relationship is obtained from Toda-Yamamoto (TY) Granger Causality (Toda & Yamamoto, 1995) through Modified Wald (MWALD) tests. This model is superior to the ordinary Granger Causality test as it does not require the pre-testing of the variables for cointegration. Therefore, this model helps to overcome the problem of using asymptotic critical values when the causality tests are conducted in the presence of both stationary or non-stationary and cointegration or no cointegration. First, the lag length (k) of the level Vector Autoregression (VAR) model is determined using AIC. However, such selection of lag length of the level VAR model is subject to clearance of diagnostic tests, such as Serial Correlation LM test, VAR Stability Test using AR Roots Table and Graph etc. Second, after the selection of optimal lags for the VAR, the maximum order of integration ($d_{\max}$) for the variables is selected to undertake the TY model. It is required to mention that the maximum order of integration is one in the full sample period and the same is zero in the COVID-19 pandemic period. The optimum lag length (k) in VAR model considering full sample period is 9. Therefore, the $(k+d_{\max})^{\text{th}}$ order i.e. 10^{th} order VAR needs to run in the TY procedure. However, in the COVID-19 pandemic period, all the variables are $I(0)$ and hence, the VAR-based Granger Causality Block Exogeneity Test has been used to investigate the short-run dynamic causal relationships. The optimal lag length of the VAR is 8 for the pandemic period. The empirical results of TY model in different sample periods are explained below:

□ Full Sample Period (1st January, 2019- 28th June, 2024)

Table 8 reports the results using the full sample period. It exhibits that Brazil granger causes Russia, India, China and South Africa and is caused by India, China and South Africa. Therefore, Brazil shares bi-directional causality with India, China and South Africa. India can influence Brazil and South Africa in the short-run and is caused by Brazil, Russia and South Africa. So, India also shares bi-directional causality with Brazil and South Africa. China has bi-directional causality with Brazil only. Therefore, China shares a short-run causal relationship only with Brazil. The non-existence of short-run dynamic causality in China makes it a safe zone for international investments and diversification benefits. All the BRICS nations collectively share short-run dynamic interactive relationships among them.

Table 8: Toda-Yamamoto (MWALD) Granger Causality Test (Full Sample Period)

Independent Countries ↓	← Dependent Countries →				
	Brazil	Russia	India	China	South Africa (SA)
Brazil	-	0.0020*	0.0000*	0.0209**	0.0000*
Russia	0.1243	-	0.0009*	0.1133	0.0181**
India	0.0000*	0.1820	-	0.4670	0.0000*
China	0.0270**	0.8358	0.5774	-	0.9835
South Africa	0.0001*	0.2537	0.0000*	0.3488	-
All Variables	0.0000*	0.0125**	0.0000*	0.0002*	0.0000*
Direction of Causality	India, China, SA granger cause Brazil	Brazil only granger causes Russia	Brazil, Russia, SA granger cause India	Brazil only granger causes China	Brazil, Russia, India granger cause SA

Source: Author's Computation Using EViews.

Note:

1. *, ** and *** indicate level of significance at 1%, 5% and 10% respectively. Figures are respective p -values of χ^2 statistics.
2. VAR model is at log level and Optimal Lag Length is 9 as per AIC.
3. The maximum order of integration is one.

COVID-19 Pandemic Period (11th March, 2020- 30^h June, 2020)

Table 9 exhibits the VAR-based Granger Causality/ Block Exogeneity test results of the pandemic period. Such a test is used as all the variables are $I(0)$ i.e. they are stationary at level forms. It excludes the scope of using the Toda-Yamamoto causality test as the maximum order of integrated (i.e. $d_{\max}$) is also zero. The results show a very interesting scenario of the short-run causality during the pandemic period. Brazil is not granger caused by any country, but it can granger cause all four countries. India and South Africa are impacted by all the remaining countries individually.

Table 9: VAR-Based Granger Causality/ Block Exogeneity Test (COVID-19 Pandemic Period)

Independent Countries ↓	← Dependent Countries →				
	Brazil	Russia	India	China	South Africa (SA)
Brazil	-	0.0001*	0.0000*	0.0370**	0.0065*
Russia	0.2799	-	0.0837***	0.0010*	0.0014*
India	0.4176	0.6364	-	0.1514	0.0666***

China	0.7528	0.9483	0.0219**	-	0.0676***
South Africa	0.2537	0.0150**	0.0024*	0.0077*	-
All Variables	0.0000*	0.0000**	0.0000*	0.0000*	0.0000*
Direction of Causality	No country granger causes Brazil	Brazil and SA granger cause Russia	Brazil, Russia, China, SA granger cause India	Brazil, Russia and SA granger cause China	Brazil, Russia, India, China granger cause SA

Source: Author's Computation Using EViews.

Note:

1. *, ** and *** indicate level of significance at 1%, 5% and 10% respectively. Figures are respective p -values of χ^2 statistics.
2. VAR model is at log level and Optimal Lag Length is 8 as per AIC.

Therefore, Brazil is the safest zone for investing during the pandemic period as, in the short-run, it is not influenced by the other four countries. In this period, diversification benefit was reduced to a great extent for international investors.

6. Conclusion

The current study attempts to empirically examine the cointegrating relationships among the BRICS countries. It also tries to unveil whether the COVID-19 pandemic period has any impact on both the long-run cointegration and short-run causal relationships among the nations in BRICS. Considering the entire period, the study shows that China and South Africa are individually cointegrated in the long-run with significant values of speed of adjustment which implies their convergence to the long-run integrating relationships. The remaining countries in BRICS are either not cointegrated or the strength of association is so poor giving inconclusive results about integration. However, during pandemic period, three countries i.e. Russia, India and South Africa move together in the long-run. In the absence of equilibrium relationships, the speed of convergence to equilibrium relationship is significantly very high for India, Russia and South Africa during the pandemic period. It indicates that during pandemic period, India, Russia and South Africa had heavy market corrections in the short-run which is an indicator of the market dynamism and adjustability of these countries.

Short-run dynamic relationships are also very interesting in both study periods. There is a paradigm shift in the causal behaviour during these two periods. In the full sample period, China has no short-run causality with India, Russia and South Africa except Brazil. It makes China a completely isolated and safe investment avenues among the BRICS countries. India has no short-run impact on China and Russia. Hence Russian and Chinese investors can safely invest in India. The COVID-19 pandemic, although a health crisis, had a short-term contagious effect on the BRICS stock markets. In the pandemic period, Brazil completely acts in an isolated manner. Brazil, Russia and South Africa have short-term impacts on the Chinese stock market. Therefore, during the pandemic period, the Chinese market captures the short-term causal information from Brazil, Russia and South Africa. The absence of an error correction mechanism in China makes it difficult for the stock market of China to maintain a steady long-run relationship with the rest of the BRICS nations. The study also shows that BRICS countries can act strongly when they act as a bloc. It is supported by the strong evidence of joint causality of the BRICS countries.

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Management of Assets and Liabilities in Indian Commercial Banks – An empirical study

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Abstract

Asset Liability management is a strategic technique to manage and minimize various risks and simultaneously maximize the profit and market value of equity. Slacks-based measure (SBM) model in Data Envelopment Analysis is applied for evaluation of the competency of Asset Liability Management of thirty-one banks for a time frame of six years (2016 to 2021). The best performing banks in context of asset liability management are Nainital Bank Ltd., Bandhan Bank Ltd., Tamilnad Mercantile Bank Ltd. and City Union Bank Ltd. Asset liability management of majority of banks have improved over the study period.

Keywords: Asset Liability Management (ALM), Liquidity Risk, Credit Risk, Data Envelopment Analysis (DEA), Interest Rate Risk.

1. Introduction

Primary business for a bank is to accept deposits from people and institutions that have excess finance and give loans and advances to people and institutions who are in need of finance. Banks while acting as financial intermediary face diverse forms of risk.

During 1940s-1950s, focus of banks was on asset management as excessive funds were available in terms of demand and saving deposits. During 1960s-1970s, there was huge demand for loans and advances, the deposit seemed less in comparison to the demand of loans, hence, the focus of banks shifted to management of liabilities.

Banks make profit in the form of spread by charging a higher rate of interest on loans and advances in comparison to interest rate paid on deposits. Spread Management also become an important function of banks.

High degree of inflation pressure, volatility of interest rates and recession during 1970s-1980s, compelled financial institutions to plan asset liability management for their existence. During 1980s, a formalized approach of bank's balance sheet management was introduced to integrate fragmented approach of asset management, liability management and spread management.

Liberalization, privatization and globalization of financial markets have brought about many changes in the banking sector during 1990s. Consolidation, product expansion and diversification,

securitization, deregulation of interest rates, volatility in foreign exchange rates, modifications in the rules and regulations have made Asset Liability Management more complex for banks. Regulatory bodies of financial markets and financial institutions have introduced several methods for helping banks to deal with the changing environment, which has led to better focus on the bank's asset liability management.

Harrington (1990) stated that innovative methods of management of asset and liability are formed to cope with a complex banking business. Banks now have to deal with different types of assets and liabilities and in varied currencies. Hence, it is very important for the banks to be more efficient and organized. Past methods and processes are now not sufficient and banks need to come up with advanced methods and revise the existing asset liability management system.

Kosmidou. & Zopounidis (2002) explained that the vagueness which exists in economic surroundings which compelled to come up with better techniques in bank's asset liability management. The decisions taken today on asset management generate both difficulties and prospects for tomorrow. Hence, banks must maintain a proper balance of profitability, liquidity, uncertainties and risks. The proper balance between these elements cannot be established without taking into account significant interactions that occur amid the composition of assets, capital and liabilities. In asset liability management, a bank needs to combat various contradictory objectives, like enhancement of profit, reduction of uncertainty, preservation of liquidity and growth of advances and deposits.

Prabhu (2012) defined ALM as the method used by banks to ensure that the accumulation and use of resources is carried out in such a way that profits are maximized and risk is minimized. It includes identification, measurement and pricing of different risks in such a manner that income is maximized given the desired level of risk and consequently trying to ensure that the disturbances from these risks are reduced.

Choudhry (2011) defined ALM as the strategic administration of assets and liabilities of bank. ALM is established either by its Asset Liability Management Committee or by Treasury department of the bank. ALM's basic objective is to control risk of rate of interest and liquidity. Strategic level management of credit risk is also included in ALM.

The three main risks which needs to managed are credit risk, interest rate and liquidity risk. Credit risk occurs because of the probability of a failure or postponement in settlement of commitment by the fund borrowers. The structure of credit risk emphases on, the quantification of credit risk, risk supervision and controls, including screening abidance with credit risk limits, and creation of regulatory capital vital to support credit risk. The Basel framework provides for the distinctive modelling and quantification of credit risk. Banks use both fundamental and advanced internal ratings-based approach. Banking supervisors should timely assess the usefulness of policies for credit risk and methodologies used in evaluating its quality.

Susceptibility of interest income and or value of the bank in market to variations in the rate of interest is known as interest rate risk. Bank suffers from interest rate risk as there exists a difference in the rate of interest fixed on deposits and rate of interest fixed of assets. Banks have a chance to make profit or losses with every change in the interest rate level. Previously changes in interest rate were anticipatable, hence interest rate risk was manageable. With interest rates becoming more volatile, it became necessary to monitor and control interest gaps. Banks need to use more advanced and scientific methods for interest risk management.

Liquidity risk includes both market liquidity and comfort of transforming resources into funds. It is the main threat that a bank faces in the short period. Even a slightest short-term liquidity issue can go out of control, regardless of the bank being solvent. This requires taking decision that would forgo

profit in order to survive. Poor decisions pertaining to issue of credit can cause liquidity issues in banks and affect the economy as a whole. It is important that growth and development decisions should be made taking into account ALM decisions made by the bank. Liquidity risk has two aspects one is the shortfall of cash and liquid assets and another is having surplus liquidity in the bank. There may be a situation when bank is having excess funds but no profitable projects in to invest the money. Intra-day liquidity is also an important factor, which needs continuous monitoring and management.

Asset Liability Risk Management is not always flawless, as it is based on numerous assumptions and estimates. There is a scope to improve ALM with the help of application of advanced management information system. The bank must have ALM systems that takes into consideration all important sources of liquidity risk, interest rate and credit risk and evaluates the effect of interest rate fluctuations on the income and market value of equity.

2. Literature Review

Sudesh & Neetu (2017) used input-oriented DEA model to calculate technical efficiency of scheduled commercial banks for a decade i.e. 2005-2014 by classifying them on the basis of their ownership. Results showed that SBI & its associates followed by foreign banks have been most efficient bank group during the study period.

Azad et al. (2020) evaluated competence of Bangladesh's banks with the help of Network analysis model. For better evaluation of efficiency, bank operation is divided into principal operations and supplementary operations. The results revealed that eighteen banks were efficient out of total of thirty-nine banks. Banks in Bangladesh have proficiency in core operations such as issuing equity and deposit mobilization but were not good in supplementary operations. The study concluded that public sector banks displayed competence in supplementary operations and private sector banks in core operations.

Vittal and Reddy (2021) used DEA model for evaluation of public sector bank efficiency during the financial year 2018-2019 using Slack Based Measure (SBM) and CCR (Charns, Cooper and Rhodes) model. SBM directly deals with surplus of inputs and deficit of outputs. Presence of higher than zero slack in variables represent substantial amount of inefficiency. Peer count (reference set) is the procedure to identify outperformer banks among efficient banks. The results showed that Punjab & Sind Bank, Indian Bank and Central Bank of India as public sector outperformers in India.

3. Research Gap

DEA has been used in many research to estimate competence of several industries namely education, insurance, health, banking and tourism. DEA is widely applied in evaluation of banking sector efficiency in India. Many studies have focussed on measurement of overall efficiency of Indian banks. This leaves a wide scope to use DEA to evaluate competence of bank's ALM in India.

4. Objective:

- understand the basics of ALM
- examine bank's competence in ALM
- examine efficiency of banks in interest rate, liquidity risk and credit risk supervision and suggest measures to improve their performance.
- examine the trend of ALM strategies of banks in India.

5. Research Methodology

In this paper, efficiency of ALM of thirty-one banks is evaluated using non-oriented and non-radial efficiency model i.e. slacks-based measure with the supposition of a variable return to scale (SBM NO VRS) for a period of six years i.e. 2016-2021. Non-radial measure is selected as it does not simultaneously increase or decrease all the outputs and inputs in the same proportion. The no orientation feature in the model highlights need to reduce the inputs and increase the outputs instantaneously. Variable returns to scale is selected as each bank has a different scale of operation and are not homogeneous.

Visbal-Cadavid et al. (2017) states an essential technique for assessment of performance and is DEA which is applicable in various fields. DEA is a non-parametric method, which formulates a pragmatic efficiency border according to information inputted into the model. It helps in deriving only one competence score for assessed entity and creates a peer group of competent entities, for establishing a standard for enhancing performance. This method is useful and appropriate for banks as it manages various put in and put out at once. Since a single competence score is produced, it also simplifies analysis. It is critical to properly select the output and input variables, as they have a straight effect on measurement of efficiency.

Selection of input & output variables

Three major risks faced by the banks have been identified i.e. credit, interest rate and liquidity risk. One ratio each for input and output for each of the risk has been selected. Banks will try to reduce their input and at the same time try to increase their output. Hence, in total, there are three inputs and three outputs for application of SBM NO VRS model for identifying banks which have a proper Asset Liability Management system and can efficiently, manage all the risks. Table 1 shows the identified risks and Input & Output ratio for each of the risk.

Table 1: Input and Output Ratio calculations			
Serial No.	Type of Risk	Input Ratio	Output Ratio
1	Credit Risk	Credit Deposit Ratio (in percentage)	ENPA (Earnings before Tax i.e. Operating Profit / Gross Non-Performing Assets) (in times)
2	Interest Rate Risk	Investment and Advances to Deposits & Borrowings (in percentage)	Net Interest Margin (in percentage)
3	Liquidity Risk	Short term Obligations to Total Liabilities (in percentage)	Liquid Assets to Balance Sheet Size (in percentage)

Sample Size

All public and private commercial banks in India as at 31st March 2021 have been taken as a part of sample except for IDFC First Bank and CSB Bank [since one of their data (ENPA) had negative value].

Total Number of banks i.e. decision-making units (DMUs) is 31 banks. It satisfies thumb rule of DMUs to be greater than or equals to 3 times summation of the inputs and the outputs i.e. 18 [3 x (3+3)].

6. Findings & Analysis of the Study

A bank is efficient if it has perfect efficiency score of one and there are zero slacks, i.e. there is no excess of inputs and there is no shortfall of outputs in any optimum result. If the slack variables are greater than zero and efficiency score is less than perfect score of one, then it is essential to consider non-radial move as shown by variables (slack) to achieve competence. For conversion of an incompetent bank to efficient bank, SBM-projection on efficiency frontier is possible, by reducing the surplus of inputs and supplementing the shortfall in output.

Table 2 shows the efficiency Scores under SBM (Non Oriented Variable Returns to Scale). It is observed that Bandhan Bank Ltd., City Union Bank Ltd., Nainital Bank Ltd. and Tamilnad Mercantile Bank Ltd. have a perfect score of one during the six-year period of study. Hence, the above four banks are fully SBM-efficient and have maintained a consistency in their performance during the study period. All the above banks belong to private sector bank category. These four banks have managed their assets and liabilities in the most efficient manner and have been successful in reducing the interest rate, credit and liquidity risk.

No.	DMU	2016 Score	2017 Score	2018 Score	2019 Score	2020 Score	2021 Score
1	Bank of Baroda	0.9944	0.1092	0.1824	0.2876	0.2636	0.3312
2	Bank of India	0.0775	0.0627	0.1173	0.1775	0.2510	0.4870
3	Bank of Maharashtra	0.0467	0.0217	0.0961	0.2019	0.3799	0.5780
4	Canara Bank	0.1246	0.0589	0.1360	0.2651	0.2842	0.7364
5	Central Bank of India	0.0326	0.9983	0.1035	0.4020	0.9999	1
6	Indian Bank	0.1070	0.0828	0.2735	0.3479	0.3871	0.4287
7	Indian Overseas Bank	0.0266	0.0408	0.0855	0.2532	0.4186	0.6841
8	Punjab and Sind Bank	0.2825	0.0424	0.9993	0.3096	0.2610	0.2265
9	Punjab National Bank	0.0840	0.1219	0.1515	0.2559	0.3619	0.4382
10	State Bank of India	0.0786	0.0631	0.1434	0.2230	0.3596	0.4890
11	UCO Bank	0.0838	0.0330	0.0446	0.3189	0.5795	0.7180
12	Union Bank of India	0.0569	0.0442	0.1128	0.1535	0.2039	0.3192
13	Axis Bank Ltd.	0.2645	0.0788	0.1657	0.3171	0.3920	0.5287
14	Bandhan Bank Ltd.	1	1	1	1	1	1
15	City Union Bank Ltd.	1	1	1	1	1	1
16	DCB Bank Ltd.	0.2849	0.1915	0.4340	0.6318	0.7324	0.6598
17	Dhanlaxmi Bank Ltd.	0.8629	0.2218	0.3066	0.3143	0.7077	0.9984
18	Federal Bank Ltd	0.2177	0.1988	0.3766	0.5182	0.5877	0.7894
19	HDFC Bank Ltd.	0.5053	0.2857	0.6659	1	1	1
20	ICICI Bank Ltd.	0.1055	0.0604	0.1821	0.2686	0.3840	0.5498
21	IDBI Bank Ltd.	0.0446	0.0182	0.1065	0.0972	0.2139	0.4381

22	IndusInd Bank Ltd	0.4535	0.3561	0.5869	0.5444	0.6006	1
23	Jammu & Kashmir Bank Ltd.	0.0882	0.0295	0.1312	0.2042	0.2443	0.3650
24	Karnataka Bank Ltd.	0.4615	0.1681	0.4508	0.4374	0.4917	0.9997
25	Karur Vysya Bank Ltd.	1	1	1	1	0.4775	0.4535
26	Kotak Mahindra Bank Ltd.	1	0.1763	0.4692	0.5648	0.6803	0.7701
27	Nainital Bank Ltd	1	1	1	1	1	1
28	RBL Bank Ltd.	0.2986	0.2151	0.4961	0.6558	0.5510	0.9168
29	South Indian Bank Ltd.	0.3853	0.9992	0.8686	0.4901	0.5552	0.9998
30	Tamilnad Mercantile Bank Ltd.	1	1	1	1	1	1
31	Yes Bank Ltd.	0.4901	0.2058	0.4565	0.3553	0.1505	0.1933

Karur Vysya Bank Ltd. has a perfect efficiency score of one in four out of six-year study period, basically during the first four years i.e. from 2016 – 2019. HDFC Bank Ltd. has a perfect efficiency score of one in the last three years out of six-year study period, i.e. from 2019-2021 thus the performance of asset liability management has improved for this bank.

Central Bank of India has a perfect one competency score in the year 2021 and a score of 0.9983 and 0.9999 in the year 2017 and 2020 respectively. This is the only bank in the public sector bank, which has achieved perfect efficiency score in one of the years, and we can say that it is outperforming the other banks in this sector. The performance of this bank has improved, it is efficiently managing its assets and liabilities and minimizing risks.

Kotak Mahindra Bank Ltd. has a perfect score of one in the year 2016 and thereafter its asset liability management performance has declined. Hence, this bank needs to take proper measures in order to improve risk management techniques and ALM position.

IndusInd Bank Ltd. has a perfect score of one in the year 2021, it has shown a remarkable improvement in the last year of the study compared to the previous years.

IDBI Bank Ltd., Bank of Maharashtra, Indian Overseas Bank, UCO Bank, Jammu & Kashmir Bank Ltd. and Union Bank of India show low efficiency scores. These banks need to improve their ALM position and manage their risks in a better way, their performance has improved compared to the year 2016 & 2017 but is still not up to the mark.

From table 2, we can observe that perfect efficiency score of 1 is achieved maximum number of times i.e. seven times in the year 2021 and the least performing scores are maximum for the year 2017 followed by the year 2016.

Table 3 shows the average, deviation and relative standard distribution of efficiency scores computed under Slacks Based Measure (SBM) Model. Four private sector banks i.e., Bandhan Bank Ltd., City Union Bank Ltd., Nainital Bank Ltd. and Tamilnad Mercantile Bank Ltd. score one throughout the study period, have mean efficiency score of one, standard deviation and coefficient of variation as zero. These are the best performing banks in terms of asset liability management.

Table 3: Descriptive Statistics of Efficiency Scores of Decision-Making Units under Slacks Based Measure Model (Non Oriented Variable Returns to Scale)				
No.	DMU	Mean	Standard Deviation	Coefficient of Variation (%)
1	Bank of Baroda	0.3614	0.3201	88.5693
2	Bank of India	0.1955	0.1588	81.2078
3	Bank of Maharashtra	0.2207	0.2185	99.0151
4	Canara Bank	0.2675	0.2455	91.7593
5	Central Bank of India	0.5894	0.4660	79.0592
6	Indian Bank	0.2712	0.1460	53.8461
7	Indian Overseas Bank	0.2515	0.2598	103.3342
8	Punjab and Sind Bank	0.3536	0.3303	93.4173
9	Punjab National Bank	0.2356	0.1417	60.1422
10	State Bank of India	0.2261	0.1686	74.5426
11	UCO Bank	0.2963	0.2954	99.7070
12	Union Bank of India	0.1484	0.1027	69.2215
13	Axis Bank Ltd.	0.2911	0.1605	55.1391
14	Bandhan Bank Ltd.	1	0	0
15	City Union Bank Ltd.	1	0	0
16	DCB Bank Ltd.	0.4891	0.2200	44.9788
17	Dhanlaxmi Bank Ltd.	0.5686	0.3299	58.0254
18	Federal Bank Ltd	0.4481	0.2286	51.0185
19	HDFC Bank Ltd.	0.7428	0.3065	41.2643
20	ICICI Bank Ltd.	0.2584	0.1840	71.1866
21	IDBI Bank Ltd.	0.1531	0.1550	101.2671
22	IndusInd Bank Ltd	0.5902	0.2208	37.4010
23	Jammu & Kashmir Bank Ltd.	0.1771	0.1203	67.9250
24	Karnataka Bank Ltd.	0.5015	0.2712	54.0742
25	Karur Vysya Bank Ltd.	0.8218	0.2761	33.5988
26	Kotak Mahindra Bank Ltd.	0.6101	0.2802	45.9326
27	Nainital Bank Ltd	1	0	0
28	RBL Bank Ltd.	0.5222	0.2527	48.3971

29	South Indian Bank Ltd.	0.7164	0.2721	37.9893
30	Tamilnad Mercantile Bank Ltd.	1	0	0
31	Yes Bank Ltd.	0.3086	0.1455	47.1444

Karur Vysya Bank Ltd. has an average efficiency score of 0.8218, ranking second after the four most efficient banks. This bank also has the least coefficient of variation of 33.5979 per cent among the inefficient banks showing a somewhat consistent trend in its ALM performance in the first four years of the study period. HDFC Bank Ltd. has an average efficiency score of 0.7428, ranking third among all the banks. This bank also has a high standard deviation of 0.3065 as its performance has seen a jump in the last three years out of six-year study period. South Indian Bank Ltd. has an average efficiency score of 0.7164, ranking fourth among all the banks. This bank also has a low coefficient of variation showing a low variability in its ALM performance in comparison to other banks in the study. Kotak Mahindra Bank Ltd. has ranked fifth having efficiency score (average) of 0.6101. IndusInd Bank Ltd. has ranked sixth with efficiency score (average) of 0.5903 and a low coefficient of variation of 37.3986 per cent as compared to other banks showing less variability in its ALM performance.

Central Bank of India has ranked seventh with 0.5894 average score. It also has the highest standard deviation of 0.4659 among all banks in the study period. This bank has the highest average efficiency score among all public sector banks.

Karur Vysya Bank Ltd., IndusInd Bank Ltd. and South Indian Bank Ltd. have high average efficiency scores and low coefficient of variation indicating less variability in their ALM position.

Union Bank of India has lowest average efficiency of 0.1484 and lowest standard deviation of 0.1027 showing a consistency in its poor performance with very less scope of improvement in the entire study period. IDBI Bank Ltd. has second lowest average efficiency score of 0.1531. It has one of the highest coefficient of variation of 101.2787 per cent showing high variability in its asset liability management performance.

Jammu & Kashmir Bank Ltd. has the third lowest average efficiency score of 0.1203 and one of the highest standard deviations of 0.1203. Bank of India scores 0.1955 being the fourth least efficiency score (average).

Indian Overseas Bank, IDBI Bank Ltd., UCO Bank and Bank of Maharashtra have a high coefficient of variation representing high variability in its ALM position. These banks have low scores in the initial years and have improved their performance in later years.

Table 4: Descriptive Statistics (Year wise) of Efficiency Scores of Decision-Making Units under Slack Based Model (Non Oriented Variable Returns to Scale)							
No.	Statistic	2016	2017	2018	2019	2020	2021
1	Average	0.4019	0.3188	0.4240	0.4708	0.5329	0.6806
2	Standard Deviation	0.3759	0.3825	0.3457	0.2961	0.2771	0.2740
3	Coefficient of Variation	93.5334	119.9501	81.5516	62.8897	51.9926	40.2637

Table 4 shows the explanatory statistics (Year wise) of Scores of efficiency of DMUs under Slack Based Model (Non Oriented Variable Returns to Scale). From table 4, we observe that average efficiency scores of banks under study have improved over the study period i.e., 0.4019 in the year

2016 to 0.6806 in the year 2021 only exception is in the year 2017 i.e., 0.3188. The most efficient scores of banks are from the year 2021 and the most inefficient scores of banks are from the year 2017 as observed in Table 2.

Hence, we can conclude from the above table 4, that the asset liability function of commercial banks has improved over period of study and there has been more consistency in the efficiency scores in the later years as compared to the initial years. This may be due to development of more sophisticated tools and techniques for better management of assets and liabilities as well as improvement in IT supporting timely supply of information and accurate data.

Table 5 in the annexure shows the mean of slacks of all inputs and outputs over six-year period under SBM DEA model. Four private sector banks i.e. Bandhan Bank Ltd., City Union Bank Ltd., Nainital Bank Ltd. and Tamilnad Mercantile Bank Ltd. being the most efficient banks have a perfect one score throughout the time frame and have mean slack for all inputs and outputs as zero. Hence, the above banks have a proper, interest rate risk, credit risk and liquidity risk management system in banks.

Efficiency under SBM is achieved by simultaneous minimizing input and maximizing output. Slack of a particular bank is the difference between the input/output ratio of the most efficient bank and the input/output ratio of that particular bank. In the following selection, we study slacks individually for each of the risk.

Credit Risk

High slack for Credit Risk

Mean of slack of credit deposit ratio is highest for Yes Bank Ltd. i.e. 28.8838 followed by Axis Bank Ltd. and ICICI Bank Ltd. i.e. 12.6216 and 12.0843 respectively.

Mean of slack of ENPA in times is highest for ICICI Bank Ltd. i.e. 8.1447 followed by Axis Bank Ltd. and Yes Bank Ltd. i.e. 7.95 and 6.5145 respectively.

Low slack for Credit Risk

Mean of slack of credit deposit ratio is zero for Central Bank of India, Indian Overseas Bank, Punjab and Sind Bank, UCO Bank and Dhanlaxmi Bank Ltd. It is low for Jammu and Kashmir Bank Ltd and Karnataka Bank Ltd. i.e. 0.3064 and 0.4482 respectively, followed by Karur Vysya Bank Ltd., Bank of Maharashtra and South Indian Bank Ltd. i.e. 1.0811 1.2673 and 1.6252 respectively.

Mean of slack of ENPA in times is lowest for Karur Vysya Bank Ltd. i.e. 0.3969 followed by South Indian Bank Ltd. and Dhanlaxmi Bank Ltd. i.e. 0.7091 and 0.9613 respectively.

Hence, we can conclude after the four most efficient banks, Dhanlaxmi Bank Ltd., Karur Vysya Bank Ltd., South Indian Bank Ltd. have low slacks in both credit deposit ratio and ENPA ratio. These banks are able to have a higher ENPA ratio with lower credit deposit ratio. Hence, they are efficient in managing the credit risk well compared to other banks in the study period.

Central Bank of India, Karnataka Bank Ltd., Punjab and Sind Bank, UCO Bank, Indian Overseas Bank, Jammu and Kashmir Bank have zero or very low slack in the credit deposit ratio but a higher slack in ENPA Ratio, hence these banks should take measure to increase its profit and reduce the amount of non-performing assets to improve the credit risk management in the bank.

Yes Bank Ltd., Axis Bank Ltd. and ICICI Bank Ltd. are the most inefficient in credit risk management as they have high slack in both credit deposit ratio and ENPA ratio. These banks have a

higher credit deposit ratio and lower ENPA ratio. These banks should issue more loans but at the same time have a proper credit risk assessment of the clients before issuing loans. These banks also have reported a lower gross profit and a higher amount of gross non-performing assets.

Interest Rate Risk

High slack for interest rate risk

Mean of slack of investment and advances to deposits and borrowings ratio is highest for UCO Bank i.e. 11.7838 followed by Indian Bank and Bank of Maharashtra i.e. 9.1488 and 8.757 respectively.

Mean of slack of NIM ratio is highest for Yes Bank Ltd. i.e. 3.4355 followed by Axis Bank Ltd. and ICICI Bank Ltd. i.e. 2.9953 and 2.9513 respectively.

Low slack for interest rate risk

Mean of slack of investment and advances to deposits and borrowings ratio is zero for South Indian Bank Ltd. It is low for IDBI Bank Ltd. i.e. 0.6319, Axis Bank Ltd. and Karur Vysya Bank Ltd. i.e. 0.7438 and 0.9626 respectively.

Mean of slack of NIM ratio is lowest for Karur Vysya Bank Ltd. i.e. 0.1288 followed by Dhanlaxmi Bank Ltd., Central Bank of India and South Indian Bank Ltd. i.e. 0.5527, 0.6061 and 0.7104 respectively.

Hence, we can conclude after the four most efficient banks, South Indian Bank Ltd. and Karur Vysya Bank Ltd. have low slack in both input and output ratios. They have lower investment and advances to deposits and borrowings ratio and at the same time a high NIM ratio. Hence, they are efficient in managing the interest rate risk well compared to other banks in this time frame.

IDBI Bank Ltd. and Axis Bank Ltd. have low slack in input ratio but they have high slack in output ratio suggesting that these banks are making proper investment and advances out of their deposits and borrowings but are failing to generate adequate amount of NIM. These banks need to improve spread management and should invest in those areas, which yield higher interest and borrow from those areas, which charge lower interest. They should charge a superior interest rate on advances in relation to interest rates on deposits. It is the opposite case for Central Bank of India and Dhanlaxmi Bank as they have high slack in investments and advances to deposits and borrowings and low slack in NIM ratio. These banks should have proper utilization of the funds generated in the form of deposits and borrowings, by making investments and advancing loans to customers. Hence, all the above banks have a scope to improve interest rate risk management.

Liquidity Risk

High slack for liquidity risk

Mean of slack of short-term obligations to liquid assets ratio is highest for Axis Bank Ltd. i.e. 19.102 followed by ICICI Bank Ltd., Jammu and Kashmir Bank Ltd. and State Bank of India i.e. 18.2391, 15.6008 and 15.2394 respectively.

Mean of slack of liquid assets in relation to total assets ratio is highest for DCB Bank Ltd. i.e. 15.8316 followed by Punjab and Sind Bank Ltd., Dhanlaxmi Bank Ltd. and IDBI Bank Ltd. i.e. 13.8326, 13.3987 and 12.8749 respectively.

Low slack for liquidity risk

Mean of slack of short-term obligations to liquid assets ratio is zero for Punjab & Sind Bank, Karnataka Bank Ltd. and South Indian Bank Ltd. It is low for Karur Vysya Bank Ltd. i.e. 0.1731, Dhanlaxmi Bank Ltd. and DCB Bank Ltd. i.e. 0.1863 and 0.2039 respectively.

Punjab National Bank and IndusInd Bank Ltd. have mean of slack of liquid assets in comparison to total assets as zero. It is low for Kotak Mahindra Bank Ltd. i.e. 0.1146, Indian Bank, Bank of Baroda and Karur Vysya Bank Ltd. i.e. 0.1769, 0.2773 and 0.2851 respectively.

Hence, we can conclude after the four most efficient banks, Karur Vysya Bank Ltd. is efficient in managing the liquidity risk well compared to other banks in the study period.

Punjab & Sind Bank, Karnataka Bank Ltd. and South Indian Bank Ltd., Dhanlaxmi Bank Ltd. and DCB Bank Ltd. have zero/low slack in short term obligations to liquid assets ratio but a high slack in liquid asset to total assets ratio. Hence, these banks should increase the amount of liquid assets (such as cash, balance with banks in current account, Investment in Government securities and bills purchased and discounted) in relation to the total assets to improve liquidity risk management.

Punjab National Bank, IndusInd Bank Ltd., Kotak Mahindra Bank Ltd., Indian Bank and Bank of Baroda have zero/low slack in liquid asset to total assets ratio but a high slack in short term obligations to liquid assets ratio. Hence, these banks should make efforts to reduce short term obligations in comparison to the liquid assets held by them, to improve risk management of liquidity. These banks need to take initiative so as to increase the amount of fixed deposits and reduce the dependency on borrowings.

After analysis of slack, we can say that Karur Vysya Bank Ltd., South Indian Bank Ltd. and Dhanlaxmi Bank Ltd. have better risk management system and ICICI Bank Ltd., Axis Bank Ltd. and Yes Bank Ltd. do not have a proper risk management system.

Table 6 in the annexure shows the number of times an Efficient DMU appears in indication set of the other DMUs. Ramanathan, R. (2003) stated that a bank can have a perfect efficiency score of one when the bank attains extraordinarily better outcomes in terms of one output but performs below normal in terms of other outputs. The method to evaluate these competent banks is by recognizing the reference group for incompetent banks. If the bank is competent, it is possible that there are some incompetent banks in its surroundings, so that it is taken as a reference bank for these incompetent banks. However, if the bank is not a peer for any incompetent bank, then its best performance is dubious. Hence, the study of reference group gives a significant sensitivity data for evaluation of outcome of data envelopment analysis.

Reference analysis of this study shows irregular results. Out of the four best performing banks, Nainital Bank Ltd. formed a peer for 143 inefficient banks in the study period. Bandhan Bank Ltd. formed a peer for 118 inefficient banks. Tamilnad Mercantile Bank Ltd. for 36 inefficient banks and City Union Bank Ltd. for only 12 inefficient banks. In contrast, HDFC Bank Ltd. and Karur Vysya Bank Ltd. not being a part of most efficient banks, have appeared as peer for 31 and 13 inefficient banks which is higher compared to City Union Bank Ltd. It is also interesting to know that IndusInd Bank Ltd. has formed a peer for four inefficient banks; Central Bank of India and Punjab and Sind Bank have formed a peer for two inefficient banks and Kotak Mahindra Bank have formed a peer for one inefficient bank each.

Hence, we can conclude the order of efficiency of banks as Nainital Bank Ltd. being the most efficient bank followed by Bandhan Bank Ltd., Tamilnad Mercantile Bank Ltd., HDFC Bank Ltd., Karur Vysya Bank Ltd. and City Union Bank Ltd.

7. Conclusion

The best performing banks in context of management of assets and liabilities are Nainital Bank Ltd., Bandhan Bank Ltd., Tamilnad Mercantile Bank Ltd., and City Union Bank Ltd. Apart from above efficient banks, Karur Vysya Bank Ltd. also has a well-organized credit risk management system, interest risk management system and liquidity risk management system in place. Dhanlaxmi Bank Ltd. and South Indian Bank Ltd. are efficient in credit risk management system. South Indian Bank Ltd. is efficient in interest risk management system. ICICI Bank Ltd., Axis Bank Ltd. and Yes Bank Ltd. do not have a proper risk management system.

To improve management of credit risk, banks should have a well-defined Loan Policy and pre-approved Credit Risk Management Policy. To diversify risk in the portfolio, the bank must set prudential limits across industries, sectors and borrowers.

To improve liquidity risk management, banks should maintain a sufficient level of good quality liquid assets and implement liquidity risk monitoring tools, Liquidity Coverage Ratio (LCR) and disclosures standards as per BASEL III Guidelines on Liquidity Standards.

To improve interest rate risk management, banks should include Traditional Gap Analysis, Modified Duration of Equity and Earning at Risk for proper calculation and monitoring of banking book's interest rate risk. Earnings at Risk method should be used to study the short-range impact of movements in interest rate on net interest income. The long-term consequence of movements in interest rate should be measured and observed through variations in Market Value of Equity.

The strategic framework for interest rate risk and liquidity management should be incorporated in the bank's ALM Policy, which is guided by regulatory guidelines. It is the responsibility of Bank's Asset Liability Committee to ensure that both risks are within the set tolerance limits. Board approved stress testing programme for liquidity and interest rate risk is required to be conducted from time to time in banks.

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Sensex and Systemic Risk Nexus: The Interaction Effect of Covid Pandemic

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Abstract

The study attempts to examine how the shock in the form of Covid-19 got transmitted into the Indian financial system via the Indian stock market (proxied by SENSEX) and added to India's contribution to the global systemic risk (proxied by SRISK). The COVID-19 pandemic, being a non-financial event, did not directly influence India's SRISK. Instead, it exerted an indirect impact on it through Sensex. Controlling for movements in Index of Industrial Production (IIP) and crude oil prices, a positive relationship has been found between the interaction dummy (Sensex*Covid) and India's SRISK.

Keywords: Systemic Risk, Covid, Sensex, Event Dummy, Interaction Dummy

1. Introduction

The COVID-19 pandemic, while seemingly receding into the past, continues to leave a significant imprint across various sectors of the Indian economy. Its impact transcended the confines of the health sector, extending its reach to wreak havoc across numerous other industries. The magnitude of this disruption is comparable, if not greater, to that witnessed during the global financial crisis. The ripple effects of the pandemic have been profound, reshaping economic landscapes and altering the course of growth and development in myriad ways. (Akhtaruzzaman *et al.*, 2021; Elnahass *et al.*, 2021; Sahoo, 2021).

The global economy is grappling with sluggish growth rates, signaling that another recession may be imminent, further dampening growth prospects. In response to these challenges, the government of India, akin to many other governments worldwide, swiftly implemented a variety of measures to mitigate the economic and financial shocks brought about by the pandemic. These measures encompassed an array of fiscal, monetary, and macro-financial stimuli. The Reserve Bank of India (RBI) played a crucial role by easing regulatory requirements, such as permitting EMI moratoriums for customers and deferring the recognition of non-performing assets (NPAs) for banks. Despite these efforts, the persistent lockdowns, delays in loan repayments, and instances of non-payment have exposed Indian banks and the broader financial system to heightened risk. (Caporinet *et al.*, 2022; Rizwan *et al.*, 2020).

This study is driven by the need to understand the profound impacts of the COVID-19 pandemic on the Indian financial system. It seeks to investigate how the shockwaves of the pandemic were

transmitted through the Indian stock market, represented by the SENSEX in this study, and how this, in turn, contributed to India's share of global systemic risk, as measured by SRISK. By examining these dynamics, the study aims to shed light on the mechanisms through which COVID-19 exacerbated financial vulnerabilities and influenced the broader economic landscape (Acharya *et al.*, 2012).

More specifically, this study aims to achieve two primary objectives. Firstly, it seeks to investigate the impact of the SENSEX, the benchmark index of the Indian stock market, on India's systemic risk, as quantified by SRISK. Secondly, it aims to examine the interaction effects of the COVID-19 pandemic on the relationship between the SENSEX and India's SRISK (refer endnote 1). By exploring these objectives, the study endeavors to provide a comprehensive understanding of how the pandemic influenced the interconnection between stock market dynamics and systemic risk within the Indian financial system.

2. Data & Methodology

In this study, the reference period is March 2003 to June 2022 and the country of reference is India. The monthly data used in this study have been collected from secondary sources. We have taken the SRISK data from the V-lab of Stern Business School, Sensex data from Yahoo Finance, Index of Industrial Production (IIP) data from EPWRF India Time Series, and crude oil price data from the U.S. Energy Information Administration. We have winsorised the data at 5th and 95th percentiles to deal with the outliers in the data. As we are dealing with time series data, it is imperative that we conduct the unit root test before we proceed further. Unit root test reveals that none of the variables included in the model is stationary at level (see Table 3). However, they are found to be stationary at the first log difference (see Table 4). Thus, our initial model is of the following form:

$$\Delta \text{SRISK}_t = \beta_0 + \beta_1 \Delta \text{SENSEX}_t + \beta_2 \Delta \text{IIP}_t + \beta_3 \Delta \text{COP}_t + \varepsilon_t$$

where,

$$\Delta \text{SRISK}_t = \text{LN}(\text{SRISK}_t / \text{SRISK}_{t-1})$$

$$\Delta \text{SENSEX}_t = \text{LN}(\text{SENSEX}_t / \text{SENSEX}_{t-1})$$

$$\Delta \text{IIP}_t = \text{LN}(\text{IIP}_t / \text{IIP}_{t-1})$$

$$\Delta \text{COP}_t = \text{LN}(\text{COP}_t / \text{COP}_{t-1})$$

ε_t = Error term

In our initial model, the dependent variable is ΔSRISK and the independent variable of interest is ΔSENSEX . The model attempts to capture the relationship between ΔSENSEX and ΔSRISK after controlling for the movements in the Index of Industrial Production (ΔIIP), a proxy for India's real economy (refer endnote 2), and crude oil prices (ΔCOP), a proxy for India's inflation. As SRISK at the country level can be considered as a measure of a country's economic instability, it is important to control for ΔIIP (Giglio *et al.*, 2016; Kanas & Zervopoulos, 2021; Stolbov *et al.*, 2021) and ΔCOP (Chen & Zhang, 2023; Ouyang *et al.*, 2022; Qi, 2020; Sánchez García & Cruz Rambaud, 2023; Tiwari *et al.*, 2020) as these two macro variables, among others, significantly impact the stability of the Indian economy. We have used heteroskedasticity-consistent and robust standard errors. As parts of diagnostic tests, we have checked the problems of autocorrelation, multicollinearity, and instability, if any, in the model. The problem of autocorrelation is tested using Durbin Watson statistics, the problem of multicollinearity is tested using Variance Inflation Factors (VIFs), and the problem of model instability is tested using the plot for the CUSUM of Squares.

Table 1 shows descriptive statistics of the variables included in the model at their levels while Table 2 shows the correlation matrix for the variables included in our initial model. Δ SENSEX has a statistically significant negative correlation with Δ SRISK while Δ IIP has a statistically significant positive relationship with Δ SRISK.

Table 1: Descriptive Statistics

Particulars	SRISK	SENSEX	IIP	COP
Mean	46.93	23089.13	102.79	62.59
Median	55	19411.26	103.65	58.90
Maximum	84.35	52519.16	137.11	102.37
Minimum	8	5126.40	67.29	27.41
Std. Dev.	27.62	13006.36	21.78	22.91
Skewness	-0.17	0.66	-0.08	0.28
Kurtosis	1.42	2.67	1.82	1.91
Observations	232	232	232	232

Source: Authors' calculations

Table 2: Correlation Matrix

Variables	Δ SRISK	Δ SENSEX	Δ IIP	Δ COP
Δ SRISK	1			
Δ SENSEX	-0.37 (***)	1		
Δ IIP	0.15 (**)	0.04	1	
Δ COP	-0.09	-0.02	0.13 (**)	1

Source: Authors' calculations

Notes: $p < 0.01$ are $p < 0.05$ are represented by *** and ** respectively.

Table 3: Unit Root Test at Level

Method	Statistic		Probability	
ADF - Fisher Chi-square	5.65		0.69	
ADF - Choi Z-stat	1.02		0.85	
Series	Probability	Lag	Maximum Lag	Observations
SRISK	0.66	1	14	230
SENSEX	0.97	0	14	231
IIP	0.83	12	14	219
COP	0.11	1	14	230

Source: Authors' calculations

Table 4: Unit Root Test at First Log Difference

Method	Statistic		Probability	
ADF - Fisher Chi-square	341.43		0	
ADF - Choi Z-stat	-17.27		0	
Series	Probability	Lag	Maximum Lag	Observations
Δ SRISK	0	0	14	230
Δ SENSEX	0	0	14	230

ΔIIP	0	11	14	219
ΔCOP	0	0	14	230

Source: Authors' calculations

3. Analysis and Findings

3.1 Initial Model Analysis

Table 5 shows the regression output for our initial model. All the slope coefficients of the independent variables are statistically significant at a 5% level of significance and standard errors are robust as they are heteroskedasticity-consistent. The Durbin Watson statistic of 2.29 indicates the absence of any autocorrelation problem. Table 6 reports VIFs for the independent variables and all the VIFs are less than 3 indicating that there is no multicollinearity problem in our initial model. Figure 1 shows the plot for the CUSUM of Squares and indicates that the model is not stable at 5% levels of significance even though the model is statistically significant at 1% as evidenced by the F-statistics (16.05). As the model is not stable, we do not attempt to interpret its output further. To make our initial model stable, we have taken the help of an event dummy and an interaction dummy. The choice of using an event dummy variable to represent the impact of the COVID-19 pandemic is grounded in the event study methodology commonly employed in financial econometrics. Covid pandemic hit India hard in March 2020. Thus, the event dummy takes the value of 0 before March 2020 and 1 from March 2020 onwards, capturing the onset of the pandemic as an exogenous shock. Given that COVID-19 represents a significant non-economic, exogenous disruption, this binary representation allows for isolating its structural break effect on the relationship between the Indian stock market (Sensex) and systemic risk (SRISK). The interaction dummy (COVID dummy $\times$ Δ SENSEX) captures the differential effect of Sensex on SRISK during the pandemic. Lagging the dummy by 5 months accounts for delayed transmission effects often observed in macro-financial dynamics and ensures the dummy captures statistically significant impacts. The approach of factoring in event dummy aligns with prior empirical studies that model exogenous shocks (e.g., financial crises, pandemics, or policy interventions) using binary indicators (Rizwan et al., 2020; Caporin et al., 2022). Hence, the dummy variable selection and construction are consistent with accepted practice in systemic risk modelling under exogenous shocks. The revised model is of the following form:

$$\Delta SRISK_t = \beta_0 + \beta_1 \Delta SENSEX_t + \beta_2 \Delta IIP_t + \beta_3 \Delta COP_t + \beta_4 Covid_{t-5} + \beta_5 (Covid_{t-5} \times \Delta SENSEX) + \varepsilon_t$$

Where, $Covid_{t-5}$ is the event dummy and $(Covid_{t-5} \times \Delta SENSEX)$ is the interaction dummy.

Table 5: Regression Outputs of Initial Model (Dependent Variable: $\Delta SRISK$)

Variables	Coefficient	Standard Error (SE)	t-Statistic	Probability
$\Delta SENSEX$	-0.97	0.17	-5.67	0
ΔIIP	0.44	0.14	3.15	0
ΔCOP	-0.22	0.08	-2.58	0.01
C	0.02	0.01	1.79	0.07
R^2	0.18			
Adjusted R^2	0.16			
SE Regression	0.15			
F-statistic			16.05	0
Durbin-Watson statistic			2.29	
Wald F-statistic			14.69	0

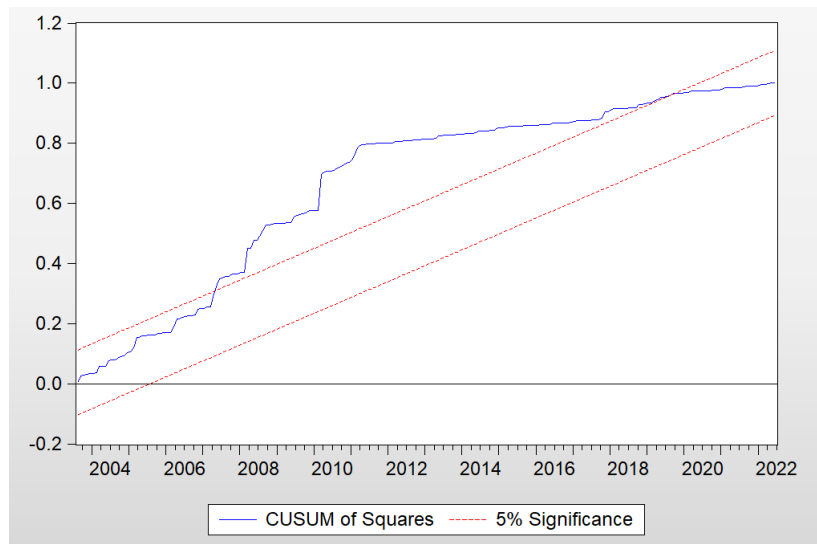
Source: Authors' own calculation

Table 6: Multicollinearity Test for Initial Model

Variables	Coefficient Variance	Uncentered VIF	Centered VIF
Δ SENSEX	0.03	1.09	1.00
Δ IIP	0.02	1.09	1.06
Δ COP	0.00	1.06	1.06

Source: Authors' calculations

Figure 1: CUSUM of Squares Plot for Initial Model



Source: Authors' own calculations

3.2. Revised Model Analysis

Table 7 shows the regression outputs for our revised model. All the slope coefficients of the independent variables except the lagged dummy are statistically significant at the 5% level. The interaction dummy is statistically significant with a positive slope coefficient indicating a strong positive impact of Covid on systemic risk (Rizwan *et al.*, 2020). The results are quite interesting. Note that even though the slope coefficient of lagged dummy is not statistically significant, the slope coefficient of the interaction dummy is statistically significant. Covid being a pandemic, which is essentially a non-financial phenomenon, did not impact the systemic risk directly. However, it indirectly impacted the systemic risk via the financial market (proxied by Sensex in this study). The slope coefficient of Δ SENSEX is negative (-1.05) and statistically significant at 1% and implies an increase in SENSEX leads to a decrease in India's SRISK. The explanation is quite intuitive. A country with a growing and stable stock market is systemically less risky for the global financial system (Sahoo, 2021). The slope coefficient of Δ IIP is positive (0.43) and statistically significant at 1%, which implies an increase in IIP leads to an increase in India's SRISK. Note that IIP is a proxy for the size of India's real economy. Thus, the bigger the economy, systemically riskier it is for the global financial system (Kanas & Zervopoulos, 2021). The slope coefficient of Δ COP is negative (-0.21) and statistically significant at 5%. The plausible explanation for the negative relationship comes from monetary policy reactions to inflation. When inflation increases, interest rates are also increased as a monetary policy measure. An increase in interest rate slows the economy down and makes it systemically less risky for the global financial system (Sánchez García & Cruz Rambaud, 2023). Overall, the revised model is statistically significant as the F-statistic (10.54) is statistically significant

at 1%. Standard errors are heteroskedasticity-consistent and hence robust. The Durbin Watson statistics of 2.27 indicates the absence of any autocorrelation problems. Table 8 reports VIFs for the independent variables and all the VIFs are less than 3 indicating that there is no multicollinearity problem in the revised model. Figure 2 shows the plot for the CUSUM of Squares and indicates that the model is stable at 5% level of significance.

Table 7: Regression Outputs of Revised Model (Dependent Variable: Δ SRISK)

Variable	Coefficient	Standard Error (SE)	t-Statistic	Probability
Δ SENSEX	-1.05	0.179	-5.86	0
Δ IIP	0.43	0.140	3.07	0.002
Δ COP	-0.21	0.087	-2.42	0.016
Covid _{t-5}	-0.001	0.020	-0.34	0.737
Covid _{t-5} $\times$ Δ SENSEX	0.995	0.395	2.52	0.012
C	0.018	0.011	1.66	0.099
R ²	0.192			
Adjusted R ²	0.174			
SE Regression	0.148			
F-statistic			10.54	0
Durbin-Watson statistic			2.27	
Wald F-statistic			9.27	0

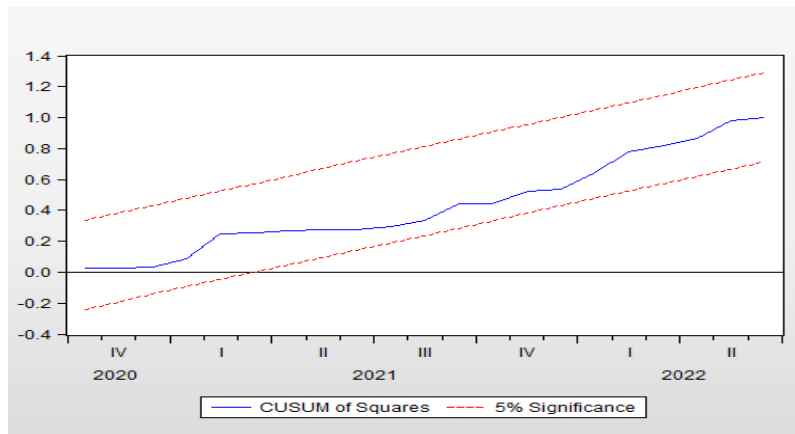
Source: Authors' own calculations

Table 8: Multicollinearity Test for Revised Model

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
Δ S	0.032	1.39	1.27
Δ IIP	0.019	1.11	1.11
Δ COP	0.008	1.22	1.20
Covid _{t-5}	0.0004	2.09	1.33
Covid _{t-5} $\times$ Δ S	0.155916	1.572921	1.467413

Source: Authors' own calculations

Figure 2: CUSUM of Squares Plot for Revised Model



Source: Authors' own calculations

4. Limitations of the Study

While this study provides valuable insights into the impact of COVID-19 on systemic risk via the Indian stock market, it is not without limitations. First, the analysis relies on monthly data, which, while suitable for macro-level examination, may miss short-term volatility and higher-frequency market reactions. Second, the use of SRISK as the sole proxy for systemic risk, although widely accepted, may not capture all dimensions of systemic vulnerability, such as liquidity risk or cross-border contagion. Third, the model includes a limited set of control variables due to data constraints, particularly the unavailability of monthly GDP data, which necessitated the use of IIP as a proxy for economic activity. Fourth, while the use of lagged dummy and interaction terms improves model stability, the choice of lag length may still be subject to model-specific sensitivities. Finally, the pandemic is a multifaceted shock with health, economic, policy, and behavioural dimensions; modelling it solely through a binary dummy may oversimplify its complex and evolving nature. Future research could extend this work by incorporating higher-frequency data, alternative systemic risk measures, sectoral decomposition, or cross-country comparisons to deepen understanding of pandemic-related financial contagion.

5. Conclusions

The COVID-19 pandemic, being a non-financial event, did not have a direct influence on India's contribution to systemic risk (SRISK). Instead, its impact was channeled indirectly through the Indian stock market, represented by the SENSEX in this study. The analysis reveals an inverse relationship between the SENSEX and India's SRISK, indicating that as the Indian stock market grows and stabilizes, the country's systemic risk contribution to the global financial system diminishes. This suggests that a robust and stable stock market can act as a buffer, reducing the overall vulnerability of the Indian financial system to global systemic risks.

The positive relationship observed between India's real economy, represented by the Index of Industrial Production (IIP) in this study, and its SRISK suggests that as the Indian economy expands, it increasingly influences the global economy. Consequently, this expansion amplifies India's systemic risk profile within the global financial system, highlighting its growing interconnectedness and impact on global economic stability.

The negative association observed between inflation, specifically represented by crude oil prices in this study, and India's SRISK suggests a nuanced relationship. As inflation rises, typically reflected in higher crude oil prices, the central bank, i.e., RBI, may respond with tighter monetary policies, such as increasing interest rates. This proactive response aims to mitigate inflationary pressures but can also lead to an economic slowdown. Consequently, a slowdown in economic activity tends to reduce India's systemic risk contribution to the global financial framework.

Endnotes

1. India's SRISK can be seen as the aggregate capital shortfall experienced by the financial institutions in India due to a significant decline in the global stock market index.
2. We have used IIP as a proxy for India's real economy due to non-availability of monthly GDP data.

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Impact of Exchange Rate on the Trade of BIMSTEC Countries

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Abstract

The study examines the impact of exchange rate fluctuations on the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) among seven member countries. It examines factors like currency valuations, trade patterns, macroeconomic conditions, and policy frameworks. The research uses quarterly data from 2011-2022 and tests like VAR Granger Causality Test, Regression Analysis, and ARDL Cointegration Model. Results show that exchange rate and trade are major economic factors for BIMSTEC countries, with cointegration exists between these factors in India, Bangladesh, Bhutan and Nepal.

Keywords: Import, Export, BIMSTEC Countries, Exchange Rate, Trade

1. Introduction

With an emphasis on seven member nations, the study looks at exchange rate changes within the “Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC). The acronym BIST-EC stood for Bangladesh, India, Sri Lanka, and Thailand Economic Cooperation. SAARC, which was founded in 1985 by Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka”, and BIMSTEC, which was founded in 1997 by five South Asian countries and two ASEAN countries, adopted these acronyms, which consists of Bangladesh, India, Bhutan, Nepal, Sri Lanka, Myanmar and Thailand.

It emphasises how these variations affect a number of factors, including debt payments, FDI, tourism, inflation, trade balances, and remittances. By lowering import prices and increasing export-to-export rates, a declining national currency might help export-heavy nations' trade balance. The dynamics of international commerce are greatly impacted by exchange rates, which also have an impact on export competitiveness, import volumes, profitability, and overall economic performance. By lowering the cost of goods for overseas consumers, a favourable exchange rate can increase demand and income and so increase exports. On the other hand, a stronger home currency may make exports more difficult by driving up prices and perhaps lowering export quantities. It is imperative that businesses and policymakers comprehend and effectively handle exchange rate risks.

2. Literature Review

Sugihartiet.al (2020) studied that the exchange rate volatility significantly impacts exports of commodities to India, Japan, South Korea, and the US, with negative effects on plastics goods and a

strong long-term effect on Asian countries. Thuy and Thuy (2019) identified that exchange rate volatility negatively impacts long-term export volume, while depreciation of domestic currency negatively impacts short-term exports but positively in long run, despite foreign country real income increase. Raphael *et.al* (2016) studied that long-term deflation effects are much more "contagious" than appreciation ones; that is, it is shown that it is longer-run weakening impact which is more transmitted among economies than other way around (such as strengthening position), and exporters in the long run get final-demand powers. As for an import-oriented country, the impact of the exorbitant use of foreign currency is more critical because of this disparity. Choudhri and Hakura (2015) observed that the exchange rate pass-through to import prices for numerous countries is incomplete and larger than the pass-through to export prices.

However, Khan and Ismail (2014) found that trade and government intervention, foreign remittances, and transactions with the IMF and USAID may significantly affect exchange rate variability in Pakistan in recent years. Adeniran *et.al* (2014) found that developing countries benefit from flexible exchange rate regimes, while interest rates and inflation negatively impact economic growth. Cheung and Sengupta (2013) found that Currency appreciation and volatility negatively impact Indian firms' export shares, with labour costs intensifying trade effects due to which smaller firms respond asymmetrically, with services being more affected.

3. Research Objectives

The objectives taken for the study:

1. To examine the relationship of exchange rate and foreign trade;
2. To analyse the effect of exchange rate on the foreign trade;
3. To analyse the influence of exchange rate shocks on foreign trade in long run;

4. Research Methodology

The data of trade (Export and Import), Exchange Rates is taken on quarterly basis from 2011-2022 of the BIMSTEC Countries from sources like Trading Economics, CEIC Data and Investing.com. Test like Granger Causality Test using VAR, Autoregressive Distributed Lag [ARDL] Cointegration Long Run Test and Regression analysis using the software EViews.

5. Analysis and Interpretation

The analysis starting from VAR Granger Causality followed by Regression and ARDL Model.

VAR Granger Causality

We investigate that if Exchange rate has a significant relationship on Foreign Trade, for which VAR Granger Causality Test had been conducted. For our research we conducted a study on BIMSTEC countries.

Figure 1: VAR Granger Causality Test of Bangladesh through EVIEWS

VAR Granger Causality/Block Exogeneity Wald Tests Date: 02/25/24 Time: 10:30 Sample: 2011Q1 2022Q4 Included observations: 46				Dependent variable: BAN_IMPORT			
				Excluded	Chi-sq	df	Prob.
				_1\$_BDT	3.724843	2	0.1553
				BAN_EXPORT	0.032583	2	0.9838
				All	4.067365	4	0.3970
Dependent variable: _1\$_BDT				Dependent variable: BAN_EXPORT			
				Excluded	Chi-sq	df	Prob.
				BAN_IMPORT	5.854188	2	0.0536
				BAN_EXPORT	0.302578	2	0.8596
				All	19.67543	4	0.0006
				Excluded	Chi-sq	df	Prob.
				_1\$_BDT	2.665563	2	0.2637
				BAN_IMPORT	4.459698	2	0.1075
				All	6.697887	4	0.1527

For **Bangladesh's** point of view, Import does granger cause Exchange Rate of 1\$ to BDT since P-value is equal to 0.05. Export doesn't granger cause Exchange Rate of 1\$ to BDT since P-value is greater than 0.05. All the independent variables when put together can granger cause Exchange Rate of 1\$ to BDT.

Exchange Rate of 1\$ to BDT, Export and all doesn't granger cause Import since P-value is greater than 0.05.

Exchange Rate of 1\$ to BDT, Import and all doesn't granger cause Export since P-value is greater than 0.05.

Figure 2: VAR Granger Causality Test of India through EVIEWS

VAR Granger Causality/Block Exogeneity Wald Tests Date: 02/25/24 Time: 10:32 Sample: 2011Q1 2022Q4 Included observations: 46				Dependent variable: IND_EXPORT			
				Excluded	Chi-sq	df	Prob.
				_1\$_INR	1.272923	2	0.5292
				IND_IMPORT	1.393422	2	0.4982
				All	3.297601	4	0.5093
Dependent variable: _1\$_INR				Dependent variable: IND_IMPORT			
				Excluded	Chi-sq	df	Prob.
				IND_EXPORT	0.252896	2	0.8812
				IND_IMPORT	0.857984	2	0.6512
				All	8.545265	4	0.0735
				Excluded	Chi-sq	df	Prob.
				_1\$_INR	0.160146	2	0.9230
				IND_EXPORT	6.710594	2	0.0349
				All	8.833886	4	0.0654

For **India's** point of view, Import, Export and all doesn't granger cause Exchange Rate of 1\$ to INR since P-value is greater than 0.05.

Exchange Rate of 1\$ to INR, Import and all doesn't granger cause Export since P-value is greater than 0.05.

Exchange Rate of 1\$ to INR doesn't granger cause Import since P-value is greater than 0.05. Export does granger cause Import since P-value is less than 0.05. All the independent variables when put together can't granger cause Import.

Figure 3: VAR Granger Causality Test of Bhutan through EVIEWS

VAR Granger Causality/Block Exogeneity Wald Tests Date: 02/25/24 Time: 10:33 Sample: 2011Q1 2022Q4 Included observations: 46				Dependent variable: BHUT_EXPORT			
	Excluded	Chi-sq	df	Prob.			
	_1\$_BTN	7.633148	2	0.0220			
	BHUT_IMPORT	5.214180	2	0.0737			
	All	25.28632	4	0.0000			
Dependent variable: _1\$_BTN				Dependent variable: BHUT_IMPORT			
	Excluded	Chi-sq	df	Prob.			
	BHUT_EXPORT	2.226208	2	0.3285			
	BHUT_IMPORT	8.030824	2	0.0180			
	All	10.22691	4	0.0368			
	Excluded	Chi-sq	df	Prob.			
	_1\$_BTN	1.721133	2	0.4229			
	BHUT_EXPORT	3.536503	2	0.1706			
	All	9.494212	4	0.0499			

For **Bhutan's** point of view, Export doesn't granger cause Exchange Rate of 1\$ to BTN since P-value is greater than 0.05. Import does granger cause Exchange Rate of 1\$ to BTN since P-value is less than 0.05. All the independent variables when put together can granger cause Exchange Rate of 1\$ to BTN.

Import doesn't granger cause Export since P-value is greater than 0.05. Exchange Rate of 1\$ to BTN does granger cause Export since P-value is below 0.05. All the independent variables when put together can granger cause Export.

Exchange Rate of 1\$ to BTN, Export and all doesn't granger cause Import since P-value is greater than 0.05. All the independent variables when put together can granger cause Import.

Figure 4: VAR Granger Causality Test of Myanmar through EVIEWS

VAR Granger Causality/Block Exogeneity Wald Tests Date: 02/25/24 Time: 10:50 Sample: 2011Q1 2022Q4 Included observations: 46				Dependent variable: MYAN_EXPORT			
	Excluded	Chi-sq	df	Prob.			
	_1\$_MMK	3.749751	2	0.1534			
	MYAN_IMPORT	3.966169	2	0.1376			
	All	8.585684	4	0.0723			
Dependent variable: _1\$_MMK				Dependent variable: MYAN_IMPORT			
	Excluded	Chi-sq	df	Prob.			
	MYAN_EXPORT	1.594207	2	0.4506			
	MYAN_IMPORT	1.568469	2	0.4565			
	All	2.477358	4	0.6487			
	Excluded	Chi-sq	df	Prob.			
	_1\$_MMK	7.217346	2	0.0271			
	MYAN_EXPORT	1.598139	2	0.4497			
	All	11.76603	4	0.0192			

For **Myanmar's** point of view, Import, Export and all doesn't granger cause Exchange Rate of 1\$ to MMK since P-value is greater than 0.05.

Exchange Rate of 1\$ to MMK, Export and all doesn't granger cause Import since P-value is greater than 0.05.

Exchange Rate of 1\$ to MMK does granger cause Import since P-value is less than 0.05. Export doesn't granger cause Import since P-value is greater than 0.05. All the independent variables when put together can granger cause Import.

Figure 5: VAR Granger Causality Test of Nepal through EViews

VAR Granger Causality/Block Exogeneity Wald Tests Date: 02/25/24 Time: 10:55 Sample: 2011Q1 2022Q4 Included observations: 46				Dependent variable: NEP_EXPORT			
				Excluded	Chi-sq	df	Prob.
				_1\$_NPR	0.040682	2	0.9799
				NEP_IMPORT	1.014939	2	0.6020
				All	2.259885	4	0.6881
Dependent variable: _1\$_NPR				Dependent variable: NEP_IMPORT			
				Excluded	Chi-sq	df	Prob.
				NEP_EXPORT	0.019198	2	0.9904
				NEP_IMPORT	3.839934	2	0.1466
				All	6.577268	4	0.1600
				Excluded	Chi-sq	df	Prob.
				_1\$_NPR	3.479003	2	0.1756
				NEP_EXPORT	1.276212	2	0.5283
				All	6.040294	4	0.1962

For **Nepal's** point of view, Import, Export and all doesn't granger cause Exchange Rate of 1\$ to NPR since P-value is greater than 0.05.

Exchange Rate of 1\$ to NPR, Import and all doesn't granger cause Export since P-value is greater than 0.05.

Exchange Rate of 1\$ to NPR, Export and all doesn't granger cause Import since P-value is greater than 0.05.

Figure 6: VAR Granger Causality Test of Sri Lanka through EViews

VAR Granger Causality/Block Exogeneity Wald Tests Date: 02/25/24 Time: 10:41 Sample: 2011Q1 2022Q4 Included observations: 46				Dependent variable: SL_EXPORT			
				Excluded	Chi-sq	df	Prob.
				_1\$_LKR	2.883941	2	0.2365
				SL_IMPORT	0.578626	2	0.7488
				All	3.974904	4	0.4094
Dependent variable: _1\$_LKR				Dependent variable: SL_IMPORT			
				Excluded	Chi-sq	df	Prob.
				SL_EXPORT	2.128671	2	0.3450
				SL_IMPORT	1.055637	2	0.5899
				All	8.745254	4	0.0678
				Excluded	Chi-sq	df	Prob.
				_1\$_LKR	1.447977	2	0.4848
				SL_EXPORT	0.842320	2	0.6563
				All	1.988992	4	0.7378

For **Sri Lanka's** point of view, Import, Export and all doesn't granger cause Exchange Rate of 1\$ to LKR since P-value is greater than 0.05.

Exchange Rate of 1\$ to LKR, Import and all doesn't granger cause Export since P-value is greater than 0.05.

Exchange Rate of 1\$ to LKR, Export and all doesn't granger cause Import since P-value is greater than 0.05.

Figure 7: VAR Granger Causality Test of Thailand through EVIEWS

VAR Granger Causality/Block Exogeneity Wald Tests Date: 02/25/24 Time: 10:58 Sample: 2011Q1 2022Q4 Included observations: 46				Dependent variable: THAI_EXPORT			
Excluded	Chi-sq	df	Prob.	Excluded	Chi-sq	df	Prob.
_1\$_THB	1.169704	2	0.5572	_1\$_THB	4.019233	2	0.1340
THAI_IMPORT	4.987259	2	0.0826	THAI_EXPORT	4.329255	2	0.1148
All	8.248082	4	0.0829	All	8.055513	4	0.0896

Dependent variable: _1\$_THB				Dependent variable: THAI_IMPORT			
Excluded	Chi-sq	df	Prob.	Excluded	Chi-sq	df	Prob.
THAI_EXPORT	0.184211	2	0.9120	_1\$_THB	4.019233	2	0.1340
THAI_IMPORT	0.892136	2	0.6401	THAI_EXPORT	4.329255	2	0.1148
All	4.406257	4	0.3538	All	8.055513	4	0.0896

For **Thailand's** point of view, Import, Export and all doesn't granger cause Exchange Rate of 1\$ to THB since P-value is greater than 0.05.

Exchange Rate of 1\$ to THB, Import and all doesn't granger cause Export since P-value is greater than 0.05.

Exchange Rate of 1\$ to THB, Export and all doesn't granger cause Import since P-value is greater than 0.05.

Regression Analysis

Now to find the effect of exchange rate on the trade, regression analysis had been conducted.

H₀: There is a no significant effect of exchange rate on import and export of a country.

Bangladesh:

Figure 8: Regression Analysis of Bangladesh through EVIEWS

Dependent Variable: _1\$_BDT				
Method: Least Squares				
Date: 02/21/24 Time: 23:31				
Sample: 2011Q1 2022Q4				
Included observations: 48				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
BAN_EXPORT	3.121283	2.248924	1.387901	0.1720
BAN_IMPORT	1.590511	1.165603	1.364540	0.1792
C	66.90084	2.238084	29.89202	0.0000
R-squared	0.585354	Mean dependent var	81.51243	
Adjusted R-squared	0.566925	S.D. dependent var	4.832799	
S.E. of regression	3.180388	Akaike info criterion	5.212345	
Sum squared resid	455.1692	Schwarz criterion	5.329295	
Log likelihood	-122.0963	Hannan-Quinn criter.	5.256541	
F-statistic	31.76314	Durbin-Watson stat	0.499367	
Prob(F-statistic)	0.000000			

The exchange rate of 1\$ to BDT, Import and Export have a moderate association, as seen by the value of $R^2 = 58.53\%$. The F statistic is 31.763 and p-value of Export and Import to the exchange rate of 1\$ to BDT is beyond 0.05, which is 0.172 and 0.179 respectively. Since the p-value is above the

acceptable significance level, the model is therefore not significant. The variation in the exchange rate of 1\$ to BDT has no appreciable effect on the Trade. The H_0 hypothesis is thus accepted.

Bhutan:

The study found a moderate correlation between the Exchange rate of 1\$ to BTN and trade, with a $R^2=48.86\%$ value. The P-values for Export and Import were less than 0.05, indicating significant adjustment due to trade. The exchange rate of 1\$ to BTN in Bhutan increased by 74.05% for every 1% increase in export and 73.93% for every 1% increase in import, rejecting the H_0 theory and indicating a significant positive impact between Exchange rate and Trade.

Figure 9: Regression Analysis of Bhutan through EVIEWS

Dependent Variable: _1\$_BTN
Method: Least Squares
Date: 02/25/24 Time: 10:07
Sample: 2011Q1 2022Q4
Included observations: 48

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BHUT_EXPORT	74.04887	24.52096	3.019819	0.0042
BHUT_IMPORT	73.92967	18.31242	4.037133	0.0002
C	40.64245	3.863670	10.51913	0.0000
R-squared	0.488589	Mean dependent var		65.07671
Adjusted R-squared	0.465860	S.D. dependent var		9.088461
S.E. of regression	6.642292	Akaike info criterion		6.685253
Sum squared resid	1985.402	Schwarz criterion		6.802203
Log likelihood	-157.4461	Hannan-Quinn criter.		6.729448
F-statistic	21.49594	Durbin-Watson stat		0.509609
Prob(F-statistic)	0.000000			

India:

Figure 10: Regression Analysis of India through EVIEWS

Dependent Variable: _1\$_INR
Method: Least Squares
Date: 02/25/24 Time: 10:05
Sample: 2011Q1 2022Q4
Included observations: 48

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IND_EXPORT	1.820613	0.672483	2.707301	0.0096
IND_IMPORT	-0.594608	0.371447	-1.600789	0.1164
C	40.27426	7.194494	5.597928	0.0000
R-squared	0.221947	Mean dependent var		65.11181
Adjusted R-squared	0.187367	S.D. dependent var		9.071524
S.E. of regression	8.177633	Akaike info criterion		7.101144
Sum squared resid	3009.316	Schwarz criterion		7.218094
Log likelihood	-167.4275	Hannan-Quinn criter.		7.145340
F-statistic	6.418329	Durbin-Watson stat		0.257817
Prob(F-statistic)	0.003529			

The value of $R^2=22.19\%$, indicating a moderate degree of correlation between the Exchange rate of 1\$ to INR and Trade. P-value of both Export is less than 0.05, which is 0.01 and the p-value of Import is beyond 0.05, which is 0.116, and the F statistic is 21.49. The p-value of Export is below the acceptable significance level while the p-value of Import is beyond the acceptable significance level, indicating that the result is significant for Export and insignificant for Import. Because the P-value of

Export is below the permissible value of 0.05, there has been a considerable adjustment in Exchange rate of 1\$ to INR due to its trade. The Exchange rate of 1\$ to INR rate of India will rise by 1.82% every 1% increase in Export. The H_0 theory is therefore rejected for Export and for Import it is accepted. As a result, the data points to a significant positive impact between Exchange Rate and Export.

Myanmar:

Figure 11: Regression Analysis of Myanmar through EVIEWS

Dependent Variable: _1\$_MMK
Method: Least Squares
Date: 02/25/24 Time: 10:09
Sample: 2011Q1 2022Q4
Included observations: 48

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MYAN_EXPORT	677.9307	225.6593	3.004222	0.0043
MYAN_IMPORT	665.2905	193.1608	3.444231	0.0012
C	-442.2431	207.2832	-2.133521	0.0384
R-squared	0.588387	Mean dependent var	1176.204	
Adjusted R-squared	0.570093	S.D. dependent var	493.3136	
S.E. of regression	323.4525	Akaike info criterion	14.45644	
Sum squared resid	4707968.	Schwarz criterion	14.57339	
Log likelihood	-343.9546	Hannan-Quinn criter.	14.50064	
F-statistic	32.16293	Durbin-Watson stat	0.667746	
Prob(F-statistic)	0.000000			

The value of $R^2=58.84\%$, indicating a moderate degree of correlation between the Exchange rate of 1\$ to MMK and Trade. The P-values for Export and Import were less than 0.05, indicating a significant adjustment due to trade. The Exchange rate of 1\$ to MMK in Myanmar increased by 677.93% for every 1% increase in export and 665.29% for every 1% increase in import, rejecting the H_0 theory. The data indicates a significant positive relationship between Exchange Rate and Trade.

Nepal:

Figure 12: Regression Analysis of Nepal through EVIEWS

Dependent Variable: _1\$_NPR
Method: Least Squares
Date: 02/25/24 Time: 10:11
Sample: 2011Q1 2022Q4
Included observations: 48

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NEP_EXPORT	-147.6400	67.95019	-2.172769	0.0351
NEP_IMPORT	46.53085	6.130998	7.589442	0.0000
C	78.12969	4.652380	16.79349	0.0000
R-squared	0.604811	Mean dependent var	103.9504	
Adjusted R-squared	0.587247	S.D. dependent var	14.56806	
S.E. of regression	9.359367	Akaike info criterion	7.371094	
Sum squared resid	3941.899	Schwarz criterion	7.488044	
Log likelihood	-173.9063	Hannan-Quinn criter.	7.415290	
F-statistic	34.43483	Durbin-Watson stat	0.509336	
Prob(F-statistic)	0.000000			

The value of $R^2=60.48\%$, indicating a moderate degree of correlation between the Exchange rate of 1\$ to NPR and Trade. The P-values for Export and Import were less than 0.05, indicating a significant adjustment in the Exchange rate of 1\$ to NPR due to trade. The data showed that the Exchange rate of 1\$ to NPR rate in Nepal decreases by 147.64% for every 1% increase in export and rises by 46.53%

for every 1% increase in import, rejecting the H_0 theory and indicating a significant positive impact between the Exchange rate and trade.

Sri Lanka:

Figure 13: Regression Analysis of Sri Lanka through EVIEWS

Dependent Variable: _1\$_LKR
Method: Least Squares
Date: 02/25/24 Time: 10:08
Sample: 2011Q1 2022Q4
Included observations: 48

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SL_EXPORT	382.3999	55.74217	6.860154	0.0000
SL_IMPORT	-173.1404	35.10752	-4.931719	0.0000
C	90.33726	60.36661	1.496477	0.1415
R-squared	0.541132	Mean dependent var	164.7326	
Adjusted R-squared	0.520738	S.D. dependent var	56.73624	
S.E. of regression	39.27780	Akaike info criterion	10.23966	
Sum squared resid	69423.56	Schwarz criterion	10.35661	
Log likelihood	-242.7518	Hannan-Quinn criter.	10.28385	
F-statistic	26.53369	Durbin-Watson stat	1.068899	
Prob(F-statistic)	0.000000			

The value of $R^2=54.11\%$, indicating a moderate degree of correlation between the Exchange rate of 1\$ to LKR and Trade. The P-values for Export and Import were less than 0.05, indicating a significant adjustment in the exchange rate due to trade. The exchange rate of 1\$ to LKR in Sri Lanka increased by 382.40% for every 1% increase in export and decreased by 173.14% for every 1% increase in import. Therefore, the H_0 theory is rejected, indicating a significant positive effect of the exchange rate and trade.

Thailand:

The value of $R^2=9.94\%$, indicating a low degree of correlation between the Exchange rate of 1\$ to THB and Trade. The P-values for export and import were less than 0.05, indicating significant adjustments due to trade. The exchange rate of 1\$ to THB in Thailand increased by 0.528% for every 1% increase in export and decreased by 0.402% for every 1% increase in import. Therefore, the H_0 theory is rejected, indicating a significant positive effect of the exchange rate and trade.

Figure 14: Regression Analysis of Thailand through EVIEWS

Dependent Variable: _1\$_THB
Method: Least Squares
Date: 02/25/24 Time: 10:12
Sample: 2011Q1 2022Q4
Included observations: 48

Variable	Coefficient	Std. Error	t-Statistic	Prob.
THAI_EXPORT	0.528297	0.249577	2.116772	0.0398
THAI_IMPORT	-0.402116	0.185788	-2.164382	0.0358
C	29.90651	2.701020	11.07230	0.0000
R-squared	0.099412	Mean dependent var	32.48431	
Adjusted R-squared	0.059385	S.D. dependent var	1.860507	
S.E. of regression	1.804418	Akaike info criterion	4.078814	
Sum squared resid	146.5165	Schwarz criterion	4.195764	
Log likelihood	-94.89154	Hannan-Quinn criter.	4.123010	
F-statistic	2.483664	Durbin-Watson stat	0.283552	
Prob(F-statistic)	0.094808			

Autoregressive Distributed Lag (ARDL) Model

To apply Autoregressive Distributed Lag (ARDL) Model, the data needs to be stationary. To test the stationarity, Unit Root Test had been conducted.

After the Unit Root was conducted, it was found that the value of Exchange Rate from 1\$ to domestic currencies, Export and Import for all the BIMSTEC countries, the data series was stationary in nature.

Now to analyse the influence of exchange rate shocks on foreign trade, Autoregressive Distributed Lag (ARDL) Model has been used.

Bangladesh:

H_0 : There is no long run relationship and cointegration does not exist.

Figure 15: F-Bounds Test of Bangladesh through EVIEWS

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	8.008149	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
Finite Sample: n=50				
Actual Sample Size	46	10%	2.788	3.513
		5%	3.368	4.178
		1%	4.695	5.758
Finite Sample: n=45				
		10%	2.788	3.54
		5%	3.368	4.203
		1%	4.8	5.725

In long run form and bounds we found that in F-Bounds test the value of F-statistic is 8.008 which greater than I(1) value at 5% level of significance, the null hypothesis gets rejected and thus, it can be concluded that there is a long run relationship and cointegration exists.

Figure 16: Levels Equation of Bangladesh through EVIEWS

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
BAN_EXPORT	-5.058883	4.926074	-1.026960	0.3106
BAN_IMPORT	8.670657	3.212190	2.699298	0.0101
C	63.01859	5.012841	12.57143	0.0000
EC = _1\$_BDT - (-5.0589*BAN_EXPORT + 8.6707*BAN_IMPORT + 63.0186)				

Error correction is represented by the symbol EC, which is the residual form long run equation.

The p-value of Import is less than 0.05 which is significant whereas the p-value of Export is more than 0.05 which is not significant, so it can be concluded that Import have long run effect on the Exchange Rate- 1\$ to BDT whereas Export does not have long run effect on the Exchange Rate- 1\$ to BDT.

Thus, the equation stands as:

$$EC = 1\$_BDT - (8.6707 * Ban_Import + 63.0186)$$

Now we estimate Error Correction Model.

CointEq (-1) signifies the degree of error correction. Because the p-value is lower than 0.05 and CointEq is negative and thus long run causality exists. The slope of any adjustment path to the long to run equilibrium state is marked as CointEq (-1) Hence, the pace of adjustment here will be very less at $0.2044\% * 100 = 20.44\%$.

Figure 17: Error Correction Model of Bangladesh through EVIEWS

ARDL Error Correction Regression
Dependent Variable: D(_1\$_BDT)
Selected Model: ARDL(1, 0, 2)
Case 2: Restricted Constant and No Trend
Date: 02/25/24 Time: 19:04
Sample: 2011Q1 2022Q4
Included observations: 46

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BAN_IMPORT)	0.396487	0.382350	1.036975	0.3060
D(BAN_IMPORT(-1))	-1.101625	0.463695	-2.375753	0.0224
CointEq(-1)*	-0.204447	0.034840	-5.868138	0.0000
R-squared	0.377352	Mean dependent var		0.530435
Adjusted R-squared	0.348391	S.D. dependent var		1.442363
S.E. of regression	1.164309	Akaike info criterion		3.205125
Sum squared resid	58.29142	Schwarz criterion		3.324385
Log likelihood	-70.71788	Hannan-Quinn criter.		3.249801
Durbin-Watson stat	1.453065			

* p-value incompatible with t-Bounds distribution.

India:

H₀: There is no long run relationship and cointegration does not exist.

Figure 18: F-Bounds Test of India through EVIEWS

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	5.797768	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
Finite Sample: n=50				
Actual Sample Size	47	10%	2.788	3.513
		5%	3.368	4.178
		1%	4.695	5.758
Finite Sample: n=45				
		10%	2.788	3.54
		5%	3.368	4.203
		1%	4.8	5.725

In long run form and bounds we found that in F-Bounds test the value of F-statistic is 5.7978 which greater than I (1) value at 5% level of significance, the null hypothesis gets rejected and thus, it can be concluded that long run relationship and cointegration exists.

Figure 19: Levels Equation of India through EViews

Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IND_EXPORT	-2.062994	4.920160	-0.419294	0.6771
IND_IMPORT	2.920945	3.625373	0.805695	0.4250
C	26.67833	38.27018	0.697105	0.4896
EC = _1\$_INR - (-2.0630*IND_EXPORT + 2.9209*IND_IMPORT + 26.6783)				

Error correction is represented by the symbol EC, which is the residual form long run equation.

The p-value of Export and Import is more than 0.05 which is not significant, so it can be concluded that Export and Import does not have long run effect on the Exchange Rate- 1\$ to INR. Thus, no equation is formed.

Now we estimate Error Correction Model.

Figure20: Error Correction Model of India through EViews

ARDL Error Correction Regression
Dependent Variable: D(_1\$_INR)
Selected Model: ARDL(1, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 02/28/24 Time: 00:26
Sample: 2011Q1 2022Q4
Included observations: 47

ECM Regression Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IND_IMPORT)	-0.106010	0.050721	-2.090069	0.0427
CointEq(-1)*	-0.037649	0.007553	-4.984735	0.0000
R-squared	0.310946	Mean dependent var		0.784762
Adjusted R-squared	0.295634	S.D. dependent var		1.746363
S.E. of regression	1.465662	Akaike info criterion		3.644112
Sum squared resid	96.66737	Schwarz criterion		3.722841
Log likelihood	-83.63663	Hannan-Quinn criter.		3.673738
Durbin-Watson stat	2.042732			

* p-value incompatible with t-Bounds distribution.

CointEq (-1) signifies the degree of error correction. Because the p-value is lower than 0.05 and CointEq is negative and thus long run causality exists. The slope of any adjustment path to the long to run equilibrium state is marked as CointEq (-1) Hence, the pace of adjustment here will be very less at $0.0376\% \times 100 = 3.76\%$.

Bhutan:

H₀: There is no long run relationship and cointegration does not exist.

Figure21: F-Bounds Test of Bhutan through EVIEWS

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	4.295903	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
Finite Sample: n=50				
Actual Sample Size	47	10%	2.788	3.513
		5%	3.368	4.178
		1%	4.695	5.758
Finite Sample: n=45				
		10%	2.788	3.54
		5%	3.368	4.203
		1%	4.8	5.725

In long run form and bounds we found that in F-Bounds test the value of F-statistic is 4.2959 which greater than I (1) value at 5% level of significance, the null hypothesis gets rejected and it can be concluded that long run relationship and cointegration exists.

Figure22: Levels Equation of Bhutan through EVIEWS

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
BHUT_EXPORT	88.40494	64.61489	1.368182	0.1785
BHUT_IMPORT	111.0600	53.61238	2.071537	0.0445
C	38.64643	10.23002	3.777749	0.0005
EC = _1\$_BTN - (88.4049*BHUT_EXPORT + 111.0600*BHUT_IMPORT + 38.6464)				

Error correction is represented by the symbol EC, which is the residual form long run equation.

The p-value of Import is less than 0.05 which is significant whereas the p-value of Export is more than 0.05 which is not significant, so it can be concluded that Import have long run effect on the Exchange Rate- 1\$ to BTN whereas Export does not have long run effect on the Exchange Rate- 1\$ to BTN.

Thus, the equation stands as:

$$EC = 1\$_BTN - (111.060 * Bhut_Import + 38.64643)$$

Now we estimate Error Correction Model.

Figure 23: Error Correction Model of Bhutan through EVIEWS

ARDL Error Correction Regression
 Dependent Variable: D(_1\$_BTN)
 Selected Model: ARDL(1, 0, 1)
 Case 2: Restricted Constant and No Trend
 Date: 02/28/24 Time: 01:00
 Sample: 2011Q1 2022Q4
 Included observations: 47

ECM Regression Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BHUT_IMPORT)	3.985248	6.033416	0.660529	0.5125
CointEq(-1)*	-0.102696	0.023934	-4.290806	0.0001
R-squared	0.151083	Mean dependent var		0.784255
Adjusted R-squared	0.132218	S.D. dependent var		1.764150
S.E. of regression	1.643391	Akaike info criterion		3.873022
Sum squared resid	121.5330	Schwarz criterion		3.951751
Log likelihood	-89.01601	Hannan-Quinn criter.		3.902648
Durbin-Watson stat	1.883477			

* p-value incompatible with t-Bounds distribution.

CointEq (-1) signifies the degree of error correction. Because the p-value is lower than 0.05 and CointEq is negative and thus long run causality exists. The slope of any adjustment path to the long to run equilibrium state is marked as CointEq (-1) Hence, the pace of adjustment here will be very less at $0.1027\% \times 100 = 10.27\%$.

Myanmar:

H₀: There is no long run relationship and cointegration does not exist.

Figure 24: F-Bounds Test of Myanmar through EVIEWS

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	2.287589	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
Finite Sample: n=50				
Actual Sample Size	47	10%	2.788	3.513
		5%	3.368	4.178
		1%	4.695	5.758
Finite Sample: n=45				
		10%	2.788	3.54
		5%	3.368	4.203
		1%	4.8	5.725

In long run form and bounds we found that in F-Bounds test the value of F-statistic is 2.2876 which less than I (0) value at 5% level of significance, the null hypothesis gets accepted and it can be concluded that no long run relationship and cointegration doesn't exists.

Now we estimate ARDL Model.

Figure 25: ARDL Model of India through EVIEWS

ARDL Long Run Form and Bounds Test
Dependent Variable: D(_1\$_MMK)
Selected Model: ARDL(1, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 02/28/24 Time: 01:19
Sample: 2011Q1 2022Q4
Included observations: 47

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	87.90874	110.5248	0.795375	0.4308
_1\$_MMK(-1)*	-0.152728	0.074587	-2.047641	0.0467
MYAN_EXPORT**	146.1182	118.9257	1.228651	0.2259
MYAN_IMPORT**	-31.89274	110.7011	-0.288098	0.7747

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as $Z = Z(-1) + D(Z)$.

For currency exchange rate- 1\$ to MMK its lagged period has a negative influence on itself. In case of both Import and Export at level it does not have any impact on exchange rate- 1\$ to MMK.

Sri Lanka:

Figure 26: F-Bounds Test of Sri Lanka through EVIEWS

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	3.541648	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
Finite Sample: n=50				
Actual Sample Size	47	10%	2.788	3.513
		5%	3.368	4.178
		1%	4.695	5.758
Finite Sample: n=45				
		10%	2.788	3.54
		5%	3.368	4.203
		1%	4.8	5.725

In long run form and bounds we found that in F-Bounds test the value of F-statistic is 3.5416 which is in between I (0) and I (1) value at 5% level of significance, which concludes the test is inconclusive.

Nepal:

Figure 27: F-Bounds Test of Nepal through EViews

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	4.805314	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
Finite Sample: n=50				
Actual Sample Size	46	10%	2.788	3.513
		5%	3.368	4.178
		1%	4.695	5.758
Finite Sample: n=45				
		10%	2.788	3.54
		5%	3.368	4.203
		1%	4.8	5.725

In long run form and bounds we found that in F-Bounds test the value of F-statistic is 4.8053 which greater than I (1) value at 5% level of significance, the null hypothesis gets rejected and it can be concluded that long run relationship and cointegration exists.

Figure 28: Levels Equation of Nepal through EViews

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
NEP_EXPORT	7.968799	192.1242	0.041477	0.9671
NEP_IMPORT	33.33601	18.50958	1.801014	0.0792
C	90.25691	14.51934	6.216325	0.0000
EC = _1\$_NPR - (7.9688*NEP_EXPORT + 33.3360*NEP_IMPORT + 90.2569)				

Error correction is represented by the symbol EC, which is the residual form long run equation.

The p-value of Export and Import is more than 0.05 which is not significant, so it can be concluded that Export and Import does not have long run effect on the Exchange Rate- 1\$ to NPR.

Thus, the equation stands as:

$$EC = 1\$_NEP - 90.2569$$

Now we estimate Error Correction Model.

Figure 29: Error Correction Model of India through EVIEWS

ARDL Error Correction Regression
Dependent Variable: D(_1\$_NPR)
Selected Model: ARDL(1, 0, 2)
Case 2: Restricted Constant and No Trend
Date: 02/28/24 Time: 09:44
Sample: 2011Q1 2022Q4
Included observations: 46

ECM Regression Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NEP_IMPORT)	-7.180031	2.812733	-2.552689	0.0146
D(NEP_IMPORT(-1))	-5.144692	2.935215	-1.752748	0.0873
CointEq(-1)*	-0.104682	0.023029	-4.545641	0.0000
R-squared	0.277548	Mean dependent var		1.291377
Adjusted R-squared	0.243946	S.D. dependent var		2.842630
S.E. of regression	2.471705	Akaike info criterion		4.710687
Sum squared resid	262.7010	Schwarz criterion		4.829946
Log likelihood	-105.3458	Hannan-Quinn criter.		4.755362
Durbin-Watson stat	1.900789			

* p-value incompatible with t-Bounds distribution.

CointEq (-1) signifies the degree of error correction. Because the p-value is lower than 0.05 and CointEq is negative and thus long run causality exists. The slope of any adjustment path to the long to run equilibrium state is marked as CointEq (-1) Hence, the pace of adjustment here will be very less at $0.1047\% \times 100 = 10.47\%$.

Thailand:

Figure 30: F-Bounds Test of Thailand through EVIEWS

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	1.652428	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
Finite Sample: n=50				
Actual Sample Size	47	10%	2.788	3.513
		5%	3.368	4.178
		1%	4.695	5.758
Finite Sample: n=45				
		10%	2.788	3.54
		5%	3.368	4.203
		1%	4.8	5.725

In long run form and bounds we found that in F-Bounds test the value of F-statistic is 1.6524 which less than I (0) value at 5% level of significance, the null hypothesis gets accepted and it can be concluded that no long run relationship and cointegration does not exists.

Now we estimate ARDL Model.

Figure 31: ARDL Model of India through EVIEWS

ARDL Long Run Form and Bounds Test
 Dependent Variable: D(_1\$_THB)
 Selected Model: ARDL(1, 0, 1)
 Case 2: Restricted Constant and No Trend
 Date: 02/28/24 Time: 09:52
 Sample: 2011Q1 2022Q4
 Included observations: 47

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.081496	2.504261	0.032543	0.9742
_1\$_THB(-1)*	-0.057920	0.071706	-0.807752	0.4238
THAI_EXPORT**	0.026343	0.119805	0.219882	0.8270
THAI_IMPORT(-1)	0.071621	0.088887	0.805748	0.4249
D(THAI_IMPORT)	-0.115421	0.132251	-0.872741	0.3878

* p-value incompatible with t-Bounds distribution.

** Variable interpreted as $Z = Z(-1) + D(Z)$.

For currency exchange rate- 1\$ to THB its lagged period has no influence on itself and even in case of both Import and its lagged variable and Export at level it does not have any impact on exchange rate- 1\$ to THB as the p-value is greater than 0.05 which means there is no significance.

6. Findings and Implications

In Bangladesh, import & export when taken together does granger cause Exchange Rate of 1\$ to BDT. In any other cases, variables do not granger cause each other. In India Export does granger cause Import. In any other cases, variables do not granger cause each other. In Bhutan, Import and both import & export when taken together does granger cause Exchange Rate of 1\$ to BTN. 1\$ to BTN and both import & Exchange Rate of 1\$ to BTN when taken together does granger cause Export. Even exchange rate of 1\$ to BTN & Export when taken together does granger cause import. In any other cases, variables do not granger cause each other. In Myanmar, Exchange Rate of 1\$ to MMK and 1\$ to MMK & Export when taken together does granger cause Import. In any other cases, variables do not granger cause each other. In case of Nepal, Sri Lanka and Thailand none of their variables granger cause each other.

The study reveals that the exchange rate of \$1 to BDT has a minor impact on import and export, with no substantial influence on trade. The exchange rate of \$1 to BTN and trade have a moderate association, with trade accounting for a considerable adjustment. A substantial positive association between the exchange rate and trade and a positive relationship between export and import is found. The exchange rate of \$1 to INR and trade have a modest link, with import and export having less impact than import. The Null hypothesis suggests a strong positive correlation. The exchange rate of \$1 to MMK and trade have a moderate association, with trade accounting for a considerable adjustment. The data in Nepal, Sri Lanka, and Thailand contradicts the H_0 theory, indicating a significant positive and negative relationship between exchange rates and trade, with exports decreasing and imports increasing, respectively. The exchange rate of \$1 to THB and trade have a weak association, with commerce accounting for a large portion of the variance.

The analysis of ARDL Model was applied to the influence of exchange rate shocks on foreign trade, based on stationary data at 1st Difference analysed through Unit Root Test.

The study found that Bangladesh has a long-run relationship and cointegration with import and export, with a significant p-value for import and a non-significant p-value for export. India's long-run relationship and cointegration exist. Bhutan also has a long-run relationship and cointegration between import and export, with import having a significant effect on the exchange rate and export not having a long-run effect. The study finds a long-run causality, with a low adjustment speed of 10.27%. The F-Bounds test for Myanmar showed no significant impact, while the ARDL Model showed a negative influence of lagged periods on currency exchange rates but no impact on import and export. Sri Lanka's F-Bounds test yielded that the test is inconclusive. The study in Nepal found that cointegration exists with a low-speed adjustment towards long-run equilibrium between export and import. Thailand's F-Bounds test showed no significant impact on the currency exchange rate. The lagged period and import/export levels also did not significantly affect the exchange rate.

7. Recommendation

Trade practices are complex and often create barriers, impacting economic growth. In BIMSTEC countries, many countries import more than they export, leading to a significant trade deficit. To control this deficit, many countries started home production of imported products, which helped maintain a healthy GDP rate and economic development. However, these trade deficits decrease a country's forex deposit, slowing its development rate. To control GDP, it is recommended to have a controlled forex reserve and gold reserve. Governments should provide new schemes and benefits to manufacturers of imported products, motivating them to produce in the home country instead of import. This will eventually affect the trade balance, leading to higher exports and appreciation of a country's currency value to US Dollars. This approach helps to maintain a healthy GDP and stimulate new businesses to produce in the home country.

8. Conclusion and Scope for Further Research

“The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)” is made up of countries that have exchange rates. Trade balance hugely depends on the value of a currency, which can fluctuate over time. An appreciating rate might not be good for competitiveness because it will raise export prices in foreign markets; however, a depreciating rate could increase export competitiveness by making the products cheaper to foreign customers. For import expenses, fluctuations in exchange rates have consequences as well; an appreciating home currency reduces import costs while a depreciating one increases them. Exchange rate oscillations impact trade balances where a down-turning local currency may raise exports and decrease imports. In order to attract foreign direct investment into BIMSTEC, stability of exchange rates is important. Joint policies have been put in place to manage exposure relating to changes in forex markets and promote stable trading relationships between different economies. Mitigating risks that come with heavy reliance on few key business partners or unstable industries with regard to currency fluctuations are done through diversification techniques. Since there are data restrictions, the study looks at the relationship between export results and exchange rates across a twelve-year period, concentrating on quarterly data. In order to comprehend the effect of exchange rates on export results, future research might investigate the use of different currencies, such as Sterling Pounds, and cross-national comparisons.

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Integrating Selected Petro Products under GST and its Impact on Revenue Generation and Retail Selling Prices – with a Special Reference Towards Major Metropolitan Cities in India

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Abstract

India underwent the largest indirect tax reform with the implementation of the Goods and Services Tax (GST) law. Although all items and services (apart from alcoholic beverages intended for human consumption) are included in the scope of the GST, the GST Council has not yet recommended adding five petroleum products to the GST law. These goods include natural gas, high-speed diesel, aviation turbine fuel, motor spirit/petrol, and crude petroleum. Due to their tax autonomy, these items currently provide significant revenue to the Central and State governments. State governments impose value added tax, and the Central Government levies central excise and cess, creating a tax-on-tax impact. By calculating revenue neutral rates for the Central and State Governments, this study examines the revenue impact of including these products under the GST umbrella (s). According to the analysis, adding petroleum items to the GST will significantly decrease both the Union Government and State Governments' revenue (s).

Keywords: Goods and Services Tax (GST); Retail Selling Prices; Petroleum Products; Motor Spirit, High Speed Diesel, Excise Duty & Value Added Tax (VAT)

1. Introduction

Inclusion of petroleum products which comprises of petrol, natural gas and aviation turbine fuel (ATF) is awaiting recommendations from the GST Council. The draft proposal of the finance ministry of the GST regime proposes to keep crude oil, petrol, diesel, ATF and natural gas permanently outside GST. However, the ministry advocates the idea of integrating petro products under GST and this requires discussions with the respective State Governments. The petroleum products have been kept so far outside the reach of GST as these products fetch a major chunk of revenue for the State Governments. (Sharma, 2022). The oil needs of India are primarily sourced from imports and thus the retail rates are linked to international prices. Petroleum products account for a major part in GDP of India and being an item that is majorly imported has a direct as well as indirect influence on every human being and on every other commodity (Sharma, 2022). There is no doubt that if petroleum products are brought under the shelter of GST it will become much cheaper. But at the same time it has some direct impacts on the revenue generation of the State Governments. Presently in the GST regime there are five different taxation rates of 0, 5, 12, 18 and 28 per cent. Thus

if petroleum products have to be brought under GST then the rate that it will fetch will have to be 28% and also it cannot be considered at par with the sin products. If cess is attached to the rate there will be some political implications. As per the recent discussions held by NITI Aayog, Centre will require to make a bigger revenue sacrifice than the States for the plan because of its current high rate of tax on petrol and diesel. As per the recent petition filed in the Kerala High Court, the petitioner proposed for unification of the tax on petrol and diesel as their prices differ in different States. The petition also points out that the frequent price increases of the petroleum products is adversely affecting and making the life of citizens miserable. The reasons for not including petroleum products under GST can be outlined as (a) high revenue implication, (b) Different VAT rates in respective State Government, (c) Concern for ESG and Green Energy.

2. Review of Literature

There can be four major reasons for which inclusion of Petrol and other petroleum products in GST can be considered as a must. These are uniformity in taxation; check in inflation; extending real benefits to the citizens and boosting GDP by 2%. (Gulati, N., & Adhana, D., 2018). Tax collection is positively and significantly dependent on sales or consumption of petroleum products which is evidenced from the estimation of petroleum tax collection based on panel data (Mukherjee, 2020). High deviation from current retail price of Diesel and petrol can be expected even if Government pushes petroleum products to highest GST tax rate bracket. (K., Akhila Ibrahim K., 2018). It is well identified that keeping petroleum products out of input tax credit mechanism either partially or fully would result into cascading. GST reforms implemented alongside price correction provide an overwhelming opportunity to reform without any possible worries about price rise. Sectors with considerable presence in export sector will witness significant incidence of tax cascading which is quite detrimental for its competitiveness in the international market. (Mukherjee, S. & Rao, R.K., 2015). Both Central and State Governments are highly dependent on energy sector as these sectors provide considerable amount of tax revenues. Since the country is slowly shifting away from fossil fuels, India's energy taxation needs to be redesigned (Gambhir, A., Sreenivas, A. & Ketkar, A. , 2021). Fuel Pricing, Crude Fact, petrol and diesel may not be subject to the GST for the next eight to ten years due to the States' loss of tax revenue. (Sushil Kumar Modi, 2020). Addressing to a post Budget interactive session with the members of the industry chamber PHDCCI, the Finance Minister of India, Mrs. Nirmala Sitharaman said that bringing the petroleum products under GST can be done if there is agreement among the State Government (Anwesha Mitra, 2023). Yet, no study that forecasts State and Centre's revenue under the GST statute had been found.

3. Objectives of the Study

1. The present paper focuses on the revenue comparisons of Motor Spirit and High Speed diesel under the current regime of taxation and the proposed GST regime with a proxy rate of 28%.
2. The paper also aims to assess the impact of integration of Motor Spirit and High Speed diesel under GST on the benefits towards the citizens in terms of retail prices on Y-o-Y basis.

4. Methodology

For the purpose of the study we propose to evaluate the RSP of the selected petroleum products viz. Motor Spirit and High Speed Diesel, whereby we will compare the revenue generation of both Central and selected State Governments on the selected petro products under two situations: Firstly, in the current regime through implementing Excise Duty and Cess by the Central Government and Value Added Tax by the respective State Governments; and Secondly, our proposed GST regime whereby,

revenue shall be collected in form of GST by the Governments. For our study, the followings are to be considered:

Sample Products: Out of 5 petroleum products which are outside the purview of GST, we shall focus on researching with only 2 out of such products, namely – Motor Spirit (MS) & High Speed Diesel (HSD).

Sample Period: We shall be researching with the data for seven years beginning from FY: 2017 – 18 (since the implementation of GST in India) to FY: 2023 – 24.

Sample Cities: The oil prices of 4 metropolitan cities in India are considered: Delhi, Mumbai, Kolkata and Chennai.

Collection of data are done through secondary source mainly from the ‘Indian Petroleum & Natural Gas Statistics’ published by the Ministry of Petroleum & Natural Gas every year in their annual report.

In this paper, we would like to check the revenue generating capacity of both Centre and States, if our sample products are brought under the purview of GST and finally we will show how the citizens will be affected or benefitted out of such change.

5. Data Analysis & Findings

Pre-GST (Current)Regime

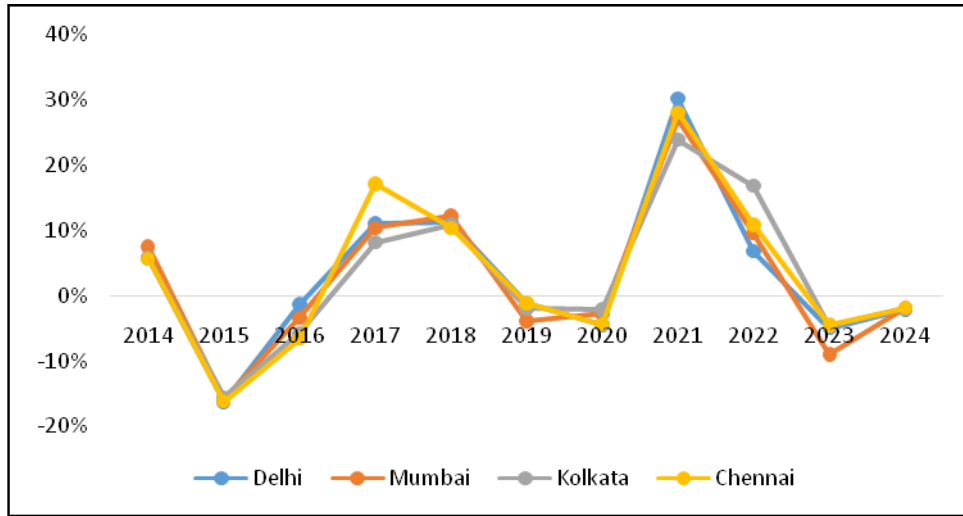
Year after year, the prices of petroleum products keep on increasing. For the last 10 years (2013 being the base) we show the change in the prices of MS and HSD compared to its previous year in from of tables and charts below. Such movement indeed reflects high volatility.

Table 1: Change in the Retail Selling Price city wise [2014-2024]

Years	High Speed Diesel (HSD)				Motor Spirit (MS)			
	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
2014	14%	16%	14%	14%	6%	8%	6%	6%
2015	-10%	-11%	-10%	-11%	-16%	-16%	-16%	-16%
2016	-3%	-3%	-7%	-7%	-1%	-3%	-6%	-7%
2017	15%	11%	14%	20%	11%	10%	8%	17%
2018	16%	12%	16%	16%	11%	12%	11%	10%
2019	2%	1%	1%	2%	-1%	-4%	-2%	-1%
2020	-6%	-4%	-3%	-6%	-4%	-3%	-2%	-4%
2021	30%	33%	23%	31%	30%	27%	24%	28%
2022	15%	15%	19%	14%	12%	20%	23%	16%
2023	-4%	-7%	-4%	-3%	-5%	-9%	-5%	-4%
2024	-2%	-2%	-2%	-2%	-2%	-2%	-2%	-2%

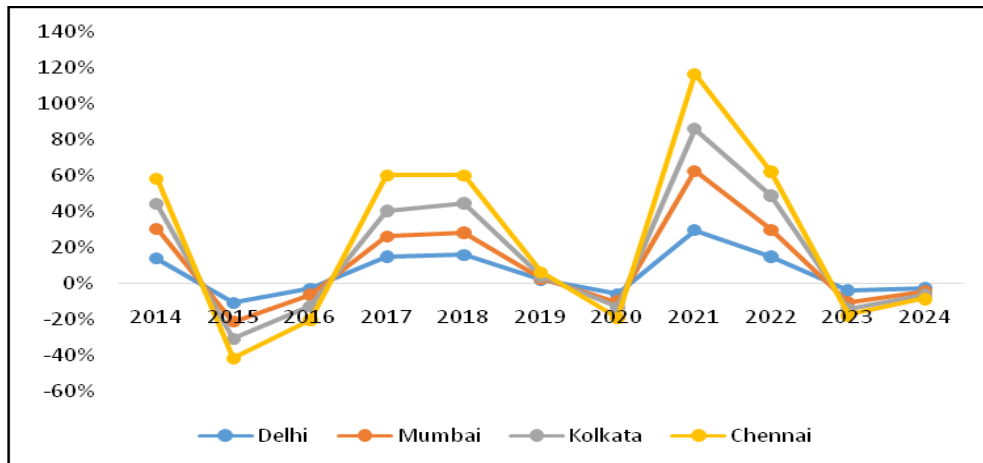
Source: Author’s Compilation (Annexure – II& IV)

Figure 1: Y-o-Y Changes in Retail Selling Prices of Motor Spirit



Source: Author's Compilation (Table – 1)

Figure 2: Y-o-Y Changes in Retail Selling Prices of High Speed Diesel



Source: Author's Compilation (Table – 1)

Thus, it is evident that there had been a lot of ups and downs instead of having the trend of stable change down the last 10 years. The data registered the lowest change in the 2015 for both the products whereas the biggest jump is seen in the year of the outbreak of COVID – 19 crises i.e., 2020 – 21.

In our next discussion, we represent the composition of Central and State level taxes in RSP

Table 2: Composition of Taxes (Proportion) on Motor Spirit [F.Y. 17-18 to F.Y. 23-24]

Cities:	Composition of Excise Duty on RSP of MS				Composition of VAT on RSP of MS			
	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
FY: 17 - 18	26%	24%	25%	25%	21%	29%	20%	24%
FY: 18 - 19	25%	23%	24%	24%	21%	27%	19%	24%
FY: 19 - 20	33%	30%	31%	32%	21%	28%	20%	24%
FY: 20 - 21	36%	34%	36%	36%	23%	28%	19%	25%
FY: 21 - 22	27%	24%	25%	26%	16%	27%	19%	21%
FY: 22 – 23	21%	19%	19%	19%	16%	24%	19%	21%

FY: 23 – 24	21%	19%	19%	20%	16%	24%	19%	21%
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Source: Author's Compilation (Annexure – I)

Table 3: Composition of Taxes (Proportion) on High Speed Diesel [F.Y. 17-18 to F.Y. 23-24]

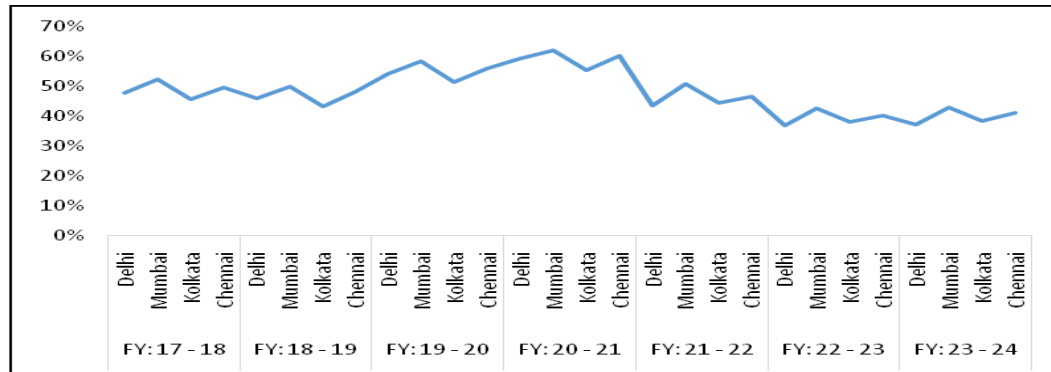
Cities:	Composition of Excise Duty on RSP of HSD				Composition of VAT on RSP of HSD			
	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
FY: 17 - 18	24%	22%	23%	23%	15%	20%	15%	19%
FY: 18 - 19	21%	20%	20%	20%	15%	19%	14%	19%
FY: 19 - 20	30%	28%	29%	29%	15%	20%	15%	19%
FY: 20 - 21	39%	36%	39%	37%	15%	22%	15%	20%
FY: 21 - 22	23%	22%	23%	22%	15%	21%	14%	19%
FY: 22 – 23	18%	17%	17%	17%	15%	19%	14%	19%
FY: 23 - 24	18%	17%	17%	17%	15%	19%	14%	19%

Source: Author's Compilation (Annexure – III)

Hence, we can see that in all cases for both the petro products, the composition of either E.D. or VAT on the RSP is in double digit (more than 10%) and in some cases the composition goes beyond 30%. Hence we can say that the consumers pay at least 10% of the price to a tax authority.

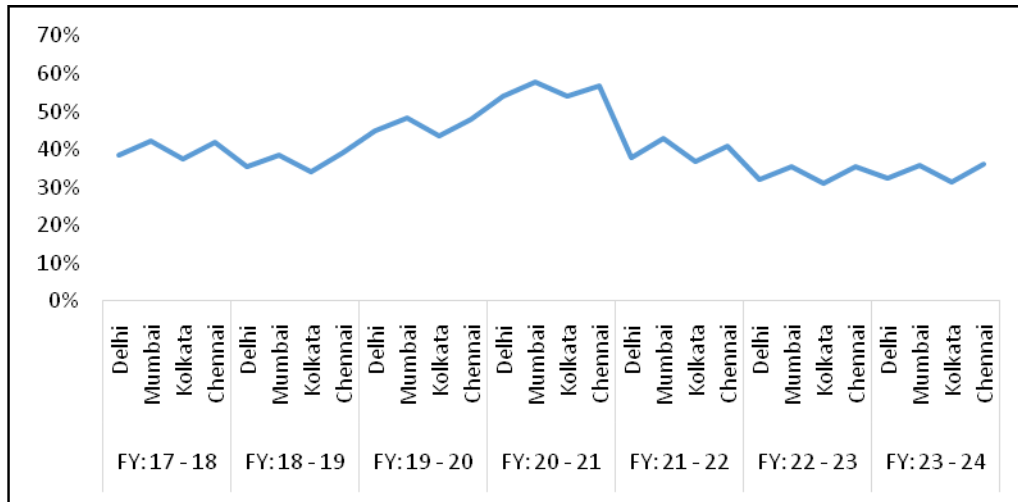
Now if we sum up the proportionate composition of taxes, we can find that the difference between the base price (price charged to dealers) and the RSP widens ultimately leading to higher cost to consumers.

Figure 3: Proportionate of Total Tax on the Retail Selling Prices of Motor Spirit



Source: Author's Compilation (Annexure – V)

Figure 4: Composition of Total Tax on the Retail Selling Prices of High Speed Diesel



Source: Author's Compilation (Annexure – V)

In all cases, the tax component in RSP (total of ED & VAT levied on per litre) extends beyond 30% and during the year of pandemic i.e., 2020-21, such composition seems to be at its peak by crossing 50% (for some cities even 60%) for all the four cities for both the sample products.

Table 4: Descriptive Statistics (from 2017 to 2024)

Cities:	Total Tax (ED + VAT) on per litre of MS				Total Tax (ED + VAT) on per litre of HSD			
	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
Average	₹ 40.93	₹ 49.18	₹ 40.97	₹ 44.16	₹ 25.91	₹ 30.33	₹ 26.05	₹ 29.35
Maximum	₹ 53.80	₹ 60.23	₹ 50.38	₹ 55.85	₹ 43.65	₹ 50.81	₹ 43.65	₹ 48.76
Minimum	₹ 33.47	₹ 39.14	₹ 32.31	₹ 36.34	₹ 23.56	₹ 26.80	₹ 23.12	₹ 27.35

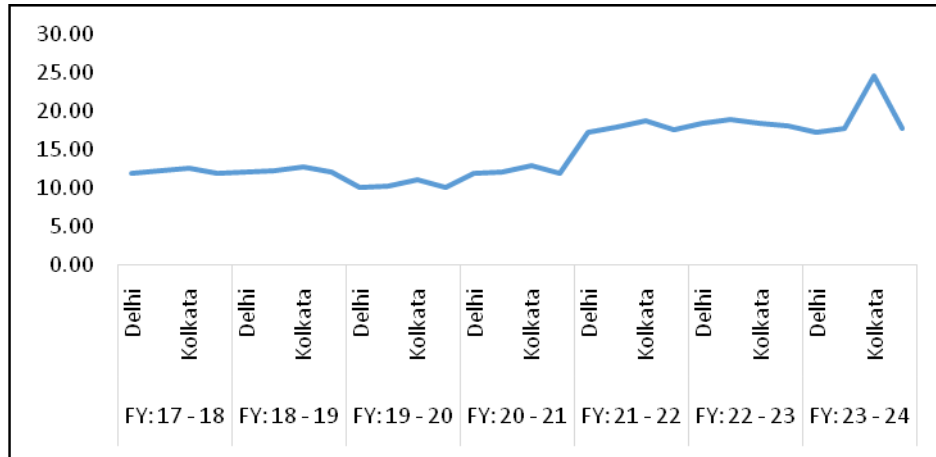
Source: Author's Compilation (Annexure – V)

Such an increased tax margin may enable the governments to pull funds, but on the other hand, it would be directly feeding to inflationary pressure on the prices of inputs and other public goods such as transportation, etc. ultimately severely affecting the citizens.

Proposed GST Regime

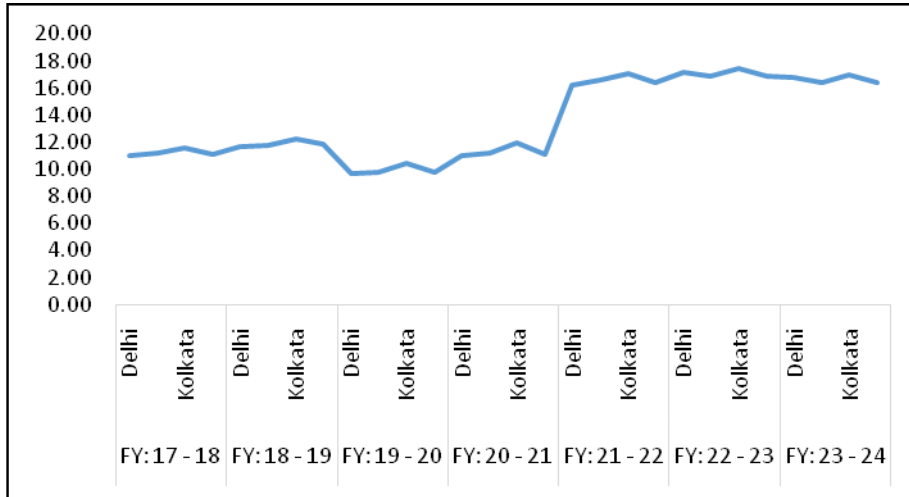
In form of solution to the above-mentioned problem, we propose to integrate our sample petroleum products i.e., MS & HSD under the purview of GST. Keeping in mind the goal of maximisation of government's revenue, we assume to keep the petroleum products in the highest tax bracket of 28% (currently in force), which shall be shared equally by the Centre and States in form of CGST @ 14% and SGST @ 14%. In addition to that, to ensure the composition of tax in RSP remains same as that of current regime (Pre-GST), the balancing figure (current composition of tax in RSP minus proposed 28% tax component) shall be considered as 'Cess', to be applied on the amount of CGST levied and hence is the revenue for the Central Government. Under the hypothetical situation, if GST on these products was made applicable since its inception i.e., 1st July 2017, we could have seen the following changes:

Figure 5: Total Revenue Collection (per Litre) in form of Tax on Motor Spirit



Source: Author's Compilation (Annexure – VI)

Figure 6: Total Revenue Collection (per Litre) in form of Tax on High Speed Diesel



Source: Author's compilation (Annexure – VII)

Hence by applying a flat rate, the revenue generation year after year is found to be stabilized since now it's dependent on the price charged to the dealers (base price) and the dealer's commission. However, a spike in the revenue is noticed for all the States in 2021 – 22 and the same sustained till the last year (2023 – 24).

We now compare the results by performing a comparative study on the revenue generated by both Centre and States per litre of MS and HSD under current regime and our proposed GST regime and thereby we represent how much in terms of rupee does the governments would lose per litre if they would have shifted to the proposed GST regime:

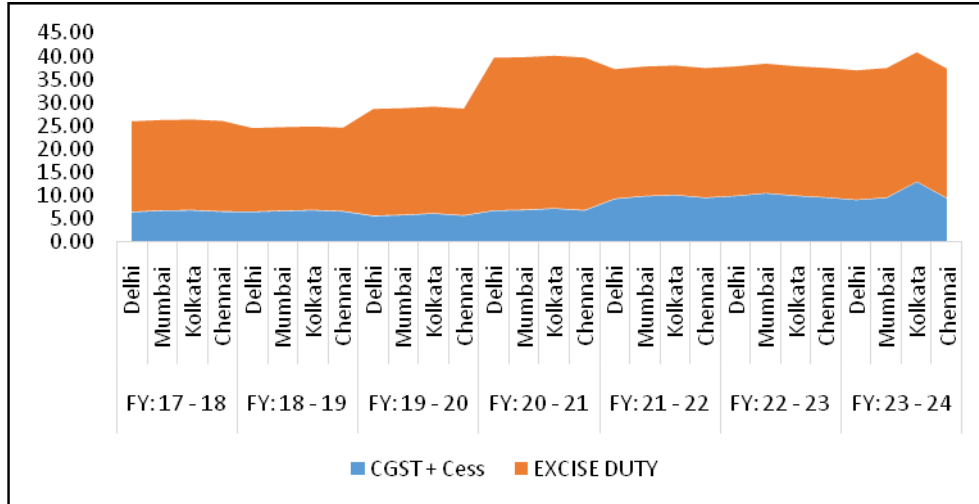
Table 5: Loss in Revenue collection per Litre of Motor Spirit

Financial Years	Excise Duty minus CGST				VAT minus SGST			
	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
17 - 18	₹ 13.02	₹ 12.72	₹ 12.64	₹ 12.93	₹ 10.27	₹ 17.86	₹ 9.62	₹ 13.19
18 - 19	₹ 11.48	₹ 11.27	₹ 11.12	₹ 11.38	₹ 9.98	₹ 15.66	₹ 8.37	₹ 12.86
19 - 20	₹ 17.35	₹ 17.18	₹ 16.84	₹ 17.28	₹ 10.34	₹ 17.07	₹ 9.83	₹ 13.07
20 - 21	₹ 26.14	₹ 26.00	₹ 25.69	₹ 26.10	₹ 15.75	₹ 22.19	₹ 11.83	₹ 17.81

21 - 22	₹ 18.61	₹ 18.02	₹ 17.81	₹ 18.37	₹ 8.51	₹ 23.33	₹ 12.90	₹ 14.11
22 - 23	₹ 18.01	₹ 17.42	₹ 17.96	₹ 18.43	₹ 7.98	₹ 22.83	₹ 13.02	₹ 13.62
23 - 24	₹ 18.85	₹ 18.37	₹ 14.96	₹ 18.49	₹ 8.22	₹ 23.04	₹ 9.81	₹ 13.83

Source: Author's Compilation (Annexure – I & VI)

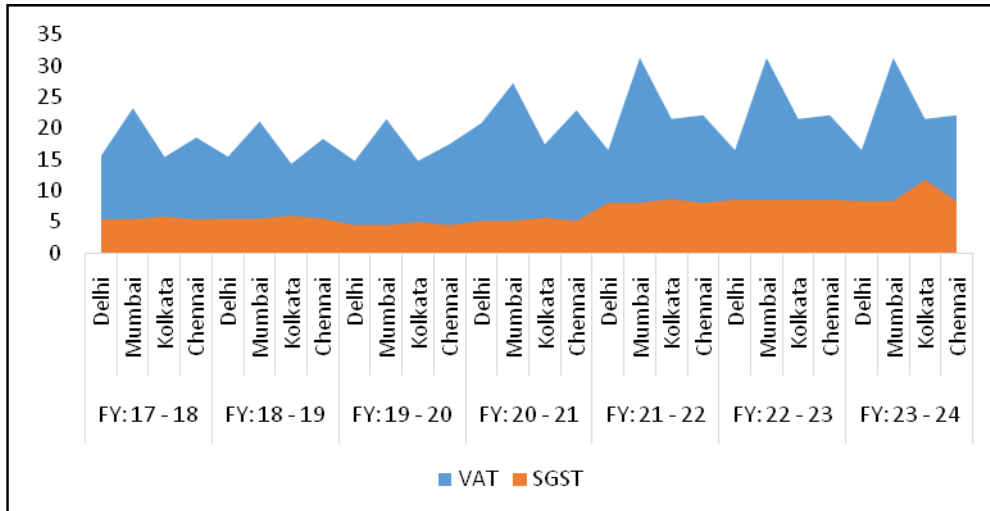
Figure 7: Old Vs. New Regime Tax imposition by the Centre on Motor Spirit



Source:

Author's Compilation (Table – 5)

Figure 8: Old Vs. New Regime Tax imposition by the States on Motor Spirit



Source: Author's Compilation (Table – 5)

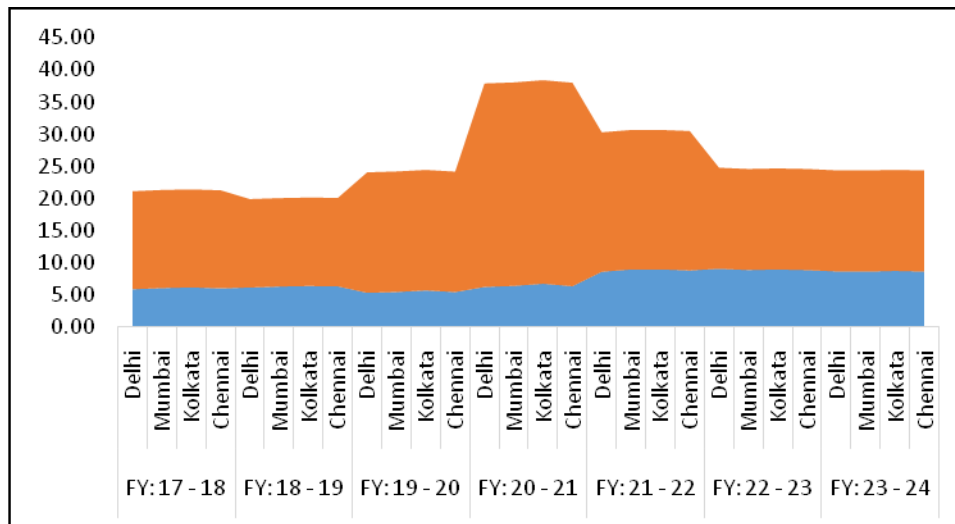
Table 6: Loss in Revenue collection per Litre of High Speed Diesel

Financial Years	Excise Duty minus CGST				VAT minus SGST			
	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
17 - 18	₹ 9.57	₹ 9.38	₹ 9.28	₹ 9.42	₹ 4.31	₹ 7.74	₹ 4.01	₹ 7.27
18 - 19	₹ 7.80	₹ 7.65	₹ 7.56	₹ 7.61	₹ 4.12	₹ 7.39	₹ 3.38	₹ 7.93
19 - 20	₹ 13.63	₹ 13.49	₹ 13.25	₹ 13.51	₹ 4.74	₹ 8.76	₹ 5.01	₹ 8.28
20 - 21	₹ 25.68	₹ 25.51	₹ 25.17	₹ 25.56	₹ 6.99	₹ 14.16	₹ 6.59	₹ 12.12
21 - 22	₹ 13.31	₹ 12.95	₹ 12.93	₹ 13.10	₹ 5.89	₹ 13.82	₹ 5.50	₹ 10.41
22 - 23	₹ 6.84	₹ 7.04	₹ 6.95	₹ 7.04	₹ 6.27	₹ 9.67	₹ 4.57	₹ 9.64

23 - 24 ₹ 7.25 ₹ 7.28 ₹ 7.18 ₹ 7.27 ₹ 4.65 ₹ 9.52 ₹ 4.53 ₹ 9.72

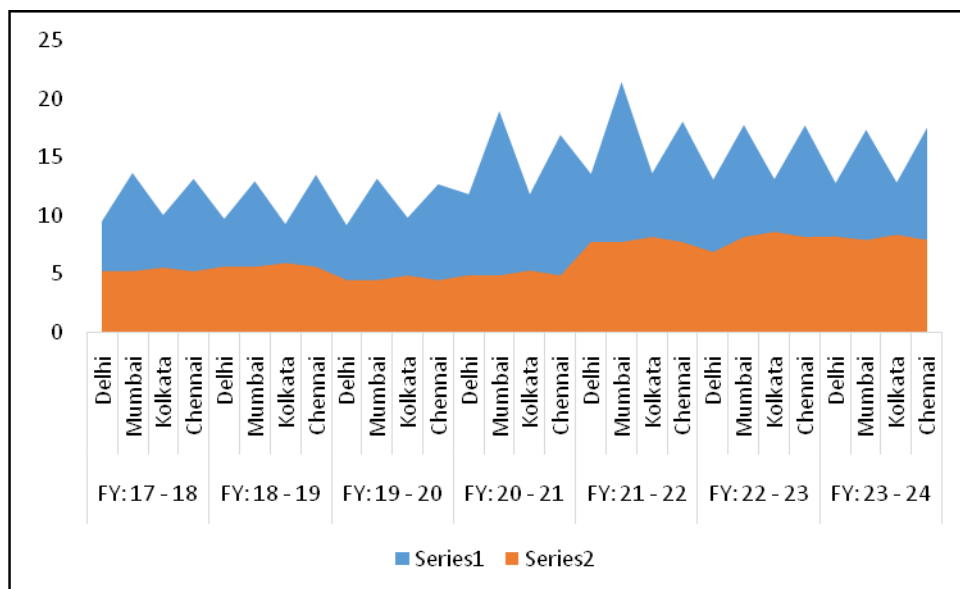
Source: Author's Compilation (Annexure – III & VII)

Figure 9: Old Vs. New Regime Tax imposition by the Centre on High Speed Diesel



Source: Author's Compilation (Table – 6)

Figure 10: Old Vs. New Regime Tax imposition by the States on High Speed Diesel

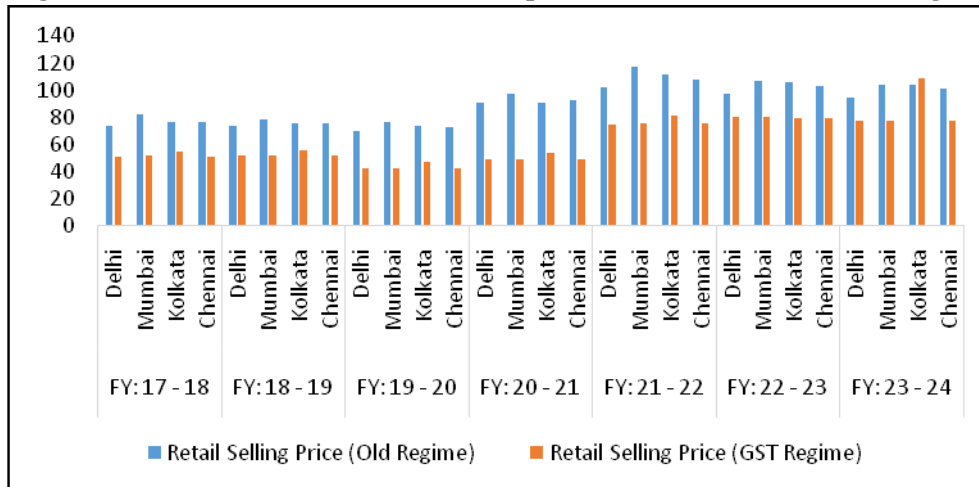


Source: Author's Compilation (Table – 7)

Therefore, we can find that if our sample products: MS & HSD are brought under the ambit of GST, the governments have to forgo substantial amount of its revenue that they are currently earning through applying ED & VAT on these products. In majority of the cases the sacrifice of the revenue for the governments (₹/litre) comes in double digit. Though the State Governments will evenly lose out revenue down the years due to the introduction of GST on these products, but, the Centre had to lose a big chunk during COVID outbreak year (2020-21).

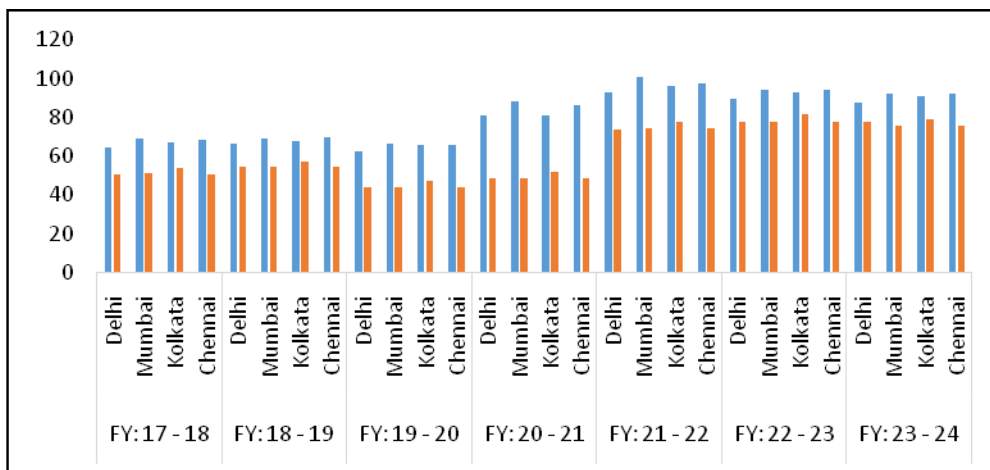
We now compare the RSP of both the products: MS& HSD under two situations – current and GST regime.

Figure 11: Cost to customers for Motor Spirit under Current Vs. GST Regime



Source: Author's Compilation (Annexure – I & VI)

Figure – 12: Cost to customers for High Speed Diesel under Current Vs. GST Regime



Source:

Author's Compilation (Annexure – III & VII)

Therefore, from the data it is evident that incorporating the two products under the umbrella of GST would obviously pull the down the prices which it is offered to the end consumers and hence, would benefit the citizens against inflation.

6. Conclusion

The governments would have to give up a significant portion of the money they are currently receiving through the application of ED & VAT to MS& HSD if these products were included in the scope of GST. The bulk of the time, governments sacrifice is double-digit amounts of income per litre. Although the State governments will gradually lose money as a result of the adoption of the GST on certain goods, the Centre was forced to lose a significant amount of money during the COVID outbreak year (2020-21). From the data, it is clear that including the two products under the GST will logically drive down the rates at which they are sold to end users and thereby protect citizens from inflation. The income generation is found to be stabilized by applying a flat rate because it is now

reliant on the price paid to the dealers (base price) and the dealer's commission. But during the past year, all States have seen their revenue increase (2021-22). The tax component in RSP (total of ED and VAT levied on per litre) exceeds 30%, and in the pandemic year of 2020–21, this composition appears to be at its highest by exceeding 50% (for certain cities, 60%) for all 4 cities for both sample items. It is clear that throughout the past ten years, there have been more ups and downs than a steady downward trend. For both goods, the data showed the least change in 2015; however, the COVID-19 crisis' emergence year, 2020–21, saw the largest increase.

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Annexure

Annexure – I: Price Break up of MS

Years	FY: 17 - 18				FY: 18 - 19			
Metro Cities	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	34.98	35.15	37.9	34.8	35.83	35.68	38.99	35.69
Add: Excise Duty	19.48	19.48	19.48	19.48	17.98	17.98	17.98	17.98
Price after E.D.	54.46	54.63	57.38	54.28	53.81	53.66	56.97	53.67
Add: Dealer's Commission	3.6	3.67	3.63	3.63	3.56	3.61	3.58	3.59
Price After D.C.	58.06	58.3	61.01	57.91	57.37	57.27	60.55	57.26

Tonoy Dey and Ayan Banerjee

Add: VAT	15.67	23.29	15.43	18.57	15.49	21.16	14.33	18.36
Retail Selling Price	73.73	81.59	76.44	76.48	72.86	78.43	74.88	75.62

Years	FY: 19 - 20				FY: 20 - 21			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	28.28	28.21	31.95	28.21	33.07	33	36.69	33.02
Add: Excise Duty	22.98	22.98	22.98	22.98	32.9	32.9	32.9	32.9
Price after E.D.	51.26	51.19	54.93	51.19	65.97	65.9	69.59	65.92
Add: Dealer's Commission	3.54	3.6	3.57	3.57	3.69	3.75	3.7	3.71
Price After D.C.	54.8	54.79	58.5	54.76	69.66	69.65	73.29	69.63
Add: VAT	14.79	21.52	14.8	17.52	20.9	27.33	17.48	22.95
Retail Selling Price	69.59	76.31	73.3	72.28	90.56	96.98	90.77	92.58

Years	FY: 21 - 22			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	53.54	53.49	57.97	53.52
Add: Excise Duty	27.9	27.9	27.9	27.9
Price after E.D.	81.44	81.39	85.87	81.42
Add: Dealer's Commission	3.83	3.96	3.92	3.88
Price After D.C.	85.27	85.35	89.79	85.3
Add: VAT	16.54	31.37	21.56	22.15
Retail Selling Price	101.81	116.72	111.35	107.45

Years	FY: 22 - 23				FY: 23 - 24			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	57.36	57.16	57.16	57.16	55.62	55.57	80.05	55.59
Add: Excise Duty	19.90	19.90	19.90	19.90	19.90	19.90	19.90	19.90
Price after E.D.	77.26	77.06	77.06	77.06	75.52	75.47	99.95	75.49
Add: Dealer's Commission	3.75	3.83	3.83	3.8	3.81	3.9	3.9	3.87
Price After D.C.	81.01	80.89	80.89	80.86	79.33	79.37	103.85	79.36
Add: VAT	15.71	25.27	20.50	21.26	15.39	24.84	20.09	21.39
Retail Selling Price	96.72	106.31	106.03	102.63	94.72	103.94	103.94	100.75

Annexure – II: Historical Prices of MS

Years	Motor Spirit (MS)			
Cities	Delhi	Mumbai	Kolkata	Chennai
2013	68.3	75.2	75.78	71.42
2014	72.26	80.89	80.13	75.49
2015	60.49	68.04	67.67	63.26
2016	59.68	65.78	63.76	59.13
2017	66.29	72.66	68.97	69.28
2018	73.73	81.59	76.44	76.48

2019	72.86	78.43	74.88	75.62
2020	69.59	76.31	73.3	72.28
2021	90.56	96.98	90.77	92.58
2022	101.81	116.72	111.35	107.45
2023	96.72	106.31	106.03	102.63
2024	94.72	104.21	103.94	100.75

Annexure – III: Price Break up of HSD

Years	FY: 17 - 18				FY: 18 - 19			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	37.21	37.22	39.36	37.08	40.04	39.87	42.21	39.93
Add: Excise Duty	15.33	15.33	15.33	15.33	13.83	13.83	13.83	13.83
Price after E.D.	52.54	52.55	54.69	52.41	53.87	53.7	56.04	53.76
Add: Dealer's Commission	2.52	2.53	2.52	2.53	2.49	2.5	2.5	2.5
Price After D.C.	55.06	55.08	57.21	54.94	56.36	56.2	58.54	56.26
Add: VAT	9.52	13.69	10.06	13.18	9.73	12.97	9.29	13.52
Retail Selling Price	64.58	68.77	67.27	68.12	66.09	69.17	67.83	69.78

Years	FY: 19 - 20				FY: 20 - 21			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	28.28	28.21	31.95	28.21	33.07	33	36.69	33.02
Add: Excise Duty	22.98	22.98	22.98	22.98	32.9	32.9	32.9	32.9
Price after E.D.	51.26	51.19	54.93	51.19	65.97	65.9	69.59	65.92
Add: Dealer's Commission	3.54	3.6	3.57	3.57	3.69	3.75	3.7	3.71
Price After D.C.	54.8	54.79	58.5	54.76	69.66	69.65	73.29	69.63
Add: VAT	14.79	21.52	14.8	17.52	20.9	27.33	17.48	22.95
Retail Selling Price	69.59	76.31	73.3	72.28	90.56	96.98	90.77	92.58

Years	FY: 21 - 22			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	55.09	55.01	58.18	55.01
Add: Excise Duty	21.8	21.8	21.8	21.8
Price after E.D.	76.89	76.81	79.98	76.81
Add: Dealer's Commission	2.58	2.61	2.59	2.6
Price After D.C.	79.47	79.42	82.57	79.41
Add: VAT	13.6	21.52	13.65	18.11
Retail Selling Price	93.07	100.94	96.22	97.52

(Contd...)

Years	FY: 22 – 23				FY: 23 - 24			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	58.17	58.11	61.26	58.11	58.38	56.32	59.47	56.31
Add: Excise Duty	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80
Price after E.D.	73.97	73.91	77.06	73.91	74.18	72.12	75.27	72.11
Add: Dealer's Commission	2.54	2.55	2.55	2.55	2.62	2.63	2.63	2.63
Price After D.C.	76.51	76.46	79.61	76.46	76.80	74.75	77.90	74.74
Add: VAT	13.11	17.81	13.15	17.78	12.82	17.40	12.86	17.60
Retail Selling Price	89.62	94.27	92.76	94.24	97.82	91.15	90.76	92.34

Annexure – IV: Historical Prices of HSD

Years	High Speed Diesel			
Cities	Delhi	Mumbai	Kolkata	Chennai
2013	48.63	54.87	52.85	51.77
2014	55.49	63.86	60.11	59.18
2015	49.71	57.02	54.28	52.91
2016	48.33	55.06	50.75	49.09
2017	55.61	61.27	57.86	58.82
2018	64.58	68.77	67.27	68.12
2019	66.09	69.17	67.83	69.78
2020	62.29	66.21	65.62	65.71
2021	80.87	87.96	80.87	85.88
2022	93.07	100.94	96.22	97.52
2023	89.62	94.27	92.76	94.24
2024	97.82	91.15	90.76	92.34

Annexure – V: Total Revenue (Taxes to Centre and States) included in Per Litre

MS					HSD				
Years	Delhi	Mumbai	Kolkata	Chennai	Years	Delhi	Mumbai	Kolkata	Chennai
17 - 18	₹ 35.15	₹ 42.77	₹ 34.91	₹ 38.05	17 - 18	24.85	29.02	25.39	28.51
18 - 19	₹ 33.47	₹ 39.14	₹ 32.31	₹ 36.34	18 - 19	23.56	26.8	23.12	27.35
19 - 20	₹ 37.77	₹ 44.50	₹ 37.78	₹ 40.50	19 - 20	28.02	32.03	28.66	31.54
20 - 21	₹ 53.80	₹ 60.23	₹ 50.38	₹ 55.85	20 - 21	43.65	50.81	43.65	48.76
21 - 22	₹ 44.44	₹ 59.27	₹ 49.46	₹ 50.05	22 - 23	35.4	43.32	35.45	39.91
22 - 23	₹ 35.61	₹ 45.17	₹ 40.4	₹ 41.16	22 - 23	₹ 29	₹ 33.61	₹ 28.95	₹ 33.58
23 - 24	₹ 35.29	₹ 44.74	₹ 39.99	₹ 41.29	23 - 24	₹ 28	₹ 33.20	₹ 28.66	₹ 33.40

Annexure – VI: RSP of MS under Proposed GST Regime

Years	FY: 17 - 18	FY: 18 - 19
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Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	34.98	35.15	37.9	34.8	35.83	35.68	38.99	35.69
Add: Dealer's Commission	3.6	3.67	3.63	3.63	3.56	3.61	3.58	3.59
Price before Tax	38.58	38.82	41.53	38.43	39.39	39.29	42.57	39.28
Add: CGST @ 14%	5.40	5.43	5.81	5.38	5.51	5.50	5.96	5.50
Add: Cess	1.06	1.33	1.03	1.17	0.99	1.20	0.90	1.10
Total Tax by Centre	6.46	6.76	6.84	6.55	6.50	6.71	6.86	6.60
Add: SGST @ 14%	5.40	5.43	5.81	5.38	5.51	5.50	5.96	5.50
GST @ 28% + Cess	11.87	12.20	12.66	11.93	12.02	12.21	12.82	12.10
Retail Selling Price	50.45	51.02	54.19	50.36	51.41	51.50	55.39	51.38

Years	FY: 19 - 20				FY: 20 - 21			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	28.28	28.21	31.95	28.21	33.07	33	36.69	33.02
Add: Dealer's Commission	3.54	3.6	3.57	3.57	3.69	3.75	3.7	3.71
Price before Tax	31.82	31.81	35.52	31.78	36.76	36.75	40.39	36.73
Add: CGST @ 14%	4.45	4.45	4.97	4.45	5.15	5.15	5.65	5.14
Add: Cess	1.17	1.35	1.17	1.25	1.62	1.75	1.56	1.66
Total Tax by Centre	5.63	5.80	6.14	5.70	6.76	6.90	7.21	6.80
Add: SGST @ 14%	4.45	4.45	4.97	4.45	5.15	5.15	5.65	5.14
GST @ 28% + Cess	10.08	10.26	11.12	10.15	11.91	12.04	12.86	11.95
Retail Selling Price	41.90	42.07	46.64	41.93	48.67	48.79	53.25	48.68

(Contd...)

Years	FY: 21 - 22			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	53.54	53.49	57.97	53.52
Add: Dealer's Commission	3.83	3.96	3.92	3.88
Price before Tax & after DC.	57.37	57.45	61.89	57.4
Add: CGST @ 14%	8.03	8.04	8.66	8.04
Add: Cess	1.26	1.83	1.42	1.49
Total Tax by Centre	9.29	9.88	10.09	9.53
Add: SGST @ 14%	8.03	8.04	8.66	8.04
GST @ 28% + Cess	17.32	17.92	18.75	17.57
Retail Selling Price	74.69	75.37	80.64	74.97

FY: 22 - 23	FY: 23 - 24
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Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
57.36	57.16	57.16	57.16	55.62	55.57	80.05	55.59
3.75	3.83	3.83	3.8	3.81	3.9	3.9	3.87
61.11	60.99	60.99	60.96	59.43	59.47	83.95	59.46
8.56	8.54	8.54	8.53	8.32	8.33	11.75	8.32
1.34	1.95	1.40	1.03	0.73	1.21	1.19	1.08
9.89	10.48	9.94	9.57	9.05	9.53	12.94	9.41
8.56	8.54	8.54	8.53	8.32	8.33	11.75	8.32
18.45	19.02	18.48	18.10	17.37	17.86	24.69	17.73
79.56	80.01	79.47	79.06	76.80	77.33	108.64	77.19

Annexure – VII: RSP on HSD under Proposed GST Regime

Years	FY: 17 - 18				FY: 18 - 19			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	37.21	37.22	39.36	37.08	40.04	39.87	42.21	39.93
Add: Dealer's Commission	2.52	2.53	2.52	2.53	2.49	2.5	2.5	2.5
Price before Tax	39.73	39.75	41.88	39.61	42.53	42.37	44.71	42.43
Add: CGST @ 14%	5.21	5.21	5.51	5.19	5.61	5.58	5.91	5.59
Add: Cess	0.55	0.74	0.54	0.72	0.43	0.60	0.36	0.63
Total Tax by Centre	5.76	5.95	6.05	5.91	6.03	6.18	6.27	6.22
Add: SGST @ 14%	5.21	5.21	5.51	5.19	5.61	5.58	5.91	5.59
GST @ 28% + Cess	10.96	11.16	11.56	11.10	11.64	11.76	12.18	11.81
Retail Selling Price	50.69	50.91	53.44	50.71	54.17	54.13	56.89	54.24

(Contd...)

Years	FY: 19 - 20				FY: 20 - 21			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	31.78	31.68	34.46	31.67	34.71	34.62	37.58	34.59
Add: Dealer's Commission	2.49	2.5	2.5	2.5	2.51	2.53	2.52	2.53
Price before Tax	34.27	34.18	36.96	34.17	37.22	37.15	40.1	37.12
Add: CGST @ 14%	4.45	4.44	4.82	4.43	4.86	4.85	5.26	4.84
Add: Cess	0.76	0.90	0.76	0.89	1.26	1.44	1.37	1.39
Total Tax by Centre	5.20	5.34	5.58	5.32	6.12	6.29	6.63	6.24
Add: SGST @ 14%	4.45	4.44	4.82	4.43	4.86	4.85	5.26	4.84
GST @ 28% + Cess	9.65	9.77	10.41	9.75	10.98	11.14	11.89	11.08
Retail Selling Price	43.92	43.95	47.37	43.92	48.20	48.29	51.99	48.20

(Contd...)

Years	FY: 21 - 22			
Items/Metro Cities	Delhi	Mumbai	Kolkata	Chennai
Price to Dealers	55.09	55.01	58.18	55.01
Add: Dealer's Commission	2.58	2.61	2.59	2.6
Price before Tax & after DC.	57.67	57.62	60.77	57.61
Add: CGST @ 14%	7.71	7.70	8.15	7.70
Add: Cess	0.77	1.15	0.72	1.00
Total Tax by Centre	8.49	8.85	8.87	8.70
Add: SGST @ 14%	7.71	7.70	8.15	7.70
GST @ 28% + Cess	16.20	16.55	17.01	16.40
Retail Selling Price	73.87	74.17	77.78	74.01

FY: 22 - 23				FY: 23 - 24			
Delhi	Mumbai	Kolkata	Chennai	Delhi	Mumbai	Kolkata	Chennai
58.17	58.11	61.26	58.11	58.38	56.32	59.47	56.31
2.54	2.55	2.55	2.55	2.62	2.63	2.63	2.63
60.71	60.66	63.81	60.66	61	58.95	62.1	58.94
8.14	8.14	8.58	8.14	8.17	7.88	8.33	7.88
0.82	0.62	0.28	0.62	0.38	0.63	0.30	0.64
8.96	8.76	8.85	8.76	8.55	8.52	8.62	8.53
8.14	8.14	8.58	8.14	8.17	7.88	8.33	7.88
17.10	16.89	17.43	16.89	16.72	16.40	16.95	16.41
77.81	77.55	81.24	77.55	77.72	75.35	79.05	75.35

Employee Engagement and Psychological Empowerment: How Workplace Resources Contribute to Affective Commitment?

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Abstract

In this study, within the scope of the accumulated literature, the mediating effect of Employee engagement (EE) between nurses' Psychological Empowerment (PE) Levels on their Affective Commitment (AC) was examined. Health care relies on nurses. Nurse involvement improves job performance and organizational commitment. Employee Engagement, Psychological Empowerment, and Affective Commitment are closely linked to the Conservation of Resources (COR) model. Employee Engagement components like Vigor, Dedication, and Absorption align with resource gain in COR, as they signify the acquisition of energy, purpose, and time. Psychological Empowerment elements, such as Autonomy, Competence, and Impact, also relate to resource gain as they provide employees with confidence. Affective Commitment, being an emotional connection, serves as a resource gain itself by offering security and well-being. Together, these links show how these constructs reflect outcomes of resource gain in the COR model, contributing to employees' overall well-being and fostering a positive work environment. Cross-sectional, descriptive, correlational design with multistage cluster sampling was used. 347 RNs working in private hospitals were polled. Individuals completed self-administered questions. Data were analyzed using SPSS 23 and Smart PLS 4 programs. Research results show that nurses' Psychological Empowerment (PE) levels have a significant impact on Employee Engagement. Additionally, EE plays a mediating role in the relationship between PE and Affective Commitment. Complementary partial mediating role of Employee Engagement in the relation between PE and AC was supported.

Keywords: Employee engagement, JD-R model, organizational commitment, psychological empowerment, smart pls.

1. Introduction

Nurses have a key role in providing high-quality health care and ensuring programme efficacy (Rosa et al., 2021). Nurse performance predicts the quality of services provided to patients by a health care institution (Gavurova et al., 2021). As a result, strong levels of employee engagement among nursing workers are critical.

Employee engagement has been characterized as "a constructive work-related stimulus marked by vigor, dedication, and absorption" (Schaufeli et al., 2006). Vigor is described as mental fortitude and motivation while working. Dedication implies entire commitment to one's activity and a sense of importance. Absorption is described as being entirely focused on one's work (Schaufeli, 2012).

Personal resources such as self-efficacy are positively associated to employee engagement & affective organizational commitment based on Job Demands-Resources Model in a sample of Spanish nurses (Orgambidez et al., 2019). Creative self-efficacy is connected with psychological empowerment (Huang, 2017; Teng et al., 2020; Yao et al., 2013).

Thus, in the workplace, psychological empowerment is essential for fulfilling varied job expectations, making independent decisions, and overcoming employment obstacles (Panda & Sahoo, 2021). Psychological empowerment is an essential personal resource that predicts employee engagement (Baek-Kyoo et al., 2019). Employees with a high level of psychological empowerment believe that with effort, they can handle demanding job expectations such as those in the JD-R model (Tripathi et al., 2021).

According to Dehghani-Tafti et al. (2022), psychological empowerment is essential in the nursing profession for coping with the stresses of the work, enhancing nurses' psychological well-being, and delivering the highest possible level of care to patients. In addition, psychological empowerment is linked to higher levels of engagement, and commitment to the organization (Alotaibi et al., 2020; Gong et al., 2020; Loes & Tobin, 2020).

Organizational commitment is a worker's participation with an organization (Wu & Norman, 2006). N. Allen & J. Meyers' (1990) three-dimensional model of organizational commitment is perhaps the most extensively used. Organizational commitment has three components: affective, continuous, and normative. Continuous commitment is the perception that departing costs more than staying in the firm. It's 'forced'. Normative commitment is shown by employees who remain in an ethical company. The affective component shows a person's affinity to and interest in their organization. Nurses with affective component of organizational commitment remain at the same hospital rather than being forced to (Karem et al., 2019).

When nurses have difficulties in regulating job stresses, the role of organizational commitment becomes clear, which has a direct impact on nurses' performance. The importance of this study rests in the findings, which will aid in evaluating if psychological empowerment and organizational commitment promote nurses' employee engagement.

2. Objectives of the Study

The study sought to investigate the link between registered nurses' job engagement, psychological empowerment, and organizational commitment in Indian hospitals.

3. Literature Review

Psychological Empowerment (PE) And Affective Commitment (AC)

Psychological empowerment refers to employees' perception of control, autonomy, and meaningfulness in their work (Spreitzer, 1995). It is based on four dimensions: meaningfulness, competence, self-determination, and impact. When employees feel psychologically empowered, they have a sense of

ownership over their work and are more likely to be proactive, innovative, and committed to their organization.

Self determination or Autonomy, a component of psychological empowerment, aligns with job resources in the JD-R model. Job resources, such as autonomy and control over one's tasks, can empower employees by providing them with a sense of self-determination and the ability to influence their work. When employees have the autonomy to make decisions and take ownership of their tasks, it can lead to feelings of empowerment and increased job satisfaction. The positive impact of PE on the psychological state of employees associated with affective commitment and JD-R model is documented in the study by Ochoa Pacheco et al. (2023).

Psychological empowerment has been proven in studies to be important for organizational commitment. Mahmood & Sahar's (2017) study revealed that affective commitment mediated the relationship between psychological empowerment and nurses' work engagement. Another study by Heron & Bruk-Lee (2020) on nurses revealed psychological empowerment was positively related to affective organizational commitment. Structural empowerment was strongly correlated with organizational commitment according to study on nurses by Fragkos et al. (2020). Al Otaibi et al. (2022) findings also support significant relation between PE & AC.

Within the context of accumulated literature, the following hypothesis has been developed:

H1: PE positively affects Affective Commitment.

Mediating Role of EE in The Effect Between PE and AC

Psychological Empowerment (PE) can lead to various positive effects for the employee. Opportunities that increase the employee's control over business processes can eventually lead to increased control of the individual's work. In other words, being accessible throughout the work process and meeting job expectations can increase involvement from the employee. This situation brings up the Employee Engagement (EE) phenomenon.

As explained by Schaufeli (2012), EE refers to the constructive work-related stimulus marked by vigor, dedication, and absorption. This feeling is based on empowerment activities promoted by the management like giving important information, and suggesting contributing to key organizational decisions. Most research found a strong correlation between psychological empowerment and staff engagement. Nurse managers, comprising first- and middle-line supervisors, were studied in relation to psychological empowerment and staff engagement (Alotaibi et al., 2020). The engagement of first-line managers was found to be favorably impacted by psychological empowerment in one study (Zaki & Mohammed, 2018). Psychological empowerment has been proven in studies to be important for employee engagement (Jose & Mampilly, 2015; Meng & Sun, 2019).

The increased PE and resulting EE, caused by individuals constantly searching for information exchange can lead to employee commitment. COR theory is also relevant here because it suggests that individuals who have accumulated and maintained job-related and personal resources are more likely to feel committed to their workplace. In fact, the well-defined task processes of nurses can result in work-related

motivation factors. As a result, commitment is inevitable after a certain period of time. This can be explained in the context of the Conservation of Resources Theory. Nurses are under increasing pressure to be constantly accessible due to PE. This leads to an intense process of looking for job resources. In this process, their motivation to stay current with developments increases, as they experience a continuous EE on necessary knowledge and relationship networks. Increasing dual workplace motivators (PE and EE) cause nurses to conserve their resources. As a result, nurses often experience significant commitment due to abundance of resources.

A study conducted by Orgambidez & Almeida (2020) on 267 nurses found that employee engagement significantly predicted affective commitment. No study was reached in the literature review that addresses the role of EE as a mediator variable in the effect between PE and AC. However, in a study conducted by Mahmood & Sahar (2017) on telecom sector employees, it was empirically revealed that Psychological empowerment significantly affected affective commitment and that employees with high employee engagement increased this effect more.

Again, in the study, there is a call for empirical studies with large samples that address the relationship between EE and PE concepts and AC. To achieve this, the existing literature will be examined within the context of the Job Demands-Resources (JD-R) framework and the Conservation of Resources Theory.

The JD-R framework provides a foundation for understanding the dynamics of job demands and resources in the workplace. It highlights how certain aspects of a job can be demanding (e.g., high workload, time pressure) or resourceful (e.g., social support, feedback).

COR theory complements the JD-R framework by explaining how individuals are motivated to acquire, maintain, and protect resources. Resources in this context can include not only those in the workplace but also personal resources like self-esteem and well-being. COR theory can be linked to employee engagement by recognizing that when individuals perceive a net gain of resources (both job-related and personal) in their work, they are more likely to be engaged, as the presence of resources promotes a sense of security and well-being.

Affective commitment is tied to how employees emotionally connect with their organization. When job resources are abundant, employees are more likely to experience job satisfaction and positive emotions, which, in turn, can strengthen their affective commitment to the organization. COR theory is also relevant here because it suggests that individuals who have accumulated and maintained job-related and personal resources are more likely to feel committed to their workplace. These resources may include a supportive work environment and the psychological resources necessary to invest emotionally in the organization.

In summary, the JD-R framework helps us understand the relationship between job demands and resources, while the COR theory emphasizes the importance of resource preservation and acquisition. Employee engagement is fostered when individuals perceive a balance in these resources, and Affective Commitment can be influenced by the emotional attachment that results from having sufficient resources and positive experiences in the workplace. Hypotheses thus developed are:

H2: PE positively affects EE

H3: EE positively affects AC.

H4: EE plays a mediator role in the effect of PE on AC

3. Methodology

Population, Sample and Measurement Tools

The main purpose of this research is to examine the mediating role of EE in the relationship between PE and AC. Data has been collected from nurses in hospitals in September, 2022.

The participants were chosen via multistage cluster sampling. A list of all the hospitals in corporation area of northern district of Kozhikode, Kerala state, was compiled. These hospitals were classified into five categories: north, east, south, west, and centre. Following that, slips of paper with the names of the hospitals in each group were created, and a person was instructed to choose two slips at random.

The google form link was sent to the WhatsApp group of nurses from the selected institutions. G*Power 3 software was used to compute the sample size (Faul, 2007). It was found using Pearson correlation, which needed a total sample of 308 participants when using a power of 0.70, a medium effect size (Cohen $f = 0.25$), and $\alpha = .05$. To account for non-respondents or possibly missing data, the researcher raised the sample size by 15% from the initial sample size, bringing the total number of participants to 354.

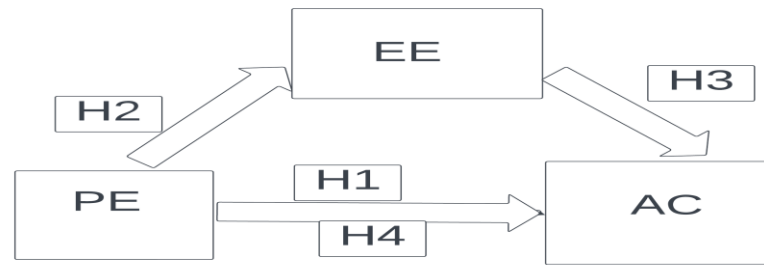
Nurses in selected hospitals were contacted through professional WhatsApp groups. The participants who were reached were asked to voluntarily complete a questionnaire. As a result of this process, data of 347 participants were reached. 327 (94.0%) were female, and 19 (5.5%) were male. Most of the participants had a professional degree in nursing ($n = 179$, 51.4%). Of the participants, 170 (48.9%) were nursing officers, whereas 96 (27.5%) were staff nurses. Guideline followed for research design is STROBE since this is an observational study.

To achieve the main purpose of the study, four different scales were utilized, comprising of 44 questions in total. These include demographic questions, as well as questions pertaining to Psychological Empowerment, Employee Engagement, and Affective Commitment variables. The demographic section of the survey inquires about age, marital status department, designation, and gender. In addition, other measurement tools related to the main variables are;

Employee Engagement (EE): EE was measured using the Utrecht Employee engagement Scale, developed by Schaufeli et al. (2002). The three aspects of employee engagement—vigor, dedication, and absorption—are measured by the Utrecht Employee Engagement Scale (UWES). The mean score for each dimension was calculated using a 7-point Likert scale from 0 (never) to 6.

Psychological Empowerment (PE): The PE levels of nurses were examined with the Spreitzer's 1995 12-item scale. The scale had four dimensions: meaning ("My job activities are personally meaningful to me"), competence ("I am confident about my ability to do my job"), choice ("I have considerable opportunity for freedom in how I do my job"), and impact ("I have significant influence over what happens in my department").

Figure 1: Research Model



Affective Commitment (AC): To measure the Affective Commitment levels of nurses, the researchers used the Organizational Commitment Scale (OCS). OCS is a popular tool for determining organizational commitment. Allen and Meyer (1990) created the OCS. The researchers chose this scale to measure participants' perceptions of Organizational commitment specifically related to work. The measure is divided into three parts: affective commitment, continuous commitment, and normative commitment.

High scores on all scales indicate a high perceptual state for that scale. For this study, data were analyzed using SPSS 23 and Smart PLS 4 programs, and hypothesis tests were conducted.

4. Findings

Structural equation modeling, one of the multidimensional analysis methods, was used to analyze the data collected within the scope of the research. Hypothesis tests were conducted using a statistical significance level of $p < 0.05$ with the Smart PLS 4 program. During the structural equation analysis in Smart PLS, measurement model analyses are performed, which involve a detailed examination of the scales and variables used. The results of the structural equation analysis are shared.

Measurement Model Analysis

As suggested by Hair et al. (2012), items with a loading value below 0.7 were identified in the scale items. Those with loading values below 0.40 were directly deleted, and for those between 0.40-0.70, their AVE and CR values were checked to determine whether they were within the acceptable range. As a result of the scale pre-analysis, EE6, EE8, EE9 & EE10 indicators in the EE were excluded from the analysis.

In the second stage, internal consistency analysis was conducted using Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) values for convergent validity. Following the framework suggested by Hair et al. (2012), Cronbach's alpha and composite reliability (CR) were analyzed for construct reliability. As shown in Table 1, both Cronbach's alpha and CR values exceed the literature's threshold value of 0.7 (Urbach Frederik, 2010). In this context, it is observed that the scales are reliable. Additionally, standardized loadings and average variance extracted (AVE) were calculated to ensure convergent validity of each construct. Upon examination of Table 1, the values being above 0.7 and 0.5, which are established as threshold values in the literature, indicate that the necessary conditions for convergent validity are met (S, 2003).

Table 1: Measurement Model Analysis Results

Construct	Items	Factor	Mean	Cronbach's alpha 0.70	Composite ≥ 0.70	reliability	AVE 0.50	α ≥	VIF
PE	PE1	0.759		0.896	0.915	0.523			2.001
	PE2	0.736							1.949
	PE3	0.518							1.41
	PE4	0.608							2.135
	PE5	0.727							2.416
	PE6	0.801							2.424
	PE7	0.668							2.176
	PE8	0.778							2.771
	PE9	0.712							2.327
	PE10	0.861							3.175
EE	EE1	0.831		0.831	0.881	0.565			2.172
	EE2	0.755							1.759
	EE3	0.856							3.277
	EE4	0.881							3.703
	EE5	0.682							1.599
AC	EE7	0.394		0.882	0.904	0.542			1.064
	AC1	0.725							1.909
	AC2	0.759							1.978
	AC3	0.798							2.335
	AC4	0.798							2.199
	AC5	0.702							2.868
	AC6	0.648							2.751
	AC7	0.77							1.811
	AC8	0.677							2.398

Discriminant validity was established using the Fornell-Larcker criterion, which compares the square root of the average variance extracted (AVE) to the inter-construct correlations. If the AVE is greater than the inter-construct correlation, the variables are considered to have discriminant validity (Fornell, C., & Larcker, 1981). When examining the results obtained from Fornell and Larcker analysis in Table 2, it can be seen that the model demonstrates discriminant validity. However, it is important to note that Fornell and Larcker analysis alone may not be sufficient to establish discriminant validity, as noted by Henseler et al. (2014). Therefore, it is recommended to also conduct a Heterotrait-Monotrait ratio (HTMT) analysis.

Table 2. Fornell and Larcker Analysis

	AC	EE	PE
AC	0.736		
EE	0.509	0.752	
PE	0.677	0.573	0.723

Table 3: Heterotrait-Monotrait ratio (HTMT) Analysis

	AC	EE	PE
AC			
EE	0.542		
PE	0.732	0.636	

Upon examining the Table 3, it is observed that the HTMT values are below the threshold of 0.90, meeting the necessary conditions for discriminant validity (Henseler et al., 2014).

Structural Model Analysis-Hypothesis Testing

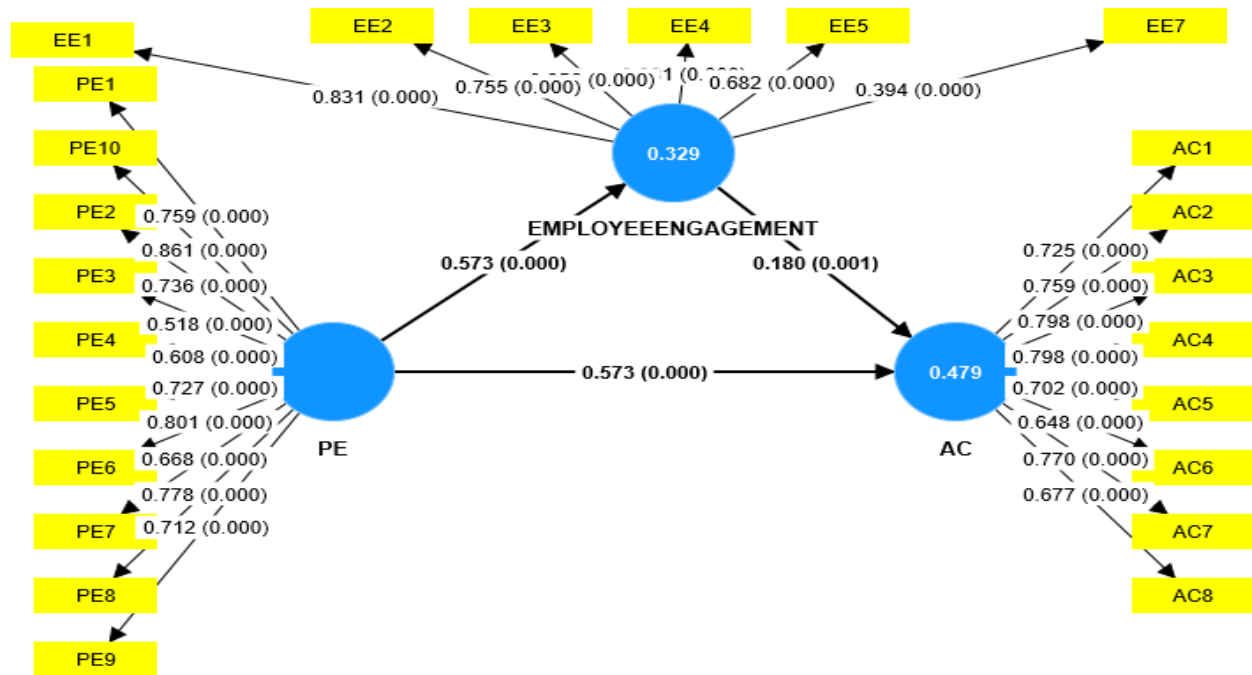
As suggested by Hair et al. (2012), the Variance Inflation Factor (VIF) was checked first in the path analysis. In the literature, VIF values are expected to be less than 5 (Hair et al., 2012). When examining Table 1, VIF values are between 1.599 and 3.703 and are less than the threshold value indicating no multi- collinearity problem. In the next stage, the relationship between variables was examined using path analysis in the research model. Path analysis was performed with 5000 resampling bootstrapping in Smart PLS v4 (Hair et al., 2012). To determine whether the β values obtained from the analysis were significant at a 5% significance level, t-tests and p-values were examined. Within the scope of the hypothesis test results, it was determined that there was a direct effect of PE on EE ($\beta = 0.573$, $p < 0.01$), PE on Affective commitment ($\beta = 0.573$, $p < 0.01$), and EE on Affective Commitment ($\beta = 0.180$, $p < 0.01$). Thus, hypotheses H1, H2, and H3 were supported.

Table 4: Mediation Analysis Results

Total Effects (PE-->AC)	Effects (PE-->AC)		Direct Effect (PE-> AC)			Indirect Effect (PE-> EE-> AC)				
Coefficient	T value	p-value	Coefficient	T value	p-value	Coefficient	SE	T value	p-value	Percentile bootstrap 95% confidence interval
										Lower Upper
0.677	21.361	0.001	0.573	11.29	0.000	0.103	0.036	2.894	0.002	0.072 0.271

Mediation Analysis was performed to assess the mediating role of Employee Engagement in the relationship between Psychological Empowerment and Normative commitment. The results (see Table 4) revealed a significant indirect effect of Psychological Empowerment on Affective commitment through EE ($H_1: \beta = .103, t=2.894, p<.005$).

Figure 2. Mediation analysis



The total effect of PE on AC was significant ($\beta = .677, t=21.361, p<.001$), with the inclusion of mediator EE, the effect of PE on AC was still significant ($\beta = .573, t=11.290, p<.000$). This shows a complementary partial mediating role of Employee Engagement in the relation between PE and AC. Hence, H_4 was supported.

5. Discussion

The study's first important finding is the empirical demonstration that PE, which has been examined to a limited extent in the literature, affects academicians' perceptions of EE and AC. This conclusion was reached by examining a larger sample than previous studies. Nurses' affective commitment levels are affected by Psychological Empowerment. This finding supports the limited amount of accumulated literature (Al Otaibi et al., 2022; Linando & Halim, 2023; Ochoa Pacheco et al., 2023). PE increases EE, which is considered an important workplace motivation factor for nurses. This study shows that the PE, which nurses have experienced significantly, affects their level of EE. In this respect, the study expands the existing literature.

Another important finding of the study is that EE increases AC levels among nurses. Due to their administrative workloads and involvement in various societal fields related to their areas of expertise, nurses must constantly establish information and networks. Consequently, they experience a high level of

EE in order to closely follow information and developments, particularly in nursing environments and nursing processes.

Within the scope of the main hypothesis of the study, it has been determined that EE has a mediating role in the effect of PE on AC. This situation has empirically revealed that the need and pressure of EE, that is, the need and pressure to be in a constant search for information and developments, plays a role in the formation of AC created by PE, which nurses experience due to their various roles. No study has been found in the existing literature that addresses the mechanism between PE, EE, and AC within the framework of EE's mediating role. This study aims to expand the literature by exploring the effect and importance of EE as a mediator between work-related motivational factors (PE) and work-related AC levels. It is clear that two important motivational factors, PE and EE, should be emphasized in order for nurses to exhibit effective and productive performance, maintain well-being, and experience high AC.

The study's results indicate that PE and EE should be prioritized to improve efficiency, productivity, and employee well-being. AC can lead to numerous positive outcomes, including increased productivity and quality for organizations, both directly and indirectly. To address this issue, it is important to assess the PE and EE levels of employees. Specifically, the Human Resources Department should gauge nurses' perceptions of their multifaceted roles. Additionally, the possibility of PE and EE as workplace motivating factors should be examined. Establishing communication norms can help increase PE and AC. Building a business culture that aligns with the organizational culture can also alleviate concerns among employees, about information, opportunities, and resources. However, setting just one norm may not always produce the desired results. To increase awareness among top management about PE and EE, practical training on effective and healthy communication norms should be provided to all employees, especially managers at all levels. In this context, top management should emphasize and support the need to bring about a change in the organizational culture. The expectation is that technological advancements will increase the speed and solution capability, leading to a positive effect on the overall performance of the enterprise. However, a significant amount of technological advancements can cause the deterioration of the physical and psychological health of nurses. This can result in a serious loss of performance and a qualified workforce. Therefore, a balance should be established between technological advances and the well-being of employees within the framework of a sustainable management approach.

In addition, managers have the responsibility of ensuring a supportive environment for their employees. This environment should include assistance from superior, access to relevant resources, recognition for accomplishments and awards, all of which contribute to improved work performance. Because of the nature of the environment in which nurses operate, which is one that is very demanding and tough, it is necessary to adopt effective tactics in order to boost organizational commitment.

In addition, those in charge of formulating public policy need to strive towards the establishment of an atmosphere at nursing facilities that is conducive to the production of a high degree of employee engagement. This may be done through increasing the registered nurses' view of the organization's aims, sharing the principles and objectives of health care leaders with registered nurses, and including registered nurses in the process of making choices.

The study primarily contributes to the theory by empirically examining the mechanism between the emerging work-related motivation factors (EE and PE) in the field between the sustainable performance of nurses and the AC state that positively affects their work lives. In addition, the study raises the

awareness of the top management by making suggestions to take measures against the distorted effects of new technological advances to ensure that managers have an effective management practice.

However, like any study, there are some limitations in terms of time and resources. Firstly, the cross-sectional nature of the study is a significant limitation. To obtain more comprehensive results, conducting a longitudinal study would be appropriate. Additionally, examining the mechanism between PE and AC can be accomplished by developing models that incorporate internal factors, such as personality and self-esteem. By adopting this methodology, a deeper awareness of the correlation between the two variables could be attained.

Implications for Nursing & Health Policy:

The study recommends prioritizing psychological empowerment and employee engagement to enhance efficiency, productivity, and employee well-being in nursing environments. It suggests that Human Resources Departments should assess nurses' perceptions of their roles and consider psychological empowerment and employee engagement as vital workplace motivating factors. Establishing communication norms aligned with organizational culture is proposed to increase psychological empowerment and Affective Commitment. Practical training on effective communication norms is advised, especially for managers, to raise awareness and support a cultural shift.

The findings highlight the delicate balance required between technological advancements and nurses' well-being within a sustainable management approach. The study suggests that managers play a pivotal role in creating a supportive environment by offering assistance, providing access to resources, and recognizing accomplishments. Additionally, it emphasizes the responsibility of those formulating public policy to create conducive atmospheres in nursing facilities, involving registered nurses in decision-making processes and aligning organizational goals with nurses' perspectives.

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Effect of Pandemic on the Food Processing Industries in West Bengal -A Study

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Abstract

Food processing industries experienced disruption in supply of raw materials, sudden hike in raw materials price, labour layoffs, reduction in wages, disturbance in production process, a massive loss of working hours, difficulties in arrangement of working capital as well as loan, delay in distribution process and decrease in demand of finished food products during the lockdown period. The study aims to examine the effect of COVID-19 pandemic on the food processing units in West Bengal. The study found that the food processing units went through several challenges during the pandemic and the government assistance was not sufficient to fulfil the demand of the units.

Keywords: Covid-19, pandemic, food processing, layoffs, supply chain

1. Introduction

COVID-19 pandemic is the biggest challenge that the world face in the post World War II era. Like a forest fire it spread all over the world (Siddiqua & Swathi, 2020). The central government imposed the decisions like nation wise lockdown and night curfew to reduce the effect of pandemic like COVID-19. All the international airports and ports were closed which disrupted the imports and export activities and the factories were shuttered down (Yadav & Agarwal, 2021). The MSME sector was compelled to reduce its operations, including not acquiring raw materials, producing and supplying fewer finished goods, and hiring fewer workers to assist in the production process. Consequently, there is a reduction in working class earnings, sales, revenue, productivity, and employment (Hariharan et al., 2021). The pandemic hit hard the food processing units (FPU) like the other industries. The study reviewed several articles, newspaper reports and report of different agencies. The study examined the effect of COVID-19 pandemic on the FPU in West Bengal. A field survey was conducted to evaluate and analysed the challenges faced by the 200 FPU in West Bengal like obstruction in supply chain, shortage in labour, worker's layoffs, reduction of labour wages, decreased in working hours, hampered in production process, financial crises, decrease in demand, reduction of consumption and increase in essential food commodities, etc. The study also evaluated the initiatives taken by the government and offered valuable suggestions.

2. Review of Literature

Koner & Laha (2023) have made an effort to evaluate the potential effects of COVID-19 on production, handling and storage of food after harvest, processing and packing, distribution, and consumption. A lack of labour, inadequate transportation and storage facilities, food waste from disruptions in the procurement process, etc. all had an effect on the production process. They also observed that the lockdown had a significant negative effect on processing and packing, with production ceasing or decreasing due to a lack of labour, raw materials, and transportation. Movement restrictions brought about by the lockdown also presented a number of significant

obstacles for the distribution of food items. They came to the conclusion that the Covid-19 pandemic epidemic had taught us a valuable lesson about the system's current vulnerabilities, especially in the areas of distribution and logistics. Munshi et al. (2023) stated Early on in the closure, there was a total disruption to the food supply chain and supply. They observed first-hand the substantial loss of food items, especially perishables like milk, fruits, and vegetables, resulting from the government's travel restrictions. They noticed that reverse migration, lost man-days, and job losses caused the poor's purchasing power to decline and their degree of poverty to rise. Even after the post-pandemic period, some homes are still unable to revert to their pre-pandemic state. And in the end, they concluded that, in order to guarantee the country's nutritional security, the Indian government needed to improve its supply chain, production methods, and storage facilities in case of a pandemic-like emergency. Gopal & Nair (2022) have found that Staff layoffs, a reduction in working hours and pay, difficulties obtaining raw materials, a decline in production levels, difficulties obtaining individual capital, difficulties marketing food products, and difficulties upholding administrative procedures were just a few of the significant effects that COVID-19 had on Kerala's MSME food units. Arumugam et al. (2020) noted that the spill over of the COVID-19 outbreak affects even the most resilient agricultural sector, which is the foundation of our country. The lockdown across the state - which was not directly caused by the coronavirus, but rather its indirect effect - has turned out to be disastrous for the farming community. This study emphasized how the COVID-19 pandemic effected the ability of indigenous communities in the Indian state of Jharkhand to obtain sufficient, reasonably priced, and nutrient-dense food sources, while some aspects of the surveyed communities' indigenous food systems demonstrated critical resilience features to support the main pillars of food security, particularly access and stability. Ghosh-Jerath et al. (2022). Hossain (2020) has accepted that since COVID-19 is a worldwide issue, a coordinated regional and international response is needed. Policies and programs must focus on the agri-food and agriculture industries in order to support vital enterprises and supply networks that are local, regional, national, and worldwide. He also concluded that The COVID-19 pandemic has disrupted some activities in agriculture and its supply chains in India. Kumari et al. (2020) have investigated that how the pandemic has affected and is posing issues for India's agricultural sector COVID-19. The government's first priority now is to take action to reduce its effect on the nation's food security. The farmers have been requested to implement standard safety procedures and safeguards during the harvesting, post-harvest handling, storage, and, in the end, marketing of the rabi crops. They also suggested that the government must open its purse strings and meet farmers' immediate requirement of funds by infusion through account system. Purkait et al. (2020) argued that Long-term lockdown would be disastrous for the economy, given the 1.3 billion people on the country and the unstable state of the economy prior to the COVID pandemic. The most vulnerable sectors will be those in agriculture and related industries. India, with its capable leadership, saw the crisis as a challenge and made every effort to contain the pandemic.

3. Objectives of the Study

The objectives of the study are:

- (i) To examine the effect of the pandemic on the performance of the FPU's in West Bengal.
- (ii) To evaluate the initiatives taken by the Government to support the FPU's during the pandemic.

4. Research Methodology

This is a study of both empirical and exploratory in nature. The exploratory part is based on related literatures, which were published in several journals, articles, newspaper reports, Government guidelines and report of different government agencies. The empirical part is based on primary data which has been collected through the primary survey conducted in six selected districts namely, North 24 Parganas, South 24 Parganas, Nadia, Hooghly, Burdwan and Kolkata. These districts were selected based on a higher concentration of FPU's. Total 210 FPU's were considered for the survey, but finally 200 respondents fully responded. Non-probabilistic convenience sampling techniques was used in the selection of the FPU's.

A structured questionnaire was prepared to measure the effect of pandemic on raw materials, labours, production process, finance, marketing and sales and also to check satisfaction level of the respondents regarding Government role. Through direct communication with the respondents, who were the unit owners, the questionnaire was filled up.

In this study, the primary survey data were analyzed using the SPSS software. Categorical variable tables, different charts, and percentage have been used to interpret the primary data. Descriptive statistical tools like Chi-Square Tests have been used to examine the the association among the variables and Principal Component Analysis (PCA) has been conducted to identify the factors that effected the FPU. Three sets of hypotheses have been formulated in the study which is as follows:

Table-1: Hypotheses formulated

Hypothesis 1	H ₀ : There is no association between loss of working hours in the food processing unit and hampered in Production process of the units during the pandemic
Hypothesis 2	H ₀ : There is no association between pandemic-related regulations circulated by the government and problem regarding distribution of food products of the units during lockdown
Hypothesis 3	H ₀ : There is no association between the high price of raw materials during the pandemic and decrease in demand of food products in the market during pandemic.

Source: Compiled by the researcher

5. Results and Discussion

(a) Respondents profile

The demographic profile of the respondents has been shown in this section. The researcher has tried to understand the social status like gender, caste and educational qualification of the respondents through the demographic.

Table-2: Details of the Respondents

		Number	(%)
Gender	Male	178	89.0
	Female	22	11.0
	Total	200	100.0
Caste	Gen	148	74.0
	SC	29	14.5
	OBC-A	5	2.5
	OBC-B	18	9.0
	Total	200	100.0
Educational Qualification	Literate	4	2.0
	Primary	21	10.5
	Secondary	15	7.5
	H.S	55	27.5
	UG	95	47.5
	PG	10	5.0
	Total	200	100.0

Source: Compiled by the researcher

89 % of the respondents are male and 11% are female. Most of the respondents i.e. 74% belong from general caste and only 2.5% belonged to Other Backward Class-A (OBC-A) category. No respondent is from ST

category. A good trend has observed that most of the respondents are highly qualified. 47.5% of the respondents are under graduate (UG) and 27.50% respondents are higher secondary qualified and 2.0 % were only literate.

(b) Effect of pandemic on Raw Materials of FPU

A lockdown announcement resulted in limited human movement. During the lockdown, important roads and points of entry into the state were closed. The supply chain was interrupted and the line of trucks was stopped (Carberry & Padhee, 2020). People keep stockpiling more raw materials than they need due to which there is shortage of raw materials in the market and as a result, the market price of raw materials is risen quickly.

(i) Supply of Raw Materials in Food Processing Unit during Pandemic

Supply chain of raw food products were disrupted due to the unavailability of informal labour for procurement of post-harvest crops and lack of transportation of such foods during the lockdown. Covid-19 had little effect on agricultural output, but it did cause supply disruptions that prevented farmers from receiving their crops on schedule or from receiving the rental price of their produce. Cereals and prepared food markets have not been as affected as those of perishable commodities (Sapna, 2021).

Table-3: Supply of Raw Materials in FPU during Pandemic

The supply of Raw Materials disrupted during the COVID-19 pandemic	Number	(%)
Firmly Admit	61	30.5
Admit	68	34.0
Neutral	17	8.5
Deny	43	21.5
Firmly Deny	11	5.5
Total	200	100.0

Source: Compiled by the researcher

Supply of raw materials was severely disrupted for the 30.50% (61) of respondents and 34% (68) of the respondents replied that their supply of raw materials was slightly disrupted. But, 21.50% (43) of the respondents received their raw materials seamlessly and supply of raw materials was flawless accepted by the 5.50% (11) of the respondents during pandemic.

(ii) Hike in Price of Raw Materials

The market disruption of raw material availability, rising labour wages, rising agricultural input costs, and needless storage all result to the rapid fluctuations in raw material prices.

Table-4: Hike in Raw Material's Price during Pandemic

Raw material's price was very high during the COVID-19 pandemic	Number	(%)
Firmly Admit	71	35.5
Admit	43	21.5
Neutral	33	16.5
Deny	29	14.5
Firmly Deny	24	12.0
Total	200	100.0

Source: Compiled by the researcher

Majority of the respondents i.e. 35.50% (71) bought raw materials for their units at much higher prices during the pandemic. 21.50% (43) of the respondents purchased raw materials at slightly higher prices during the pandemic than in normal time. 14.50% (29) of the respondents bought raw materials at normal price and 12% (24) of the respondents bought raw materials at lower prices during the pandemic.

(c) Effect of Covid-19 on Labours of FPU's

During pandemic a large number informal labours lost their jobs. The FPU's reduced the employment of labours for production to maintain the government regulations regarding social distancing, as a result these units suffered from man-hours loss. Causes such as sickness, a shortage of labour and the need to maintain physical distance during manufacturing, the crisis lowers businesses' ability (*Barman et al., 2021*).

(i) Labours laid off during Pandemic

During the pandemic like other industries, food processing industries also had to take steps like layoffs. Labours are considered the most important element of production that should exist, with unpaid labours involved in agriculture and at risk of losing their jobs in the food supply chain (*Yadav & Agarwal, 2021*).

Table-5: Laid off Labours during Pandemic

The unit has laid off labours during the Covid-19 pandemic	Number	(%)
Yes	69	34.5
No	131	65.5
Total	200	100.0

(Source: Compiled by the researcher)

Most of the respondent units i.e. 65.50% (131) retained their labours during the pandemic. Whereas, 34.50% (65) of the respondent units laid off their labours during the pandemic due to reduction in production process, decrease in demand of finished food products in the market, etc.

(ii) Reduction in Wages of Labours

During the pandemic some FPU's reduced wages of their workers in their units. It has been shown in the Table-7:

Table-6: Reduction in Wages of Labours during Pandemic

The unit reduced the wages of labours during the pandemic	Number	(%)
Yes	157	78.5
No	43	21.5
Total	200	100.0

Source: Compiled by the researcher

During the pandemic 78.50% (157) of the respondent units were forced to reduce the wages of their labours but, 21.50%(43) of the respondent units did not follow the same path. They paid full wages to their labours.

(iii) Labours related Challenges

Labour related issues are a serious issue in any industrial establishment. The FPU's is no exception. It has been shown in the Table-8:

Table-7: Labours related Issues in FPU's

Labours related issues in the FPU's have been prominent during the Pandemic	Number	(%)
Firmly Admit	88	44.0
Admit	19	9.5
Neutral	50	25.0
Deny	26	13.0
Firmly Deny	17	8.5
Total	200	100.0

Source: Compiled by the researcher

Labours related issues were prominent in the majority 44% (88) of the respondent units. 9.50% of the respondent units also faced labours related issues but not so much. These units faced labours related problems like labours absenteeism, death of labours due to corona, labours migration, etc. during pandemic. 13% (26) of the respondent units did not face labours related problems. 8.5% (17) of the respondent units not at all faced any labours problem during pandemic.

(iv) Effect on Working Hours of FPU's

COVID 19 had a major effect on the FPU's in terms of workers' lives, reduced working hours and wages (Gopal & Nair, 2022). It has been shown in the Table-9:

Table-8: Loss of Working Hours in FPU's

The lockdown has resulted in a massive loss of working hours in the unit	Number	(%)
Firmly Admit	59	29.5
Admit	75	37.5
Neutral	35	17.5
Deny	14	7.0
Firmly Deny	17	8.5
Total	200	100.0

Source: Compiled by the researcher

29.50% (59) of the respondents accepted that during the lockdown period they closed their unit for a long time and when production resumed later they also reduced their working hours and also employed a minimum number of labours during that period as a result they faced a massive working hour loss. 37.50% (75) of the respondents replied that their units faced minimum working hour loss. 17.50% of the respondents did not reply. 7% of the respondents' very nominal working hour loss. But, 8.5% of the respondent units did not face any working hour loss because they themselves were involved in their production.

(d) Effect of pandemic on Production Process of FPU's

The production process in the FPU's has been disrupted due to various reasons such as, movement restriction, disruption of supply of raw materials, shortage of labour, decrease in the demand for products in the market, etc.

(i) Closure during Lockdown

The Government of India imposed the nation wise lockdown since 25th March 2020. A large number of FPU's were closed due to movement restrictions at the beginning of the lockdown. It has been shown in the Table-10:

Table-9: Closed due to Lockdown

The FPU's have to be closed due to the lockdown	Number	(%)
Yes	184	92.0
No	16	8.0
Total	200	100.0

Source: Compiled by the researcher

92% of the respondent units were closed during the 1st phase of the lockdown. But, from the next phase of the lockdown they were operational. 8% of the respondent units never closed their unit because either these units use raw materials which were perishable in nature or they produce essential food products like rice, bread, baby food, etc.

(ii) Effect of Pandemic on Production Process of FPU's

Production processes of the FPU's has been shown in the Table-11:

Table-10: Hampered in Production during Pandemic

The production process of the unit was hampered during the pandemic	Number	(%)
Firmly Admit	57	28.5
Admit	85	42.5
Neutral	16	8.0
Deny	22	11.0
Firmly Deny	20	10.0
Total	200	100.0

Source: Compiled by the researcher

During pandemic, production process of 28.50% (57) of the respondent units were severely hampered. 42.50% of the respondents admitted that production process of their units also hampered but not severely. Production process was hazard free for 11% of the respondent units and was very smooth for 10% of the respondent units during pandemic.

(e) Effect of pandemic on finance of FPU's

The FPU's suffered from financial problems at the time of lockdown period, in one hand increase in prices of raw materials, increase in wages of workers, increase in production cost, as well as, reduced sales of food products, stoppage of exports, etc.

(i) Arrangement of Working Capital

Like any other industry, the food processing sector needs a significant amount of working capital. The industry's working capital needs during the pandemic has been shown in the Table-12:

Table-11: Working Capital arrangement during Pandemic

The unit faced difficulties in arranging working capital	Number	(%)
Firmly Admit	56	28.0
Admit	52	26.0
Neutral	26	13.0
Deny	37	18.5
Firmly Deny	29	14.5
Total	200	100.0

Source: Compiled by the researcher

Majority 28% (56) of the respondent units faced extreme difficulty in raising working capital during the pandemic. 26% of the respondent units accepted that they faced minor difficulties to arrange working capital. 18.50% of the respondent units did not face any difficulties to arrange that fund and 14.50% of the respondents arranged easily their required working capital.

(ii) Arrangement of Loan

Food processing industries raise loans from various sources to meet capital requirements. It is shown below whether these industries have faced any problems in collecting these loans during pandemic has been shown in the Table-13:

Table-12: Arrangement of Loan for FPU's

The food processing unit faced problems in getting loans during the pandemic	Number	(%)
Firmly Admit	57	28.5
Admit	44	22.0

Neutral	57	28.5
Deny	22	11.0
Firmly Deny	20	10.0
Total	200	100.0

Source: Compiled by the researcher

Most of the respondents i.e. 28.50% units faced extreme difficulty in getting loans from different sources. 22% of the units faced some difficulty in getting loan from various sources. 11% of the units somehow arranged their loan but 10% of the respondents raised their loan easily from various sources.

(f) Effect of pandemic on Marketing and Sales of FPU's

At the initial phase of the lockdown due to movement restriction huge quantities food products in perishable nature like milk, ice-cream, raw –meat, stored fish, fruits and vegetables, etc. either wasted or sold at very cheap price. During the same period demand of essential foods like rice, wheat was very high in the market.

(i) Effect on Distribution of Food Products

Due to lockdown-induced movement restrictions, a number of significant distribution-related issues have arisen, including a labour shortage, a lack of logistics services, food loss from delayed distribution, business closures at restaurants, wholesale agricultural markets, and retail locations, limitations on international trade, etc (Koner & Laha, 2023).

Table-13: Distribution of Finished Food Products of the FPU's

Faced difficulties in the distribution of food products during the lockdown	Number	%
FirmlyAdmit	58	29.0
Admit	78	39.0
Neutral	45	22.5
Deny	8	4.0
Firmly Deny	11	5.5
Total	200	100.0

Source: Compiled by the researcher

Distribution of finished food products to the wholesaler, retailers and consumers was very difficult during lockdown period replied by 29% of the respondents. 39% of the respondents faced some difficulties in the distribution process. 4% of the respondents somehow manage this process. 5.5% of the respondents replied that they easily managed this process.

(ii) Demand of Food Products in Market

As people rush to fill their cupboards, sales of staples like bread and eggs, as well as rice, beans, and frozen goods, have also soared. In Mumbai, Delhi-NCR, and Pune, products including rice, atta, lentils, sugar, biscuits, tea, instant noodles, butter, and frozen meals are flying off the shelves (Sharma, 2020).

Table-14: Demand of Food Products in Market

During the pandemic, the demand for food products decreased in the market	Number	%
FirmlyAdmit	69	34.5
Admit	60	30.0
Neutral	49	24.5
Deny	13	6.5
Firmly Deny	9	4.5
Total	200	100.0

Source: Compiled by the researcher

Most of the units accepted that a massive fall in demand of their food products found in the market during pandemic. 30% of the respondents noticed that demand of their food products slightly decreased in the market. 6.50% of the respondents said that demand of finished food products slightly increased during the pandemic. 4.50% of the respondents answered that their food products had huge demand in the market during lockdown in comparison of other time.

(g) Government Support to the FPU's during Pandemic

The COVID-19 epidemic struck suddenly, posing severe problems for the FPU's. To tackle the problem, they ask the government for special attention in the form of financial and non-financial aid.

1. Financial Relief Package: The Government of India provided relief package under Atmanirbhar Bharat as financial aid to the MSME as well as the FPU's.

- The industry is able to obtain term loans with a concessional interest rate and no security for 20% of its existing credit, which is additional operating capital. Nevertheless, only up to a 25 crore rupee outstanding credit and a 100 crore rupee turnover.
- The government has allocated a total of Rs. 20,000 crore to assist stressed MSME's.
- Rs. 1 lakh crore has been approved by the GoI for the development of agricultural infrastructure.
- The Government of India granted permission for the marine and inland fisheries to continue operating with a sanction of Rs. 11,0000 crore. Additionally, they were given Rs. 9,000 crore to modernize their infrastructure through the Pradhan Mantri Matsya Sampada Yojna (PMMSY) scheme.
- To encourage private investment in the dairy industry, the government has proposed a package worth Rs. 15,000 crores for infrastructure development and incentives to build new facilities and infrastructure for cow feed.
- The government has set aside Rs. 500 crore as incentives for beekeeping in order to boost the honey processing business. It is anticipated that these measures will benefit about 2 lakh beekeepers.
- Reserve Bank of India provided a three-month grace period for all types of term loan interest and instalment payments.
- The government has established funds under SIDBI to fund start-up firms under MSME.

2. Non- financial Assistances: The Government of India as well as different the state governments provided several non-financial assistances to the FPU's. These are discussed below:

- The Government of India announced the FPU's as an essential commodity sector.
- A Grievance Redressal Cell and a Special Task Force were formed by the Indian government to expeditiously address any concerns pertaining to food processing during the lockdown.
- The government took action and gave the transport unions assurances that there would be no disturbance and that trucks carrying food items and raw materials could go freely.
- Introduced a new program known as "Formalization of Micro Food Processing Enterprises" during the lockout to assist over 25 lakh unorganized food processing businesses that are located in rural areas.
- FASSI launched a number of programs to help the food industry respond to COVID-19.

(i) Government Circulars regarding Pandemic

FPU's have different experience regarding the regulations imposed by the Government time to time. It has been shown in the Table-16:

Table-15: Government Circulars on COVID-19 Pandemic

The food processing unit faced problems with the COVID-19 pandemic-related regulations circulated by the government	Number	%
Firmly Admit	65	32.5
Admit	45	22.5
Neutral	60	30.0
Deny	14	7.0
Firmly Deny	16	8.0
Total	200	100.0

Source: Compiled by the researcher

The majority of the respondents i.e. 32.50% faced several problems with the government circulars like lockdown, social distancing, hygiene, transportation problem, etc. 22.50% units faced some problems with the circulars. 7% of the respondents faced negligible problems with the regulations. COVID-19 pandemic-related regulations had no effect on the 8% of the respondents units.

(ii) Financial Assistance by the Government to the FPU

The majority of food processors have been dealing with serious problems with financing, and they have been waiting on government assistance to get through this tough time. However, the government's assured stimulus package offers not much reason for jubilation for the FPU (Baishya, 2020).

Table-16: Financial Assistance by the Government to the FPU

Financial assistance provided by the Government was not helpful for the FPU	Number	%
Firmly Admit	38	19.0
Admit	65	32.5
Neutral	44	22.0
Deny	32	16.0
Firmly Deny	21	10.5
Total	200	100.0

Source: Compiled by the researcher

19% (38) of the respondents did not received any financial assistance. So, they are extremely dissatisfied with the government initiatives. 32.50% of the respondents expected more assistance from the government. 22% of the respondents were unaware about the assistance. 16% of the respondents received a small amount of financial assistance. 10.50% of the respondents were fully satisfied with government initiatives.

Table-17: Result of the Chi-Square Test

Hypothesis	Assumptions	P Value	Null Hypothesis Accepted or Not
Hypothesis 1	H ₀ : There is no association between loss of working hours in the food processing unit and hampered in production process of the units during the pandemic	0.000	Not Accepted
Hypothesis 2	H ₀ : There is no association between Covid-19 pandemic-related regulations circulated by the government and problem regarding distribution of food products of the units during lockdown	0.000	Not Accepted
Hypothesis 3	H ₀ : There is no association between high price of raw materials during the Covid-19 pandemic and decrease in demand of food products in the market during pandemic	0.001	Not Accepted

Source: Compiled by the researcher

Hypothesis-1: In this case, the alternative hypothesis has been accepted and the null hypothesis has been rejected as the Pearson Chi-Square Statistics P value is 0.000, which is less than 0.05. Therefore, it can be said that the production process has been hampered due to loss of working hours in FPU's during the pandemic.

Hypothesis- 2: In this case, the alternative hypothesis has been accepted and the null hypothesis has been rejected as the Pearson Chi-Square Statistics P value is 0.000, which is less than 0.05. Due to the Covid-19 pandemic-related regulations promulgated by the government, the units faced problems related to distribution of food products.

Hypothesis-3: In this case, the alternative hypothesis has been accepted and the null hypothesis has been rejected as the Pearson Chi-Square Statistics P value is 0.001, which is less than 0.05. During the epidemic, the price of raw materials increases in the market. Therefore, the cost of production of food products increases and the selling price increases accordingly, resulting in a decrease in the demand for the product in the market.

Principal Component Analysis (PCA)

The researcher conducted Principal Component Analysis (PCA). In PCA the researcher considered ten issues and challenges related variables to understand whether they are correlated or not. The researcher has been divided the PCA into four sections i.e. (a) KMO-Bartlett's Test, (b) Analysis of Eigenvalues and Variance Explained, (c) Analysis of Scree Plot and (d) Analysis of Rotated Component Matrix, to discuss the results of the PCA.

(a) KMO and Bartlett's Test

The result of KMO and Bartlett's test is shown below in the table- 19:

Table-18: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.679
Bartlett's Test of Sphericity	Approx. Chi-Square	914.050
	df	55
	Sig.	.000

Source: Compiled by the researcher

From the above table, it has been seen that the calculated Kaiser-Meyer-Olkin of sampling adequacy value is .679. The result is satisfactory and the PCA can be run successfully.

The calculated Bartlett's Test value is .000. So, the correlation matrix is not an identity matrix. Here, both the results are positive; therefore, PCA can be undertaken.

(b) Analysis of Eigenvalues and Variance Explained

An Eigenvalue represents the amount of variance associated with the factor. Total Variance is explained by Initial Eigenvalues, Extraction sums of squared loading and Rotation sums of squared loading. Results of the total variance has been shown in the table-20:

Table-19: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.866	26.051	26.051	2.866	26.051	26.051	2.402	21.836	21.836
2	2.421	22.012	48.063	2.421	22.012	48.063	2.307	20.970	42.807
3	1.839	16.717	64.780	1.839	16.717	64.780	1.981	18.010	60.816

4	1.261	11.460	76.240	1.261	11.460	76.240	1.697	15.423	76.240
5	.693	6.301	82.541						
6	.482	4.382	86.923						
7	.378	3.435	90.358						
8	.352	3.204	93.562						
9	.282	2.562	96.124						
10	.231	2.101	98.225						
11	.195	1.775	100.000						
Extraction Method: PCA									

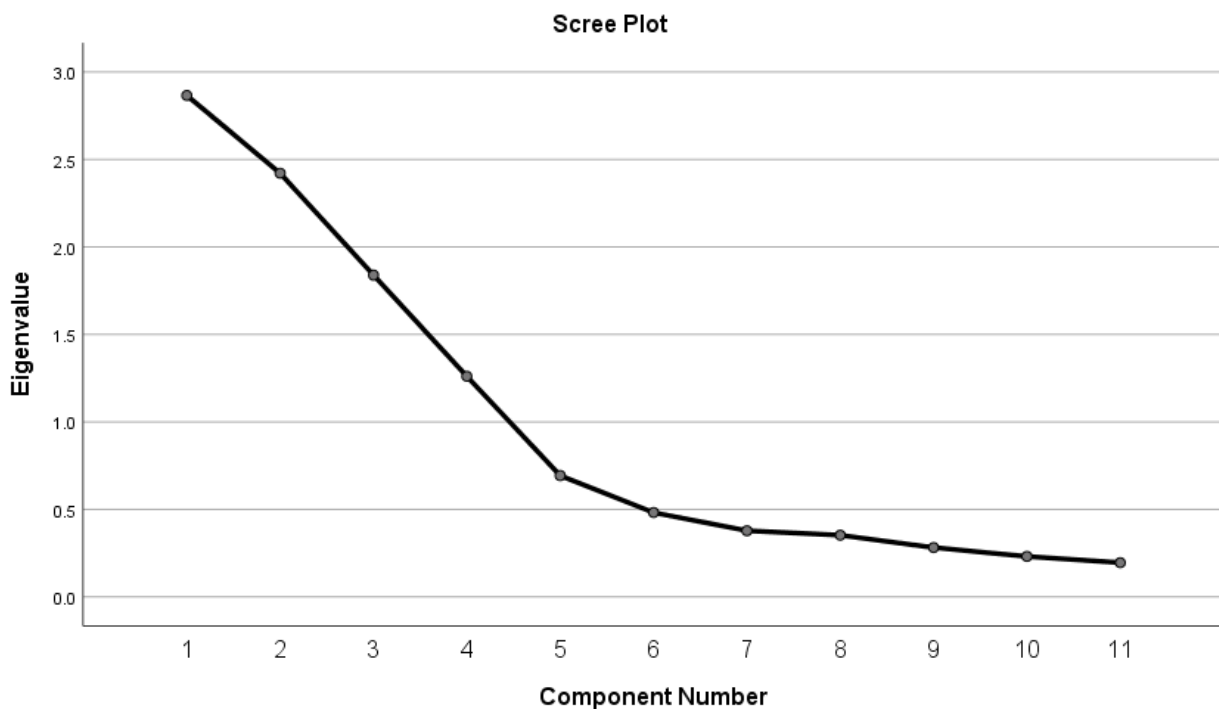
Source: Compiled by the researcher

From the above table it has been observed that eigenvalues, as well as the associated proportion of variance, are explained by each dormant factor. The eigenvalue of the first four components is more than 1. In this case, the result is 76.240%. This means that the first four components together account for 76.240% of the total variance.

(c) Analysis of Scree Plot

Scree Plot is nothing but the graphical representation of Eigenvalue against each component. The components have 1 or more than 1 eigenvalue, plotted above bar 1 and the components have eigenvalue below 1, plotted between 1 and 0 in the scree plot. Scree plot has been shown in the figure-1

Figure-3: Scree Plot



Source: Compiled by the researcher

From the above graphical representation, it has been observed that 4 components have more than 1 eigenvalue and they were plotted above bar 1. After the third component, the line is almost flat, therefore it can be concluded the first four components have the most explanatory power and the rest seven components account for lesser and lesser amounts of the total variance.

(d) Analysis of Rotated Component Matrix

The Rotated Component Matrix table helps to understand the result of the analysis. The components are rotated so that they are easier to interpret. The rotated component matrix has been shown in the table-21:

Table-20: Rotated Component Matrix

	Component			
	1	2	3	4
The supply of raw materials disrupted during the COVID-19 pandemic				.887
The price of raw materials was very high during the COVID-19 pandemic.				.863
Labours issues in the FPU's have been prominent during the COVID-19 pandemic			.854	
The lockdown has resulted in a massive loss of working hours in the unit			.706	
The production process of the unit was hampered during the pandemic			.849	
The unit faced difficulties in arranging working capital	.895			
The food processing unit faced problems in getting loans during the pandemic	.912			
The food processing unit faced problems with the COVID-19 pandemic-related regulations circulated by the government		.829		
Financial assistance provided by the government was not helpful for the FPU's	.858			
Faced difficulties in the distribution of food products during the lockdown		.842		
During the pandemic, the demand for food products decreased in the market		.906		
Extraction Method: PCA.				
Rotation Method: Varimax with Kaiser Normalization.				
a. Rotation converged in 4 iterations.				

Source: Compiled by the researcher

The rotated component matrix has been shown loading of each variable after rotation. Here the researcher used the option and subcommand and suppressed the absolute values less than 0.50.

The Principle Component Analysis has considered 4 factors which were highly affected by the COVID-19 pandemic.

The first component has 3 variables, (a) the unit faced difficulties in arranging working capital (.895) (b) the food processing unit faced problems in getting loans during the pandemic (.912) and (c) financial assistance provided by the government was not helpful for the FPU's (.858). The first component clearly reflects the **‘Effect on financial sector’**,

The second component has 3 variables, (a) the food processing unit faced problems with the COVID-19 pandemic-related regulations circulated by the government (.829) (b) faced difficulties in the distribution of food products during the lockdown (.842) and (c) during the pandemic, the demand for food products decreased in the market (.906). The second component clearly reflects the **‘Effect on marketing and sales’**.

The third component has 3 variables, (a) labours issues in the FPU have been prominent during the COVID-19 pandemic (.854) (b) The lockdown has resulted in a massive loss of working hours in the unit (.706) and (c) the production process of the Unit was hampered during the pandemic (.849). The third component clearly reflects the **‘Effect on labours of the units’**.

The fourth component also has 2 variables (a) the supply of raw materials disrupted during the COVID-19 pandemic variables (0.887). (b) The production process of the unit was hampered during the pandemic (0.849). The fourth component clearly reflects the **‘Effect on raw materials’**

6. Conclusion

This study analysed the effect of pandemic on the FPU in the state of West Bengal. It has been found that the pandemic has a significant effect on the FPU of the state such as disruption in raw materials supply, sudden increase in the price of the raw materials, labour layoffs, reduction in the wages of labour, loss of working hours, hampered in production process, faced difficulties in arrangement of working capital as well as getting loan, decrease in demand of finished food products and disruption in distribution. Finance, marketing and sales, labour and raw material segments of the FPU in West Bengal were the most affected by the pandemic. During the lockdown period as well as in unlock period the FPU received continuous assistances from the government. The study also observed that despite of this effort a large number of respondents were unsatisfied with the government initiatives. The study suggests the government to provide more grants and waive the fees and taxes to support the FPU to overcome the current situation and attract new entrepreneurs in this food processing sector.

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Online Relationship Marketing Performance During Pre-Covid (Before 2020) & Post-Covid

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Abstract

Digital networks have made regular communication simpler and played an important role in the initial conversation between a firm and a consumer. The study aims to have a deeper understanding on the awareness, perception and satisfaction of customers towards digital sales. With respect to the usage of online doesn't make a difference among the gender of the respondents, whereas the occupational status and preference on media for information access differ during the pre- and post-COVID period. The satisfaction towards online purchase was found to be the same regarding occupational status, indicating that this marketing is updating in accordance with the needs.

Keywords: Preference, Digital advertising, Demographic profile, Satisfaction

1. Introduction

Digital advertisement has provided us with an excellent method of protecting and building our digital credentials. Today, it has the convenience of searching for discussions, the ability to create notifications to help us keep track of our identities, the continual availability of learning opportunities, and more methods to connect and interact with other people than ever before. With the availability, these tools were not accessible much, a few short years ago. Now, there's feasible proactiveness in preserving, establishing, and defending one's personal brand and well contributing to the spread of word-of-mouth about other's works.

In response to digital advertisements, various perceptions are generated, which demonstrates that digital networks are well-suited exclusively for information exchange activities and communication processes. A few networks are suitable for advertising purposes; the majority of networks are not a viable advertising instrument. Digital networks are mostly used exclusively for communication purposes. As per previous research, the digital networks initiate conversation between a firm and a consumer to have them connected with a deep link in the relationship.

For its role, businesses may build brand community pages and begin discussions with employees, friends, and relatives. This will encourage active member engagement and, more importantly, will strengthen the link between the brand and the members. The contact exists between businesses and online consumers may help the client better comprehend the products/services offered by the brand, resulting in the customer becoming a regular customer. As a result, researchers can see that without the exchange of information and the discourse of the brand has no chance to participate in real interaction.

However, if an organization is grappling with effective contact with digital networks and

understanding to handle the communication environment in the community, that will be easier to defend its brand image. Previous research has also discovered that a great network should have binding and be able to track down the leading head with prospects in order to employ the member network correctly and profitably. Then there will be a powerful network for the company or brand. To accomplish the extreme, it is essential that both implementation and scheduling be crystal clear so that it reaches the consumer.

2. Statement of The Problem

A large number of people's everyday lives have become more reliant on the internet, social media, mobile applications, and other digital communication technologies. The current rate of internet use among Indians is about 87 per cent, and it is closer to 100 per cent. Participants such as graduates and those with higher incomes have become active internet users. Youth, the next generation of mass consumers, have equally high levels of early adulthood. People are also spending an increasing amount of time online. The primary question addressed by the research is whether digital advertisements can be effectively implemented in conjunction with online shopping to attract clients.

3. Objectives

The digital environment made the world active during the recent era, especially during COVID-19. The entire world is disconnected physically but connected or related through the digital mode. The paper thrives to study customer's perception towards digital advertisements during the pandemic and post-pandemic advertisements. Further also analyses the awareness and level of satisfaction with the service provided by digital advertisement.

4. Research Questions

H_{1a}: Is there any relationship between demographic profile of the respondents and their preference of digital advertisement over traditional media?

H_{2b}: Is there a significant difference between demographic profile of the respondents (age, occupation, preference on media for getting information) and their preference of digital advertisement over traditional media?

H_{3c}: Does there exist any relationship between demographic profile of the respondents and their level of awareness on digital advertisement and traditional media?

H_{4d}: Is there any relationship exists between demographic profile of the respondents (gender) and their level of satisfaction on digital advertisement and traditional media?

5. Methods

Descriptive research was conducted with the objective of understanding the facts of online relationship marketing in Coimbatore city. Coimbatore is identified as an upcoming smart city by the central government, as per the development potential and also an industrial and educational hub of South India. The study tries to bring out the online relationship marketing performance during the post-COVID period, as the study was already conducted before COVID it was extended as a comparative study. The study was conducted in the Coimbatore city population, and 250 complete responses were taken for the analysis. To study the comparative result of the pre- and post-COVID period Kruskal-Wallis test and one-way ANOVA analysis were done.

Demographic Profile

Out of 250 respondents, 47.2 per cent are male and 52 per cent are female. 17.2 per cent have an age group between 18 – 25 years, 37.6 per cent are in the age group from 26 – 35 years, 4 per cent between 36 – 45 years and 21.2 per cent above 46 years of age. It reveals that most of those who responded to the survey questions are between the ages of 26 and 35. 34 per cent are self-employed, 46.8 per cent are students, 13.2 per cent are employees, and 6 per cent are employers. Out of 250 respondents, 42 per cent prefer digital marketing and 58 per cent prefer traditional media like Television, newspapers, etc.

Table 1: Comparison between gender (demographic variable) and their Preference on Digital Advertisement and Traditional Media

H01a: There is no relationship between the gender of the respondents and their preference for digital advertisement over traditional media.

Demographic variables	Period	Particulars	N	Mean Rank	Chi-Square	Asymp. Sig.
Gender	Pre Covid	Male	118	127.57	1.186	0.046
		Female	132	123.65		
		Total	250			
	Post Covid	Male	118	121.51	0.692	0.406
		Female	132	129.07		
		Total	250			

Source: Primary Data

The scenario before Covid, shown in Table 1 that there is a relationship between gender (0.046) and their preference for digital advertisement over traditional media, wherein the majority are male respondents, whereas it was the reverse during the Post Covid behavior. There is no relationship between gender (0.406) and their preference towards digital advertisement over traditional media.

AWARENESS

Table 2: Comparison between Gender (demographic variables) and their Level of Awareness on Digital Advertisement and Traditional Media

H02a: There is no relationship between the demographic profile of the respondents (gender) and their level of awareness of digital advertisement and traditional media.

Demographic variables	level of awareness	Particulars	N	Mean Rank	Chi-Square	Asymp. Sig.
Gender	Pre Covid	Male	118	129.08	0.552	0.457
		Female	132	122.30		
		Total	250			
	Post Covid	Male	118	125.11	0.006	0.936
		Female	132	125.84		
		Total	250			

Source: Primary Data

The results in Table 2 revealed that there is no relationship between gender and their level of awareness of digital advertisement and traditional media during pre (0.457) and post (0.936) COVID, immaterial of gender, all are aware of the digital advertisement methods during the study period covered.

Table 3: Comparison between demographic profile of the respondents and their level of awareness on Digital Advertisement and Traditional Media

H02b: There is no significant difference between the demographic profile of the respondents (age, occupation, preference on media for getting information) and their preference on digital advertisement and traditional media.

Demographic variables	Period	F	Sig
-----------------------	--------	---	-----

Age	Pre-covid	3.424	0.018
	Post-covid	0.811	0.489
Occupation	Pre-covid	1.033	0.379
	Post-covid	2.959	0.011
Preference on media for information	Pre-covid	0.074	0.786
	Post -covid	0.126	0.723

Source: Primary data

Table 3 reveals that there is no significant difference between the age (0.018) of the respondents and their level of awareness on digital advertisement and traditional media, whereas there is a significant difference between age (0.489) and preference on media for getting information (0.723) during post-COVID. There is a significant difference between occupational status (0.379), preference for media for getting information (0.786) of the respondents and their level of awareness on digital advertisement and traditional media during Pre and Post COVID. With respect to the level of awareness, all the age groups are aware of the digital media advertising, namely, age group between 18 – 25 years (2.65), 26 – 35 years (2.96), 36 – 45 years (2.63) and above 45 years of age (2.92) are aware of digital advertisement and traditional media.

Table 4 Level of awareness towards digital advertising factors

Particulars	Pre Covid		Post Covid		Gap	T Value	P Value
	Mean	SD	Mean	SD			
Awareness on advertisement	3.06	1.332	2.24	1.062	-0.82	7.639	.981
Awareness on Traditional media	2.00	.907	2.13	.893	0.13	-1.647	.279
Advertisements in digital marketing	2.46	1.158	2.35	.937	-0.11	1.353	.000
Fast updates on digital advertisement	2.58	1.346	2.32	1.034	-0.26	2.434	.870
Reliability on digital advertisement	2.22	1.122	2.26	.974	0.04	-.397	.250

Source: Primary Data

Table 4 shows the Relationship between pre and post covid period for level of awareness towards advertising factors with advertisements in digital markets (.000). There is no relationship exists between pre and post covid period for awareness on advertisement (0.981), awareness on traditional media (0.297), fast updates on digital advertisement (0.870) and Reliability on digital advertisement (0.250). It also reveals that the respondents have a higher level of awareness towards advertisements in digital marketing during pre-covid period compared to the post-COVID period.

Level of Satisfaction

Satisfaction level was measured by nine statements and validated by factor analysis. The KMO value is at 0.576, which shows that the factors are normally distributed and can be proceeded further. It indicates that satisfaction level towards online marketing is triggered because of the factors shopping availability on a 24*7 basis (3.62), followed by loyalty to the brand advertised in digital advertisements (2.27) shown in Table 5.

Table 5: Descriptive statistics- Level of Satisfaction on Digital Advertisement and Traditional Media (Pre covid)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
The description of products shown on the websites are very accurate	250	1	5	3.05	1.190
Trust and past purchase experiences are satisfactory based on digital marketing	250	1	5	2.58	1.043
Valid N (listwise)	250				

Source: Primary Data

The descriptive statistics results show that the users are satisfied with product details displayed on very accurate websites, with a mean value of 3.05, followed by the trust and purchase experiences in digital marketing is reliable with a mean of 2.58. In general, the level of satisfaction appears to be good in digital media than in traditional. The post-COVID analysis tries to understand the level of awareness and its preferential factors with respect to media.

Table 6: Descriptive statistics - level of satisfaction of the respondents in digital advertisement and traditional media (Post covid)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	SD
Loyalty of brand advertised in digital advertisement	250	1	5	2.27	.943
24*7 shopping available	250	1	5	3.62	1.427
Valid N (listwise)	250				

Source: Primary Data

Table 6 reveals that the users are satisfied with trust and purchase experiences based on digital advertisements is 24/7 (3.62) and pleased with the loyalty of the brand advertised in digital media (2.27). Therefore, the pre and post-analysis of satisfaction criteria differ as the purchase experience during the period gave them more confidence and flexible time of purchase. Further analysis studied the relationship between demographic variables and the level of satisfaction with digital advertisement over traditional media.

Table 7: Comparison between gender (demographic variable) and their level of satisfaction on digital advertisement and traditional media

H03a: There is no relationship between gender and their level of satisfaction with digital advertisement and traditional media.

Demographic variable	Level of satisfaction	Gender	N	Mean Rank	Chi-Square	Asymp. Sig.
Gender	Pre Covid	Male	118	118.89	2.944	0.003
		Female	132	131.41		
		Total	250			
	Post Covid	Male	118	128.10	0.298	0.585
		Female	132	123.18		

Demographic variable	Level of satisfaction	Gender	N	Mean Rank	Chi-Square	Asymp. Sig.
Gender	Pre Covid	Male	118	118.89	2.944	0.003
		Female	132	131.41		
		Total	250			

Source: Primary Data

There is a relationship between the gender (0.003) of the respondents and their level of satisfaction with digital advertisement and traditional media during pre-covid period, whereas it is inverse during post period (0.585) shown in Table 7.

Table 8: Demographic profile (age, occupation, preference on media for getting information) and their Level of Satisfaction on Digital Advertisement and Traditional Media

H03b: There is no significant difference between the demographic profile of the respondents (age, occupation, preference on media for getting information) and their level of satisfaction on digital advertisement and traditional media.

Demographic variables	Period	F	Sig.
Age	Pre-covid	1.817	0.145
	Post-covid	2.018	0.012
Occupation	Pre-covid	2.642	0.049
	Post-covid	1.800	0.148
Preference on media for information	Pre-covid	0.036	0.849
	Post -covid	1.205	0.273

Source: Primary data

Table 8 shows that there is significant difference between age (0.145) and preference on media for getting information (0.849) of the respondents and their level of satisfaction on digital advertisement and traditional media whereas there is no significant difference between age (0.012) and satisfaction level.

In the case of occupation, pre-COVID period, there is no significant difference in the level of satisfaction based on occupational status (0.049) of the respondents, but during post period, it is contrary (0.148), revealing that immaterial of occupation, the satisfaction level appeared to be the same. The demographic variable, the preference for media for information is appears to be different (0.273)

6. Findings and Recommendations

As a result of the digital revolution, businesses now have an increasing number of alternatives for communicating with the market and, more importantly, with their target audiences. The male respondents (127.57) have a higher level of preference towards digital advertisement over traditional media than females. With tremendous development, digital experience does not imply that organizations should entirely abandon their old marketing strategies. While it is true that digital marketing is a hot issue that is still expanding, conventional marketing tactics can reinforce the message and helps fulfilling the marketing goals by utilizing proven methods. Marketers shall be more aware that these two tactics can be utilized in conjunction with one another to provide mutual

assistance. It is critical to understand the distinctions between the two tactics, together with the associated each pro and cons should not be considered in isolation.

Compared to traditional media, there are various features like fast updates, reliability, effectiveness, etc. are present in online marketing. Similarly, brand loyalty and awareness are higher in online marketing than traditional media which is a preferred factor in case of satisfaction towards online marketing. Therefore, hybrid markets for a company would cover advantages of both the markets and shall boost the satisfaction of customers.

7. Conclusion

It has become possible to defend and promote one's digital reputation through the use of digital ads. Today, having the convenience of browsing chats, the opportunity to set notifications to assist us in monitoring the names, the continual availability of learning possibilities, and more methods to engage and interact with people are all available to us; we must be thankful for technological advancements. The paper aimed to learn about customers' preferences for digital relationships by marketers and to determine if digital advertisement networks can increase brand recognition more effectively than traditional advertising methods. The respondents stated that they have difficulty understanding the message or easy access to the content, indicating that the organization should design it to be much more user-friendly in order to appease the users in the long run. It was also suggested that the advertisement post is not visually appealing, indicating that if the company attempts to improve the advertisement page to match the tastes and increase the viewership. With respect to the usage of online mode doesn't make a difference in the gender of the respondents, whereas the occupational status and preference for media for information access differ during the pre- and post-COVID period, revealing that, based on their working nature, the information access and its persistence vary marginally. The level of satisfaction towards online purchase during the pandemic and before that found to be same with reference to occupational status, indicating that the online relationship marketing which are found to be progressing and updating according to the needs and wants. Online business and marketing tools are highly promoting the business volume and it's apparent that this industry is not going to face a downturn trend and hence, the organization shall increase the value of the business and the development of the industry.

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Innovative Pathways to a Circular Economy: Entrepreneurship & Sustainability

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Abstract

The UN noted that entrepreneurship is essential for tackling issues related to sustainable development, coupled with innovation. This paper examines existing literature pertaining to "Sustainable Entrepreneurship" with the aim of delineating research directions within this field. Additionally, it investigates the impact of technology and innovation, along with entrepreneurial challenges and opportunities, on fostering a circular economy. Google Scholar and ERIC are discovered for research papers/articles by searching the terms "sustainable entrepreneurship", "sustainable Artificial Intelligence and entrepreneurship" and "sustainable entrepreneurship and innovation". We employed a systematic literature review (SLR) technique to select a sample of 48 papers (that were published between the year 2000 and 2024) is extracted and then analyzed for underlying themes and trends in current research. Research papers are categorized in order to better understand the path of this field's research. The two most often used databases for literature reviews are Google Scholar and ERIC. The search terms "sustainable entrepreneurship" and "sustainable entrepreneurship and innovation" produce the greatest number of results when used in combination with these databases. The method we used was focused on identifying themes and sub-themes from the most cited papers from previous decades. In doing so, the researcher can identify patterns and knowledge gaps in the field.

Keywords: Sustainability, Entrepreneurship, Systematic Literature Review

1. Introduction

The goal of today's producers and consumers is to create a cleaner, greener environment. (Linnanen, 2002, Sumathi et al., 2014) and there is evidence of a growing dedication to sustainable principles and an increase in the market for green goods and services (Gliedt and Parker, 2007, Sumathi et al., 2014). The need to include environmental issues and sustainability in "considerations of the bottom line" has been acknowledged by society (Allen and Malin, 2008,). The idea of sustainable development has gained significant attention from environmentalists worldwide. Sustainable development has become more and more well-liked since the Brundtland Report was released, and it is now one of the most significant environmental discourses and numerous scientific disciplines are actively researching entrepreneurship. The Brundtland Report serves as the foundation for consideration of environmental issues (Sneddon et al., 2006), as well as introducing academics and professionals to the three pillars of sustainable development—ecology, society, and economy (Crals and Vereeck, 2005). The UN recognized innovation and entrepreneurship as essential components for tackling issues related to sustainable development. People are aware of the challenges of social and environmental sustainability in the dynamic and demanding world of today. To create a more sustainable world, everyone must simultaneously take greater responsibility for the environment, society, and economy (Khizar et al., 2021) in order to create a more sustainable future (Jurgita Raudeliūnienė et al., 2014). Halder, S. (2019) highlights that all-encompassing phrase used to describe how entrepreneurial endeavors help address social and environmental issues is "sustainable entrepreneurship." Gawel, A. (2012) unearth the link between sustainability and enterprise, particularly entrepreneurship oriented.

The objective of this paper is to bridge this void by conducting a literature review on entrepreneurship and sustainability, thereby advancing research in this domain. To achieve this, we examine and evaluate papers pertaining to entrepreneurship and sustainability available on Google Scholar. Our analysis entails presenting an overview of the various perspective's authors have taken in conceptualizing entrepreneurship within the sustainability context. This study aims to investigate three primary research questions. (RQs).

RQ1- What is the current status of sustainable entrepreneurship research?

RQ2- In the spectrum of sustainable entrepreneurship, which are the main theme areas?

RQ3- What are the limits and gaps in the research about sustainable entrepreneurship?

The RQ1 seeks to emphasize the general traits or characteristics like publications frequency over the time, author and journal related information, research methodology, information related to Industry as well as country context of the research. RQ2 intends to determine the major themes around sustainable entrepreneurship. RQ3 aims to identify the limitations and research gaps in this topic. This study aims to deepen our comprehension of the connection between entrepreneurship and sustainability, alongside the challenges encountered from an Economy perspective. Such an investigation holds the potential to yield valuable insights for both managers and policymakers.

2. Methodology

Pittaway et al. (2004) and Rousseau et al. (2008) outlined the study that was structured to offer a clear methodology for conducting the review. The main objective was to identify and examine pertinent literature that addresses both sustainability and entrepreneurship simultaneously. This research endeavor

facilitated the provision of a descriptive and evaluative overview of the existing knowledge base concerning the intersection of these two subjects. A systematic literature analysis was conducted to unearth the various themes and sub themes of sustainability and entrepreneurship.

This methodology ensured a thorough and organized approach to collect, assess, and integrate pertinent information from diverse sources. The research sought to delve into the complexities inherent in sustainability and entrepreneurship within the business environment, investigating the nuances between these concepts and their ramifications for organizational strategies. The aim was to gain a comprehensive understanding of the evolving correlation between sustainability and entrepreneurship challenges, research gaps, and implications for contemporary business practices.

Our research methodology comprised a systematic literature review encompassing peer-reviewed journals, conference proceedings, and books. We conducted thorough searches utilizing keywords such as "sustainability and entrepreneurship". Articles were meticulously chosen based on their titles, abstracts, and keywords, with a focus on relevance and methodological robustness. We evaluated the quality of the studies and extracted essential information, organizing findings into thematic categories concerning people development and startups within modern business environments. This methodological approach facilitated a comprehensive examination of their interplay in today's dynamic global business arena. The subsequent actions have been executed. (Pittaway et al., 2004); (Spender et al., 2015)

- (i) The analysis team generated keywords related to the topic based on their collective expertise. These terms were generated through a brainstorming process and encompassed concepts such as entrepreneurship and sustainability.
- (ii) The keywords were assembled to form search strings. For instance, the initial search string utilized was: ("Entrepreneurship*") OR ("Sustainability*") AND (("innovation*") OR ("innovate*") OR (Entrepreneurship and Sustainability*)) AND ("AI and Innovation") AND ("Entrepreneurship and Innovation and Sustainability").
- (iii) An initial exploration of Google Scholar and ERIC was conducted using the aforementioned keywords to uncover additional keywords for the search. Supplementary terms like entrepreneurship challenges and opportunities, startups, and Artificial Intelligence were incorporated into the search criteria.
- (iv) Out of 53 papers – only 48 papers were included and 05 were excluded. Inclusion criteria for selecting studies included the presence of terms like " entrepreneurship " and " Sustainability " or "innovation" in articles and book chapters, written in English and having open access. Exclusion criteria comprised studies not written in English, only abstracts, Book Review and conference proceedings. List of selected studies were checked for duplicity and irrelevant materials which did not align to the study's focus of study's focus on entrepreneurship and sustainability.

3. Systematic Literature Review:

3.1 Key Words Analysis

5

5	Sustainable development and entrepreneurship: Past contributions and future directions	Journal of Business Venturing	(Jeremy K. et al., 2010)
6	The role of sustainable entrepreneurship in sustainability transitions: A conceptual synthesis against the background of the multi-level perspective	Administrative sciences	(Jacob Hörisch, 2015)
7	Doing business in a green way: A systematic review of the ecological sustainability entrepreneurship literature and future research directions.	Journal of Cleaner Production	(J Gast et al., 2017)
8	Sustainable entrepreneurship: A convergent process model. Business Strategy and the Environment	Business Strategy and the Environment	(Frank Martin Belz ¹ * and Julia Katharina Binder, 2017)
9	Sustainability entrepreneurs, ecopreneurs and the development of a sustainable economy	Greener management international,	(D Gibbs, 2006)
10	Social Entrepreneurship and Sustainability: A Conceptual Framework	Journal of Social Entrepreneurship	(Mohammed Faiz Kamaludin et al., 2021)
11	Market imperfections, opportunity and sustainable entrepreneurship.	Journal of business venturing	(Boyd Cohen et al., 2021)
12	Greening Goliaths versus emerging Davids—Theorizing about the role of incumbents and new entrants in sustainable entrepreneurship.	Journal of business venturing,	(Kai Hockerts a et al., 2010)
13	Sustainable entrepreneurship research: Taking stock and looking ahead	Business Strategy and the Environment	(Muñoz, P., & Cohen 2018)
14	Sustainability entrepreneurs: Could they be the true wealth generators of the future?	Greener Management International	(Fiona Tilley & William Young, 2006)
15	Social innovation and social entrepreneurship: A systematic review.	Group & Organization Management	(Wendy Phillipset al., 2015)
16	Learning apart and together: towards an integrated competence framework for sustainable entrepreneurship in higher education.	Journal of Cleaner Production	(Thomas Lanset al., 2014)
17	The new field of sustainable entrepreneurship: Studying entrepreneurial action linking “what is to be sustained” with “what is to be developed”	Entrepreneurship theory and practice	(Dean A. et al., 2011)
18	Promoting sustainable development: The role of entrepreneurship education	International Small Business Journal	(Fernando Lourenço, et al., 2013)

19	Entrepreneurship and innovation systems: Towards a development of the ERIS/IRIS concept	Enacting Regional Dynamics and Entrepreneurship	(Håkan Ylinenpää, 2013)
20	Sustainable entrepreneurship and sustainability innovation: categories and interaction	Business strategy and the environment	(Stefan Schaltegger ¹ et al., 2011)
21	Towards a conceptual understanding of sustainability-driven entrepreneurship	Responsibility and Environmental Management	(Stuti Haldar, 2019)
22	Sustainability-driven entrepreneurship: a literature review.	University of Leeds	(Bradley D. Parrish, 2008)
23	Entrepreneurship and sustainability: The need for innovative and institutional solutions.	Technological Forecasting and Social Change	(Adel Ben Youssef et al., 2018)
24	Sustainability in entrepreneurship: A tale of two logics.	International Small Business Journal	(Stefan Schaltegger et al., 2016)
25	Psychological capital and entrepreneurship sustainability.	Frontiers in Psychology	(Tang, J. J, 2020)
26	Entrepreneurship as a platform for pursuing multiple goals: A special issue on sustainability, ethics, and entrepreneurship.	Journal of Management Studies	(Markman, G. D., et al., 2016)
27	Entrepreneurship and sustainability: do they have anything in common?	Economics and Business Review	(Gawel, A., 2012)
28	Factors affecting entrepreneurship and business sustainability.	Sustainability	(Tur-Porcar, A et al., 2018)
29	Ecological entrepreneurship: sustainable development in local communities through quality food production and local branding.	Geoforum	(Marsden, T., & Smith, E., 2005)
30	Entrepreneurship and small business sustainability.	Southern African Business Review	(Ligthelm, A. A., 2010)
31	How Artificial Intelligence Drives Sustainable Frugal Innovation: A Multitheoretical Perspective	IEEE Transactions on Engineering Management	(Kannan Govindan, 2024)
32	Artificial intelligence components and fuzzy regulators in entrepreneurship development*	Entrepreneurship and sustainabilitycenter	(Sergii Bogachov et al., 2020)
33	Analysis of artificial intelligence-based technologies and approaches on sustainable entrepreneurship	Technological Forecasting and Social Change	(Brij B. Gupta et al., 2023)
34	Artificial intelligence and business models in the sustainable development goals perspective: A systematic literature review.	Journal of Business Research	(Di Vaio, A., et al. 2020)
35	Artificial intelligence for sustainability: Challenges, opportunities, and a research	International Journal of Information	(Nishant, R., et al., 2020)

	agenda.	Management	
36	Artificial Intelligence in the Urban Environment: Smart Cities as Models for Developing Innovation and Sustainability	Sustainability	(Anabel Ortega-Fernández et al., 2020)
37	Artificial Intelligence in the Industry 4.0, and Its Impact on Poverty, Innovation, Infrastructure Development, and the Sustainable Development Goals: Lessons from Emerging Economies?	Sustainability	(David Mhlanga, 2021)
38	Use of Artificial Intelligence in Terms of Open Innovation Process and Management.	Sustainability	(Kuzior, A., et al., 2023)
39	What contributions of Artificial Intelligence in Innovation?	Sustainability	(Yassine Barakat et al., 2021)
40	Achieving the Success of Sustainability Development Projects through Big Data Analytics and Artificial Intelligence Capability	Sustainability	(Haili Zhang, et al., 2020)
41	Artificial intelligence and business models in the sustainable development goals perspective: A systematic literature review	Journal of Business Research	(Assunta Di Vaio et al., 2020)
42	Artificial intelligence in innovation research: A systematic review, conceptual framework, and future research directions	Technovation	(Marcello M. Mariani et al., 2023)
43	How can artificial intelligence impact sustainability: A systematic literature review	Journal of Cleaner Production	(Arpan Kumar Kar et al., 2022)
44	Smart Manufacturing Systems and Applied Industrial Technologies for a Sustainable Industry: A Systematic Literature Review	Sustainability	(Raffaele Cioffi et al., 2020)
45	Barriers to the Adoption of Innovations for Sustainable Development in the Agricultural Sector—Systematic Literature Review (SLR)	Sustainability	(Laura Restrepo et al., 2023)
46	Influence of Artificial Intelligence in Civil Engineering toward Sustainable Development—A Systematic Literature Review	Sustainability	(Bilal Manzoor et al., 2021)
47	A solution looking for problems? A systematic literature review of the rationalizing influence of artificial intelligence on decision-making in innovation management	ELSEVIER	(Maria Cristina Pietronudo et al., 2022)
48	Employment of AI Tools in Achieving Sustainable Development Goals: Trends and	Springer	(Sharma, S. 2024)

	Future Scope		
49	Business Process Management and Digital Innovations: A Systematic Literature Review	Sustainability	(Tahir Ahmad & Amy Van Looy, 2020)
50	A Role of Artificial Intelligence in the Context of Economy: Bibliometric Analysis and Systematic Literature Review	International Journal of Membrane Science and Technology	(Majida Jrad, 2023)
51	The Promise of Entrepreneurship and Innovation as a Strategic Response to Global Turmoils	FIIB Business Review	(Raj K. Kovid, 2022)
52	Entrepreneurship and Innovation: How Leadership Style Makes the Difference?	Vikalpa	(Satyabir Bhattacharyya, 2006)
53	Book review: Social entrepreneurship and innovation in rural Europe	International Small Business Journal: Researching Entrepreneurship	(Ralph Richter et al., 2020)

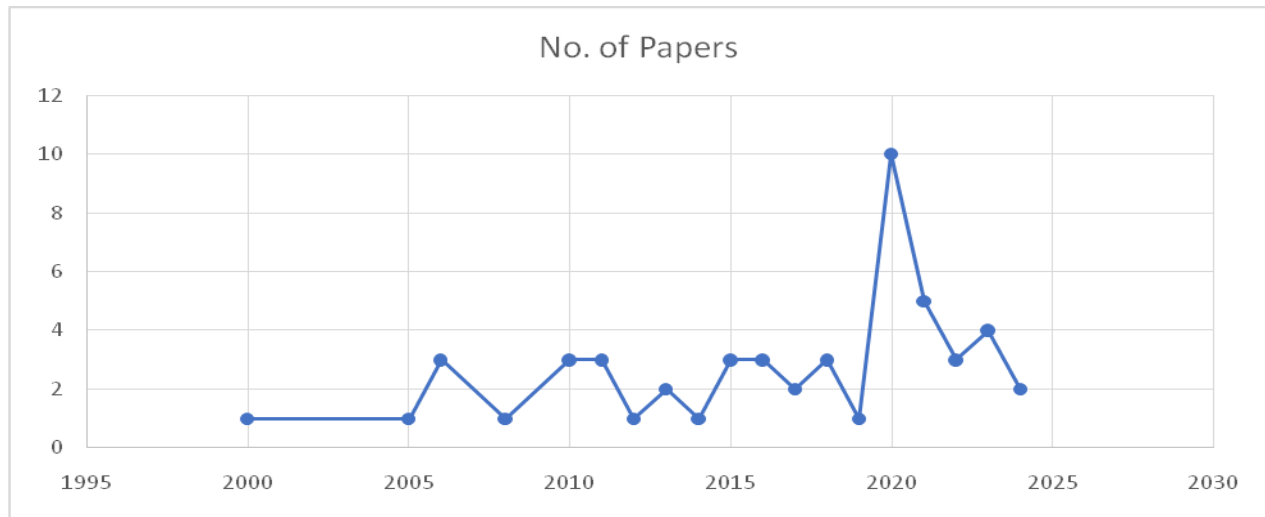
Source: Developed for the purpose of the study

3.2 Current Trends in Entrepreneurship and Sustainability

Research trends show that a wide range of subjects, including finance, technology, economy, innovation, and artificial intelligence, have been thoroughly examined in relation to sustainability and entrepreneurship. These studies' diverse scope emphasizes the need for a thorough grasp of sustainable development and entrepreneurship. In particular, there is a noticeable emphasis on elucidating the financial ramifications of sustainability and entrepreneurship, indicating the increasing recognition of innovation's economic significance. Several research works examine the relationship between sustainability and entrepreneurship, illustrating the changing environment in which economy is crucial. Sub-themes like Entrepreneurial hurdles and significant risk factors in startup ventures demonstrate the notable interest in integrating startups into various corporate frameworks. This illustrates a deliberate attempt to apply sustainability concepts to decision-making procedures. Researchers are also actively looking at the intersections between sustainability and entrepreneurship and global challenges, which shows that this is a relevant and timely way to understand how current events affect sustainable development.

Themes revolving around Sustainable Entrepreneurship, sustainable innovation, Technology, Artificial Intelligence and AI with sustainability reflect an acknowledgment of their societal impact and the crucial role of consumer perceptions in fostering sustainable business practices. A rising understanding of the complex relationship between innovation, technology, and economics is indicated by the inclusion of subjects like sustainability and entrepreneurship alongside innovation and technology. Scholars are examining the ways in which inventive tactics and advances in technology might promote the goals of startups.

Figure 2: Figure showing the year and frequency of occurrence for the given research papers



The above figure (Figure 2) represents the distribution of publications across various years. It indicates the number of research papers published each year, ranging from 2000 to 2024. There are 48 articles overall, with significant peaks in 2020 that indicate the fluctuations in the amount of research produced over the years.

3.3 Search Strategy

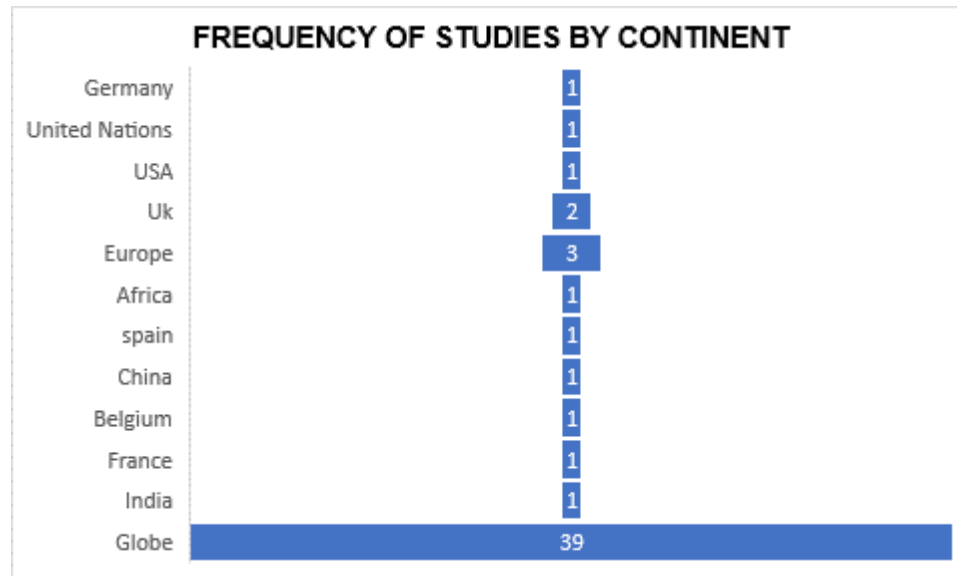
Table 2: Search Strategy (Keywords, Databases, And Inclusion/Exclusion Criteria)

A – KEYWORDS (KW)	KW1 – “entrepreneurship sustainability”
	KW2 – “entrepreneurship sustainable development”
	KW3 – “entrepreneurship + sustainability + INNOVATION + artificial intelligence”
	KW4 – “Entrepreneurship+ Innovation + Sustainability”
	KW5 – “entrepreneurship + sustainability”
B – SEARCH ENGINES/ DATABASES (DB)	DB1 – Google Scholar
	DB2 - ERIC
C1 – EXCLUSION CRITERIA (EC)	EC1 – any of the selected keywords not appeared in the title, abstract, keywords, full text
	EC2 – Books, conference preceding, editorials
	EC3 – Not in English
	EC4 – duplicate studies
C2 – INCLUSION CRITERIA (IC)	IC1 – any of the selected keywords appeared in the title, abstract, keywords, full text
	IC4 – be in the English language

Source: Developed for the purpose of the study

3.4. Distribution of Research Studies by Region

Figure 3: Frequency Distribution by Continent

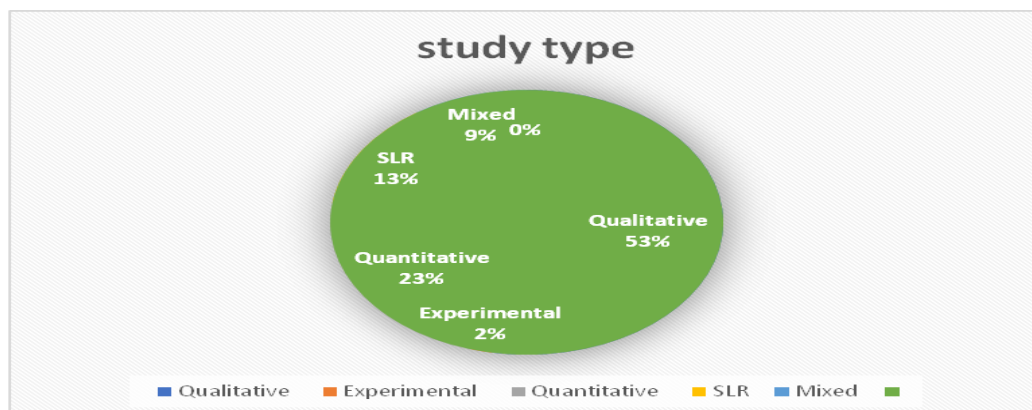


Source: Developed for the purpose of the study

The figure above highlights that the majority of research studies focus on the Sustainable Entrepreneurship at a global level. In terms of regional studies, the highest number have been conducted in Europe, followed by UK, and then studies that span multiple continents. The global focus on Sustainable Entrepreneurship reflects a growing recognition of the importance of addressing the challenges faced by the Economy for sustainable development worldwide.

3.5 Types of studies

Figure 4: Types of Studies



Source: Developed for the purpose of the study

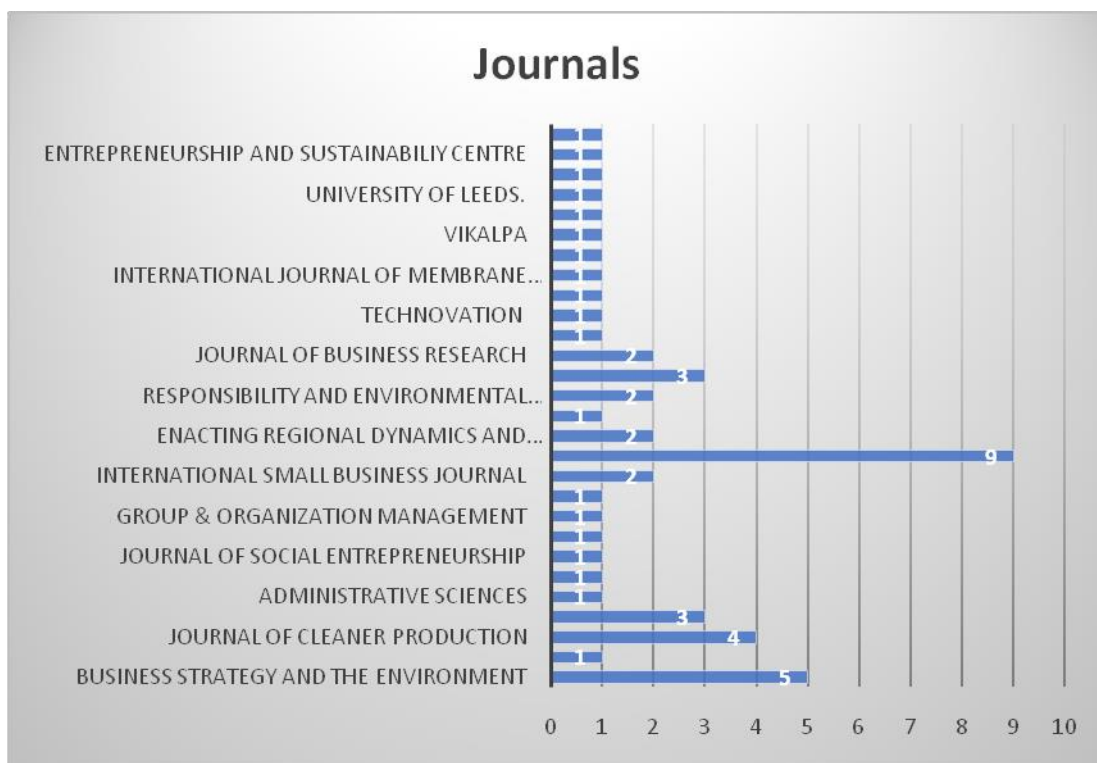
The different study types that were part of the analysis are broken down in Fig 4. There are 53% of qualitative research, which suggests that the literature places a high priority on in-depth investigation and

comprehension of phenomena. with over 53% Additionally common were quantitative studies that emphasized numerical data and statistical analysis. While less popular, other study types including systematic literature reviews (SLR) with 13%, mixed-methods approach with 9%, and experimental with 2% nonetheless made a significant contribution to the body of knowledge on sustainable entrepreneurship.

3.6 Major Journals supporting the Research

The graph (Figure 5) displays how many times papers about Sustainable Entrepreneurship have been published in various journals. It is the " Sustainability" journal that puts out the most, with 09 publications. The journal "Business Strategy and the environment" puts with 05 and "Journal of Cleaner Production" has come out 04 times. The "International Small Business Journal," " journal of business venturing ", "Technological Forecasting and social change" all these come out with 03 and the "Journal of Business Research", Administrative Sciences, Economics and business Review have also written about this subject, though not as often (one publications in each). This demonstrates that there is a significant quantity of research being carried out and published in a variety of journals on the subject of Sustainable Entrepreneurship. This is a reflection of the significance and interest that is being shown in this area of educational research.

Figure 5 – Frequency of Publication in various Journals



Source: Developed for the purpose of the study.

3.7. Thematic Analysis

Table 3: Theme	Source	Frequency	Paper Numbers
<i>Sustainable Entrepreneurship and Innovation</i>	(Stefan Schaltegger & Marcus Wagner, 2011; Schaltegger, S., et al., 2006; Larson, 2000; Håkan Ylinenpää, 2013; Stefan Schaltegger et al., 2011; Raj K. Kovid, 2022)	6	1,2,3,19,20,51
<i>Sustainable Innovation</i>	(Richard Adams et al., 2015; Laura Restrepo et al., 2023; Tahir Ahmad & Amy Van Looy, 2020)	3	4,45,49
<i>Sustainable entrepreneurship</i>	(Jeremy K. et al., 2010; Jacob Hörisch, 2015; J Gast et al., 2017; Frank Martin Belz & Julia Katharina Binder, 2017; D Gibbs, 2006; Boyd Cohen et al., 2021; Kai Hockerts et al., 2010; Muñoz, P., & Cohen 2018; Fiona Tilley & William Young, 2006; Thomas Lanset et al., 2014; Dean A. et al., 2011; Fernando Lourenço, et al., 2013; Stuti Halder, 2019; Bradley D. Parrish, 2008; Adel Ben Youssef et al., 2018; Stefan Schaltegger et al., 2016; Tang, J. J, 2020; Gaweł, A., 2012; Tur-Porcar, A et al., 2018; Marsden, T., & Smith, E., 2005; Ligthelm, A. A., 2010; Raffaele Cioffi et al., 2020)	22	5,6,7,8,9,11,12,13,14,16,17,18,21,22,23,24,25,27,28,29,30,44,
<i>Sustainable and Social entrepreneurship</i>	(Mohammed Faiz Kamaludin et al., 2021; Markman, G. D., et al., 2016; Kuzior, A., et al., 2023)	3	10,26,50
<i>Social entrepreneurship and Innovation</i>	(Wendy Phillipset al., 2015; Ralph Richter et al., 2020)	2	15,53
<i>AI and Sustainability Entrepreneurship</i>	(Kannan Govindan, 2024; Sergii Bogachov et al., 2020; Brij B. Gupta et al., 2023)	3	31,32,33
<i>AI and Sustainability</i>	(Di Vaio, A., et al. 2020; Nishant, R., et al., 2020; Anabel Ortega-Fernández et al., 2020; David Mhlanga, 2020; Haili Zhang, et al., 2020; Assunta Di Vaio et al., 2020; Arpan Kumar Kar et al., 2022; Bilal Manzoor et al., 2021; Sharma, S. 2024)	9	34,35,36,37,40,41,43,46,48
<i>AI and Innovation</i>	(Yassine Barakat et al., 2021; Marcello M. Mariani et al., 2023; Maria Cristina Pietronudo et al., 2022; Satyabir Bhattacharyya, 2006)	4	38,39,42,47

Source: Developed for the purpose of the study

The table above (Table 3) provides a comprehensive breakdown of research papers across various themes related to Sustainable Entrepreneurship in the field of business and economy. It outlines the number of papers associated with each theme, offering insights into the distribution of academic focus. The table indicates that researchers have delved into a diverse range of topics within this domain.

For instance, the theme of "Sustainable Entrepreneurship" is a prominent area of exploration, with 22 papers addressing this aspect. Similarly, the "Artificial Intelligence" theme has garnered attention with 9 papers. Other theme, such as "Sustainable Entrepreneurship and Innovation " draw the attention by 6 papers. Similarly, "Artificial Intelligence and Innovation", "Sustainable Innovation", "Social Entrepreneurship and Innovation", and "Artificial Intelligence and Sustainable Entrepreneurship " each represent specific dimensions explored in the academic landscape.

The table reflects a comprehensive and multifaceted exploration of Sustainable Entrepreneurship topics, showcasing the breadth of research within the broader context of Sustainable Entrepreneurship and Economy. It shows that the researchers are evidently investigating various facets, including disclosure and reporting, financial implications, firm characteristics, investment strategies, innovation, social impacts, challenges, and integration into valuation models.

4. Conclusion & Limitations

To conclude this paper, the research on sustainable entrepreneurship has experiences a considerable development during the last few years or we can say that after the Brundtland report. Given the demanding need for the detailed sustainable evolution, a more productive development of this field is essential. This paper provides an overview of the state of business literature research on sustainability orientation. To determine the parameters of this research, we first formulated three research questions. Subsequently, we utilized the SLR technique to provide a comprehensive overview of the corpus of information generated in this area of research thus far. In order to determine the descriptive and thematic foci of the 53 published works on this subject, we employed a clear and rigorous review methodology. Using content analysis, we discovered a few major themes, that is, sustainable and social entrepreneurship, sustainable innovation, AI and sustainability entrepreneurship, AI and innovation. Additionally, this review goes beyond summarizing the state of the art. It makes recommendations for future directions for study to overcome constraints and gaps in knowledge in order to further advance in within this area of study.

At the final stage with other studies, this paper has its limitations. First, being comprehensive in its kind, this SLR may not include all the work related on “sustainable development”, and “Sustainable Entrepreneurship” as well as related areas and therefore could be evaluated. However, by means of a thorough and clear search process, an as complete as possible literaturesample was identified and analyzed subsequently. Second, we collect the articles only from Google scholar and ERIC, as we are not having access to Scopus and Web of Science or other related articles.

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Role of Ecotourism in Creating Sustainable Employment in the Remote Tourist Destinations of North Bengal: An Empirical Study

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Abstract

Forests, Rivers, Mountains, Tea Gardens, National Parks and Beautiful Valleys are among the best tourist attractions of North Bengal. The region offers irresistible experience to tourists who enjoys several tourism immersions starting from leisure stay to adventurous travel. People from all around the world gets attracted by the beauty of North Bengal. There are several remote tourist destinations in this region that must be explored by all the tourists. This research paper takes into consideration four of those destinations namely, Paren, Jhalong, Samsing and Rocky Island. The aim of this research work is to explore different employment opportunities created by ecotourism projects in this tourist destinations. The research paper also aims to analyse the prospective impact of working conditions on financial wellbeing of local people living in and around the ecotourism projects in these four places. Exploratory Factor Analysis has been performed on primary data. Structural Equation Modeling has been utilised to estimate causal relationships between the identified factors. It has been observed from the study that governmental and non-governmental organizations need to take prolific initiatives in enhancing tourism conditions in the remote tourist destinations of North Bengal. Working conditions and financial status of the local people in these regions are found to be not at par.

Keywords: Employment opportunities, working condition, financial status, financial wellbeing, tourist destinations.

1. Introduction

According to United Nation World Tourism Organization (UNWTO), ecotourism is that variant of tourism in which the tourists observe and appreciate beauty of nature. The tourists also appreciate cultural values of the areas. The ecotourism industry consists of educational features and the service is managed by small local groups. Ecotourism activities are to be aimed at minimization of negative impacts upon natural and socio-cultural environment. Ecotourism supports local communities by generating alternative employment and income opportunities. The aim of ecotourism is to enhance awareness about importance of natural conservation among both the tourists as well as locals.

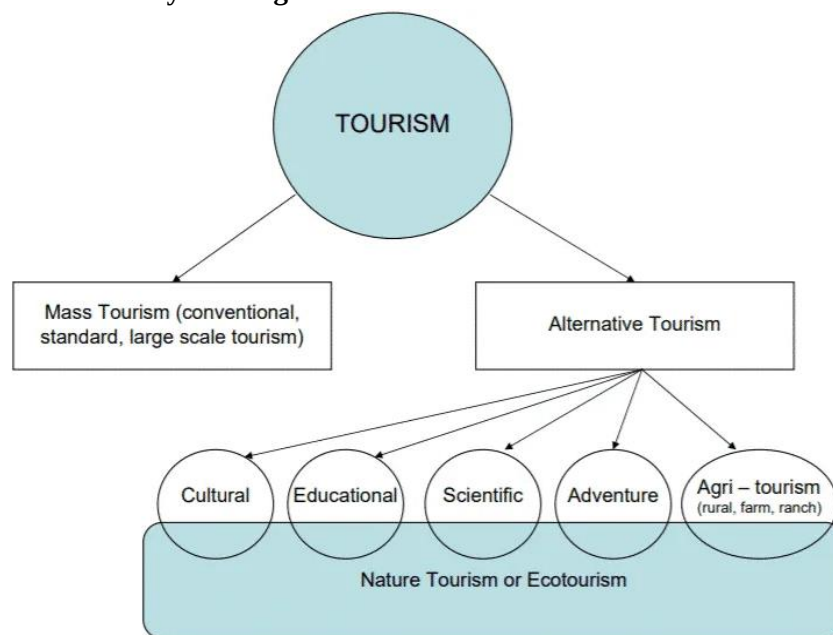
The International Ecotourism Society (TIES) coins ecotourism as responsible travelling. The ecotourists are required to be well-aware about protection of natural environment. The international ecotourism network should ensure responsible travel with maximum wellbeing to local communities. The primary role of global ecotourism network is to spread education about importance of ecotourism.

Moving in the same flow, the Australian National Ecotourism describes ecotourism as an “ecologically sustainable” tourism. They have described the primary focus of ecotourism on experiencing natural areas that preserves environment. Ecotourism is that concept which also understands, appreciates and promotes protection of remote cultural values.

Hetzer (1965) had first set forward the definition of ecotourism. Four factors of ecotourism were presented by him during that period. The factors were reduction of negative environmental effects, privilege to local cultures, increasing benefits to the indigenous communities and enhancing travellers’ enjoyment. Miller (1978) in his book had mentioned about importance of developing national parks in ecological growth. A definition of ecotourism can also be found in a work by Ceballos-Lascurin (1987). He had defined ecotourism as visits to undisturbed and untouched natural places for the purpose of studying, enjoying natural phenomenon and admiring nature. Ecotourism is also about respecting values of the local communities.

Taking note of all the above conceptualisation, it can be stated that ecotourism is responsible tourism to green or natural areas. The motives of ecotourism are reduction of harmful impacts of tourism on the natural environment, preservation of biodiversity, ensuring benefits to local people and conservation of cultural heritage in the area.

Figure 1: Necessary Paradigm Shift from Conventional Tourism to Ecotourism



Source: <https://tourismnotes.com/eco-tourism/>

Mass or conventional tourism leads to overcrowding that destroys the values of the indigenous society. It gives rise to ecological disturbances and destruction. Overcrowding in natural areas also results in disruption of indigenous people’s authenticity, privacy and dignity. Misbehaviour from visitors due to overcrowding, at times, harm human’s quality of life in the host areas. Crime incidences related to drugs and alcohol, prostitutions etc can also take place (Uttarakhand Open University, 2022).

There has been a necessity for an alternate tourism that can decrease the negative impacts of mass tourism. According to Fennell (2002) an alternative approach towards mass or conventional tourism is so called as alternative tourism. As per his point of view, there are critically five subdivisions of alternative tourism. They are cultural tourism, educational tourism, scientific tourism, adventure tourism and agricultural tourism. Cultural tourism is that type where people visit different places to

learn cultural values. Educational tourism is the one in which tourists visit places to acquire knowledge about different aspects of the location and for gathering facts for any type of research projects. Scientific tourism indicates visiting any location for collecting scientific knowledge about that place. Adventure tourism is for those types of people who loves to take challenges and explore several adventurous activities in places of the nature. The last component of alternative tourism, that is agricultural tourism, signifies exploring various process of producing agricultural items like crops, grapes or vines.

As evidence from Fennell's work, the above components are equalised to those of ecotourism. Thus, ecotourism can be termed as an alternative to the mass tourism.

In a nutshell, compressing the several definitions and conception provided by various agencies and researchers, the components of ecotourism can be as follows:

1. Natural based component
2. Sustainable management component and
3. Educational or Interpretation component (Diamintis, 2010).

2. Present Scenario of Ecotourism

India is a land of varied geography. In this country, there are several options for the tourists to come nearer to the Mother Nature. Indian topography consists of plentiful source of lush green places. There are many endangered and rare species in the surroundings. There are biological and zoological parks, wildlife sanctuaries, tea plantations, beautiful mountains and dense forests in India that makes it an attractive ecotourism destination to explore. The ecotourism industry in India is flourishing because the country has saved its mesmerizing nature. Along with several locational beauties, India is also enriched in cultural heritage and values of the tribal population. The first planned ecotourist destination in India is Thenmala, Kerala that was created with the objective of fulfilling needs of the eco-tourists. Thenmala is a government facility and is also a World Heritage Site of the UNESCO. The natural site offers cultural, adventurous and leisure activities to the ecotourists. This ecotourism project focuses on preservation and protection of nature and enhancement of natural beauties (Thenmala Ecotourism Promotion Society (TEPS), 2023). To bring about overall development of tourism in the country, the Indian Government has taken many initiatives. The ecotourism industry in states such as Uttaranchal, Himachal Pradesh, Jammu and Kashmir and Sikkim has been designated as “thrust industry” by the Indian government (IBEF, 2023). West Bengal ecotourism has huge prospect of evolving as a liaison between natural conservation and economic growth. There are several numbers of wildlife sanctuaries and national parks like Sunderban National Park, Jaldapara National Park, Gorumara National Park, Neora Valley National Park, Singalila National Park, Buxa Tiger Reserve, Rasikbil Bird Sanctuary and many more. However, the policy guidelines of Central Government do not allow for conventional tourism in the surrounding areas of National parks and Sanctuaries. In this regard, the West Bengal Tourism has taken several initiatives to promote sustainable tourism by working in proximity with the indigenous communities. North Bengal region is comprised of six districts, namely, Coochbehar, Jalpaiguri, Darjeeling, Uttar Dinajpur, Malda and Dakshin Dinajpur. There is enormous tourism prospect in North Bengal as this region is geographically enriched with mountains and forests. There are people and places from various cultures in North Bengal. The region includes several beautiful cities full of natural flora and fauna. Some of the beautiful cities of North Bengal that is full of natural factors are Cooch Behar, Darjeeling, Hasimara, Balurghat, Darjeeling, Alipurduar, Malda, Malbazar, Kalimpong and Raiganj (Northbengaltourism.com).

3. Statement of the Problem

Ecotourism in India must be promoted as it not only improves tourism industry but also encourages environmental conservation strategies. Ecotourism initiatives can be directly linked to initiatives for raising social, political and cultural awareness in remote areas. Ecotourism industry in India faces several challenges to its desired positive outcome. The foremost challenge that the industry faces is the lack of effective marketing strategies. Improper marketing activities hinder proper promotion of ecotourism projects. Lack of well-trained ecotourist guides has created another challenge for ecotourism projects. Training and educational programs for ecotourist guides are not provided in abundance. Many tourists lack awareness towards importance of responsible travel in ecotourism destinations. Due to lack of awareness about ecotourism, social and cultural values of local people may be ignored. The local inhabitants around ecotourism projects may not be the ultimate beneficiaries of infrastructural development. Increasing growth of tourists' interests towards ecotourism industry may eventually convert ecotourism into mass tourism.

4. Significance of the Study

Ecotourism can generate employment for the local people. The different job opportunities can be in the form of general staffs in the nature resorts, cooks, cleaners, drivers and so on. The income that the local people would generate from these jobs may be of higher amount than they would otherwise earn by following their traditional livelihood. Education can be provided to the local people for helping them to prepare as ecotourist guides. The local people can get opportunities to learn many things to which they might not have been exposed otherwise.

Ecotourism concept is growing and is gradually finding a noticeable place in the tourism industry especially in the developing countries. Although ecotourism in West Bengal has been growing, yet the sector needs to be assessed from every aspect. Both positive as well as negative dimension of the arena must be evaluated. Findings of this study will reveal future prospect of ecotourism in North Bengal and will also measure sustainability of the industry.

5. Literature Review

There has been an immense concern about the present and future prospect of ecotourism in the world economy since this concept received recognition. Academicians, social groups, forest conservation and wildlife protection agencies, travel agencies, local indigenous people and the state and central government have depicted their keen interest on studying and supporting ecotourism. Deb and Rout (2023) in their research article titled "Identifying the Determinants of Ecotourism Potential: An Investigation of Reiek in Mizoram" had investigated the factors that determines potential of ecotourism. After their thorough study, they had come into a conclusion that although Mizoram has strong prospect of ecotourism, government policies should be framed to discover and develop more and more ecotourist destinations. Yoon and Lee (2023) had conducted a study on residents' attitude towards ecotourism in their research work titled "The effect of ecotourism knowledge on residents' attitudes in Otavalo, Ecuador: the knowledge theory of attitude-behavior consistency". They had used knowledge theory to assess the attitude and had found that supportive behaviour and belief of the residents are the most fundamental requirements for ecotourism development in that area. Sica, Sisto and Santo (2022) in their research article titled "Are Potential Tourists Willing to Pay More for Improved Accessibility? Preliminary Evidence from the Gargano National Park" has marked in the conclusive part of their study that only a very few tourists were willing to spend extra amount for availing accessibility to remote ecotourist destinations. A study on the interests of tourists in ecotourism related activities was conducted by Gurung and Seeland (2008) in Bhutan. Back then, it was found by the authors that if young tourists

can be attracted in the country by focusing on ecotourism related activities then the Gross National Happiness Factor can get positively affected. The thesis titled “Impact of Ecotourism on Village Economy and Society in Sikkim” submitted by Oommen (2016) had the objective to assess the possibility of ecotourism as an alternate livelihood in Sikkim. The researcher observed that ecotourism offers the Sikkim villagers an alternative source of income and reduces their complete dependence on their natural habitat for sustenance. Tripathi and Jain (2017) in their article titled “Opportunities and Challenges of Ecotourism with Reference to its Employability Potential: Uttar Pradesh, India” have enumerated the various challenges and opportunities being faced by the ecotourism industry in Uttar Pradesh. Their findings revealed that presence of natural and cultural phenomenon depicts an essential role in the success of ecotourism. Debnath and Saha (2019) in their article titled “Potential Benefit of Eco-tourism of Dooars in Alipurduar District of West Bengal” have presented a detailed study of the potential advantages of ecotourism in the selected area. The identified benefits are enhancement of income source, infrastructural development, mixture of culture, sustainable uses of resources, gaining international knowledge, handloom and handicrafts market, area promotion and earning of foreign currencies. Vinodan and Manalel (2011) had recognised ecotourism as an important tool for economic development as it plays a major role in development of local community. The authors had recognised ecotourism as an environmentally and economically sustainable mechanism through their research work.

There are numerous research articles published in this domain in the international, national and state level. But very few have focused quantitatively on analysing the potential of ecotourism industry in changing standard of living of beneficiary communities. The present research is focused in critical analysis of the role of ecotourism industry in creation of direct and indirect employment opportunities among local people living in and around ecotourism projects in the remote and unconventional travel destinations of North Bengal.

6. Research Objectives

- 1) To identify different employment opportunities created by ecotourism projects in the remote tourist destinations of North Bengal.
- 2) To measure financial wellbeing of local people living in and around ecotourism projects in the remote tourist destinations of North Bengal.
- 3) To develop a model of causal relationship among working conditions, financial plan and financial well-being using structural equation model.

7. Research Methodology

Exploratory research approach has been followed in the study. Since the effect of ecotourism projects on local people is not clearly identified through past literature survey, thus exploratory approach has been followed. This research approach helps to generate better understanding about the existing research problem. Survey through scheduled questionnaire has been undertaken inside the ecotourism projects and in the surrounding areas. The official website of the North Bengal Tourism provides information about 26 alluring remote and offbeat tourist destinations of Dooars spreading around the foothills of Himalayas (North Bengal Tourism, 2023). For conducting research, the remote and unconventional areas of Dooars tourism have been considered. The ecotourism projects have been selected after making sure that they have no impact on harming the environment.

Out of the 26 destinations, 4 destinations namely, Jhalong (District: Kalimpong), Paren (District: Darjeeling), Rocky Island (District: Darjeeling) and Samsing (District: Jalpaiguri) have been considered for this research paper. The destinations have been visited in person and specific ecotourism projects

have been identified. Data related to employment generation and financial wellbeing have been collected from employees of the ecotourism projects and local people living around the projects undertaking tourism related jobs. A considerable number of lodges and homestays are unregistered in the offbeat regions. Due to this the exact number of local people who are affected by ecotourism activities could not be calculated. Our research study has 12 variables, so, at least sample size of 120 (no. of variable x 10) is required to use SEM (RVSPK, Priyanath and Megama, 2020). Thus, as per this rule of thumb, 324 samples are quite a good number. Data reliability test, exploratory factor analysis and confirmatory factor analysis have been performed on the collected data set using SPSS software.

Statement of Hypothesis

H_{a1}: Working condition of local people has a direct impact on their financial plan

H_{a2}: Financial plan of the local people has positive relationship with financial wellbeing

H_{a3}: Working condition of the local people has a direct impact on their financial wellbeing

8. Data Analysis

The data analysis portion consists of three sections, namely factor analysis including reliability and validity test of data set, confirmatory factor analysis and structural equation model. Results and interpretations have been included in each of the sections.

8.1 KMO and Bartlett's Test

Table 1: KMO and Bartlett's Test

Items		Estimate
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.860
Bartlett's Test of Sphericity	Approx. Chi-Square	1466.664
	Df	66
	Sig.	.000

Source: Authors' Calculation

8.2 Reliability Statistics

Table 2: Reliability Statistics

Cronbach's Alpha Value	N of Items
.856	12

Source: Authors' Calculation

The Kaiser-Meyer-Olkin test and Bartlett's test results are acceptable indicating adequacy of the sample and the variables are correlated. Value of Cronbach's alpha also indicates good reliability statistics as the value is greater than 0.8.

8.3 Percentage of variance explained

Table 3: Percentage of variance explained

Compon ent	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.950	41.253	41.253	4.950	41.253	41.253
2	1.140	9.497	50.750	1.140	9.497	50.750
3	1.093	9.106	59.856	1.093	9.106	59.856
4	.833	6.940	66.795			
5	.762	6.352	73.148			

6	.739	6.158	79.305			
7	.652	5.431	84.736			
8	.485	4.038	88.774			
9	.435	3.626	92.399			
10	.404	3.366	95.765			
11	.304	2.535	98.301			
12	.204	1.699	100.000			

Source: Authors' Calculation

For analysis and interpretation, we are concerned about the initial Eigenvalues and Extracted Sum of Squared Loadings. According to initial Eigenvalues, the first three components have values more than 1 and the same three components account for certain percentage of variance as per extracted sum of squared loadings. Thus, these indicates that only three components are enough to represent the features depicted by all the twelve variables.

8.4 Rotated Component Matrix

Table 4: Rotated Component Matrix

<u>Variables</u>	<u>Component</u>		
	<u>1</u>	<u>2</u>	<u>3</u>
Financial freedom (FW1)	.856		
Control over every day finance (FW2)	.849		
Capacity to absorb financial shock (FW3)	.751		
Well track of financial goals	.613		.434
Managing of daily expenses well (FW4)	.589		
Meeting financial obligations	.549		.506
No borrowings (FP1)		.794	
Good savings (FP2)		.729	
Good financial plans (FP3)		.547	
Flow of Income (WC1)			.828
Sustainability of work (WC2)			.441
Lower proportion of debt to income (WC3)			.436

Source: Authors' Calculation

The above result shows that twelve variables have positively loaded in the three components. However, 'well track of financial goals' and 'meeting financial obligations' have been loaded repetitively in two components each which is not acceptable. Thus, for confirmatory factor analysis and structural equation model, these two variables will not be considered.

8.5 Structural Equation Model

Figure 2: Structural Equation Model

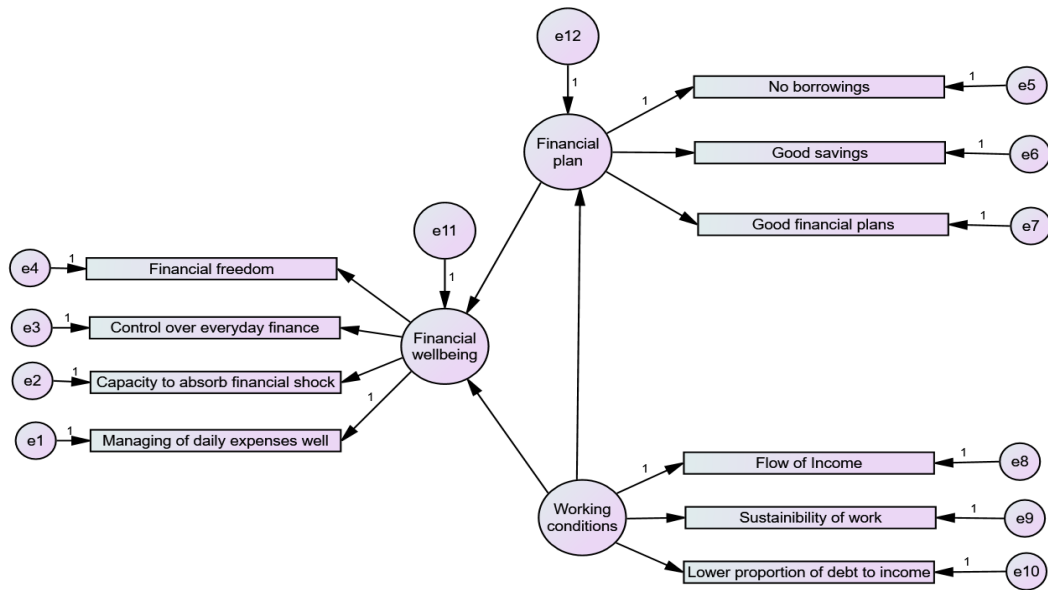


Table 5: Structural Equation Model Fit Parameters

Parameter	Revelation	Expected Result	Observed result
CMIN/DF	Chi-Square divided by Degrees of freedom	< 5: Reasonable fit	3.048
RMSEA	Root Mean Square Error of Approximation	0.08 to 1.00: Acceptable fit	0.092
GFI	Index of Goodness of Fit	> 0.90: acceptable fit	0.932
CFI	Index of Comparative Fit	> 0.90: acceptable	0.904
TLI	Index of Tucker Lewis	> 0.90: reasonable	0.919

Source: Authors' Calculation

According to the Chi-square value (CMIN), the model is reasonably fit as the value is less than 5 but more than 3. (Marsh & Hocevar, 1985). Goodness of fit index (GFI) indicates that the model is reasonably fit as the value is more than 0.9 but less than 0.95 (Hu & Bentler, 1998).

Comparative fit index (CFI) indicates that the model is an acceptable fit as the value is more than 0.9 but less than 0.95 (Fan, Thomson and Wang, 1999). The root mean square error of approximation is at the borderline as the value is in the range of 0.08 to 0.1 (MacCallum et al, 1996). Index of Tucker Lewis is in the reasonable range, that is greater than 0.90 (Tucker and Lewis, 1973).

8.6 Regression Weights

Table 6: Regression Weights

			Estimate	S.E.	C.R.	P	Result
Financial_plan	<---	Working_conditions	5.335	2.417	2.207	0.000***	Supported
Financial_wellbeing	<---	Financial_plan	.219	.342	.642	.521	Not supported

			<u>Estimate</u>	<u>S.E.</u>	<u>C.R.</u>	<u>P</u>	<u>Result</u>
Financial_wellbeing	<---	Working_conditions	3.746	2.792	1.342	.180	Not supported

Source: Authors' Calculation

From the above findings it can be inferred that only the alternative hypothesis H_{a1} is accepted. So it indicates that working condition has a direct impact on financial plan of the local people. The other two hypotheses are not being accepted. It indicates that financial plan does not have positive impact on financial wellbeing of the local people. Working conditions are not directly putting any impact on financial wellbeing of the local people.

8.7 Further Analysis

Since the impact of financial plan on financial wellbeing has appeared to be insignificant, thus further test will be performed. Pearson Chi-square test will be conducted taking good financial plan as the impacting variable and financial freedom as the impacted variable. The degree of association between these two variables has been tested as under:

8.8 Chi-Square Test

Secondary Hypothesis 1: Financial planning of local individuals affects their regular activities involving funds, that is financial freedom.

Null Hypothesis: There is no significant association between good financial planning and financial freedom

Alternative Hypothesis: There is significant association between good financial planning and financial freedom

Table 7: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	139.589 ^a	16	.000
Likelihood Ratio	145.528	16	.000
Linear-by-Linear Association	52.626	1	.000
N of Valid Cases	324		

Source: Authors' Calculation

8.9 Findings

As per the p-value of Pearson Chi-Square which is less than 5% level of significance, null hypothesis is hereby rejected indicating that there is an association between good financial plan and financial freedom.

Secondary Hypothesis 2: Sustainability of work of local individuals affects financial freedom of their lives

Null Hypothesis: There is no significant association between sustainability of work and financial freedom

Alternative Hypothesis: There is significant association between sustainability of work and financial freedom

9. Findings and Conclusion

Financial wellbeing of local people living in and around various ecotourism projects in Jhalong, Paren, Samsing and Rocky Island, can be measured by four observed variables, namely, financial freedom, control over every day finance, capacity to absorb financial shock and managing of daily expenses well. Data set has been validated and reliability test has been performed. The results are favourable in both the cases. But few of the observed variables had to be removed due to their unacceptable metrics. Further studies can be conducted considering same variables but in the different geographical location and also with a bigger number of samples. Financial planning and working conditions have been identified as the factors that impact financial wellbeing of local people in four remote and unconventional areas of North Bengal.

Regression weights of the relationship between working conditions and financial wellbeing; and financial plan and financial wellbeing are not supported by the model. This may be because financial wellbeing of the local people is inherited by them from their ancestors possessing land and other valuable assets. So, their present working conditions do not define their possessed financial wellbeing. Their present working condition determines their financial plan. Further research activities can be undertaken to assess the reason behind such discrepancy.

The very objective of the research work was to assess firstly the different types of employment opportunities created by ecotourism in the selected four remote tourist destinations of North Bengal. On assessing the direct employees of the ecotourism projects, it was noticed that most of the workers are working on full-time basis. They receive monthly salaries and moderate bonuses during festive seasons. It was observed during the primary survey in the regions, that there are only a few local shops around the ecotourism projects in the areas. Most of the shop owners were very new in their areas of work. Annual turnover of the shops barely crosses 1,50,000 INR on an average. However, the local cab drivers' earnings have been observed to be surging during peak tourist season, that is during the period from October to March. Another important discovery from the local survey was that the sustainability factor of the businesses is very poor. The business owners have mentioned during the survey that most of their customers are the local people and not the tourists. From such a finding, it can be understood that the role of ecotourism in generating indirect employment opportunities for the local people is moderate. The state government and other governmental and non-governmental agencies should take appropriate measures about sustainable nature of ecotourism projects in the remote tourist destinations of North Bengal for popularizing ecotourism concept in the state.

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Factors Affecting Women Entrepreneurship in West Bengal: Comparison of SHG members with non SHG members

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ABSTRACT

In this study we examined how women perceive entrepreneurship differently depending on their gender, confidence level, access to capital, network and relationships, childcare, and involvement in self-help groups, data was collected from two groups of women, dividing them into those who belong to self-help groups and those who do not, from five different West Bengal districts. The analysis shows that perceptions like gender bias, less respect for female entrepreneurs, lack of accessible capital, lack of women owned property are not deterring female entrepreneurship. Rather lack of confidence in own business skill, financial support from family and inadequate public connection poses hurdles. Factors like flexible working hours, lack of safety in outside work positively influence female entrepreneurship.

KEYWORDS: SHG, Barriers of Entrepreneurship for women, Role of gender (societal norms), and acquiring market opportunity for women.

1. Introduction

The issue of female participation in the labour force holds significant importance. The concept of women's empowerment aims to increase their involvement in the workforce; various barriers hinder their entry into it. An alternative avenue could be entrepreneurship, which involves self-employment and reduces the likelihood of job loss due to irregular availability caused by household and familial responsibilities. The purpose of the study is to identify the factors influencing the participation of women in entrepreneurial activities. The studied group comprises of both SHG members and non-members. The nature of the study requires a cross-sectional survey method and comparison analysis to assess the levels of influence of different factors.

2. Literature Review and objective of the study

There is lot of research about influencing factors behind female entrepreneurship. The importance of education policies for development of financial and numerical skills which can enhance entrepreneurial intentions among women (Llados et al., 2021). Women entrepreneurs play an

important role in dismantling the challenges for which they become the mediators between their business and central institution in society (Hashim *et.al.*, 2023), Agarwal *et.al.* (2024) found that regulatory obstacles, financial limitations, mentorship opportunities and also poor infrastructure and technology cause obstacles to be entrepreneur. Inverse relationship between entrepreneurship and unemployment was founded out by Musa (2013), Sarfraj *et. al.* (2014) investigates how gender related economic development and women entrepreneurial activity are related. Rajasekaran *et.al.* (2013) showed that entrepreneurship of women with the help of SHG expanded and contributed impressively in society's development. Das *et.al.* (2015) shows that women entrepreneurship in three districts of West Bengal expanded with the help of self-help group despite social and economic barriers. Chatterjee and Datta (2020) showed that state help, financial access and existence of marketing opportunity are necessary for entrepreneurial success.

All of the above literatures pointed out different factors influencing women entrepreneurship and impact of SHG. Our focus of the study is to find scenario of West Bengal in 2021 in this context based on five districts of West Bengal: Jalpaiguri, Maldah, Murshidabad, Bankura and Purulia which has not been done so far.

we have collected data from two groups of women, dividing them into those who belong to self-help groups and those who do not, from five different West Bengal districts.

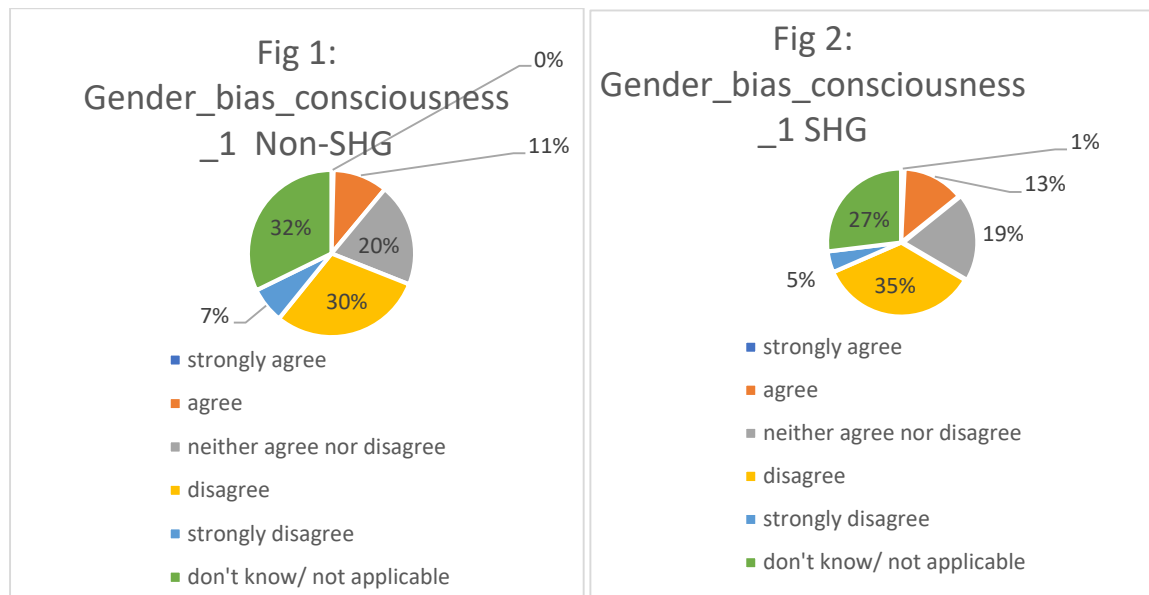
3. Methodology

A primary survey was conducted through in-depth interview research design was adopted for this study. This is found relevant to the study because the study sought to obtain the opinions of women at their reproductive age of 18-35 during 2017 to 2021 since they are about to enter into the labor market. The sample size for the study comprised by 505 female candidates obtained through simple random sampling method from 5 districts of West Bengal (Jalpaiguri, Maldah, Murshidabad, Purulia, Bankura).

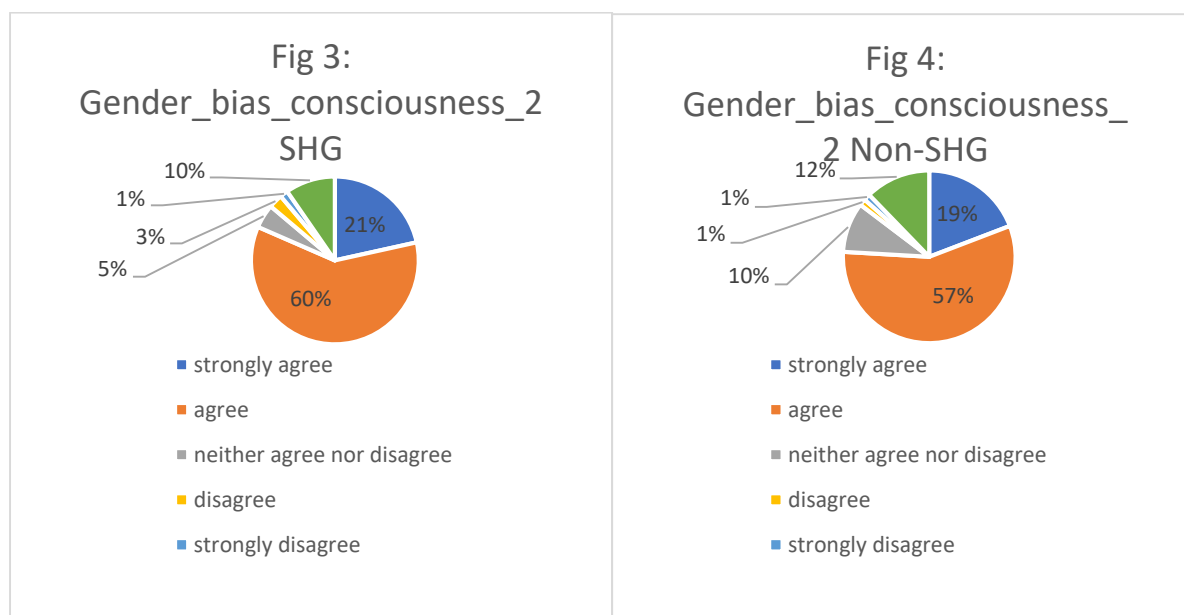
This study used the descriptive survey to investigate the perceptions of women on entrepreneurship in two groups, including the members of Self-Help Groups (SHGs) and those who were not members. To achieve this, a five-point Likert scale was created, which included 27 statements that were grouped into five major dimensions, i.e., gender bias, self-confidence, networking and relationships, childcare responsibilities, and financial barriers to entrepreneurship. Every statement had five possible responses, which were Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), and Strongly Disagree (SDA). The respondents were requested to provide a response that was the most suitable to reflect their individual perspective on each item.

4. Data Analysis

Gender_bias_consciousness_1 (Fig 1 &2) show the difference in perceptions of two different groups of women (Self-help group and non self-help group) whether gender identity influences on their profession or work. 35% of women who belongs to self-help group and 30% of women who do not belong to self-help group disagree that gender influences their profession. Only 13% and 11% of women respectively belongs to self-help group and do not belong to self-help group think gender identity influences their profession. While 19% of women belong to self-help group and 20% of women belong to non self-help group remain silent and go with neither agree nor disagree. 40% of women belong to self-help group and 37% of women who do not belong to self-help group either strongly disagree or weakly disagree with the statement that gender influences their profession.



Gender_bias_consciousness_2 (Fig 3 and 4) analyzed the difference in perceptions of two different groups of women (Self-help group and non self-help group) on whether respondent can say her opinion in her family being a woman. The diagrams show that 60% of women belong to self-help group and 57% of women belong to non-self-help group agrees that they can take family decisions. Almost 81% of women belong to self-help group and 76% of women belong to non self-help group either strongly agree or weakly agree that they can say her opinion in her family. 5% and 10% of women belong to self-help group and non self-help group respectively neither agree nor disagree for this statement. While 4% and 2% of women belong to self-help group and non self-help group respectively said they cannot take family decisions.



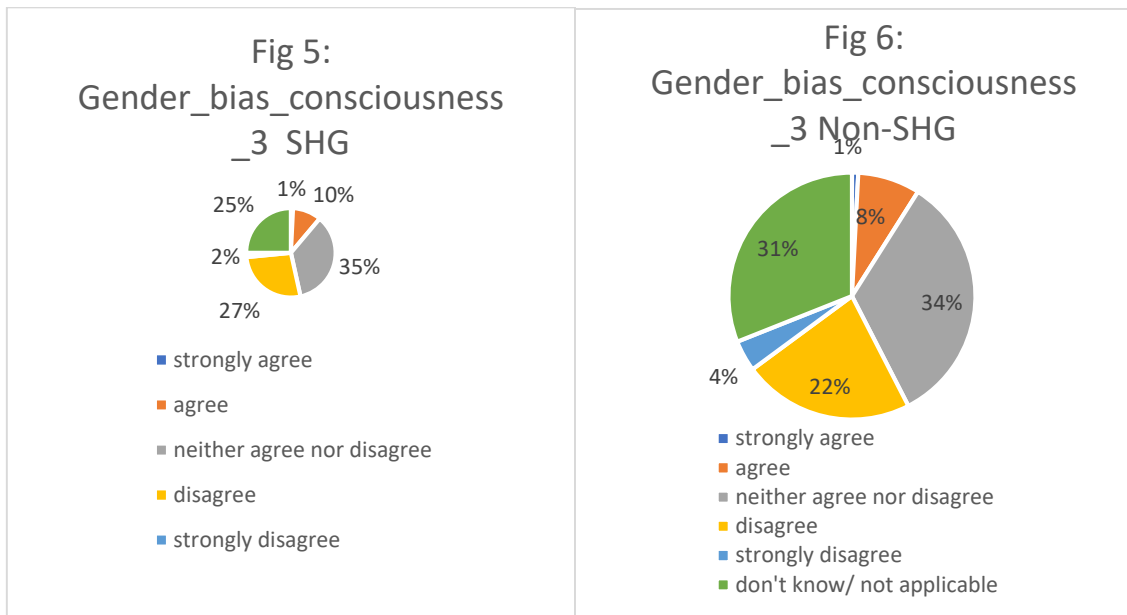


Fig 5 and 6 seek the view of two different groups of women (Self-help group and non self-help group) on whether respondents facing peer effect for being woman. 27% of women belong to self-help group and 22% of women belong to non-self-help group perceived that peers do not treat them differently because of gender. 11% and 9% of women belong to self-help group and non-self-help group respectively perceived that peers treat them differently because of gender. While 35% and 34% of women belong to self-help group and non-self-help group remained silent about their perception, they neither agree nor disagree. 29% and 26% of women belong to self-help group and non self-help group either strongly either strongly disagree or weakly disagree that peers do not treat them differently because of gender.

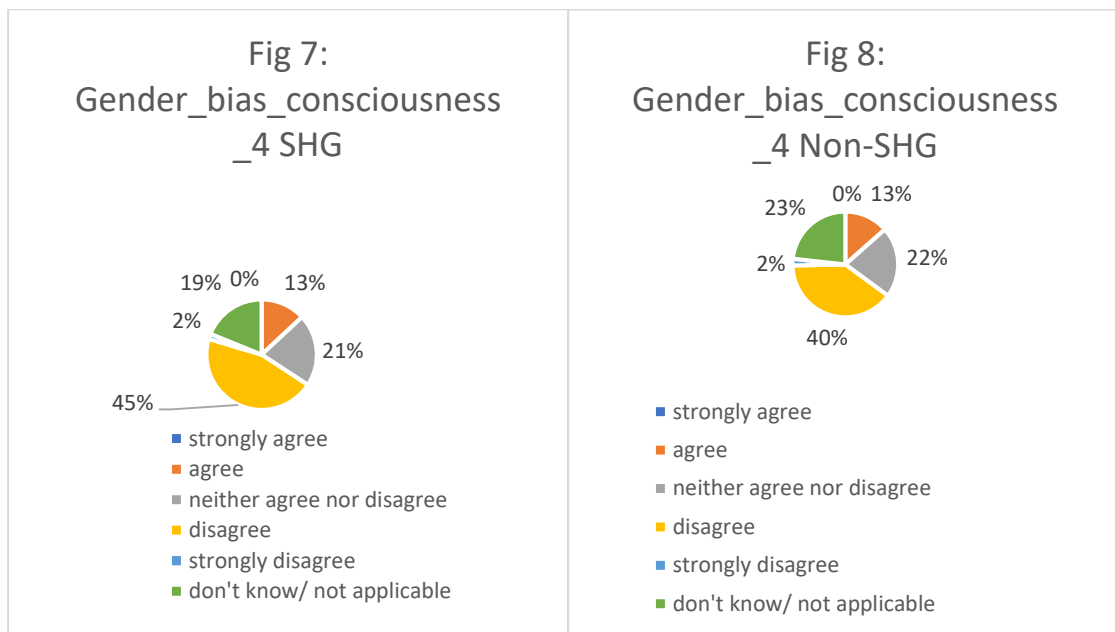
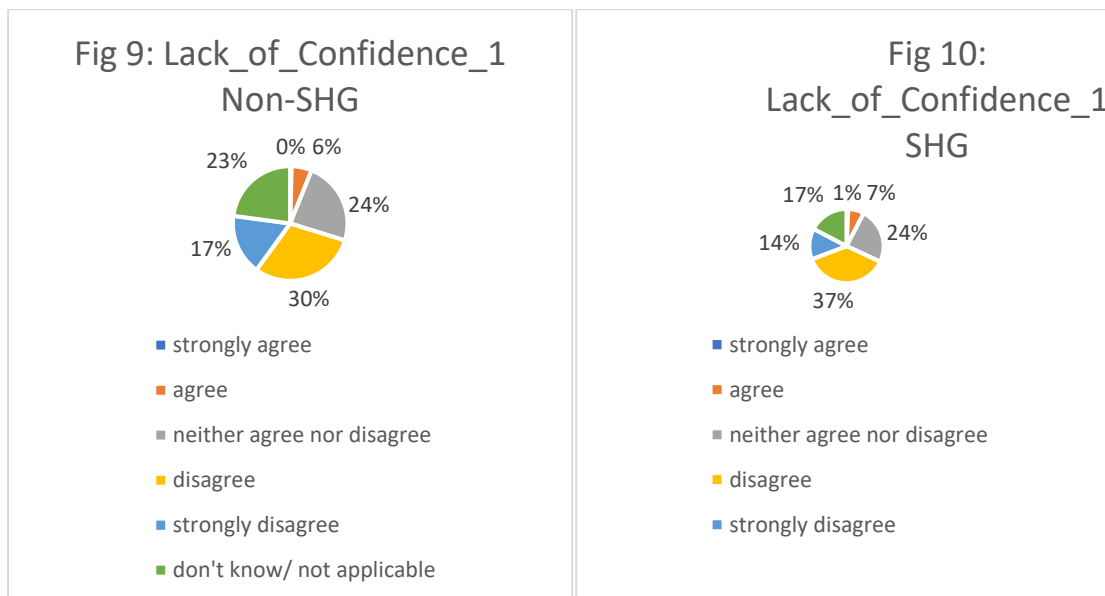
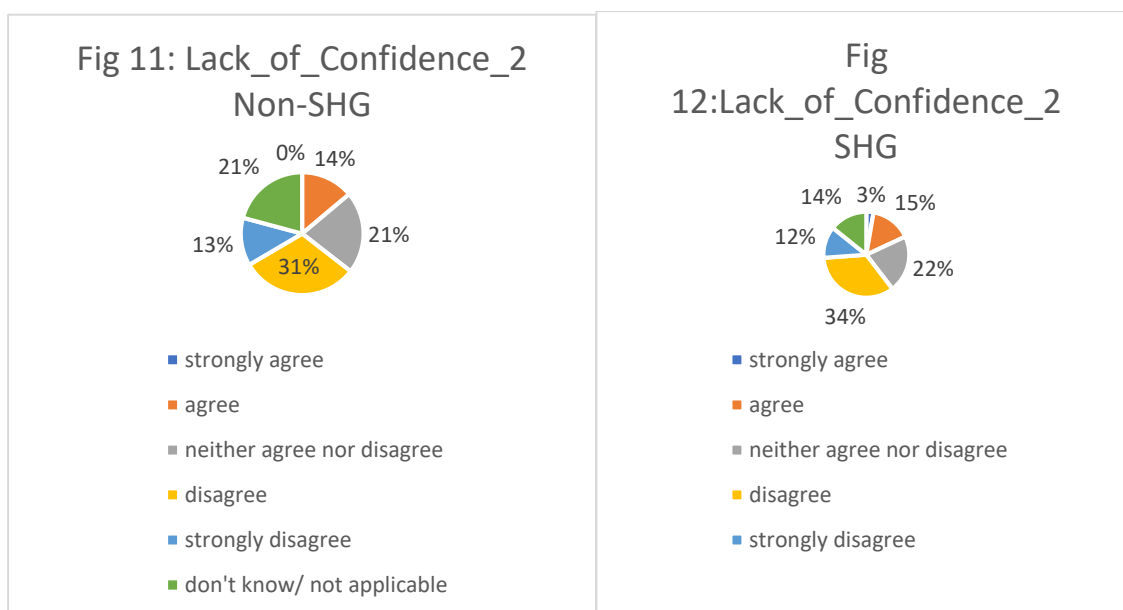


Fig 7 and 8 analysed the difference in perceptions of two different groups of women (Self-help group and non self-help group) on whether respondent, faced any unequal treatment in near past. 47% of women belong to self-help group and 42% of women belong to non self-help group are never been a victim of unequal treatment in past. While 13% of women belong to both the groups, self-help group

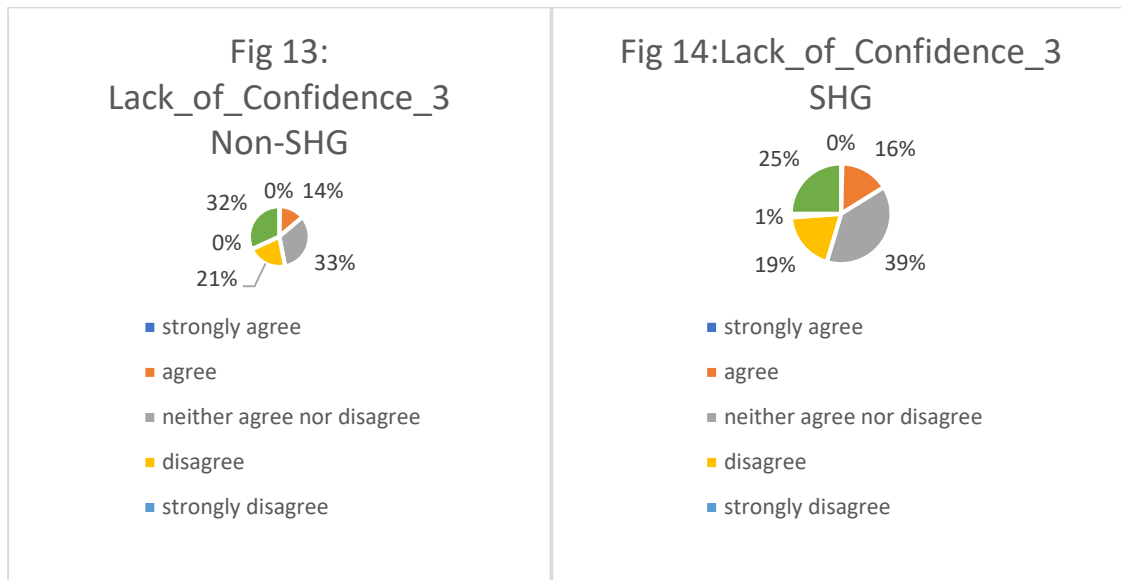
and non self-help group strongly agree with the statement that they faced unequal treatment in past. 21% and 22% of women belong to self-help group and non self-help group neither agree nor disagree with the statement.



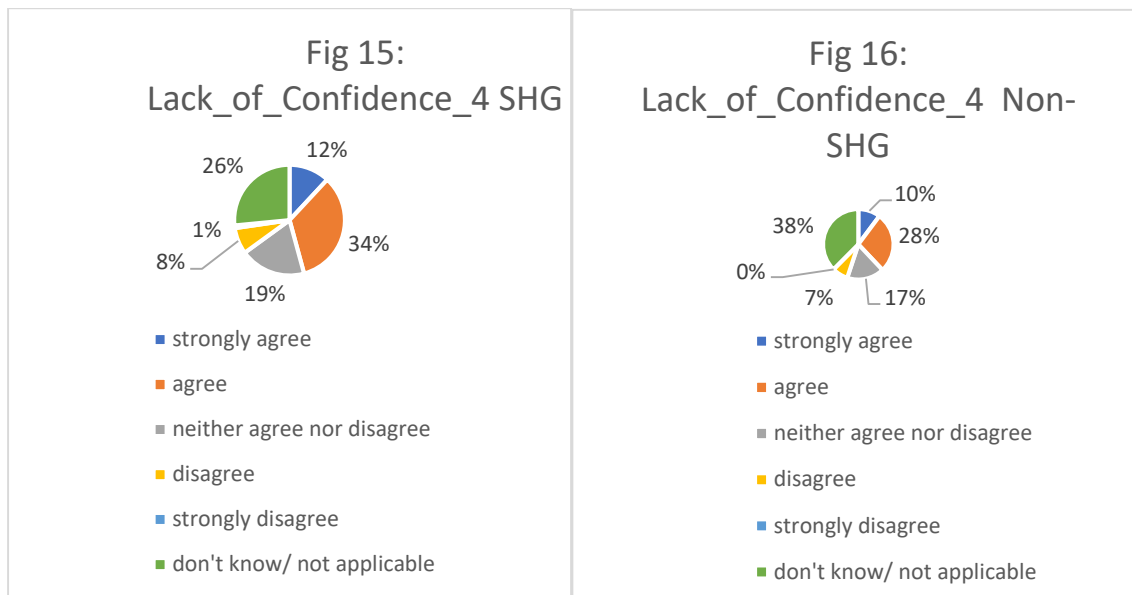
Lack of confidence1 (Fig 9 and 10) shows the difference in perception of two different groups (SHG and non self-help group) whether they believe business is not women's world. 37% of women belong to SHG and 30% of women belong to non SHG disagree with the statement in which we ask whether they think business is not women's world. 51% of women and 47% of women belong to SHG and non self-group respectively either strongly disagree or weakly disagree with the statement. 8% and 6% of women belong to SHG and non self-group either strongly agree or weakly agree with the statement. While 24% of women belong to both the group remained silent about their perception on this statement, they neither agree nor disagree.



Lack of confidence 2 (Fig 11 and 12) depicts the difference in perception of two different groups of women (SHG and non SHG) whether they agreed that men are more competent in finance than women. 34% and 31% of women belong to SHG and non SHG disagree with the statement which states that men are more competent in finance than women. 46% and 44% of women belong to SHG and non SHG either strongly disagree or weakly disagree with the statement men are competent than women in finance. 22% and 21% of women belong to SHG and non SHG respectively neither agree nor disagree against the statement. 18% of women belong to SHG either strongly agree or weakly agree with the statement. While 14% of women belong to non SHG only agree with the statement.

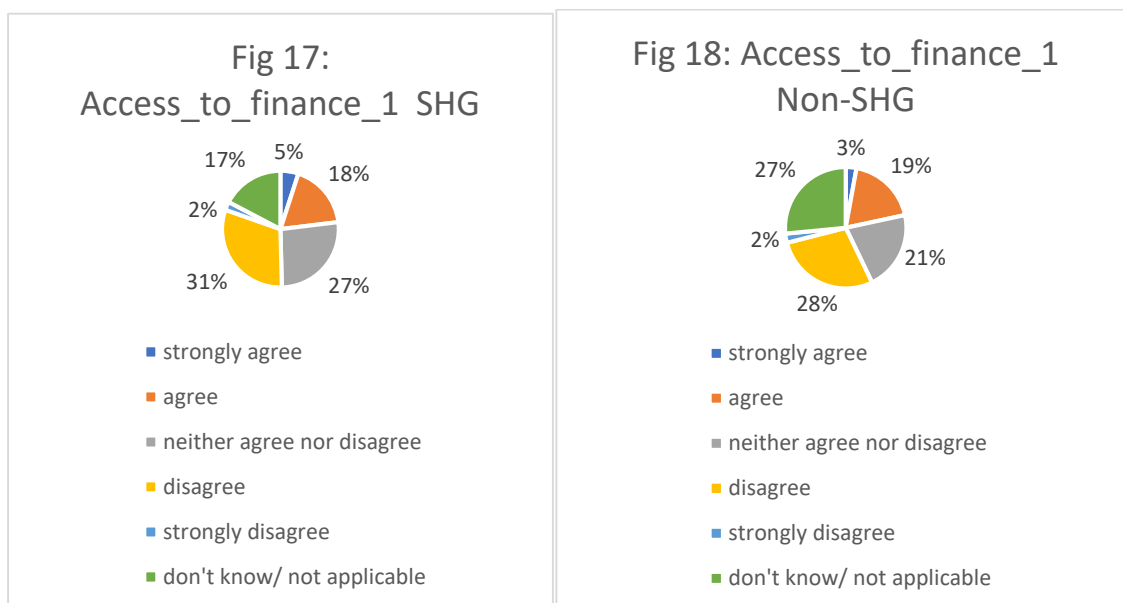


Lack of confidence 3 (Fig 13 and 14) describes the difference in perception of two different groups of women. Whether women entrepreneurs are often treated with less respect and they sense doubt when interacting with business partners. 20% of women belong to SHG either strongly disagree or weakly disagree with the statement that women entrepreneurs are treated with less respect and they sense doubt about their business partners. 21% of women belong to non SHG also disagree with the statement. 39% and 33% of women belong to SHG and non self-help respectively group remained silent on whether women entrepreneurs treated differently and whether they are in doubt about their business partners. While 16% and 14% of women belong to SHG and non SHG agree with the statement and believe that women entrepreneurs are treated differently and also always are in doubt about their business partners.



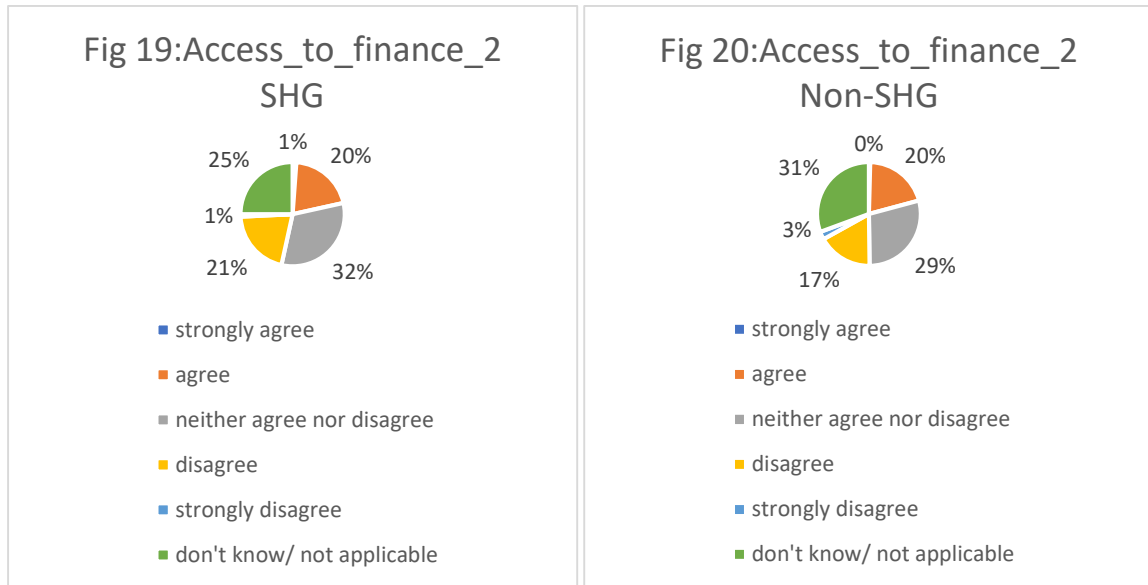
Lack of confidence 4 (Fig 15 and 16) describes the difference in perception of two different groups of women (self-help group and non SHG) whether they relied less on their business skills with compare to a man. 34% and 28% of women belong to SHG and non SHG agree with the statement that they relied less on their business skills and merely help their husband in business. 46% and 38% of women belong to SHG and non SHG respectively either strongly agree or weakly agree with the statement of less reliability on their own business skills. Though 9% of women belong to SHG and 7% of women belong to non SHG disagree with the proposed statement. While 26% and 38% of women belong to SHG and non SHG not belong to this category.

Access to finance:

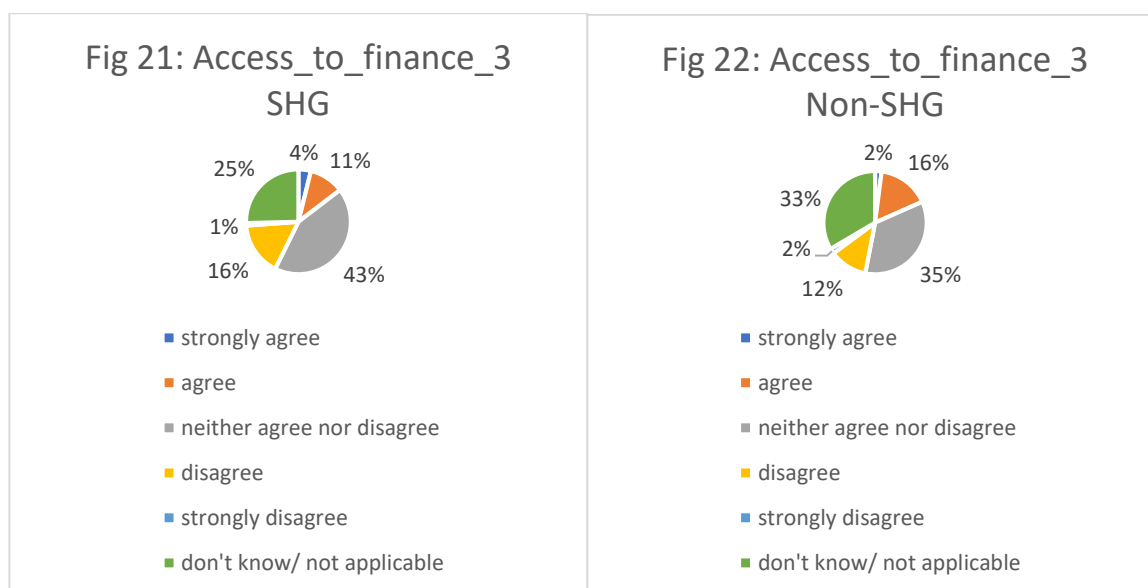


Access to finance 1 (Fig 17 and 18) analyses the difference in perception of two different groups of women (SHG and non SHG) whether assumption of less financial risk-taking behavior of women create problem to access financial capital. 31% and 28% of women belong to SHG and non SHG

disagree and perceived that less financial risk-taking behavior of women do not create any problem to access financial capital. Almost 33% and 30% of women belong to SHG and non SHG wither strongly disagree or weakly disagree with the statement. While 23% and 22% of women belong to SHG and non SHG either strongly agree or weakly agree with the statement that risk averse behaviour of women create problem to access financial capital. 27% and 21% of women belong to SHG and non SHG remained silent on this statement they neither agree nor disagree.

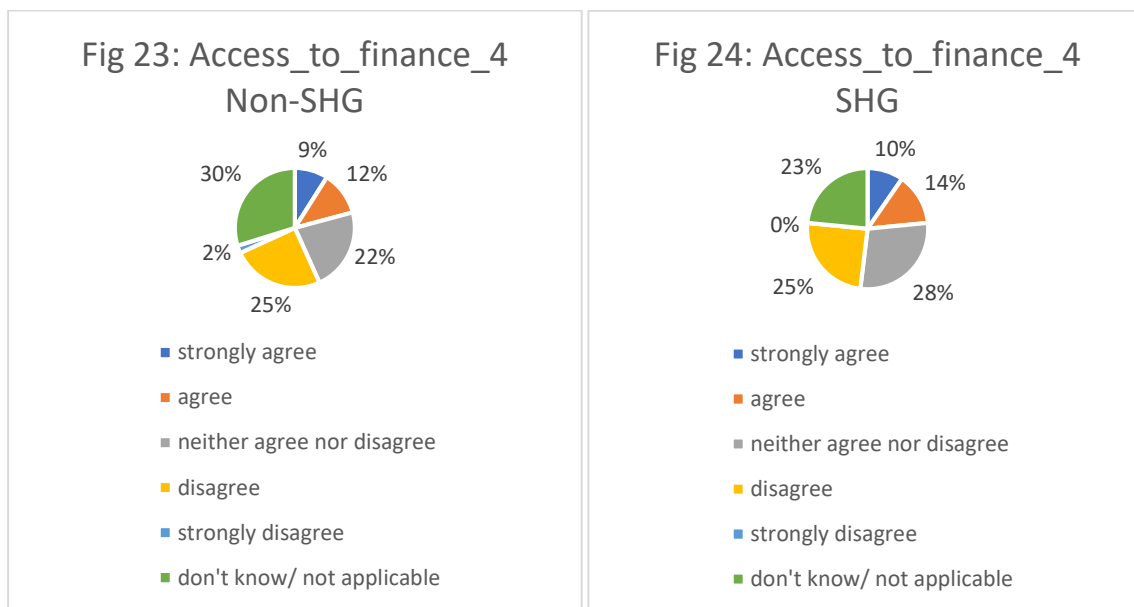


Access to finance 2 (Fig 19 and 20) shows dissected the difference in perception of two different groups of women (SHG and non SHG) whether women are perceived differently than men, and investors also have been found to prefer men as compared to those by women. 22% and 20% of women belong to SHG and non SHG disagree with the propose statement which is perception about investor's preference for men than women to access financial capital. 21% and 20% of women belong to SHG and non SHG either strongly agree or weakly agree with the statement. While 32% and 29% of women belong to SHG and non SHG go with neither agree nor disagree option on Likert scale.

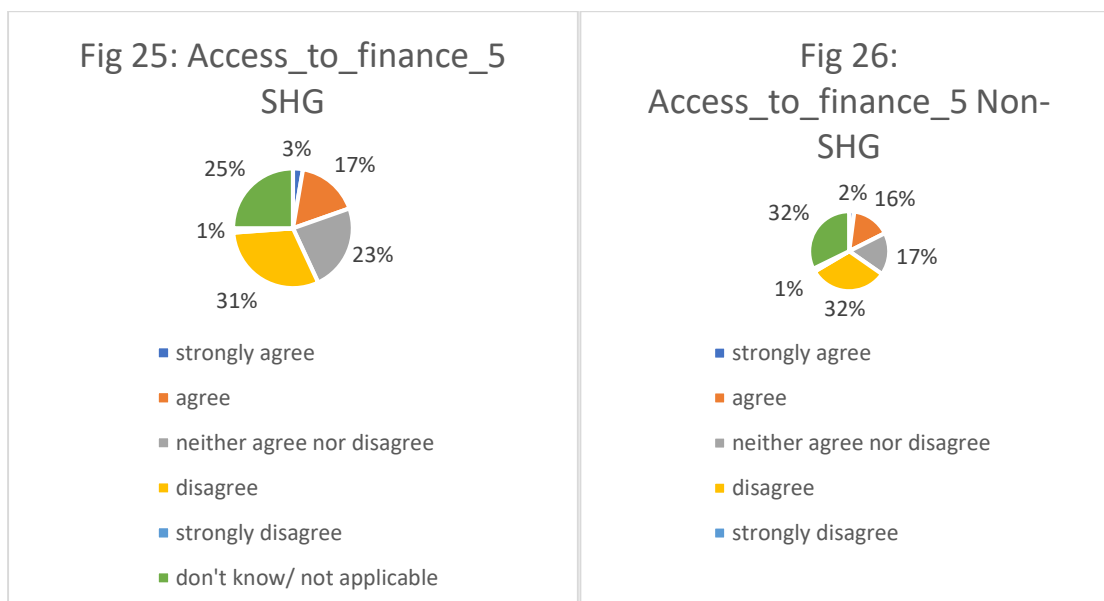


Access to finance 3 (Fig 21 and 22) analyses the difference in perception of two different groups of women (SHG and non SHG) whether they have faced difficulties to access the fund/loan due to the

fact that women rarely own property, which can be used as collateral for loans. 17% and 14% of women belong to SHG and non self-group do not believe that they get less financial capital due to lack of property ownership. 15% and 18% of women belong to SHG and non self-group either strongly agree or weakly agree with the statement that there are lack of property ownership for women to get their financial capital. 43% and 35% of women belong to SHG and non SHG neither agree nor disagree with the statement.

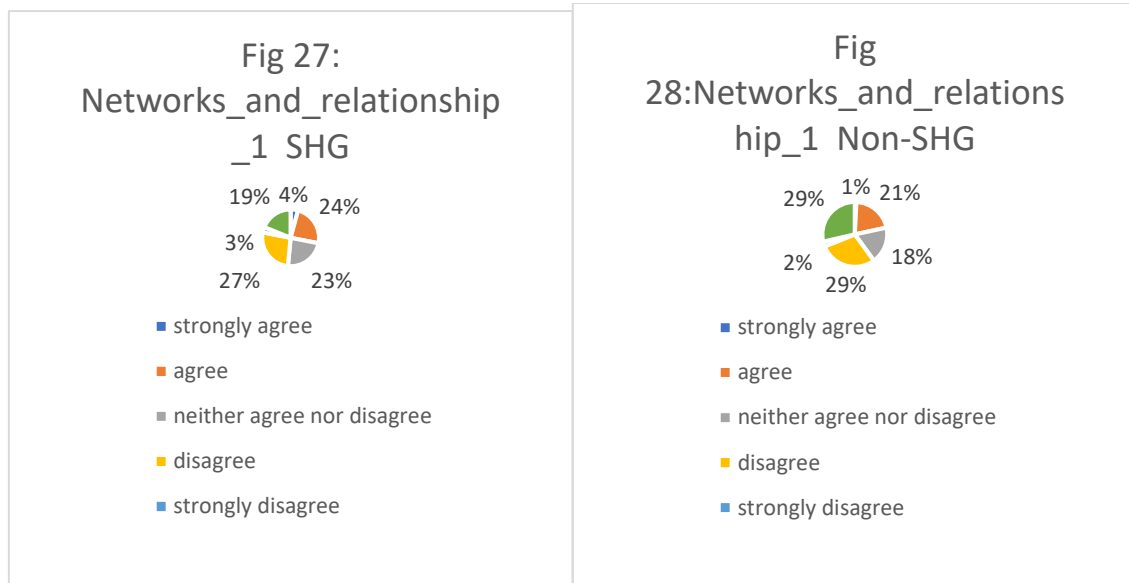


Access to finance 4 (Fig 23 and 24) shows the difference in perception of two different groups of women (SHG and non SHG) whether women-owned ventures are self-financed Finance 4- 25% of women belongs to both self-help and non SHG disagree with the statement that whether women owned ventures are self-financed. 24% and 21% if women belong to SHG and non SHG either strongly agree or weakly agree with the proposed statement. While 28% and 22% of women belong to SHG and non SHG neither agree nor disagree with the statement.

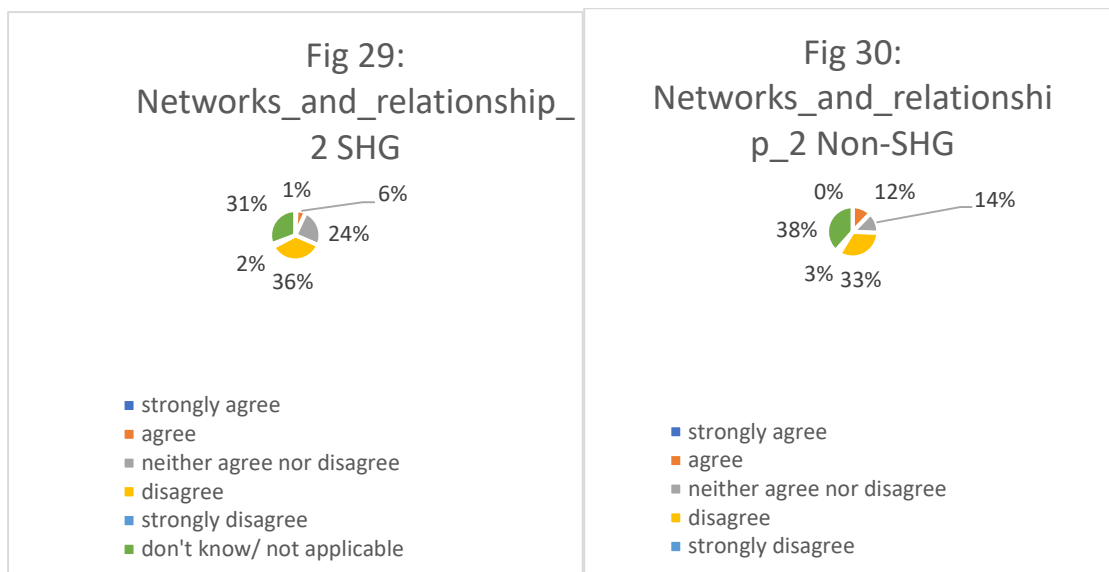


Access to finance 5 (Fig 25 and 26) depicts the difference in perception of two different groups of women (SHG and non SHG) whether families are often hesitant to support their women members' entrepreneurial ventures financially. 32% and 33% of women belong to SHG and non SHG either strongly disagree or weakly disagree with the statement that there is lack of financial support from family on women's entrepreneurial activity. While 20% and 18% of women belong to SHG and non SHG either strongly agree or weakly agree with the statement which depicts that financial support was not given by family to women's entrepreneurial activity. 23% and 17% of women belong to SHG and non SHG neither agree nor disagree with the proposed statement.

Networks and Relationships:

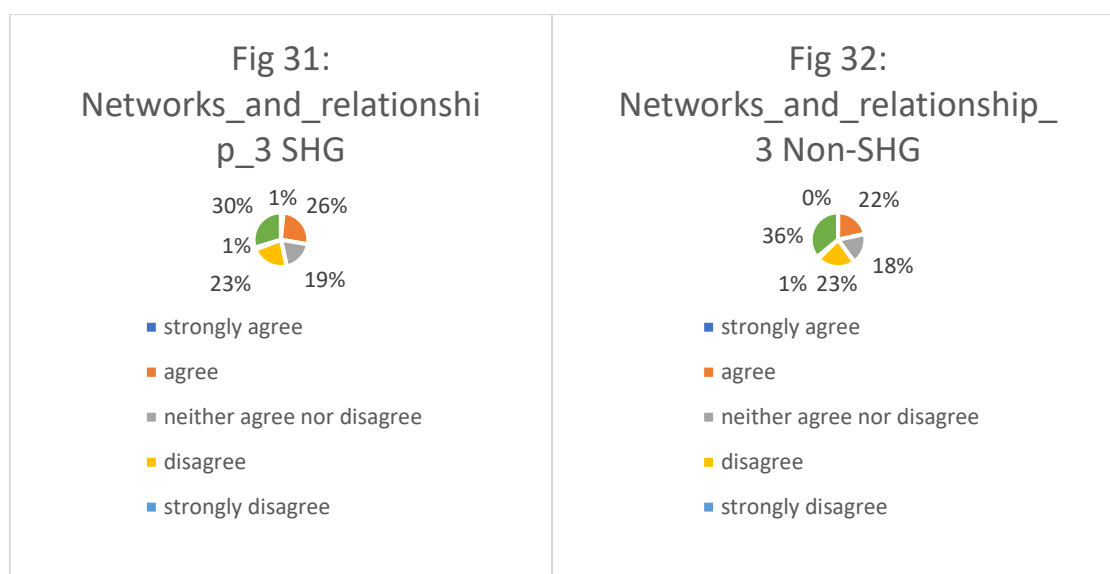


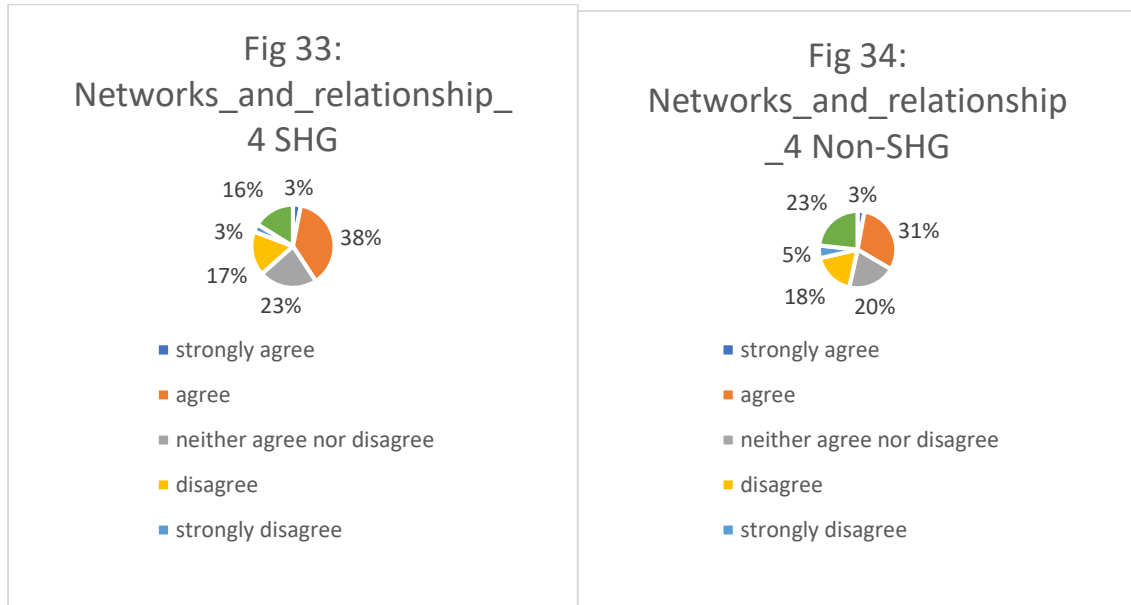
Network_and_relationship_1 (Fig 27 and 28) depicts the difference in perception about whether men led cultures are one of the most mentioned as well as important barriers to women's leadership between two different groups of women (SHG and non-SHG). 24% of women belong to SHG agreed and 28% of women belong to SHG either strongly agree or weakly agree that men led cultures are one of the most cited barriers to women's leadership whereas 22% of women belong to non SHG either strongly agree or weakly agree with the statement. 30% of women belong to SHG do not believe that men led cultures are one of the important barriers to women's leadership which is 31% in non SHG. Here also 23% and 18% of women belong to SHG and non SHG neither agree nor disagree with the statement.



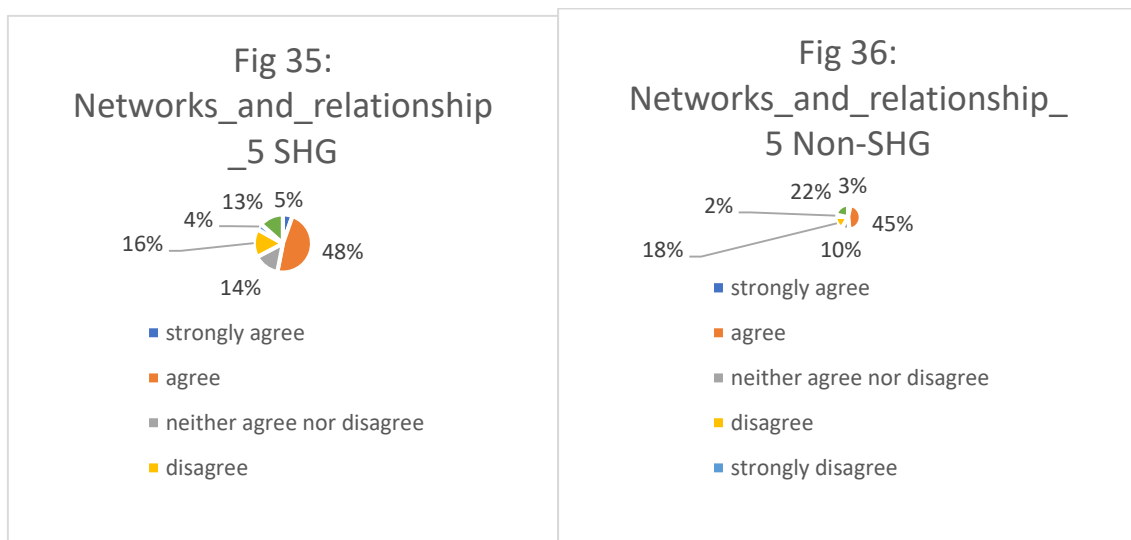
Network_and_relationship_2 (Fig 29 and 30) dissected the difference in perception in between two different groups of women (SHG and non SHG) about whether women entrepreneurs do not feel comfortable in prominent industry works. 36% of women belongs to SHG disagree with the statement which is 33% in non SHG. 6% of women belong to SHG agree with the statement where as 12% of non SHG women agree with that. 24% of women belong to SHG remained silent which is 14% in non SHG who choose neither agree nor disagree.

Network_and_relationship_3 (Fig 31 and 32) analyses the difference in perception between two different groups of women (SHG and non SHG) whether women are lacking behind in connection with people and market. 27% of women strongly or weakly believe that women entrepreneurs miss important opportunity to connect with people in the market compared to men whereas 22% of women belong to non SHG agree with the proposed statement. 24% of women belong to both the groups either weakly or strongly believe that women do not miss the important opportunities to connect with people in the market compared to men. In this regard 19% of women and 18% of women belong to SHG and non SHG respectively neither agree nor disagree with the statement.



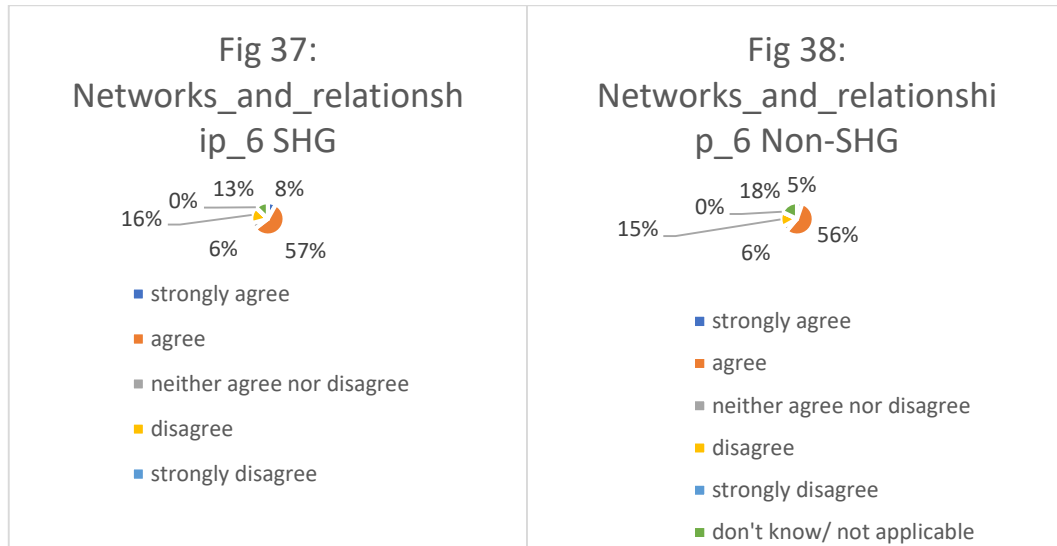


Network_and_relationship_4 (Fig 33 and 34) represents difference in perception about the social norms which restricts women's mobility between two different groups of women (SHG and non SHG). 38% of women belong to SHG agree about the presence of social norms which restricts their mobility which is 31% in non SHG. 41% of women belong to SHG either strongly agree or weakly agree about social norms which restricts their mobility whereas 34% of women in non SHG agree that. 20% of women belong to SHG either strongly believe or weakly believe that social norms don't cost them their restrictions in mobility which is 23% in non SHG. 23% and 20% of women belong to self-help and non SHG neither agree nor disagree with the statement.

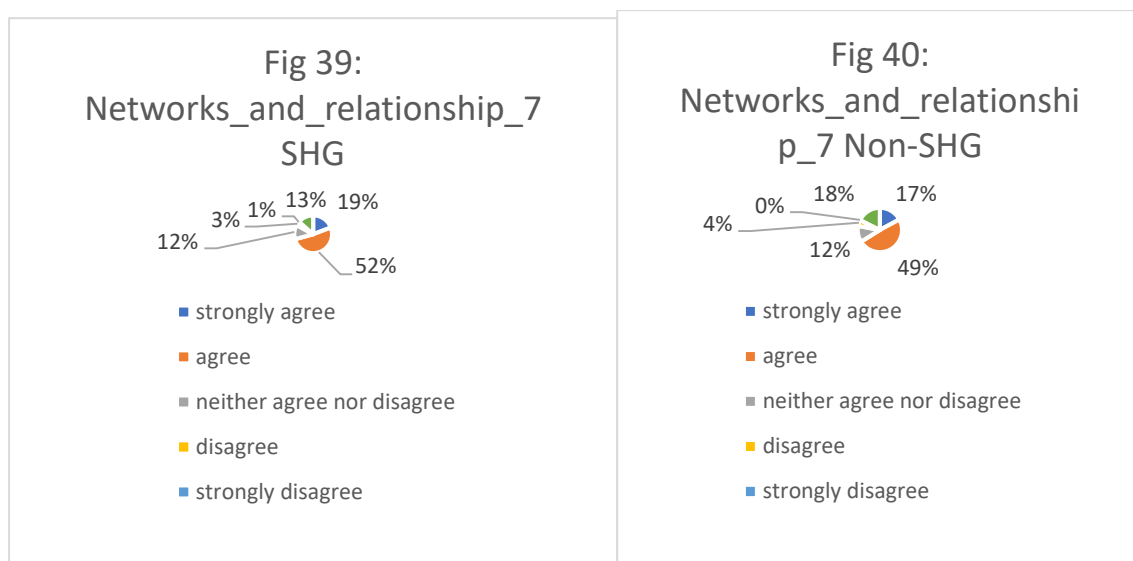


Network_and_relationship_5 (Fig 35 and 36) analyzed the perception of different groups of women whether business is a man's domain and women to first and foremost should look after their home. 48% of women belong to SHG there is an institutional norm about business is a man's domain and women to first and foremost look after their home which is 45% in non SHG. 53% of women belong to SHG either strongly agree or weakly agree with the statement whereas 48% of women belong to non SHG either strongly agree or weakly agree with the statement. While 20% of women belong to both the group either weakly or strongly disagree that existence of societal norms about business is a

man's world. 14% of women belong to SHG and 18% of women belong to non SHG neither agree nor disagree with the statement.

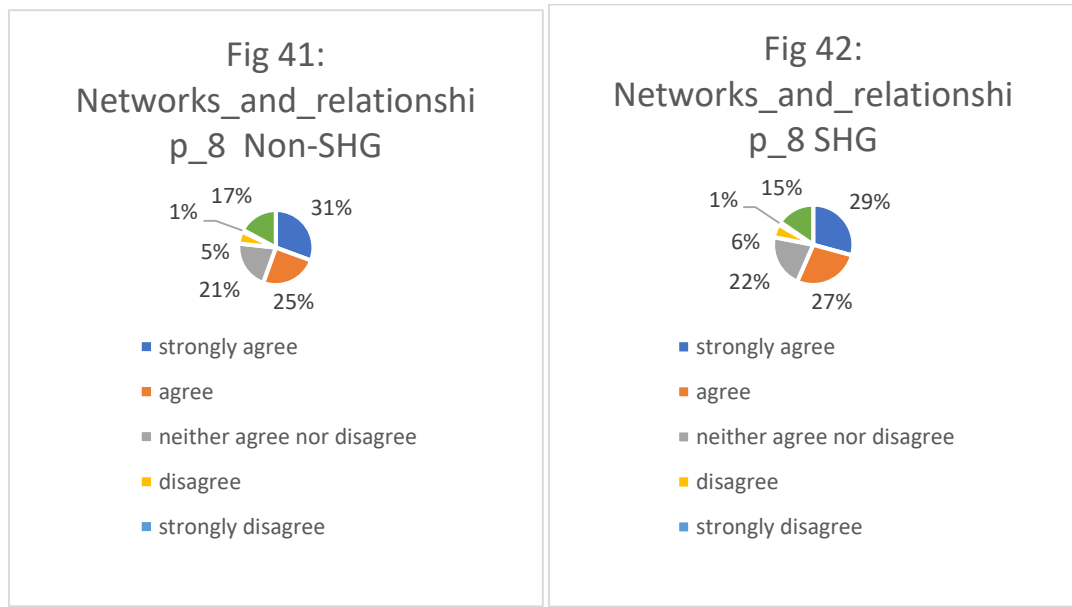


Network_and_relationship_6 (Fig 37 and 38) analysed the perception which states that whether at home women do take more responsibility and spend much more time than men at household chores. 57% of women belong to SHG believe that women do greater responsibility at home and spend much more time than men on house work where as 56% of women in non SHG think the same. 65% of women belong to SHG either strongly agree or weakly agree that women do greater responsibility at home and spend much more time on housework than men which is 61% in non SHG. 16% of women belong to SHG disagree with the proposed statement whereas 15% of women belong to non SHG disagree with the statement. 6% of women belong to both the group neither agree nor disagree with the statement.

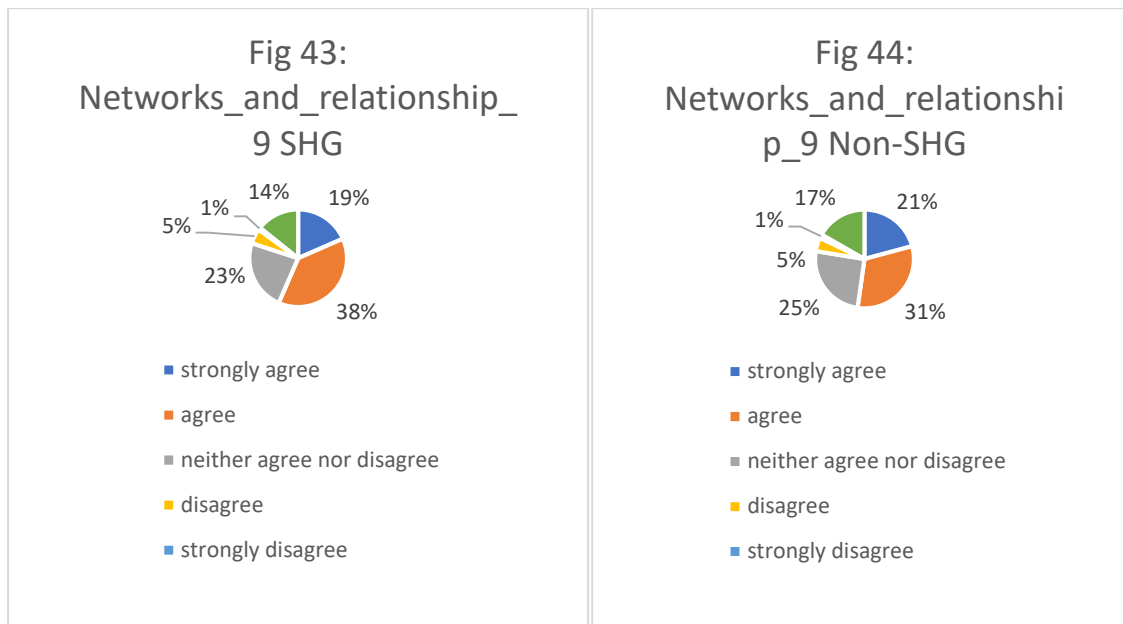


Network_and_relationship_7 (Fig 39 and 40) depicts the difference in perception between two different groups of women (SHG and non SHG) about whether women have to juggle between housework and outside work, and can it be challenging? 19% of women belong to SHG strongly

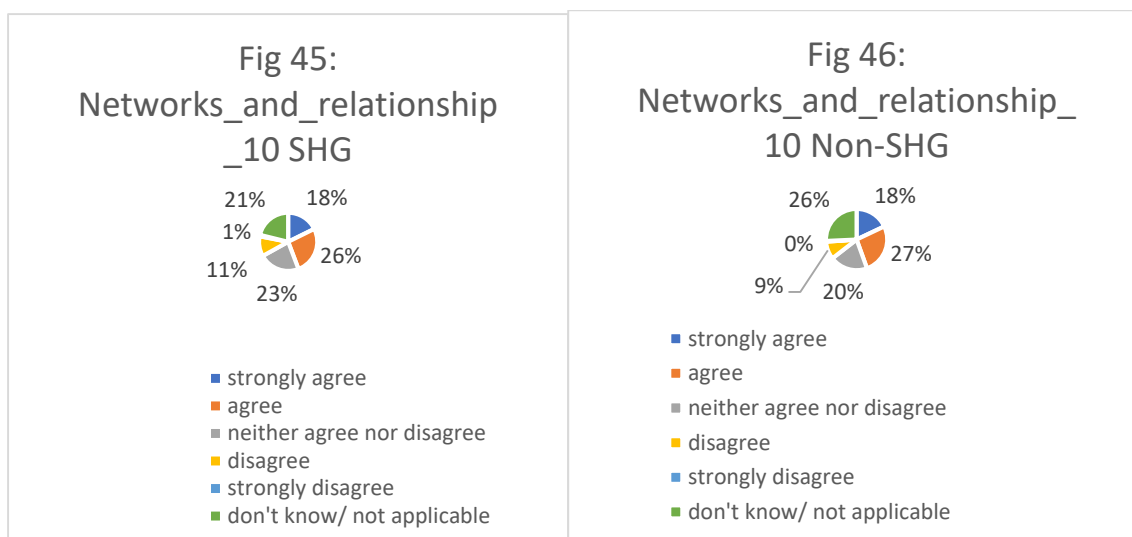
believe that maintain the balance between housework and outside work is challenging whereas 17% of women belong to non SHG strongly agree that juggle between outside work and housework is challenging. 52% of women belong to SHG agree that maintain the balance between outside work and housework is challenging which is 49% in non SHG. So, 71% of women belong to SHG either strongly agree or weakly agree with the statement which is 66% in non SHG. 3% of women belong to SHG believe that it is not challenging to maintain the balance between outside work and housework which is 4% in non SHG. 12% women in both the groups neither agree nor disagree with the statement.



Network_and_relationshipship_8 (Fig 41 and 42) analysed the comparison of perception between SHG women and non SHG women about do they feel that they have modern outlook? 27% of women belong to SHG believe of having modern outlook whereas 25% of women belong to non self-group believe the same. 31% of women belong to non SHG strongly agree with the statement about perception of having modern outlook which is 29% in SHG. 7% of women belong to SHG either strongly disagree or weakly disagree about perception of having modern outlook compared to which 6% of women belong to non SHG think so. 22% and 21% of women belong to SHG and non SHG remained silent they neither agree nor disagree with the statement.



Network_and_relationship_9 (Fig 43 and 44) depicts the difference in feelings about understanding own passion and act accordingly in between two different groups of women (SHG and non SHG). 38% of women belong to SHG think that they understand their passion and also, they act accordingly whereas in non SHG only 31% of women feel they understand their passion and act accordingly. Surprisingly 21% of women strongly believe that they understand their passion and accordingly which is 19% in SHG. 6% of women belong to both the group either strongly disagree or weakly disagree with the statement. 23% and 25% of women belong to SHG and non SHG respectively neither agree nor disagree with the statement.

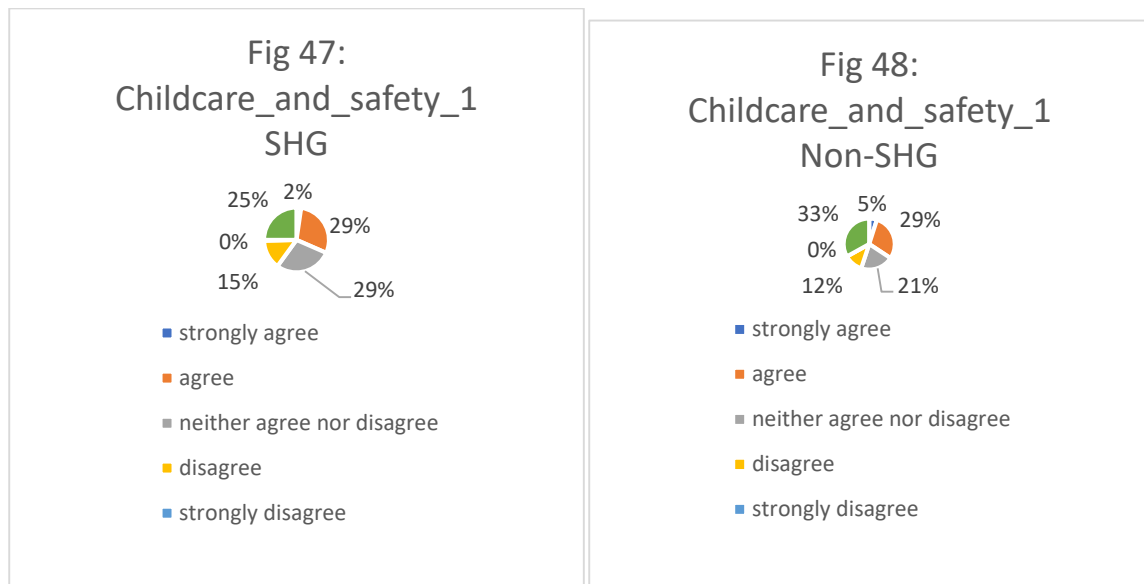


Network_and_relationship_10 (Fig 45 and 46) dissected the difference in perception about whether they can take decision on their marriage preference. Here also I made a comparison between SHG women and Non SHG women. 11% of women belong to SHG feel that they cannot take decisions on their marriage whereas 9% of women belong to non SHG feel that they cannot decisions on their marriage. 12% of women belong to SHG either strongly disagree or weakly disagree about taking

decisions on their marriage preference. 26% of women belong to SHG agree that they can take decisions of their marriage which is 27% in non SHG. The statement strongly agreed by 18% of women of both the groups. Whereas 23% and 20% of women belong to SHG and non SHG neither agree nor disagree with the statement about taking decision on marriage.

Childcare:

Childcare_and_safety_1 (Fig 47 and 48) depicts the comparison of perception between SHG women and non SHG women about whether entrepreneurial careers is good opportunity for women and allowing them to work with more flexible hours and space. 29% of women belong to SHG thinks entrepreneurial career is a good opportunity for women which is allowing them to work with more flexible hours and spaced and the percentage of women are same in non SHG as well. Surprisingly 31% of women belong to SHG either strongly agree or weakly agree with the statement but the percentage of women is more in non self-group which is 34%. 15% of women belong to SHG disagree with the statement of entrepreneurial career is a good opportunity whereas only 12% of women belong to non SHG disagree with the statement. And 29% of women belong to self-group and 21% of women belong to non SHG neither agree nor disagree about their perception on statement.



Childcare_and_safety_2 (Fig 49 and 50) asked women of two different groups (self-help and non SHG) about when they become mothers, they often encounter further difficulties holding them back struggle with a lack of options for child care and feel guilty and then give them options like strongly agree, agree, disagree, strongly disagree etc. Here 20% of women belong to SHG thinks that when women entrepreneurs become mothers, they often encounter further difficulties which holding them back and also, they struggle with a lack of options for child care and they feel guilty whereas the percentage of women agree is 18% belong to non SHG. 22% of women belong to SHG either strongly agree or weakly agree with the statement which is 21% in non SHG. 25% of women belong to SHG disagree with the asking statement whereas 29% of women belong to non SHG disagree with the statement. 33% of women belong to SHG and 23% of women belong to non self-group remained silent about their perception they neither agree nor disagree with the statement.

Fig 49:
Childcare_and_safety_2
SHG

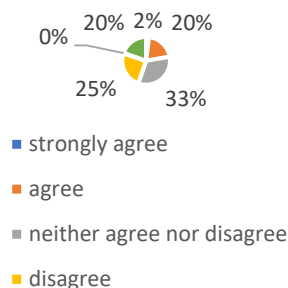
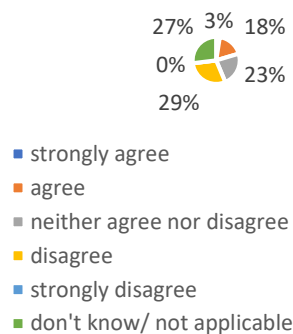


Fig 50:
Childcare_and_safety_2
Non-SHG



Childcare_and_safety_3 (Fig 51 and 52) dissected the difference in perception between two different groups women (SHG and non SHG) about whether safety in work and public spaces ensuring women's safety? 26% of women belong to SHG think that safety in work and public spaces ensuring women's safety whereas 25% of women belong to non SHG thinks so. 28% of women belong to SHG either strongly agrees or weakly with the statement which is 26% in non SHG. 24% of women belong to SHG either strongly or weakly disagree with the statement whereas 22% of women belong to non SHG either strongly or weakly disagree with the statement. 28% women belong to SHG and 22% of women belong to non self-group remained silent about their perception they neither agree nor disagree with the statement.

Fig 51:
Childcare_and_safety_3
SHG

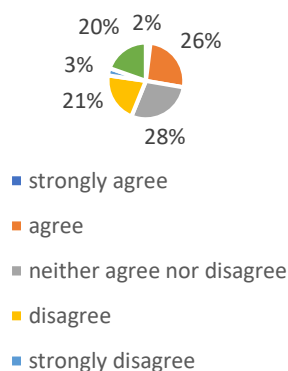
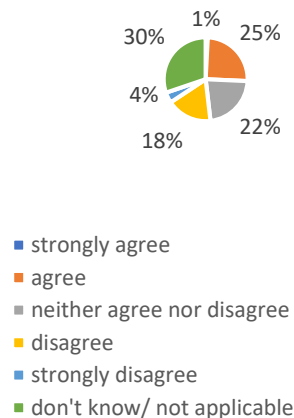
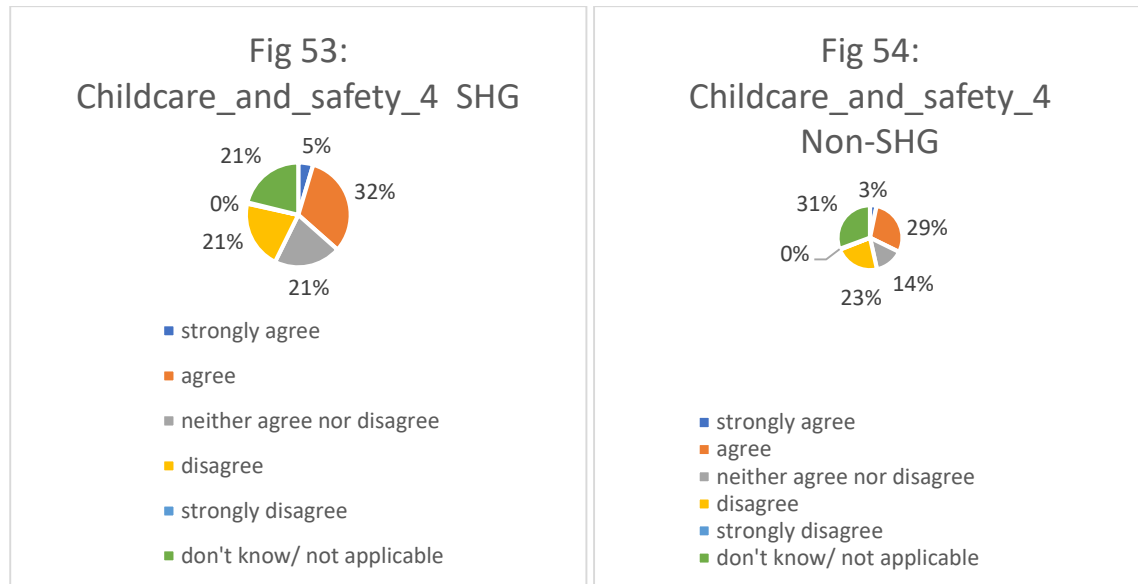


Fig 52:
Childcare_and_safety_3 Non-SHG



For childcare_and_safety_4 (Fig 53 and 54) we can see the different view in between two different groups of women belong to SHG and non SHG about whether women are to vacate the office early, because public spaces are unsafe after a certain time during the evening. 32% of women who are members of SHG concur that women have to leave the office early, because public spaces are not safe anymore after a certain time of the day which is 29% in non SHG. 37% of women belong to SHG

either strongly agree or weakly agree with the statement where as 32% of women belong to non SHG either strongly or weakly agree with the statement. Surprisingly less percentage of women belong to SHG than non SHG disagree with the statement which is 21% in SHG and 23% in non SHG. 21% and 14% of women belong to SHG and non SHG respectively neither agree nor disagree.



We consider whether the respondent starts business on her own or through group under variable ‘entrepreneur activity’. We regress ‘entrepreneur activity’ based on district, whether she belongs to SHG (shg_dummy), number of children, perception about whether gender influence on her profession/ work (gender_bias_consciousness_1), whether she believes that “business is not women’s world” (lack_of_confidence_1), whether she agrees that women perceived differently than men by investors (Access_to_finance_2), whether entrepreneurial careers is good opportunity for women and allowing them to work with more flexible hours and space (Childcare_safety_1), whether women often do assume greater responsibility at home and spend much more time than men on housework (network_relationship_6), gender_bias_consciousness average and Lack_of _confidence_average. The result shows (Table 1) that except the variable ‘district’, all other variables are statistically significant at less than 10 % level and except ‘number of children’ and ‘Childcare_safety_1’ all other are statistically significant at less than 5% level. So we can say that joining into a self-help group increases the probability to join as entrepreneur though they do not perceive that they are victim of gender bias while all other factors also influence the decision to be entrepreneur.

5. Conclusion:

Majority believes that they are not victim of gender bias. The perception is stronger among SHG members than the non-SHG ones. More than 35% respondents agree that women have lower confidence in their own business skill and they prefer to play the second fiddle to their male counterpart as a part of founding couple. However, around 45% respondents disagree that business is not a woman’s world and majority is indifferent on the possibility that women entrepreneurs are treated with less respect. Around one-thirds of the respondents deny that lack of access to financial capital is an obstacle for entrepreneurship. The perception is stronger among SHG members than the non-SHG ones. However, 20% of SHG believe that families hesitate to support financially in entrepreneurial activity. Majority is indifferent that lack of women owned property poses difficulty to get loans and SHG are less likely to agree than non-SHG in this view. Around 30% agree that lack of public connections and mobility restriction creates problems for women entrepreneurship. Around

50% or more agree that household responsibility is a hindrance for participation in outside work and so they tend towards entrepreneurial activities, though the perception is lower among non-SHG members than SHG. Around 50% feel that they have modern outlook, can act as per their passion and take marriage decisions. SHG members are better in ability to work as per passion while worse in taking marriage decisions in comparison to non-SHG members. 30-40% agree that flexible working hours, safety in work place and provision for early departure due to unsafe public place after certain time is preferable for women to work outside which indirectly boost their preference to take up entrepreneurship.

The analysis shows that perceptions like gender bias, less respect for female entrepreneurs, lack of accessible capital, lack of women owned property are not deterring female entrepreneurship. Rather lack of confidence in own business skill, financial support from family and inadequate public connection poses hurdles. Factors like flexible working hours, lack of safety in outside work positively influence female entrepreneurship.

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Effect of Social Media Cosmetic Influencer Marketing on Consumer Purchase Intentions: Credibility and Product Knowledge as a Factor in Purchase Intentions

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Abstract

In the realm of digital marketing, social media influencer marketing is a continuously evolving and significant trend. This study investigates how particular characteristics of cosmetic influencers on social media affect their perceived credibility, ultimately influencing purchase intentions through their “willingness to search for more information” (WN) and product knowledge. The model was tested with a sample size of 132 through smartPLS 4 by administering an online survey to female social media users who followed at least one cosmetic influencer with the help of a research firm (think survey). This study unveiled significant insights that cosmetic influencer credibility, driven by trustworthiness and content quality, significantly impacts purchase intentions. Product knowledge acts as a mediator, connecting credibility and WN to purchase intentions.

Keywords: Cosmetic influencers, Credibility, product knowledge, purchase intention

1. Introduction

The digital age is on the verge of announcing its arrival every day. It is becoming more and more evident that technology has changed the way businesses operate. Companies are now relying on digital advertisement to stay ahead of the competition. An important source of digital advertising is social media platform (Brettel et al., 2015; Lin & Kim, 2016) like Twitter, YouTube, Snapchat, TikTok (Lou & Yuan, 2019a) Facebook, and Instagram (Wood & Burkhalter, 2014) and have seen a surge in popularity (Dwivedi et al., 2018; Knoll, 2016; Shiau et al., 2017). In the last few years, social media usage has grown dramatically and has had a profound impact on society (Ifigeneia & Dimitrios, 2018) as people rely more on them to communicate, share information, and interact with one another. Companies are leveraging social media influencers as a contemporary and innovative marketing tool (De Veirman et al., 2017; Lou & Yuan, 2019b). Bloggers and influencers are often used by brands as advertising vehicles for their products (Khamis et al., 2017a; Pedroni, 2016). Social networking sites are increasingly popular with brands as a tool for improving brand value and establishing relationships (Arora & Sanni, 2019; Chakraborty & Bhat, 2018; Dodoo, 2018; S. Kumar et al., 2020; Shen & Bissell, 2013).

In the contemporary landscape of digital marketing, social media influencers have gained prominence due to their specialized expertise and knowledge of various niches. An increasing array of brands now harness the power of micro-celebrities, encompassing travel bloggers, food enthusiasts, beauty and

fashion connoisseurs, and more, to effectively promote their products and services (Khamis et al., 2017b; Pedroni, 2016). This allows brands to reach a wide range of potential customers who are already engaged with influencers. They are more popular, efficient, and more likely to trust endorsements from influencers than traditional advertisements (Alalwan et al., 2017; Aral et al., 2013; Chang et al., 2015; Hennig-Thurau et al., 2004; Lipizzi et al., 2015; Southgate, 2017). Furthermore, this method of marketing is relatively more effective (N. J. De Vries & Carlson, 2014). Digital advertisements on social media have a notable positive impact on users' attitudes and purchase intentions toward brands. Compared to conventional forms of advertising, digital promotional endeavors are regarded as inherently more credible (Djafarova & Rushworth, 2017; Tsang et al., 2004).

Despite being prevalent in practice, there is a dearth of academic definitions of social media influencers (Enke & Borchers, 2021; Reinikainen et al., 2020; Shan et al., 2020). (Freberg et al., 2011) defined SMIs as “a new type of independent third-party endorser who shapes audience attitudes through blogs, tweets, and the use of other social media”. Another defines ‘individuals who are in a consumer’s social graph and have a direct impact on the behavior of that consumer’ (Ge & Gretzel, 2018). (Khamis et al., 2017b) define ‘any well-known persona who is the subject of marketing communications efforts’. They frequently create videos, which are then shared with their subscribers on various platforms, such as YouTube, Instagram, and TikTok. With these videos, influencers can promote products, services, and brands to a large audience as well as become a part of the social media world (Saima & Khan, 2020).

Celebrity endorsers have drawn the attention of numerous academics (Ford, 2018; McCormick, 2016). On the other hand, according to (Abidin, 2016), neither Social media influencers nor their content is as big as celebrities. They are everyday people with an engaged following. They have become powerful in their own right and have the ability to reach millions of people with their content. Having a large audience makes bloggers more likable (De Veirman et al., 2017). The “promoting” posts of these influencers are more effective than traditional advertisements in getting customers (Aral et al., 2013; L. De Vries et al., 2012; Lipizzi et al., 2015) because it is more relatable and authentic. Notwithstanding the potential shortcomings in content professionalism, as highlighted by (Hautz et al., 2014) or the term ‘sponsored’ employed for explicit content labelling (Müller et al., 2018). In every sector of the media world, there are influencers: health, fashion, beauty, apparel, food, high-tech, etc. (Klassen et al., 2018; Raggatt et al., 2018). According to (Smith et al., 2007), bloggers have the potential to become opinion leaders whose posts have an impact on businesses, their offerings, and prospective customers. As a result, we call them influencers (Zhu et al., 2015). Influencers' intimate relationships with their audiences are highlighted by (Colliander & Dahmén, 2011) who refer to fashion bloggers as ‘fashionable friends’. In the dynamic realm of influencer marketing, there is a notable shift occurring as influencers progressively assume the role of “imaginary friends,” offering lifestyle tips and suggestions rather than primarily promoting brands (Lueck, 2015).

The surge in the prevalence of social media has spurred both academics and marketers to embark on an exploration of innovative avenues for harnessing its potential in promotional strategies (Saima & Khan, 2020). Consequently, a plethora of scholarly investigations, as exemplified by (S. Kumar et al., 2020) have been undertaken to delve into subjects of critical relevance, including online marketing, social media dynamics, and celebrity endorsement dynamics. Studies have found that social media serves as an effective marketing platform. Nevertheless, cosmetic influencer marketing remains a relatively unexplored field.

It has been shown that consumer behavior is heavily influenced by traditional celebrity endorsement (Costanzo & Goodnight, 2006; A. Kumar, 2011) and affects purchase intention (Ohanian, 1990a; Premeaux, 2009; Spears et al., 2013). It has been documented that only a handful of studies have been conducted (Abreu, 2019b; Evans et al., 2017; Lou & Yuan, 2019b; Trivedi & Sama, 2020) to study how influencer marketing on social media affects consumer purchase behavior (Arli, 2017; Hayes & Carr, 2015a; Ibrahim et al., 2020; Loureiro & Sarmento, 2019; Ott et al., 2016; Raji et al., 2020) and the mediating role played by credibility in affecting the purchase intention (Saima & Khan, 2020) but neglected product knowledge, WN and credibility as factors that influence cosmetic product purchase intentions. There has been no consideration of whether credibility generates interest in the message, which is thought to motivate people to search for products, which ultimately results in knowledge about the cosmetic product. Although these pre-purchase factors have been identified as significant drivers of buying decisions, they have received scant attention.

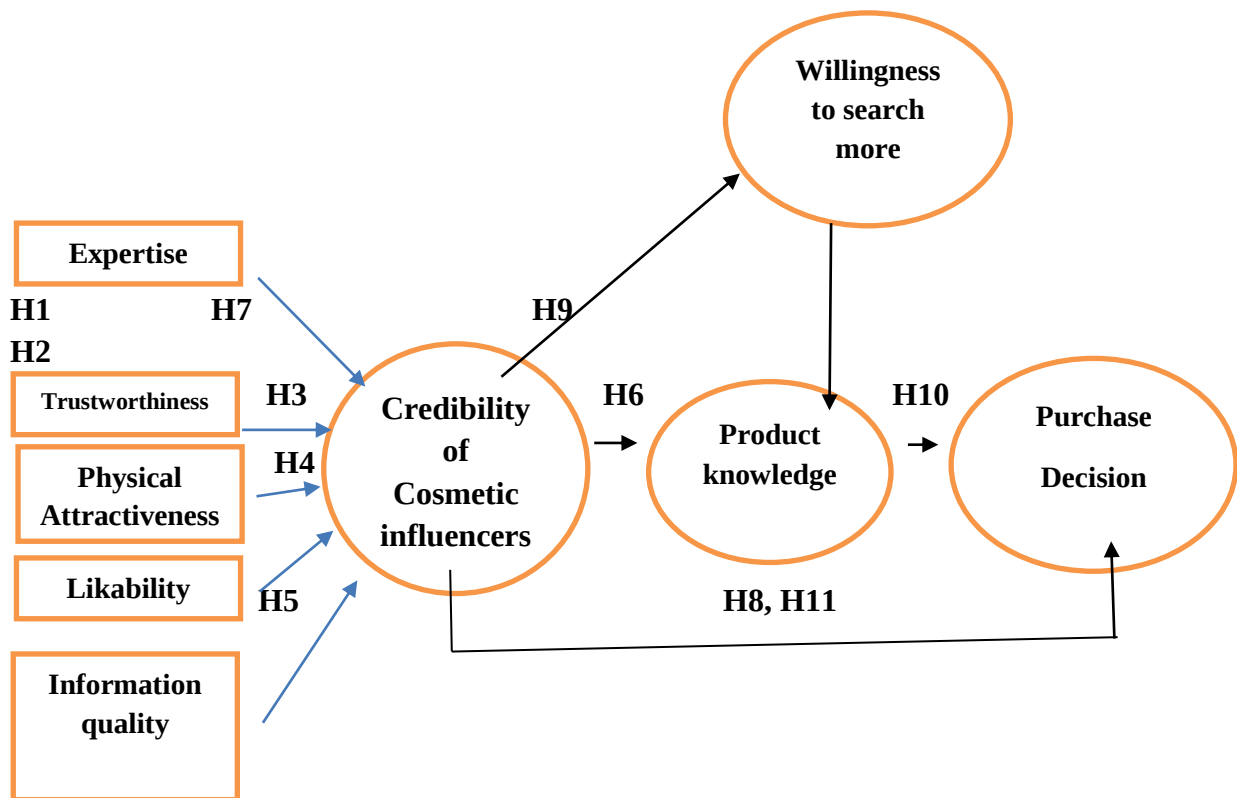
In recent years, the beauty industry has become one of the leading sectors to embrace influencer marketing [According to Influencer Marketing Hub (2022)]. As per Statista (2023) Over the next five years, the beauty care industry is forecast to grow to 88.9 billion U.S. dollars. Cosmetics are expected to remain the largest segment with 56.84 billion U.S. dollars in 2027. The primary objective of this research endeavour is to elucidate the efficacy of cosmetic influencers in the context of product marketing in an emerging market like India. There are three specific objectives of the study: (1) to assess cosmetic influencer credibility through various attributes, and (2) to determine whether credibility and product knowledge are the factors for consumers' purchase intentions. (3) to examine whether the "willingness to search for more information" mediates the association between the credibility of the cosmetic influencers and product knowledge. According to Influencer Marketing Hub (2022) Female beauty influencers have the most followers (82%) on Instagram. Therefore, only female respondents following any cosmetic influencers are included in the study.

2. Conceptual and Theoretical Framework

The source credibility model, initially proposed by Hovland et al. (1953), posits that two critical factors influencing source credibility are perceived expertise and trustworthiness. Additionally, McGuire's (1985) source attractiveness model introduces likability as another determinant of source credibility (J., 1985). In this study, we have employed both of these models to create a conceptual framework that aligns with our research objectives. It is essential to comprehend how endorsements impact consumer behavior, as (Ohanian, 1990a) suggests that source credibility encompasses three components: expertise, trustworthiness, and physical attractiveness, particularly in the context of celebrity endorsements.

Previous research, exemplified by studies such as (A. Kumar, 2011; La Ferle & Choi, 2005; Wang & Scheinbaum, 2017; Xiao et al., 2018) has consistently demonstrated that these source credibility models positively influence consumers' intentions to make purchases, particularly within traditional media platforms. Expanding on the findings of (Saima & Khan, 2020), it is evident that these source credibility models also exert a positive impact on purchase intentions in the domain of influencer marketing. Consequently, the credibility of cosmetic influencer marketing will likewise be positively affected by these attributes that convey product information and shape consumers' purchase intentions. Moreover, it is worth noting that information quality also contributes significantly to credibility and purchase intention, as indicated by studies such as (Dao et al., 2014; Ott et al., 2016; Taylor et al., 2011).

Figure 1: Conceptual model



3. Hypotheses Development

An expert is usually considered an authority in their field and is consulted by others to help solve difficult problems or answer questions. Experts often possess a deep understanding of the subject they specialize in and can provide sound advice and guidance. There is evidence that sources/celebrities who are considered experts have an enhanced ability to persuade (Horai et al., 1974; Mills & Harvey, 1972; Ross, 1973) and influence a person's decision to buy the product (Hayes & Carr, 2015a). Accordingly, celebrities with high expertise were considered more influential and effective than celebrities with low expertise (Erdogan, 1999).

H1: The expertise of cosmetic influencers exerts a favorable influence on their credibility

The notion of trustworthiness can be defined as the dignity, belief, and honesty exhibited by an endorser (Erdogan, 1999) and perceived by a target audience (Wang & Scheinbaum, 2017). For trustworthiness, (Giffin, 1967) perceives truthfulness, sincerity, and honesty as the qualities of a source. Consumers tend to perceive a message as credible when it originates from a trustworthy source (Hovland & Weiss, 1951). It has been determined by various researchers in the past that expertise (Applbaum & Anatol, 1972; Desarbo & Harshman, 1985; Simpson, 1981) and trustworthiness (Applbaum & Anatol, 1972; Bowers & Phillips, 1967; Desarbo & Harshman, 1985; Whitehead, 1968), continues to remain a pivotal component of credibility (Pornpitakpan, 2004), and based on the source credibility model, they are crucial to message effectiveness (Hovland CI, Janis IL, 1953). Trustworthiness greatly influences a message's persuasiveness, (Miller & Baseheart, 1969; Pornpitakpan, 2004) and has a greater impact than expertise (McGinnies & Ward, 1980) as a measure of source credibility.

H2: The trustworthiness of cosmetic influencers exerts a favorable influence on their credibility

(McGuire, 1969) says a source's attractiveness directly affects message effectiveness. Researchers have found that facial (Baker & Gilbert A. Churchill, 1977; Caballero & Solomon, 1984; Patzer, 1983), and Physical attractiveness influences an individual's initial judgment in the realms of advertising and communication (Baker & Gilbert A. Churchill, 1977; Chaiken, 1979; Kahle & Homer, 1985; Mills & Aronson, 1965). Celebrities' attractiveness has positively impacted purchase intentions (Erdogan, 1999; Petty et al., 1983).

H3: The physical attractiveness of cosmetic influencers exerts a favorable influence on their credibility

(Desarbo & Harshman, 1985), defines likability as the proclivity of the recipient to be irresistibly captivated by the communicator's charisma, personality, and degree of friendliness and affability towards observers (Giffin, 1967). According to (A. Kumar, 2011; Xiao et al., 2018), Credibility, consumers' attitudes, and purchase intentions are positively affected by the endorser's likeability (Munnukka et al., 2019).

H4: likability of cosmetic influencers exerts a favorable influence on their credibility

People are able to access a diverse spectrum of information, encompassing news, entertainment, trends, and opinions, through social media platforms (Lou & Yuan, 2019a). Information is widely disseminated and transmitted through influencers, and there are numerous studies that show how social media spreads attitudes and behaviors (Enke & Borchers, 2021; Reinikainen et al., 2020). A positive correlation is evident in the relationship linking information quality and perceived credibility. (Man et al., 2012; Slater & Rouner, 1996).

H5: information quality of cosmetic influencers exerts a favorable influence on their credibility

"Source credibility" embodies the affirmative attribute of the communicator that fosters the inclination of recipients to embrace a conveyed message (Ohanian, 1990b; Pornpitakpan, 2004). It has been shown that for messages to be accepted (Ajzen & Fishbein, 1977; Kapitan & Silvera, 2016) and for endorsement attitudes to be positive (Pornpitakpan, 2004), credibility is necessary. Influencer endorsements are significantly influenced by their credibility (Chu & Kamal, 2008; Munnukka et al., 2019). Endorsers' credibility exerts a substantial influence on consumers' purchase intentions and brand attitudes. (Chakraborty & Bhat, 2018; P. N. Chin et al., 2020; Djafarova & Rushworth, 2017; Hayes & Carr, 2015b). It is more persuasive to rely on a more credible source (Lirtzman & Shuv-Ami, 1986).

Information may be controlled passively by consumers by ignoring irrelevant/non-pertinent information (Wu et al., 2015). Nevertheless, influencers and opinion leaders consistently motivate their followers to seek out additional information and, ultimately, make purchase decisions by proffering recommendations they believe will pique the interest of their audience (Schouten et al., 2020). Therefore, it is crucial for an influencer to establish a level of credibility that can sufficiently capture a consumer's attention, prompting them to initiate further exploration of the recommended products before arriving at a purchase decision.

At the initiation of a purchase process, whether conducted online or otherwise, a consumer's initial inclination is to seek and analyze pertinent information in an effort to streamline the evaluation process and minimize time expenditure. (Wu et al., 2015); they tend to look at the relevant facts before making a purchase decision (Petrescu et al., 2018). Consequently, the act of seeking additional information serves the purpose of comprehending the subject matter on which individuals hold opinions (Hajli et al., 2017). Advertising is designed to persuade the audience and effect a shift in their attitude toward a product by imparting knowledge. This principle is equally applicable to influencers. (Djafarova & Rushworth, 2017; Lou & Yuan, 2019b; Pöyry et al., 2021), as they have similar goals. Accordingly, it motivates consumers to initiate a pursuit for additional insights and details regarding the product, thus advancing their decision-making process. In order to be accepted by consumers, the information must be consistent with what the consumer already has on hand (Petrescu et al., 2018).

Social media influencers' posts serve a dual purpose: to augment their followers' purchase intent and bolster product knowledge or product allure (Kay et al., 2020). So in terms of consumer perception, the first is product knowledge, or how familiar and knowledgeable consumers perceive themselves to be about a certain product (Biswas et al., 2006). A positive effect of celebrity endorsement on product knowledge has been demonstrated in previous literature (Biswas et al., 2006; Silvera & Austad, 2004; Spry et al., 2011). The recall and evaluation of a product are significantly influenced by consumers' product knowledge.

(Hong & Sternthal, 2010; Lee & Lee, 2011). There have been previous studies that show knowledge influences purchase intentions (Claycomb et al., 2005; Nguyen et al., 2019) This underscores the necessity of acquiring product knowledge prior to making a purchase.

According to (Dhanesh & Duthler, 2019) Residents in the UAE seek recommendations from prominent social media influencers, especially in the domains of beauty, fashion, and food. A significant 63% have reported that their purchasing choices are swayed by fashion and beauty influencers, and a substantial 71% express interest in making purchases from brands endorsed by these influencers. Consequently, our study is designed to explore whether the credibility of social media cosmetic influencers plays a pivotal role in augmenting consumer product knowledge and their inclination to seek further information regarding the same product, ultimately culminating in purchase intention. As such, we propose the following hypotheses:

H6: The cosmetic influencer's credibility is positively related to product knowledge

H7: The cosmetic influencer's credibility is positively related to the follower's "willingness to search for more information" about the product

H8: The cosmetic influencer's credibility is positively related to the purchase intention

H9: The follower's "willingness to search for more information" about the product is positively related to product knowledge

H10: Cosmetic product knowledge is positively related to the purchase intention

H11: Product knowledge mediates the relationship between the credibility of cosmetic influencers and purchase intention

H12: The follower's "willingness to search for more information" about the product mediates the relationship between the credibility of cosmetic influencers and Product knowledge.

4. Research Methodology

Instrument Development

In the present investigation, the methodology employed encompassed 5-point Likert scales, measuring from "strongly disagree" to "strongly agree," which were meticulously adapted from preceding research endeavours. Specifically, the constructs of expertise, trustworthiness, and attractiveness were sourced from the seminal work of (Ohanian, 1990b). The variable of purchase intention was derived from multiple scholarly sources, including (Abreu, 2019a; Kay et al., 2020; A. Kumar, 2011). Furthermore, the construct of product knowledge was extracted from the comprehensive study conducted by (Kay et al., 2020). while source credibility was thoughtfully adapted from the seminal research of (Xiao et al., 2018). To capture the aspect of likability, insights were integrated from (Reysen, 2005) and the construct of Information Quality was carefully drawn from a study conducted by (Man et al., 2012) and Finally, the construct of "willingness to search for more information" was grounded in the research findings of (Martínez-López et al., 2020).

Sampling and Data Collection

The dataset was acquired through a collaboration with "ThinkSurvey," (www.thinksurvey.co), a prominent market research firm renowned for its specialization in market research in the Indian context. They have 5,716 registered users from 108 different Indian cities, and they have collected a total of 19,336 responses for various surveys up until now. Our survey took place during August and September 2023. In this survey, we asked people if they followed cosmetic influencers on social media. If they said yes, we then asked them more questions about our study. We focused on female participants who actively use social media and follow cosmetic influencers. The non-probability sampling method was used to collect responses. we gathered 132 responses from the people who met our criteria, and we analysed those responses to conduct our study.

Data Analysis

SmartPLS 4 was the primary tool of choice for the evaluation and analysis of research hypotheses. Additionally, IBM SPSS was enlisted for the purpose of conducting a demographic profile analysis. PLS-SEM was chosen (W. W. Chin et al., 2003) for hypothesis testing due to its aptness for evaluating small sample sizes.

Demographic Profile of Respondents

The provided frequency table summarizes key demographic variables and social media usage patterns in a research paper. Under the "Age" variable, respondents are distributed across various age groups, with 1.5% falling into the "Upto 18 years" category, 22.0% in "19-24 years," 34.8% in "25-30 years," and 41.7% being "Above 30 years" category. For the "Educational Qualification" variable, the majority of respondents hold graduate degrees (45.5%), followed closely by postgraduates (41.7%). Undergraduates represent 6.8% of the sample, while doctorates and diploma holders each account for 3.0%. Regarding the "Frequency of using social media," an overwhelming 93.2% of respondents reported daily usage, with weekly usage at 6.1%, and rare usage at a negligible 0.8%.

Table 1: Demographic profile of respondents

Age	Frequency	Percent
Up to 18 years	2	1.5
19-24	29	22.0
25-30	46	34.8
Above 30	55	41.7

Educational Qualification	Frequency	Percent
Undergraduate	9	6.8
Graduate	60	45.5
Postgraduate	55	41.7
Doctorate	4	3.0
Diploma	4	3.0

Frequency of using social media	Frequency	Percent
Daily	123	93.2
Rarely	1	.8
weekly	8	6.1
Total	132	100.0

These percentages offer valuable insights into the distribution of respondents within each demographic category and their social media usage habits. The “demographic profile of respondents” is presented in Table 1.

Common Method Bias

To assess common method bias, we examined variance inflation factor (VIF) values within the inner model. It is noteworthy that all VIF values in our study were observed to be below the threshold of 3.33. This outcome serves as a robust indicator that the model remains devoid of common method bias (Kock, N., & Lynn, 2015).

Reliability and Validity Analysis

We evaluated the measurement model to check if our constructs were reliable and valid (see Table 2). To begin, it is noteworthy that all items within our model exhibited factor loadings above the established minimum threshold of 0.50 (Hair, J. F., Black, W. C., Babin, B. J., & Anderson, 2010). While it's ideal to have factor loadings above 0.7 (Vinzi et al., 2010), it's not uncommon to have slightly lower loadings in social science studies (Latif et al., 2020). In our case, one of the items (PI1, loading = 0.688) was close to 0.7 (see Table 2), so we did not remove any items from our analysis. Reliability assessment encompassed Cronbach's alpha, rho_a, and composite reliability. Importantly, all of these statistics exceeded the recommended threshold of 0.700, in line with (Wasko & Faraj, 2005).

Table 2: Item loadings, measures of reliability, and convergent validity

	Loading	Alpha	Composite reliability (rho_a)	AVE
AT1	0.867	0.808	0.836	0.718
AT2	0.807			
AT3	0.868			
CB1	0.925	0.83	0.83	0.855
CB2	0.924			
EP1	0.803	0.832	0.84	0.664
EP2	0.797			
EP3	0.84			
EP4	0.82			
LK1	0.862	0.705	0.713	0.772
LK2	0.894			
PI1	0.688	0.844	0.866	0.617
PI2	0.854			
PI3	0.72			
PI4	0.806			
PI5	0.844			
PK1	0.773	0.759	0.758	0.676
PK2	0.846			
PK3	0.845			
Q1	0.878	0.703	0.703	0.771
Q2	0.879			
TW1	0.726	0.757	0.805	0.666
TW2	0.845			
TW3	0.871			
WN1	0.871	0.769	0.795	0.684
WN2	0.869			
WN3	0.734			

Note- Expertise EP, Credibility CB, Trustworthiness TW, Physical Attractiveness AT, Likability LK, Information Quality Q, Product knowledge PK, Willingness to search WN, Purchase Intension PI

The rho_a value fell between Cronbach's alpha and composite reliability as outlined by (Schlittgen et al., 2016) also exceeded the 0.70 benchmark, affirming the high reliability of our measurement model. (Henseler et al., 2016). In testing convergent validity, we verified that the Average Variance Extracted (AVE) exceeded the minimum value of 0.500.

Table 3: Discriminant validity - Cross-loading criterion

	AT	CB	EP	LK	PI	PK	Q	TW	WN
AT1	0.867	0.445	0.415	0.603	0.473	0.397	0.393	0.443	0.502
AT2	0.807	0.317	0.385	0.518	0.44	0.27	0.331	0.367	0.443
AT3	0.868	0.5	0.448	0.512	0.498	0.382	0.469	0.475	0.505
CB1	0.473	0.925	0.585	0.57	0.608	0.521	0.618	0.616	0.404
CB2	0.47	0.924	0.591	0.524	0.553	0.545	0.614	0.682	0.395
EP1	0.32	0.473	0.803	0.407	0.478	0.407	0.533	0.603	0.426
EP2	0.387	0.448	0.797	0.523	0.534	0.351	0.577	0.501	0.495
EP3	0.405	0.562	0.84	0.502	0.489	0.371	0.601	0.586	0.461
EP4	0.482	0.572	0.82	0.559	0.502	0.379	0.587	0.499	0.481

LK1	0.596	0.486	0.519	0.862	0.606	0.531	0.528	0.491	0.559
LK2	0.533	0.55	0.557	0.894	0.519	0.474	0.59	0.528	0.431
PI1	0.521	0.389	0.468	0.484	0.688	0.482	0.4	0.376	0.524
PI2	0.533	0.518	0.46	0.544	0.854	0.635	0.535	0.524	0.462
PI3	0.384	0.358	0.354	0.382	0.72	0.407	0.472	0.3	0.323
PI4	0.394	0.541	0.527	0.518	0.806	0.6	0.597	0.545	0.425
PI5	0.383	0.602	0.564	0.546	0.844	0.692	0.634	0.555	0.499
PK1	0.397	0.391	0.467	0.588	0.644	0.773	0.49	0.413	0.479
PK2	0.368	0.503	0.343	0.437	0.57	0.846	0.513	0.535	0.378
PK3	0.272	0.528	0.324	0.374	0.592	0.845	0.476	0.497	0.293
Q1	0.436	0.584	0.638	0.54	0.589	0.489	0.878	0.612	0.328
Q2	0.404	0.586	0.601	0.58	0.609	0.565	0.879	0.661	0.407
TW1	0.31	0.354	0.383	0.35	0.304	0.418	0.433	0.726	0.273
TW2	0.467	0.614	0.571	0.491	0.525	0.48	0.654	0.845	0.346
TW3	0.448	0.673	0.633	0.543	0.581	0.528	0.642	0.871	0.349
WN1	0.445	0.386	0.52	0.501	0.505	0.413	0.38	0.364	0.871
WN2	0.511	0.396	0.514	0.481	0.546	0.426	0.392	0.372	0.869
WN3	0.476	0.275	0.361	0.395	0.339	0.31	0.246	0.237	0.734

Table 4: Discriminant validity (Fornell & Larcker and HTMT methods)

	AT	CB	EP	LK	PI	PK	Q	TW	WN
AT	0.848	0.604	0.591	0.851	0.679	0.524	0.62	0.627	0.728
CB	0.51	0.925	0.757	0.77	0.733	0.727	0.871	0.841	0.533
EP	0.493	0.636	0.815	0.795	0.724	0.579	0.92	0.814	0.704
LK	0.64	0.592	0.613	0.879	0.822	0.779	0.903	0.767	0.76
PI	0.557	0.628	0.612	0.636	0.785	0.895	0.873	0.695	0.694
PK	0.421	0.577	0.462	0.57	0.734	0.822	0.821	0.765	0.604
Q	0.478	0.666	0.706	0.638	0.682	0.601	0.878	0.963	0.558
TW	0.512	0.702	0.67	0.58	0.603	0.586	0.725	0.816	0.509
WN	0.573	0.432	0.571	0.558	0.571	0.468	0.419	0.4	0.827

Note- the diagonal and bold elements represent the square roots of the AVE (average variance extracted), with the values below the diagonal denoting correlations between the constructs. Above the diagonal, one can observe the HTMT (Heterotrait-Monotrait Method) values.

For discriminant validity, we scrutinized the correlations among latent variables and compared them to the square root of AVE (Larcker, 1981) and the heterotrait-monotrait ratio of correlations. Values below 0.9 were considered acceptable (Henseler et al., 2015). In our case, three values exceeded 0.9 (see Table 4). Indicators labeled EP, LK, and Q showed strong associations with their respective latent constructs, aligning with their theoretical foundations. However, when compared to alternative constructs—EP with respect to Q, LK with respect to Q, and Q with respect to TW—we observed a noticeable difference in loading greater than 0.10. This difference confirms the absence of cross-loading and thus supports the achievement of discriminant validity within the measurement model based on HTMT criteria (see Table 3).

Structural Model Assessment

Following the evaluation of the measurement model, the next step involved assessing the structural path to determine the path coefficient and its statistical significance.

Table 5: Direct Relationship

Hypotheses	Relationship	B	SE	T	P	Decision
H1	EP -> CB	0.154	0.098	1.574	0.058	Rejected
H2	TW -> CB	0.349	0.089	3.936	0	Supported
H3	AT -> CB	0.091	0.094	0.968	0.166	Rejected
H4	LK -> CB	0.118	0.104	1.142	0.127	Rejected
H5	Q -> CB	0.185	0.09	2.051	0.02	Supported
H6	CB -> PK	0.46	0.078	5.894	0	Supported
H7	CB -> WN	0.432	0.07	6.194	0	Supported
H8	CB -> PI	0.307	0.083	3.686	0	Supported
H9	WN -> PK	0.269	0.093	2.912	0.002	Supported
H10	PK -> PI	0.557	0.076	7.359	0	Supported

Notes – B= Beta coefficient, SE= Standard Error, T= t- Statistics, P= probability value, ExpertiseEP, Credibility CB, Trustworthiness TW, Physical Attractiveness AT, Likability LK, Information Quality Q, Product knowledge PK, Willingness to search WN, Purchase Intension PI, *Relationship are significant at $P < .05$

The structural model underwent scrutiny using the bootstrapping method, involving 10,000 resamples, to ascertain the hypotheses' significance, as shown in Table 5.

H1 sought to investigate whether cosmetic influencers' expertise significantly and positively impacted their credibility. The results indicated that expertise yielded an insignificant impact on credibility ($B = .154$, $t = 1.574$, $P > .05$), thus failing to support H1.

H2 aimed to explore whether cosmetic influencers' trustworthiness significantly and positively influenced their credibility. The findings revealed a significant impact of trustworthiness on credibility ($B = .349$, $t = 3.936$, $P < .05$), supporting H2.

H3 examined whether cosmetic influencers' physical attractiveness significantly and positively affected their credibility. The results showed an insignificant impact ($B = .091$, $t = .968$, $P > .05$), not supporting H3.

H4 tested whether cosmetic influencers' likability significantly and positively influenced their credibility. The findings indicated an insignificant impact ($B = .118$, $t = 1.142$, $P > .05$), failing to support H4.

H5 assessed whether cosmetic influencers' information quality significantly and positively impacted their credibility. The results demonstrated a significant impact of information quality on credibility ($B = .185$, $t = 2.051$, $P < .05$), supporting H5.

H6 investigated whether cosmetic influencer credibility significantly and positively affected the product knowledge of their followers. The findings revealed a significant impact ($B = .46$, $t = 5.894$, $P < .05$), supporting H6.

H7 examined whether cosmetic influencer credibility significantly and positively influenced “willingness to search for more information”. The results indicated a significant impact ($B = .432$, $t = 6.194$, $P < .05$), supporting H7.

H8 tested whether cosmetic influencer credibility significantly and positively impacted purchase intention. The findings revealed a significant impact ($B = .307$, $t = 3.686$, $P < .05$), supporting H8.

H9 assessed whether “willingness to search for more information” significantly and positively influenced product knowledge. The results showed a significant impact ($B = .432$, $t = 6.194$, $P < .05$), supporting H9.

H10 investigated whether product knowledge significantly and positively affected purchase intention. The results demonstrated a significant impact ($B = .557$, $t = 7.359$, $P < .05$), supporting H10. Detailed results can be found in Table 5, and the structural model is visually depicted in Figure 1.

Mediation Analysis

Mediation analysis was performed to assess the mediating role of product knowledge (PK) in the relationship between credibility (CB) and purchase intention (PI).

Table 6: Indirect effect

Total effect (CB - > PI)			Direct effect (CB - > PI)				Indirect effect (CB - > PI)					
Coefficient	T value	P-value	Coefficient	T value	P-value	Hypothesis	Coefficient	SE	T value	P-value	Percentile Bootstrap	
											Lower	Upper
0.628	11.325	0	0.307	3.686	0	H11: CB->PK->PI	0.256	0.052	4.962	0	0.176	0.343

The results (see table 6) unveiled a noteworthy indirect effect of CB on PI through PK (H11: $B = .256$, $t = 4.962$, $p < .05$). Importantly, the total effect of credibility on purchase intention was statistically significant ($B = .628$, $t = 11.327$, $p < .05$), and even with the inclusion of the mediator, the impact of credibility on purchase intention remained significant ($.307$, $t = 3.686$, $p < .05$). These results signify a complementary partial mediating role of product knowledge in the association between credibility and purchase intention, thus affirming support for H11.

Table 7: Indirect effect

Total effect (CB - > PI)	Direct effect (CB - > PI)	Indirect effect (CB - > PI)
--------------------------	---------------------------	-----------------------------

PI)												
Coeffi cient	T- valu e	P- valu e	Coeffi cient	T- valu e	P- valu e	Hypothesis	Coeffi cient	SE	T- valu e	P- Val ue	Percentile Bootstrap	
											Low er	Upp er
0.577	9.81 9	0	0.46	5.89 4	0	H12: CB- >WN>PK	0.116	0.0 45	2.57 6	0.00 5	0.04 9	0.19 9

We conducted a mediation analysis to assess the mediating role of “willingness to search for more information” (WN) in the relationship between credibility (CB) and product knowledge (PK). Our findings (see Table 7) revealed a significant indirect effect of CB on PK through WN (H12: $B = .116$, $t = 2.576$, $p < .05$). Notably, the total effect of credibility on PK was statistically significant ($B = .577$, $t = 9.819$, $p < .05$), and even after introducing the mediator, the effect of credibility on PK remained significant ($B = .460$, $t = 5.894$, $p < .05$). This underscores the presence of a complementary partial mediating role of “willingness to search for more information” in the relationship between credibility and product knowledge, thereby affirming the support for H12.

5. Discussion

Social media influencer marketing stands out as a prominent and evolving digital marketing trend. The study aimed to assess how particular attributes of social media cosmetic influencers impact their perceived credibility and, consequently, influence consumers' purchase intentions. This study corroborated the tenets of the source credibility model (Hovland CI, Janis IL, 1953) regarding the importance of trustworthiness and information quality in determining the credibility of cosmetic influencers (H2 and H5 received empirical support). These findings align harmoniously with earlier research outcomes (Arli, 2017; Man et al., 2012; Saima & Khan, 2020), thus further underlining their robustness and theoretical significance.

Social media influencers often strive to deliver content that is both informative and engaging in their effort to cultivate and sustain a loyal following. Thus, Significant influence is exerted on followers' purchase intentions by the quality of information contained in the content disseminated by influencers. These results are in alignment with established literature and indicate that personal attributes of influencers, such as expertise, physical attractiveness, or likability, (H1, H3, and H4 rejected), consumers predominantly gravitate towards the substantive content shared by influencers on social media platforms.

Furthermore, the study unveiled the noteworthy role of credibility as a catalyst, significantly influencing not only the inclination to “willingness to search for more information” but also enhancing product knowledge, which, in turn, facilitates purchase intentions (H6, H7, H8, H9, and H10 receiving empirical confirmation). Lastly, regarding the mediating influence of product knowledge, it was ascertained that product knowledge exerts a significant and positive indirect effect on purchase intentions (H11 supported). Additionally, the study established that credibility, in its capacity as a mediator, significantly engenders its impact on product knowledge via the intermediary factor of “willingness to search for more information” (H12 supported).

These findings, when taken together, make a significant contribution to our nuanced comprehension of the complex dynamics inherent in social media influencer marketing. They emphasize the paramount significance of credibility, information quality, and informative content in shaping consumer behaviors and purchase decisions within the context of the modern digital milieu.

6. Theoretical and Managerial Implications

This study advances our comprehension of consumer perceptions concerning influencer marketing within the expansive landscape of the Indian marketplace. In a context where limited research has explored the impact of social media cosmetic influencers on purchase intentions in India, this investigation significantly enriches the existing literature by presenting a holistic framework elucidating the influence of influencer characteristics on consumer purchase intentions, mediated by credibility and product knowledge. The study's findings underscore the pivotal roles of trustworthiness and information quality, as they exert substantial direct effects on influencer credibility and consequential indirect impacts on consumer purchase intentions via product knowledge and “willingness to search for more information” about the cosmetic product. Consequently, this study underscores the essentiality of influencers embodying informativeness and quality for the efficacy of influencer marketing initiatives. While expertise, physical attractiveness, and likability were deemed insignificant in influencing credibility and ultimately purchase intention

From a managerial perspective, these findings carry significant implications. Cosmetic firms seeking to maximize the returns on their investments in influencers should carefully consider the identified characteristics, ensuring alignment with their marketing objectives, thus potentially bolstering sales, and brand visibility. The positive influence of these attributes on consumer purchase intentions, when combined with other factors, highlights the importance of marketers identifying and engaging cosmetic influencers who possess these attributes to attain their strategic goals. The choice of cosmetic influencers should prioritize those who not only enhance post credibility but also cultivate trust among their followers, while also delivering informative and engaging content. Additionally, this study offers valuable insights for cosmetic influencers themselves, emphasizing the significance of consistently providing high-quality informative content while maintaining trustworthiness as a core attribute. In the long run, nurturing these qualities can fortify influencer-brand alliances and expand their audience reach, thereby consolidating their influence and long-term success..

7. Conclusion

Influencer marketing is a burgeoning strategy in India, shaping consumer perceptions and purchase intentions. This study unveiled significant insights that cosmetic influencer credibility, driven by trustworthiness and quality of the content significantly impacts purchase intentions. product knowledge acts as a mediator, connecting credibility and “willingness to search for more information” to purchase intentions. For influencers, maintaining trust, content quality, and credibility is essential. Consumers today are well-informed, and influencers must provide accurate, trustworthy content to retain trust. Influencer attributes alone may not drive purchases, but they influence consideration when combined with other factors, including need, perceived value, price, and brand perception. Influencers play a pivotal role in guiding consumers toward purchase consideration.

Limitation

Future research with larger samples and across a variety of product categories will be able to provide a more comprehensive insight into how marketing dynamics are influenced

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