SPECIAL ISSUE

1st International Conference on STAGE-2025: Sustainability, Technology & Innovation, AI & Analytics, Green Practices, and Entrepreneurship & Management

The Journal of Indian Management & Strategy

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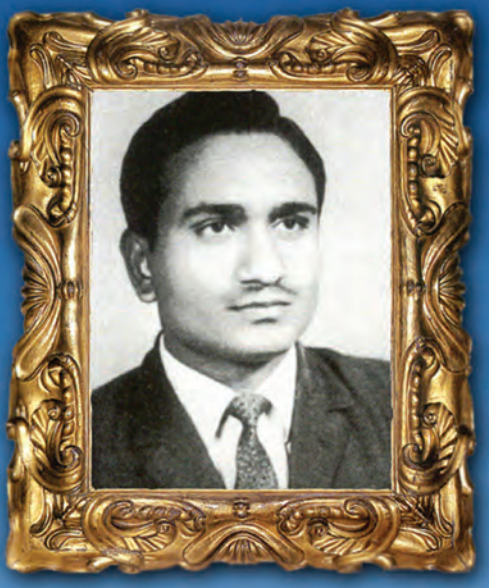
"You see things and you say **Why***? But I dream of things that never were and say* **Why** *not?"*

- George Bernard Shaw



Shri Jagannath Gupta
(1950 - 1980)

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He lives no more but his dreams live on....and on!

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Editor's Desk

It is a privilege to endorse this Special Issue of **JIMS 8M – The Journal of Indian Management & Strategy**, dedicated to the **1st International Conference on STAGE-2025: Sustainability, Technology & Innovation, AI & Analytics, Green Practices, and Entrepreneurship & Management**, organized by the Department of Commerce, Guru Jambheshwar University of Science & Technology, Hisar.

The conference, held in hybrid mode, witnessed an overwhelming academic response and brought together scholars, practitioners, and experts from across the globe. Conducted through 15 technical sessions, the event facilitated vibrant discussions and the presentation of 150 research papers, offering contemporary insights into sustainability, emerging technologies, artificial intelligence, analytics, green practices, and entrepreneurial development.

From this rich pool of submissions, 35 selected papers were compiled into an ISBN Edited Book titled "Convergence", reflecting the thematic diversity and academic strength of the conference. Additionally, following a rigorous blind peer-review process, 7 high-quality papers were recommended for publication in this Special Issue of JIMS 8M. These papers represent the most distinguished contributions of STAGE-2025 and exemplify the interdisciplinary essence of the conference.

We extend our heartfelt appreciation to our International Collaborator**, Indo-Gulf Management Association**, for their valuable partnership and support, which greatly enriched the intellectual and global engagement of the conference.

I also express my sincere gratitude to **JIMS 8M** for their collaboration in publishing this Special Issue and for helping disseminate the scholarly outcomes of STAGE-2025 to the wider academic community.

My warmest thanks go to the authors, reviewers, editorial team, and the entire organizing committee for their dedication, commitment, and scholarly rigor.

I am confident that this Special Issue will inspire future research, promote interdisciplinary dialogue, and contribute meaningfully to ongoing conversations in the domains of sustainability, technology, and entrepreneurship.

Dr Nidhi Turan
Conference Convener
Chairperson
Department of Commerce, GJUS&T, Hisar

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ECONOMIC GROWTH THROUGH TRADE AND INVESTMENT: A CAUSALITY-BASED COMPARATIVE STUDY OF INDIA AND BANGLADESH

Gourav Mittal* Ravinder Verma**
Vandana Arya* Pardeep Gupta******

Nevertheless, India and Bangladesh have close ties and are characterized as lower-middle-income nations as per the World Bank, vast differences lie in terms of foreign inflows, foreign trade, and economic growth in these nations. Therefore, this research objects to examine the comparative nexus between FDI, exports, and economic growth in India and Bangladesh from 1991 to 2023. The study employs the Autoregressive Distributed Lag (ARDL) model to analyze both long-term and short-term effects of FDI and exports on economic growth. The findings indicate a long-term connection between FDI, exports, and economic growth in both countries. Additionally, the long-term and short-term estimators demonstrate that FDI and exports positively influence economic growth. The study points out that India and Bangladesh are required to boost FDI for economic growth and to promote export-intensive policies to contain their diminishing exports.

Keywords : *Economic Growth, Exports, Foreign Direct Investment, India, Bangladesh.*

I. Introduction

Foreign Direct Investment (FDI) is regarded a significant factor contributing to the economic growth of countries. FDI has played a crucial role in the economic advancement of both host and home nations by creating job opportunities, aiding in capital formation, optimizing capacity utilization, and enhancing the managerial and technical skills of the workforce through exposure to diverse environments and workforces. It also boosts competitiveness and fosters macroeconomic stability in the host country (Kumari and Sharma, 2017; Arya & Singh, 2025). Nations benefit from FDI due to increased production through spillovers and technology transfers (Makki and Somwaru, 2004). Technology transfer via FDI can occur through four methods: introducing new ideas and technologies, enabling the import of cutting-edge technology, adopting foreign technology, and improving human capital levels (Borensztein et al., 1998; Kalirajan et al., 2011; Kumari & Sharma, 2017; Adhikary, 2017).

Due to these perceived benefits, many developing countries are taking initiatives and are liberalizing their economies to attract FDI and are receiving larger FDI inflows around the world (Lee & Fernando, 2020; Chandio et al., 2019). The governments of various developing countries are providing many inducements to overseas investors and MNCs to entice them for investing more in their countries such as providing a reduction in taxes and provision of subsidies, providing a conducive environment, liberalizing trade by reducing and abating tariffs and non-tariff barriers, enhancing global competitiveness, privatizing the state-owned enterprises, preventive government control in the private sector, and reforming the legal and regulatory environment (Shittu et al., 2020). Upsurges in FDI flows have become a global spectacle. Global FDI flows have been growing in such a way that FDI inflow was US$50 billion in the early 1990s and has increased to US$1.39 trillion in 2019 (World Bank).

For the past three decades, the association between foreign investment (FDI) and economic growth has been a contentious and significant topic of discussion. The benefits a host country derives from FDI are contingent upon its economic development. According to the growth-led FDI

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hypothesis, as a nation's economy expands, its market size grows, thereby encouraging foreign companies to increase their capital investments in that nation (Singh et al., 2023). Consequently, rapid economic expansion in host nations, improved substructure, and enhanced projections for higher profits serve as stronger incentives and attract more FDI (Arya et al., 2024; Mishra & Jena, 2019; Kalirajan et al., 2011).

Likewise, since the East Asian crisis in 1997, the interactive relationship between FDI, economic growth, and exports has also gained considerable attention from policymakers and researchers as the interaction, direction, and pattern among these variables can affect the policymaking decision. Therefore, this study is very important because it will help decision-makers in correctly formulating policies for promoting the economic growth of countries.

India and Bangladesh are both countries having the status of developing countries as per the World Bank group and have made considerable progress since their inception as independent nations. Both countries share significant bilateral cooperation in various fields such as trade, security, power, and energy. Both countries also share significant similarities in their cultural environment due to the adjacent border lines of countries, and are characterized by a steady rate of economic growth. More recently, these two countries are working towards the culmination of a Comprehensive Economic Partnership Agreement (CEPA) to extend trade and economic nexus as associates compared to rivals. Further, both countries have decided to stand "shoulder to shoulder" with the top authority and people of both nations in their development process. Further, the two countries are celebrating the Maitri Divas to mark 50 years of Bangladesh's liberation and its mutual bonds with India, which was the first nation to acknowledge its liberation. However, considerable differences have appeared in terms of FDI inflows and economic growth witnessed by these countries.

India is the third-largest economy (in terms of GDP based on PPP) and the largest democracy in the world. Since 1991, the regulatory framework in terms of foreign investment has been consistently eased to accelerate economic growth in India. Through its unswerving economic growth record and vast capable manpower, India offers huge prospects and a conducive environment for foreign investments (Arya et al., 2024). India is also among the rapidly growing economies of the world. The Indian economy has shown tremendous progress over the last two decades due to an investor-friendly environment. Since the commencement of economic transformations in 1991, major revolutions have been introduced in various fields such as investment, banking, and the financial sector. Consequently, India correspondingly liberalized its FDI policy. The position of India in the World Ease of Doing Index has improved from 139th in 2010 to 63rd in 2020 (World Bank).

On the other hand, Bangladesh became independent in 1971, but liberalized its economy much before India in 1980. It is progressively stirring towards an industrial economy from an agrarian economy. The country has recorded an average growth rate of GDP in the last decade. Since 1994, it has been receiving large inflows of FDI (Hussain & Haque, 2016). FDI has played a key role in the development and modernization of the Bangladesh economy for the last two decades. The various sectors that attract maximum FDI are Power, Food, Banking, Textiles & Wearing, and Telecommunication. Bangladesh receives a major portion of FDI from China, followed by the Netherlands, the UK, Singapore, and the USA. The factors that are working as a deterrent to FDI inflow in Bangladesh are a deficiency in basic infrastructure, regime officialdom, corruption, and political unrest. However, Bangladesh could get a comparative advantage in areas such as geographic location, cheap labor cost, and consumer market (Manzoor & Chowdhury, 2017).

Table: 01 Profile of India and Bangladesh

Countries	India				Bangladesh			
Variables	1991	2001	2012	2023	1991	2001	2012	2023
Exports of goods and services (% of GDP)	8.494	12.558	24.534	21.848	6.663	13.387	20.162	13.157
Exports of goods and services (Billion current US$)	23.020	62.130	443.845	773.177	2.120	6.837	27.591	58.885
Foreign direct investment, net outflows (% of GDP)	-0.004	0.217	0.468	0.389	0.001	0.038	0.217	0.000
Foreign direct investment, net inflows (Billion current US$)	0.074	5.128	23.996	28.079	0.001	0.079	1.584	1.385
GDP (Billion current US$)	270.105	485.440	1827.638	3567.552	30.957	53.991	133.311	437.415
GDP per capita (current US$)	305.574	450.358	1429.322	2480.792	272.065	394.656	859.681	2551.018
GDP growth (annual %)	1.057	4.824	5.456	8.153	3.485	5.077	6.521	5.775

Source: WDI, 2025

The table compares the economic performance of India and Bangladesh across four key periods (1991, 2001, 2012, and 2023) using several vital economic indicators. This table presents a comparative economic overview of India and Bangladesh from 1991 to 2023, showcasing India's significantly larger and faster-growing economy with greater export values, higher foreign direct investment inflows, and a larger GDP, while both nations have demonstrated consistent economic growth, increased participation in global trade,

and improvements in GDP per capita over the observed period. GDP annual growth is 8.153 of India and 5.775 of Bangladesh in 2023. The per capita GDP is 2480.792 of India and 2551.018 of Bangladesh in 2023.

II. Review of Literature

The notional relation between foreign inflows and economic growth is in endogenous and neo-classical growth theories. These theories emphasized the role of foreign inflows in economic development in terms of capital accretion and technology spillover. Using annual data from 1968 to 2002 for Turkey, Gunaydin and Tatoglu (2005) investigated the underlying relation between FDI and economic growth and indicated that these variables were cointegrated in the long run. Further, two-way causality was also found between FDI and economic advancement. Likewise, using yearly data from 1970 to 2005, Mun, Lin, and Man (2008) observed the linkage between external flows and economic advancement and found an optimistic linkage between external flows and economic advancement. Using yearly data from 1991 to 2019, Arya et al. (2024) examined the underlying connection amongst exports, external flows, and economic expansion in BIMSTEC using the Johansen Cointegration test and Vector error correction model (VECM) and provided evidence in support of an optimistic connection among these variables. Sharma and Kautish (2020), using curvilinear ARDL, observed the influence of macroeconomic variables on FDI in India for the period 1979 to 2016 and specified the incidence of an optimistic link amid external flows and economic development. Using annual data for 1981-2018, Lee and Fernando (2020) observed the dynamic connection amongst external flows, exports, and economic progress in Indonesia and applied the ARDL approach and the VECM procedure. The results indicated mutual causality amid foreign direct investment and economic progress, a one-way causal connection amid export and economic growth, and no causal connection between external flows and export. Likewise, Iqbal et al. (2010) discovered the continuities between trade, external flows, and economic development from 1998 to 2009 in Pakistan using the VEC model and found long-run bidirectional causation among the underlying variables. Singh et al. (2024) observed the relationship among FDI, financial sophistication and economic advancement using NARDL approach and found that the variables were co-moving in the long run and adverse repercussions of external flows on economic expansion. Sharma and Kaur (2013) emphasized the one-way causation from external flows to bilateral trade in China and two-way causation between FDI and exports and imports in India for the period 1976 to 2011. Ali and Mna (2019) examined how FDI affected domestic venture and the economic progress of three developing nations. The authors used the generalized moments' method (GMM) for analysis. The results revealed that domestic speculation convincingly relocating the repercussions of household surpluses and credit to economic growing. Whereas for Morocco, domestic investment was not laying an influence over growth. Likewise, Gursoy et al. (2013) shed some light on the nexus between FDI and economic expansion in the context of Azerbaijan, Tajikistan, Kyrgyz Republic, Turkmenistan, Kazakhstan, and Uzbekistan during the period of 1997 to 2010. The study applied the Johansen cointegration test and causality tests. The overall findings indicated that for Azerbaijan and Turkmenistan, external flows and economic evolution were found to be correlated. The Granger causality test revealed that external flows influenced GDP in both countries, and a bidirectional causal connection was observed. In a study focusing on India, Kaur et al. (2013) employed the Toda-Yamamoto method to scrutinize the connection between economic evolution and external flows inflows. The results specified existence of external flows positively affects economic evolution for both periods. Likewise, a strong indicator of economic evolution causing FDI during the post-liberalization period was also found.

Although some academicians, such as Bermejo Carbonell and Werner (2018) and Bilas (2020), found no linkage between external flows and economic development. Utilising annual data from 1984 to 2010, Bermejo Carbonell and Werner (2018) analyzed the influence of FDI on economic progress from 1984 to 2010 for Spain and reported no FDI-growth nexus in Spain. Likewise, Bilas (2020) analyzed the linkage amid external flows and growth in Croatia from 2000 to 2019. Using the Engle-Granger and Johansen cointegration test, the author found that no long-run connection occurs between FDI and economic progress. Alam (2013) applied a tri-variate framework to determine the casual nexus as well as to establish virtual associations amongst power consumption, external flows and economic development in India and Pakistan and exposed that there was no short-run causality among these variables for both the nations while in long run Economic Growth as well as external flows was Granger caused by electric power consumption.

Rehman (2016) found the growth-led impact of foreign inflows using panel data from 1970 to 2012 and also conveyed economic development to be a descriptive variable. He also reported that FDI varied with the economic development, but this linkage was not converse.

The critical appraisal of prevailing literature shows that the association among external flows, Exports, and Economic Growth is crucial for emerging economies because these nation-states face severe economic distress. Moreover, external inflows are the foremost source of capital inflow for developing economies over the last few decades throughout the world. Further, it can be seen that ample literature exists where studies have been conducted to know the absolute relationships among Economic Growth, Exports, and Foreign Direct Investment but very limited studies have tested the causality amongst the aforementioned variables. Therefore, an attempt has been made here to test the causality between FDI, Exports, and Economic Growth in India and Bangladesh by empirical analysis.

III. Data And Methodology

This study is connected by considering the following variables: net inflows of Foreign Direct Investment, Exports of merchandise goods and services, and per capita GDP of India and Bangladesh. The annual data for the period 1991 to 2023 has been obtained from the World Bank (WDI) to observe the existence of causation among FDI, Exports, and Economic Growth. The theoretical model based on Odedokun (1996) is used to analytically observe the linkage between foreign inflows and economic growth in India and Bangladesh.

Table: 02 Variable description

Symbols	Variable description
GDPG	GDP growth (annual %)
FDI	Foreign direct investment, net inflows (% of GDP)
EXPORTS	Exports of goods and services (% of GDP)

Source. World Development Indicators, 2023.

The following econometric equation is estimated:

$$GDPG_T = f(FDI_t, EXT) \qquad (1)$$

Where the GDPG is the Economic Growth, FDI is Foreign Direct Investment, and EXT is Exports of goods and services.

The following equation is estimated to govern the long-run connection between employment and the macro variables:

$$\Delta GDPG_t = C_0 + \gamma_1 FDI_{t-1} + \gamma_2 EXT_{t-1} + \varepsilon_t \qquad (2)$$

After estimating the long and short-run estimates, the error correction term is estimated, which is calculated as follows:

$$\Delta GDPG_t = C_0 + \sum_{i=1}^{p} \delta_1 \Delta FDI_{t-1} + \sum_{i=1}^{q} \delta_2 \Delta EXT_{t-1} + \varepsilon_t \qquad (3)$$

Table: 03 Descriptive Statistic

	India			Bangladesh		
	GDPG	FDI	EXPORTS	GDPG	FDI	EXPORTS
Mean	6.073	0.414	17.321	5.648	0.051	13.381
Median	6.795	0.322	18.792	5.572	0.006	12.820
Maximum	9.690	1.606	25.431	7.882	0.365	20.162
Minimum	-5.778	-0.004	8.494	3.448	0.000	6.663
Std. Dev.	2.881	0.446	5.408	1.170	0.090	3.593
Skewness	-2.267	1.400	-0.250	-0.132	2.015	0.309
Kurtosis	9.790	4.089	1.629	2.142	6.163	2.277
Jarque-Bera	91.649	12.408	2.926	1.108	36.081	1.243
Probability	0.000	0.002	0.231	0.575	0.000	0.537
Sum	200.415	13.677	571.608	186.371	1.689	441.562
Sum Sq. Dev.	265.650	6.370	935.731	43.818	0.260	413.189
Observations	33	33	33	33	33	33

Source. The authors' computation from e-views 10.

The study proceeds with the estimation of preliminary analysis. Table 03 offers the preliminary analysis of the variables involved in the study. The average economic growth of Indian and Bangladesh over the study period is 6.073 and 5.648, respectively. The average foreign direct investment is 0.14% and 0.05% for India and Bangladesh, respectively. The average exports as a percent of GDP are 17.32% for India and 13.38% for Bangladesh.

Table: 04 Unit Root Tests

	India					
	ADF			PP		
	GDPG	FDI	EXPORTS	GDPG	FDI	EXPORTS
At Level	0.000	0.688	0.857	0.000	0.672	0.839
At First Difference	0.000	0.000	0.000	0.000	0.000	0.000
	Bangladesh					
	ADF			PP		
	GDPG	FDI	EXPORTS	GDPG	FDI	EXPORTS
At Level	0.000	0.216	0.837	0.000	0.190	0.837
At First Difference	0.000	0.001	0.005	0.000	0.000	0.005

Source. The authors' computation from e-views 10.

In the initial step, the ADF and PP unit root tests are employed to assess the presence of a unit root in the series. Testing for stationarity is crucial since non-stationary data series can yield unreliable regression results. The assumption of stationarity is necessary for the regression analysis. According to the ADF and PP test results, all variables, except GDPG, are non-stationary at the level but exhibit stationarity after first differencing. The identification of mixed orders of

integration among the selected variables permits the application of the ARDL model for further analysis, as presented in Table 04.

Table: 05 Bound Testing Results

F-Bounds Test		Ho: No co-integration among the variables.		
Test	Value	Sign.	I (0)	I (1)
F-statistic		1%	3.16	4.26
India	7.701	5%	2.90	3.84
Bangladesh	3.775	10%	2.84	3.14

Source. The authors' computation from e-views 10.

In the model for further analysis, the ARDL bound test results reveal that the f-value (7.701 for India and 3.775 for Bangladesh) exceeds both the upper and lower table values, confirming the existence of a long-run association among the selected variables. Upon establishing the long-run association among the variables, the estimation of long-run and short-run coefficients is conducted, as detailed in Table 05.

Table: 06 Long-run and Short-run Results

Long-Run Results				
Variables	Coeff.	Err.	t-Stat.	P-value
India				
GDPG (-1)	-1.008	0.182	-5.50969	0.000
FDI	0.058	1.521	-0.03839	0.039
EXPORTS	0.151	0.129	0.399261	0.024
Bangladesh				
GDPG (-1)	-0.057	1.509	-0.038	0.969
FDI	0.051	0.128	0.401	0.041
EXPORTS	5.346	1.983	2.695	0.011
Short-Run Results				
India				
GDPG (-1)	-15.423	8.933	-1.726	0.102
FDI	0.578	0.223	2.583	0.019
EXPORTS	1.260	2.619	-0.481	0.035
Bangladesh				
GDPG (-1)	-0.712	0.244	-2.913	0.009
FDI	3.421	2.905	-1.177	0.052
EXPORTS	0.475	0.126	3.768	0.001

Source. The authors' compilations from e-views 10.

In the Long-run Bound Test results, as illustrated in the upper part of Table 06, the quantities for the variables FDI and exports has positive and significant for both countries. The results indicate that the FDI and Exports have an optimistic repercussion on economic growth for both countries. In the Short-run Bound Test results, as illustrated in the lower part of Table 06, the coefficients for the variables FDI and exports has positive and significant for both countries. The short-run results also suggested that the FDI and Exports have a positive impact on economic growth for both countries. The results of the positive impact of FDI and Exports on economic growth are in line with Adhikary (2011), Dey and Awal (2017), Dutta et al. (2017), Rehman (2016), Reza et al. (2018), Sarker and Khan (2020), Bilas (2020), Amir et al. (2023), and Chowdhury (2024).

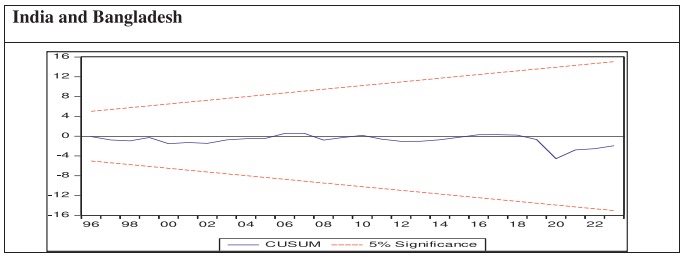
Table: 07 Diagnostic Testing Results

Diagnostic Tests	F-value	p-value
Serial Correlation LM Test (Breusch-Godfrey)	2.584	0.841
Heteroskedasticity Test (Breusch-Pagan-Godfrey)	1.628	0.983
Normality Test	3.794	0.851

Source. The authors' compilations from e-views 10.

The outcomes of the Breusch–Godfrey Test for heteroscedasticity, White test for heteroscedasticity and autocorrelation and Jarque-Bera Test for Normality confirm that the model is free from serial correlation, exhibits no heteroscedasticity, and the series follows a normal distribution (Table 07). The CUSUM test diagram in Figure 04 shows that the graphs of all four estimated models fall perfectly within the 5% critical value diverging boundaries, indicating that the models are stable.

Figure: 04 CUSUM Test



Source. The authors' compilations from e-views 10.

IV. Conclusions

The present paper explores the causal association among FDI, Exports, and Economic Growth of India and Bangladesh empirically from 1991 to 2023. India and Bangladesh, both states, are enjoying the status of developing countries. Despite the proximity, significant differences lie in terms of FDI inflows, Exports, and Economic Growth of both states. Therefore, this research investigates the potential variations in the nexus between FDI, Exports, and Economic Growth across two nations. Utilizing the Autoregressive Distributed Lag (ARDL) model, the study analyses both short-term and long-term impacts of FDI and exports on economic development. The findings indicate a long-term connection between FDI, Exports, and economic growth in both India and Bangladesh. Both short-term and long-term estimators suggest that FDI and Exports positively influence economic growth. The research concludes that to address declining

exports and foster economic growth, India and Bangladesh should implement strategies to attract more FDI and adopt export-oriented policies.

The findings have significant policy implications. The long-run connection among FDI, Exports, and Economic Growth for India as well as Bangladesh suggests that both countries should focus on increasing economic growth by attracting more FDI and promoting an export-oriented environment and policies. FDI should be invited to diverse sectors and in diverse fields to achieve its multi-faceted benefits. India and Bangladesh should adopt operative policies that would markedly expand their economic base, expand locally available assistance, and build up a vast stock of capable human resources, augment monetary and fiscal stability, and further slacken their market in such a way that these states entice as well as an advantage from long-term FDI influxes.

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UNDERSTANDING CONSUMER PERCEPTIONS OF BATTERY ELECTRIC VEHICLES: AN EXPLORATORY FACTOR ANALYSIS APPROACH

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Battery Electric Vehicles (BEVs), an alternative that is sustainable for traditional internal combustion engine (ICE) vehicles, are causing a major change in the automotive sector. Through incentives, infrastructure development, and technology improvements, governments and industries around the world are encouraging the use of BEVs as concerns over climate change, air pollution, and reliance on fossil fuels continue to grow. The success of BEVs in the general market is largely dependent on consumer attitudes and perceptions, despite these efforts. This study used to determine the important factors shaping consumer perceptions of BEVs. Data was collected through a web-based questionnaire. Then, an Exploratory Factor Analysis (EFA) was used to construct dimensions regarding consumer perceptions. EFA result identified three major factors: BEV satisfaction and recommend intention, environment benefits of BEVs and perceived functional barriers. These findings suggest for automakers, policymakers, and marketers, that efforts should concentrate on enhancing BEV performance, growing charging networks, and educating consumers regarding misconceptions.

Keywords : *Exploratory Factor Analysis, Battery electric vehicles, Satisfaction, Environment benefits.*

I. Introduction

Resource scarcity and environmental pollution have a significant impact on sustainable development and the ecological balance of the world (Liu et al., 2020). In response, all societal levels have been becoming more environmentally conscious in recent years. This issue has changed how some businesses currently operate as well as how consumers buy a lot of goods (Chowdhary et al., 2016). This has resulted in international agreements like the Paris Agreement, which mandates that nations cut their greenhouse gas emissions (Ramadhan and Aruan, 2024). India is prepared to lower its carbon footprint, and it is currently in the process of switching from carbon-based to green resources (Vishwakarma, 2024). The transportation industry contributes significantly to air pollution, which causes climate change because of greenhouse gas emissions, primarily in urban areas. This has made road transportation electrified, and moving to new energy vehicles, including electric vehicles (EVs), from internal combustion, appears to be a potential step in achieving urban sustainability (Kumar and Alok, 2019). In recent years, the proportion of electric vehicles (EVs), a new energy vehicle, in the transportation system has increased due to its low noise, low pollution, and high energy efficiency features (Wang et al., 2020). Although, first attempts to manufacture an electric vehicle (EV) date back approximately to the 1830s, and Thomas Parker produced the first useful car in London in 1884. However, fossil fuel-powered cars quickly forced EVs out the market (Mandy, 2021). However, EVs are currently being re-examined as a key alternative for environmentally friendly transportation due to growing environmental concerns and technology advancements. As a component of the first alternative, electric vehicles (EVs) are being considered extensively. Their primary benefit is that, while satisfying individual transportation demands, they can contribute to reduce the greenhouse gas emissions, local pollution, noise (Peters and Dutschke, 2014). Consumers are increasingly choosing plug-in electric vehicles (PEVs), which are a combination of battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), as a substitute to internal combustion engine (ICE) vehicles (Chakraborty et al., 2019). Because of their lower emissions of pollutants, non-renewable energy savings, and environmental friendliness, NEVs (new energy vehicles) appear to be more competitive than conventional vehicles (such as gasoline-powered cars). Hence, developed as well as emerging economies are

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devoting significant resources to the development and diffusion of NEVs (Su et al.,2020). As a result, researchers and industry professionals are becoming more interested in various EV approaches and experiences in order to explore the best ways to increase energy efficiency, tackle environmental issues, and satisfy consumer demands for a wide range of green vehicles (Secinaro et al., 2022). It is essential for legislators, automakers, and other EV industry players to understand the variables that affect customer perceptions of BEVs. This study attempts to identify the key factors shaping consumer's perceptions of BEVs.

II. Review of Literature

Buhler et al. (2014) investigated how EV drivers view and accept current EV technology and how practical experience influence their perspectives. Their result show that, with the availability of a second vehicle and a home charging station, currently available EVs are already acceptable and appropriate for daily use in urban areas. Besides that, there still remain substantial challenges such as limited range and purchase costs for mass market success. In addition, BEV customers who are satisfied intend to repurchase and recommend them to others. Liu et al. (2020) carried out research to study the role of customer experience and its influence on the adoption willingness of BEV. According to their findings, experienced consumer had significantly greater mean value for perceived behavioural control, subjective norm, attitudes, and adoption willingness than inexperienced consumers. In addition, experience has a positive influence on adoption both directly and indirectly, reinforcing the strong mediating role of subjective norm, attitudes, and perceived behavioural control. In order to determine customer demand for EVs, Morton et al. (2016) examined the impacts of consumer innovativeness and perception on EVs' functional capabilities for EV decisions. Their findings revealed that the attitudes regarding functional performance of EVs and adoption innovativeness influence the preference for Plug-In Hybrid Electric Vehicles (PHEVs) and Battery Electric Vehicles (BEVs). Prakhar et al. (2024) conducted a study to explore the attitudes and behaviour of people visiting to Delhi National Capital Region regarding electric vehicles (EVs). Based on their study, perceived ease of use plays a considerable role in user satisfaction, and perceived utility and satisfaction positively influence attitudes and intention of user towards the use of EVs. Ramadhan and Aruan (2024) investigated the factor that influences Indonesian consumer's repurchase decision for electric vehicles. Their research indicated that consumer satisfaction could shape their favourable attitudes towards electric vehicles and raise the intent to repurchase them. Su et al. (2020) examined the possible factors determining the satisfaction of consumer with new energy vehicles (NEVs). Based on their study, various aspects like usefulness, total cost, range for driving, infrastructure readiness, convenience, play an important role in determining customer satisfaction with NEVs. Vishwakarma (2024) analysed customer acceptability of electric two wheeled vehicles from a value perspective. Their conclusion revealed that the perceived financial gains, favourable attitude towards environment, pleasant acceleration, favourable social attitudes all positively affected consumer's perception of the value implied with the adoption of electric two wheelers (ETWs). Conversely, negative perception of perceived cost of ownership, range and charging risk, perceived physical risk also had an impact.

III. Research Methodology

This research applies quantitative research design to examine consumer perceptions towards battery electric vehicles (BEVs). A systematic questionnaire comprising many items adapted from previous research and suited for the context of battery electric vehicles (BEV) adoption was used to collect data. Likert scale statements (1 = strongly disagree to 5 = strongly agree) were used in the structured questionnaire. The study performs Exploratory Factor Analysis (EFA) in SPSS to determine the main variables influencing customer satisfaction, perceived environmental advantages, BEV-related concerns and recommend intention. To identify the key factors of consumer perceptions, Principal Component Analysis (PCA) with Varimax Rotation was carried out in SPSS. Reliability testing and factor extraction were done using statistical methods. Using a non-probability convenience sample technique, the study focuses on BEV owners. 201 valid responses were collected, providing a strong dataset for factor analysis.

Table 1: Demographic Profile of the respondents

Variable	Categories	Frequency	Percentage
Gender	Male	126	62.7
	Female	75	37.3
Age	Up to 20	53	26.4
	21-30	105	52.2
	31-40	32	15.9
	Above 40	11	5.5
Education Qualification	Up to 12^{th}	62	30.8
	Graduation	60	29.9
	Post-Graduation	65	32.3
	professional	14	7.0
Residential Area	Rural	156	77.6
	Urban	45	22.4
Annual family income	Less than 250000	120	59.7
	250000-500000	35	17.4
	500000-750000	21	10.4
	750000-1000000	18	9.0
	More than 1000000	7	3.5
Occupation	Student/research scholar	114	56.7
	Business owner	12	6.0
	Employee	30	14.9
	Farmer or laborer	24	11.9
	Homemaker	7	3.5
	Other	14	7.0
Time owned battery electric vehicles	Less than 6 months	76	37.8
	6-12 months	58	28.9
	1-3 years	45	22.4
	More than 3 years	22	10.9

Source: Author's work

Data collection and analysis:

The study being exploratory in nature, the sample was non-probability convenience sample comprising of 201 responses. The demographic profile of the sample is in table 1.

The demographic profile of the respondents is presented according to their gender, age, degree of education, occupation, income, place of residence, and duration of ownership of battery electric vehicles as shown in table 1. 62.7% of the total respondents were male, and 37.3% were female. Of the 201 respondents, 26.4% are younger than 20, 52.2% are between 21 and 30, 15.9% are between 31 and 40, and 5.5% are above 40. 22.4% of the 201 respondents resided in cities, and 77.6% lived in rural areas. 56.7 percent of the 201 respondents are students or research scholars, 6.0 percent are business owners, 14.9% are employees, 11.9% are labourers or farmers, 3.5% are homemakers, and 7.0% are others. The majority of BEV owner (37.8%)

have owned their vehicles for less than 6 months. 28.9% have owned a BEV for 6-12 months. 22.4% have owned a BEV for 1-3 years and 10.9% of the respondents have owned a BEV for more than 3 years.

IV. Data Analysis and Result:

Using varimax rotation and principal component analysis, an EFA was conducted with a minimum factor loading criterion of 0.50. To ensure appropriate levels of explanation, the scale's communality—which denotes extent of variance in every dimension- was also examined. According to findings, all of communalities were higher than 0.50.

Table 2: KMO and Bartlett's test result:

'Kaiser-Meyer-Olkin measure of sample adequacy'		**0.918**
Bartlett's test of sphericity	Approx. chi-square	2082.405
	Df	231
	Sig.	0.000

Source: Author's work

Bartlett's Test of Sphericity, which calculates probability that some of the components in the correlation matrix have substantial correlations with one another, was a crucial step in assessing the correlation matrix's overall importance. With a significant result of x2 (n = 201) = 2082.405 (p < 0.001), the data was appropriate for factor analysis. Table 2 shows the data's suitability for factor analysis determined by the Kaiser-Meyer-Olkin measure of sampling adequacy (MSA), which was 0.918. Accordingly, data that have MSA values greater than 0.800 are considered adequate for factor analysis.

The principal components have been extracted using the eigenvalues, given in Table 3. The Total Variance Explained shows how much of the dataset's variance can be explained by the components that were extracted during exploratory factor analysis (EFA). Ultimately, the factor solution that resulted from this research produced three factors for the scale, which explained 59.507 percent of the data variation. The factors have been added to the list of factors extracted as long as the eigenvalue is greater than one. The coefficients of variables as a function of factors are represented in a factor matrix. Factor loadings are coefficients show how factors and variables are correlated. The occurrence of a coefficient with a high absolute value suggests that the variables and the factor are closely related. The factors were explained using the factor matrix's coefficients.

Table 3: Extracted principal component based on eigenvalues criterion.

	Initial Eigenvalues			**Extraction sums of squared loadings**			**Rotation sums of squared loadings**		
Component	**Total**	**% of variance**	**Cumulative %**	**Total**	**% of variance**	**Cumulative %**	**Total**	**% of variance**	**Cumulative %**
1	7.627	40.141	40.141	7.627	40.141	40.141	6.193	32.595	32.595
2	1.813	9.543	49.685	1.813	9.543	49.685	2.370	12.475	45.070
3	1.487	7.824	57.509	1.487	7.824	57.509	2.363	12.439	57.509
4	0.955	5.026	62.534						
5	0.791	4.162	66.697						
6	0.770	4.051	70.748						
7	0.713	3.754	74.501						

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 %
8	0.628	3.303	77.804						
9	0.568	2.990	80.795						
10	0.507	2.667	83.462						
11	0.479	2.520	85.982						
12	0.458	2.408	88.390						
13	0.403	2.123	90.512						
14	0.373	1.961	92.473						
15	0.343	1.805	94.279						
16	0.328	1.726	96.005						
17	0.278	1.461	97.466						
18	0.247	1.300	98.766						
19	0.234	1.234	100.000						

Extraction method: principal component analysis.
Source: Author's work

However, in this preliminary EFA, two items (i.e. "Driving is enjoyable because there are no soundscape and no engine noise.", "I plan my trips carefully to account for charging requirements.") loaded onto an element that is not its underlying factor. One item "There is enough charging stations installed" was unable to load on any dimension at all. Hence the three elements were eliminated from the future investigation.

Table 4: Principle component analysis summary using the varimax method

Item number	Item description	Factor 1	Factor 2	Factor 3
Q1	I can save the environment by switching to a BEV (Battery Electric Vehicles) from a conventional vehicle with a combustion engine.		0.791	
Q2	BEVs make driving more ecologically friendly.		0.813	
Q3	I believe using a BEV (Battery Electric Vehicles) reduce environmental pollution		0.698	
Q4	I am pleased with the BEV's range.	0.642		
Q5	The BEV has enough battery range for daily use.	0.710		
Q6	I want my mobility needs to be fully satisfied by an electric vehicle's range.	0.573		
Q7	With my battery electric vehicle, I believe I can meet my traffic needs within its cruising range.	0.631		
Q9	Battery-electric vehicle's quick acceleration improves driving comfort.	0.589		
Q11	My satisfaction with the BEV's charging is good.	0.740		

Q13	I could integrate the batteries' charging into my daily routine without any issue	0.775		
Q15	I am satisfied that I purchased and used my BEV.	0.784		
Q16	I would suggest BEVs to my friends and relatives.	0.749		
Q17	I encourage buying a BEV and discuss its benefits with people around me.	0.761		
Q18	I would purchase a BEV as my next vehicle.	0.782		
Q12	I don't mind that charging battery cells takes more time than refuelling.	0.650		
Q19	The maximum speed of an electric vehicle is, lower than that of a conventional vehicle.			0.666
Q20	I believe that conventional vehicles are safer to drive than electric vehicles			0.793
Q21	When I drive an electric vehicle, I worry about running out of charge.			0.639
Q22	The BEV's range is a significant challenge to its use as a regular vehicle.			0.672
	Eigenvalue	7.627	1.813	1.487
	% of explained variance	40.141	9.543	7.824
	Total % of explained variance		57.509	
	Each factor's Cronbach's alpha	0.922	0.717	0.702
	All-item's Cronbach's alpha		0.909	

Extraction Method: Principal Component Analysis. Rotation method: Varimax with Kaiser Normalization.
Source: Author's work

Without these items, the authors conducted the EFA again. The findings of this new analysis supported the research's theoretical definition of the five-dimensional structure. The MSA for Kaiser-Meyer-Olkin was 0.910. A total of 57.509 percent of the variance among the study's items was described by the three factors. Results of the Bartlett's Test of Sphericity showed that all communalities were more than the required value 0.500. The three factors found in this EFA were consistent with the research's theoretical premise. Twelve items represent factor 1, three items represent factor 2, and four items represent factor 3. Three factors exhibit strong internal consistency, as indicated by their respective Cronbach's alpha values: factor 1 = 0.922, factor 2 = 0.717, and factor 3 = 0.702. Table 4 shows the factor loadings.

Table 4 indicates that, the items included in factor 1 are: Q4, Q5, Q6, Q7, Q9, Q11, Q13, Q15, Q16, Q17, Q18, Q12. These items measure users' level of satisfaction with their BEV as well as their willingness to recommend and repurchase. A high factor loading (0.589-0.784) indicates that respondents are in strong agreement. As a result, these items are grouped under one factor called "BEV satisfaction and recommend intention".

The items included in factor 2 are: Q1, Q2, Q3. These items measure users' perceptions of how much BEVs benefit the environment by lowering pollution and encouraging eco-friendly transportation. High factor loading (0.698-0.813) suggest respondents consider environmental benefits as an important factor in their purchase decision. These items are grouped under the heading "environment benefits of BEV".

Factor 3 comprises the following items: Q19, Q20, Q21, Q22. These items obtain concerns about safety problems, charging challenges, range anxiety, and BEV performance. Factor loading (0.666-0.793) suggest that respondents are worry about BEV limitations such as range anxiety, speed and charging issues. As a result, these items are grouped under the factor "perceived functional barriers".

V. Conclusion

Exploratory Factor Analysis (EFA) was used in this study to investigate how consumer perceive battery electric vehicles (BEVs). The result indicates that BEV satisfaction and recommendation intention, environmental advantages of BEVs and perceived functional barriers are the three

dominant factors affecting consumer' perceptions towards BEVs. The findings reveal that consumer' level of satisfaction with BEVs significantly affects their willingness to recommend them. If customers are satisfied with their BEVs, they will recommend others to purchase them in the future. In addition, many consumers know that BEVs bring advantages to the environment and would contribute to pollution control and eco-friendly mobility. There are still concerns regarding battery range, charging infrastructure, and safety when compared to conventional vehicles, in addition to these positive perspectives. Range anxiety and long charging times remain to be issue that impact future consumer' readiness to shift to BEVs. The finding reported that BEV satisfaction and environmental advantages have significant positive impacts on consumer perceptions, while safety charging, and range issues influence adoption. The Cronbach's alpha reliability test confirmed that all factors were internally consistent, hence supporting the validity of the findings. Finally, by providing data-driven insights into BEV adoption trends, the study identifies both opportunities and barriers. The shift to sustainable mobility could be accelerated by highlighting the benefits of BEVs while solving consumer issues.

Implications and Recommendations

This study's conclusions have important implications for a variety of stakeholders, including consumers, legislators, researchers, and automakers. In order to address consumer concerns regarding the usability, performance, and range of BEVs, automakers have a significant role to play in advancing battery technology, charging convenience, and vehicle safety. Automakers may increase consumer trust and intents to recommend BEV by strengthening these aspects and enhancing educational efforts. According to the study, policymakers need to encourage the development of charging infrastructure. Investment in renewable energy-powered charging stations will promote sustainable mobility, and financial incentives such as tax credits, subsidies, and low interest loans may make BEVs more affordable. The study reveals that, from the point view of consumer, despite growing awareness of the economic and environmental benefits of BEVs, many people continue to hold common misconceptions about their functionality, maintenance, and charging. In order to provide potential customers a firsthand view of BEVs and enable them to make sound choices, test drive programs, peer influenced promotions, and public awareness initiatives may be helpful. By encouraging current BEV owner to share their positive experiences on social media and through word-of-mouth recommendations, trust in electric vehicles can be further boosted.

Limitations and Future Research

However, providing useful information about the factor influencing the adoption of battery electric vehicles (BEVs), this study has some limitations. Because the study was limited to particular group of respondents who might not be the representative of the population as a whole, its sample size and generalizability are significant limitations. Future studies should include larger and more diverse populations to enhance generalizability. Changes in market development, demographics, and geographical differences may significantly affect how people perceive BEVs. Additionally, the study only identified three key factors that affect adoption of BEVs; it left out other important factor including financial concerns, psychological barriers, and policy awareness. While range, satisfaction, and recommend intention were found to be significant in this study, other factors such as total cost of ownership, battery durability, charging costs, and customer trust in government incentives should be included in future research.

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MEDIATING PATH OF WORKPLACE SPIRITUALITY FOR FEMALE BANKERS IN INDIA AFFECTING THE RELATIONSHIP BETWEEN JOB STRESS AND JOB SATISFACTION

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Purpose: This paper unveils the mediating effect of workplace spirituality on the relationship of job stress and job satisfaction in female bank employees, also an attempt to present a role of spirituality at workplace for female bank employees working in banks which have recently been merged.

Design/methodology/approach: Data from 296 female bank employees working in public sector banks which were merged recently in the capital of India (New Delhi) were collected and mediation through PLS-SEM was applied.

Findings: The study shows that workplace spirituality partially mediates this relationship, suggesting that fostering a spiritual workplace can mitigate job stress and enhance job satisfaction.

Originality/value: The current study adds to the psychological resources of job-demands resource model as well as shows a mediating effect of workplace spirituality.

Keywords : *Alignment with organizational values, female bank employees, job satisfaction, job stress, meaningful work, sense of community and workplace spirituality*
JEL Code: *M10, M13*

I. Introduction

An article by British Safety Council in September 2024, reported that Indian female employees are experiencing more workplace stress than men in the past few years. Among the 5000 female professionals surveyed, 72.2. % revealed high level of stress, work-life balance quoted as the main cause behind it. Though, the number of female professionals in India is increasing in all sectors of the industry, however, this is not the same in case of public sector banks, as reports on Business Standard where, Reserve Bank of India (RBI) has reported the total employee strength in public sector banks, as 764,679 at the end of the financial year 2024, as compared to 842,813 in 2014. In case of private banks, the trend is opposite the employee strength in 2024 is 846,530 as compared to 303,856 in 2014, showing a growth of 2.8 times over the decade. Within this employee strength, the number of female workforce is low which may be due to number of reasons such as inability of women to balance their work life due to long working hours in banks, support from the organizations as well as from their families etc. (moneycontrol.com, 2024). It also reports that the largest public sector bank in India i.e. State Bank of India (SBI) employs only 31.40% of females, thus showing the gender disparity among workforce in public sector banks. Apart from work-life balance, another important change that the Indian banking sector has seen in the past few years is the mergers of public sector banks, where ten banks were merged to constitute four banks and as of now there are 12 banks which make the public sector banks in India. It is highlighted in the literature that mergers become difficult to implement especially from the human resource angle (Gomes et al., 2012). Mergers affect employees in multifarious ways such as the merged banks may confront cultural clashes (Terranova, 2007); growth opportunities, retrenchment policies etc. (Goel and Aggarwal, 2020).

In this state of revamping of banks, the job stress resulting out of workplace is found to have many negative organizational, social, physical and psychological outcomes such as it affects job satisfaction among bank employees Lin et al. (2024), employee performance Ahli et al. (2024), employee creativity Rathi et al. (2024), poor health and intentions to quit Thorsteinsson et al. (2014)

The study attempts to go beyond the mechanistic framework and focus on more subtle aspects of workplace which can

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bring in change from within, one such aspect is workplace spirituality which is an acknowledgement of the fact that employees have an internal life which is nurtured through important work in the community and that inner life also nourishes their environment (Ashmos and Duchon, 2000). In their study Mittal et al. (2024) stated that workplace spirituality has constructive effect on job satisfaction; occupational stress and workplace spirituality are related Nawaz et al. (2024). Milliman et al. (2003) indicated that establishments that adopt spirituality and practices exhibit high altitudes of satisfaction, job involvement, organizational commitment, job performance, truncated stress levels and low turnover.

In this context, the present study attempts to demystify the mediating role of workplace spirituality (WPS).

Adaptations from theory

The outcomes of the job-demands- resource model Bakker and Demerouti (2007), which states that, increased job demands have the capacity to create burnout among employees; however employees can deal with it if they have sufficient resources becomes the base model for this study. For the present study the psychological resources are considered. The researchers take WPS as a resource that helps the female employees in successfully handling the demands that arise out of work pressures, job roles etc. This theory becomes the foundation to understand how female employees would be benefitted if organizations succeed in providing them external resource in the form of meaningful work, sense of community and alignment with organizational values as positive resource that aids them in handling job stress. Thus, aiming to contribute towards the job-demand-resource model's psychological dimension by highlighting the role of WPS in job satisfaction of female bank employees.

II. Literature and Development of Hypotheses

Job-related stress and Job satisfaction

Job satisfaction is seen as the feeling or emotional state or attitude that the employees hold with respect to their jobs and the different dimensions of their jobs (Robbins, 1998). In 2020, Kumari and Tharanga stated that workload pressure lead to reduce job satisfaction among female bank employees, they found that a higher number of female employees were not clear about their work roles and low level of work- life balance. Muis et al. (2021) highlighted that work stress also affects female employees' job performance. Dartey-Baah et al. (2020) examined how different factors in the workplace correlated to job dissatisfaction, stress, and burnout among bank tellers in Ghana. Reilly et al. (2014) discovered a moderately negative association between perceived stress and both job satisfaction and self-efficacy. Pasaribu and Situmorang (2020), teachers' job satisfaction was adversely affected by the factors that contributed to stress on the job.

George and Zakaria (2015) highlighted the different levels of stress that private sector and public sector bank employees feel and its negative effect for job satisfaction. Begum et al., (2023) revealed that one among the crucial factors that affect job satisfaction of bank employees in Bangladesh is job pressure. Hakro et al., (2022) established a relationship between work overload and job satisfaction for bank employees in Sindh, Pakistan. Ndengu and Leka (2022) revealed that job demands create an adverse relationship with job satisfaction, well-being and work engagement among bank employees in Zimbabwe. Jin and Lee (2019) stated that job satisfaction was inversely correlated with stress at work, these insights from the literature helped in framing the hypothesis as below;

H1: Job satisfaction and job related stress are negatively related.

Job-related stress and Workplace Spirituality

Ashmos and Duchon (2000) believe that making employees feel the part of community help in generating an atmosphere of attachment thus creating a better workplace. A low level of stress and burnout is found to be associated at workplace where employees feel concerned about each other (Jurkiewicz and Giacalone, 2004); also the place where employees sense support and cooperation builds a community among employees Zaffane and McLoughlin (2006). Psychological well-being and meaningful work are associated Arnold et al. (2007); and meaningful work & work stress are intricately interwoven Shruti et al. (2024). The insights from the literature helped in framing the following hypothesis;

H2: There is a significant relationship between job stress and workplace spirituality

Workplace Spirituality (WPS) and Job Satisfaction (JS)

It has been shown in the literature that when an organization provides spiritual support to its employees, the employees are

satisfied and committed to the organization (Milliman et al., 2003). Belwalker et al. (2018) conducted research on Indian bankers and found that spirituality in the workplace was positively connected with job satisfaction. Employees are more satisfied and more committed when their spirituality is acknowledged on the job, thus showing lower absenteeism (Gupta et al., 2014).

Meaning and spirituality at work, being purposeful in work, feeling like part of community, and a positive organizational purpose had been linked favourably to job satisfaction (Golparvar and Abedini, 2014). Mishra and Kumar (2022) found that, job satisfaction positively correlates with WPS attributes like meaningful work and meaningful life. Jalan and Garg (2022) also found that workplace spirituality is an effective means of enhancing organizational commitment among police personnel. Employees with high levels of organizational spirituality reported greater job satisfaction, higher quality work, and less stress in the workplace, as reported by Kaur and Kaur (2014); happiness and well-bieng (Asutay et al., 2021). These inputs from literature enabled the researcher to frame the following hypothesis;

H3: Workplace spirituality has a positive impact on job satisfaction

Mediating role of workplace spirituality (WPS)

The theoretical dimensions of workplace spirituality given by Milliman et al. (2003), which are Meaningful work (individual level): a core component of WPS which means that employees need to have a profound perception of meaningfulness of their work; Sense of community (group level): aspect of WPS which inculcates employees with a sense of belongingness towards their relationships with others and dwells on the interactions of employees with their co-workers and Alignment with organizational values (organizational level): is a third dimension of WPS where the employees perceive an alignment of their value system with the organizational value system which is reflected in mission and vision of the organization. In 2023, Houghton et al. stated in their study that WPS weakens the adverse effect that dispositional qualities have on job satisfaction. Workplace spirituality mediates between spiritual leadership and organizational commitment (Sapta et al., 2021); personal attributes such as mindfulness and job performance (Jayakumar and Vinodkumar, 2023); self-transcendence and innovative work behaviour (Sode and Chenji, 2024); spiritual leadership and service innovative behavior (Alfarajat and Emeagwali, 2021) and organizational change & organizational performance (Kasinathan and Rajee, 2023). Among hospitality professionals WPS mediated the link between organizational justice-organizational citizenship (Haldorai et al., 2020). The dimensions of WPS such as, meaningful work and sense of community mediated the link between job satisfaction and organizational citizenship behaviour Dubey et al. (2022). These highlights from literature reveal that, WPS serves as an important mediator between many important organizational relationships however, the researchers could not find its mediating role between job stress and job satisfaction. In order to fulfil the gap in the literature the researcher framed the following hypotheses;

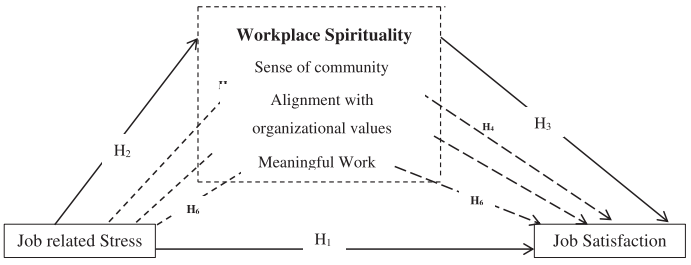
H4: JRS and JS are mediated by Sense of community.

H5: JRS and JS are mediated by Alignment with organizational values

H6: JRS and JS are mediated by Meaningful work.

With the literature reviewed the researchers proposed the model in figure 1:

Figure: 1 Proposed Model



Source: Literature Review

III. Research Methodologies

The present study is cross-sectional and collects data from 296 female respondents working in public sector banks in the capital city of India i.e. New Delhi. Sampling was done at 3 levels i) selection of bank- purposive sampling for selection of bank was employed, as only those banks were selected which were merged. ii) For selection of bank branches convenience sampling was used, there were around 175 branches of the merged bank out of which 91branches were visited; 39 branches were located in posh areas, 25 branches in semi posh and 27 in other areas of New Delhi and iii) thereafter, to collect the data from the respondents, purposive sampling was employed as only female respondents were approached by visiting bank branch personally and handing over the

questionnaire in hard copy format. This 3-step process helped us in ensuring that, the impact of recent changes were encapsulated, additionally, anonymity of the banks as well as the respondents were ensured. Further, the participants in the study were in roles of managing bank operations as well as they had experience of minimum one year with the bank irrespective of their level in the hierarchy. The sample of females had 37.4% of married females and 62.6 % of unmarried females; all married females had children; educational qualification of all the respondents was post graduate, the average age of respondents were 33.5 years and the data were analysed using Smart PLS 4.

Measurement of the constructs:

Job-related stress: The present study utilized the Job-Related Tension Index (JRTI) created by Kahn et al. (1964).

Job satisfaction: Job satisfaction was evaluated using an "Index of Job Satisfaction", which was developed by Brayfield and Rothe (1951), comprising 18 questions.

Workplace spirituality: The three-dimensional Milliman et al., (2003) scale was utilized in this research in order to measure the workplace spirituality.

IV. Results

Factor confirmation for JRS and JS

Cronbach's alpha and composite reliability (CR) (Chin, 2010) shown in table I, no values were below the 0.70 (Hair et al., 2019), that means the constructs are reliable.

Convergent validity is assessed through the AVE for the two constructs, however, several items for the construct job satisfaction (J3, J4, J6, J8, J10, J11, J14, J16, and J18) with loadings below 0.50 were eliminated. Finally, table I shows that all the AVE values meet the minimum criterion (Hair et al., 2019). Items & Factor loadings are as follows; Performance - P1, P2, P3 & P4 are 0.803, 0.732, 0.722 & 0.733; W1, W2, W3 & W4- 0.873, 0.761, 0.852 & 0.764; Workload W1, W2, W3 & W4 are 0.873, 0.761, 0.852 & 0.764; Organization Decision and authority/responsibility- OD1, OD2, OD3 & OD4 are 0.830, 0.717, 0.738 & 0.852; Decision-making DM1, DM2 & DM3-0.808, 0.805 & 0.568, Job satisfaction- J1, J2, J5, J7, J9, J12, J13, J15 & J17 are 0.782, 0.842, 0.756, 0.772, 0.763, 0.788, 0.820, 0.699 & 0.688 respectively.

Table I: Reliability assessment and convergent validity of lower order constructs

Construct	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Performance	0.803	0.809	0.599
Workload	0.845	0.856	0.608
Organization Decision and authority/responsibility	0.875	0.814	0.594
Decision-making	0.791	0.828	0.551
Job satisfaction	0.842	0.876	0.598

Survey Data (SMART PLS Results)

Criteria for discriminant validity is met as shown in table II

Table II: Discriminant Validity

	$HTMT_{0.85}$ criterion			
Decision making				
Job satisfaction	0.369			
Organizational Design	0.661	0.413		
Performance	0.620	0.349	0.683	
Workload	0.558	0.425	0.668	0.565

Source: Survey Data (SMART PLS Results)

Assessment of measurement model for higher order construct

A disjoint two-stage method was utilized to assess the higher order of JRS (Sarstedt et al., 2019). Results as shown through table III revealed that AVE of higher construct (job-related stress) meets the minimum threshold of 0.50.

Table III: Reliability and validity of higher-order constructs

Construct	Items	Outer loadings	Cronbach's alpha	Composite reliability (CR)	Average variance extracted (AVE)
Job-related stress	Performance	0.830	0.801	0.804	0.556
	Workload	0.803			
	Organizational design	0.721			
	Decision-making	0.721			
Discriminant Validity (Higher-order construct)					
HTMT Criterion ($HTMT_{.85}$ Criterion)					
JRS					
JS	0.547				

Source: Survey Data (SMART PLS Results)

***Confirming the factors of WP*S**

As shown in table IV all dimensions of WPS meet the criterion for AVE (Hair et al., 2019). Similarly, discriminant validity was met as shown in table IV. Items & factor loading are as follows; Meaningful Work - MW1, MW2, MW3, MW4 & MW5 - 0.725, 0.736, 0.801, 0.792 & 0.723; SOC1, SOC2, SOC3, SOC4, SOC5, SOC6 & SOC7-0.756, 0.824, 0.767, 0.772, 0.645, 0.756 & 0.750, alignment with work values- OV1, OV2, OV3, OV4, OV5, OV6, OV7 & OV- 80.784, 0.774, 0.789, 0.704, 0.705, 0.791, 0.798 & 0.745 respectively.

Table IV: Reliability and Validity of WPS

Construct			Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Meaningful Work			0.804	0.884	0.615
Sense of community			0.816	0.896	0.580
Alignment with Organizational values			0.804	0.8674	0.552
Discriminant validity of dimensions of WPS					
HTMT Criterion ($HTMT_{.85}$ Criterion)					
OV					
MW	0.707				
SC	0.712	0.708			

Source: Survey Data (SMART PLS Results)

Mediating effect of WPS on the relationship between JRS and JS

As shown in table V, after including 1st dimension of workplace spirituality i.e. sense of community as mediator between JRS and JS, bootstrap results shows that indirect effect is significant. Further, as shown in table V the direct negative effect of JRS on JS and the VAF (variance accounted for) value Hair et al. (2014) which is 22.75% which lies between 20%-80% thus the mediation is partial (Shrout and Bolger, 2002). Moreover, as the product of direct and indirect path coefficient is positive, the mediation effect is complementary partial mediation (Zhao et al., 2010).

Table V: Workplace Spirituality as a mediator

a) Sense of community					
Type of effect	**Effect**	**Path co-efficient**	**T-Test**	**P-value**	**Remarks**
Direct Effect	JRS -> JS	-0.277	4.473	0	Significant Direct Effect
Indirect Effect	JRS -> SC-> JS	-0.169	4.525	0	Significant Indirect Effect
Total Effect		-0.446	8.921	0	Significant Total Effect
VAF	Indirect Effect/Total Effect	37.89%			
b) Alignment with organizational values					
Type of effect	**Effect**	**Path co-efficient**	**T-Test**	**P-value**	**Remarks**
Direct Effect	JRS -> JS	-0.289	4.801	0	Significant Direct Effect
Indirect Effect	JRS -> Alignment with organizational values-> JS	-0.167	4.289	0	Significant Indirect Effect
Total Effect		-0.456	9.024	0	Significant Total Effect
VAF	Indirect Effect/Total Effect	36.62%			
c) Meaningful work					
Type of effect	**Effect**	**Path co-efficient**	**T-Test**	**P-value**	**Remarks**
Direct Effect	JRS -> JS	-0.353	6.391	0	Significant Direct Effect
Indirect Effect	JRS -> Meaningful work-> JS	-0.104	3.462	0.001	Significant Indirect Effect
Total Effect		-0.457	8.993	0	Significant Total Effect
VAF	Indirect Effect/Total Effect	22.75%			
Conclusion		**All 3 dimensions of WPS show Partial Mediation**			

Note: Significant at 1% level of significance (Two Tailed)
Survey Data (SMART PLS Results)

Similarly, taking into consideration the 2nd dimension of WPS i.e. alignment with organizational values, it can be seen from table 5 that the indirect effect shows a β value and VAF value highlights a significant complementary partial mediation. Finally, the 3rd dimension of WPS i.e. meaningful work, table V shows that the β value and VAF value highlights a significant complementary partial mediation (Shrout and Bolger, 2002; Hair et al., 2014 & Zhao et al., 2010).

V. Discussions and Conclusion

The study highlights the mediating role of all the three dimensions of workplace spirituality, the study revealed that JRS affects JS negatively, results are in line with the findings of (Dartey-Baah et al., 2020 & Hakro et al., 2022). It also proved that workplace spirituality dimensions affect job satisfaction; the results are in consistency with earlier studies such as Belwalker et al. (2018) and Mishra and Kumar (2022). The current study found that three dimensions of workplace spirituality partially mediated the relationship between job related stress and job satisfaction, these results were in line with the researches by Houghton et al. (2023). Thus, the proposed model in this study is proved empirically; that highlights the role of workplace spirituality in workplace which can be beneficial and can have a positive impact on overall job satisfaction of females working in banks as it helps them in understanding and aligning them with their job; provides them a sense of belongingness towards their organization and also helps them in harmonizing with the organizational values.

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UNDERSTANDING THE INTERPLAY BETWEEN SHOPPING MOTIVATIONS, CUSTOMER EXPERIENCE AND REPURCHASE INTENTION: A GENDER BASED MODERATION MEDIATION MODEL

Garima Chandna* Savita Ubba**

This paper seeks to explore how shopping motivations, particularly its components- utilitarian and hedonic motivation shape customer experience and in turn impact repurchase intention. Furthermore, it examines how customer experience serves as a mediator and investigates whether gender moderates these relationships, highlighting the significant differences in path coefficients between males and females. Data was collected from 280 omni-channel customers of apparel sector which were analyzed through Smartpls4. Multi-group Analysis was performed to look for the moderating effect of gender. The results confirmed a strong relationship between all variables with customer experience playing a partial mediating role in these relationships. In addition, the results confirmed the moderating effect of gender on all relationships except for a few relationships. The distinctiveness of the study lies in its in-depth analysis of moderated mediation effects using multi-group analysis, providing a detailed understanding of how different groups react to various factors in omni-channel retail environments.

Keywords : *Omni-channel Retailing, Shopping Motivations, Utilitarian Motivation, Hedonic Motivation, Customer Experience, Repurchase Intention*

I. Introduction

In recent years, there has been significant progress in retailing, with technological advancements allowing retailers to engage and transact with customers across multiple platforms like websites, mobile apps, and social media (Savastano *et al*., 2019). Undoubtedly, technology has transformed consumers' shopping experiences which leads to a change in consumer behavior and has also influenced retail managers in adapting to the changing needs of customers (Schwendtner *et al*., 2024). In light of this trend, omni-channel retailing is becoming increasingly popular. Omni-channel retailing blends technology into the customer journey by merging various offline and online platforms into a unified hub (Tyrväinen *et al*., 2020). The earlier phases of the retail evolution were multi-channel and cross-channel retailing, however, there was only partial integration between the channels, which brings omni-channel retailing into the action (Thaichon *et al*., 2024).

Despite the growing importance of omni-channel retailing, it remains in its infancy in developing countries like India and requires further research. In today's competitive retail landscape, understanding the factors that drive consumer behavior is paramount for retailers seeking to enhance customer experience and their repurchase intention. Considering the gaps in existing literature, the present study seeks to enrich the limited research on factors affecting customers' seamless experiences by incorporating the two types of motivations that captures the holistic view of consumer experience. This empirical study specifically aims to: (1) investigate the impact of utilitarian motivation (UM) and hedonic motivation (HM) on the customer experience; (2) examine how the customer's experience acts as a mediator in the relationship of UM and HM with the repurchase intention; (3) determine how gender functions as a moderator in every interaction; and (4) analyse the impact of customer experience on the intention to repurchase.

The following part of the research paper outlines the review of existing literature and the development of hypotheses, followed by the explanation of the research methodology. The subsequent section includes the data analysis and results, followed by a discussion which includes managerial implications and limitations of the study.

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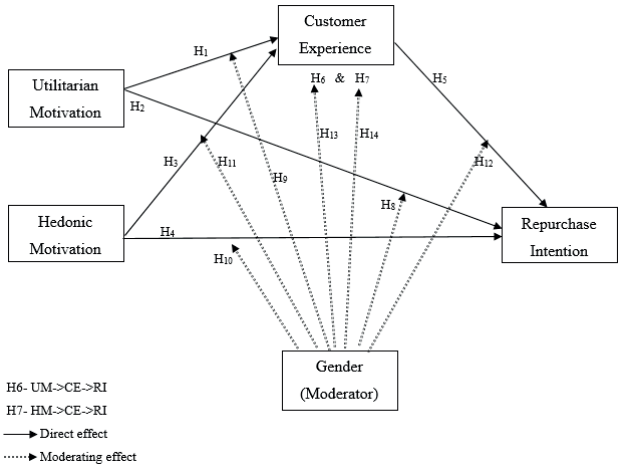
II. Review of Literature

The ideal way to conceptualise omni-channel is to consider how retailing has evolved. Advancements in information technology have paved the way for new innovative distribution channels and enhanced services for consumers, giving way to omni-channel retailing. Omni-channel retailing unifies many digital and physical channels into a single hub to include technology into the customer journey (. The proposed research framework depicting the relationships is shown in Figure I.

Figure I: Proposed Research Framework



Source: Author's work

Relationship of utilitarian motivation with customer experience and repurchase intention:

Shopping Motivations have both utilitarian and hedonistic benefits (Babin *et al*., 1994). Utilitarian motivation implies that shopping starts with a defined purpose or objective and the perceived benefit is determined by how efficiently that mission is accomplished during the process (Babin *et al*., 1994). It generally involves providing convenient, personalised, and user-friendly services to customers, which leads to the creation of a positive customer experience and an intention to repurchase. Previous research has provided evidence indicating the impact of utilitarian factors on the intention to repurchase in e-commerce contexts (Kim et al., 2012). So, we hypothesised that:

H1. Utilitarian motivation positively impacts customer experience in omni-channel retailing.

H2. Utilitarian motivation positively impacts repurchase intention in omni-channel retailing.

Relationship of hedonic motivation with customer experience and repurchase intention:

It pertains to the enjoyable, entertaining, imaginative, and sensory elements of consumption (Batra and Ahtola, 1991). Hedonic consumers enjoy shopping because they find pleasure in the shopping experience itself. Academicians also highlight that studying hedonic motivation has grown importance due to specific motivations, such as enhancing the user-friendliness of physical stores and websites to attract consumers. Thus, it can be suggested that hedonic benefits play a significant role in enhancing a positive customer experience (Hamouda, 2021). If customers enjoy browsing fashion items, they would be more inclined to stick with the same retailer, in the future. So, on the basis of above discussion, we assume that:

H3. Hedonic motivation positively impacts customer experience in omni-channel retailing

H4. Hedonic motivation positively impacts repurchase intention in omni-channel retailing

Relationship between customer experience and repurchase intention:

Customer experience exists at every stage while interacting with a retailer. It includes the search, purchase, consumption, and post-purchase phases, aspects that may or may not be under the control of the retailer (Verhoef *et al*., 2009). When customers receive a seamless experience, they start to revisit and repurchase goods from the same retailer. Repurchase intention is the individual likelihood of a customer to buy products from the same retailer again. It has frequently served as an outcome measure of customer experience in previous research (Rose *et al*., 2012). So, we proposed that:

H5. Customer Experience positively impacts repurchase intention in omni-channel retailing

Mediating role of customer experience

Customer experience is found to mediate the relationship between utilitarian motivation and repurchase intention, as well as between hedonic motivation and repurchase intention. Previous researchers have identified customer experience as one of the outcomes of both utilitarian and hedonic motivation (Tyrväinen *et al*., 2020). When retailers provide convenient, customised services (utilitarian aspect) and enjoyable journey (hedonic aspect) to their customers, they start getting a seamless experience. This experience

leads to the formation of repurchase intention. So, it is hypothesised:

H6. Customer experience mediates the relationship between utilitarian motivation and repurchase intention in omni-channel retailing

H7. Customer experience mediates the relationship between hedonic motivation and repurchase intention in omni-channel retailing

Moderating role of gender

Moderator is the third variable that alters the direction or strength of a causal relationship. In this study, gender is taken as a moderator which is categorical in nature. It is classified as- males and females. Selecting gender as the sole moderator among various demographic factors could be beneficial, primarily because it is frequently employed in marketing segmentation owing to its accessibility and straightforwardness (Mosquera *et al*., 2018). The studies on how gender moderates both online and offline sector for clothing in omni-channel retail are scarce. So, it would be interesting to know about the variation in the opinions of males and females, so that retailers can make strategies according to different gender groups. On the basis of above discussion, we proposed the following hypothesis:

H8. Gender moderates the relationship between utilitarian motivation and repurchase intention

H9. Gender moderates the relationship between utilitarian motivation and customer experience

H10. Gender moderates the relationship between hedonic motivation and repurchase intention

H11. Gender moderates the relationship between hedonic motivation and customer experience

H12. Gender moderates the relationship between customer experience and repurchase intention

H13. Gender moderates the relationship between utilitarian motivation and repurchase intention mediated through customer experience.

H14. Gender moderates the relationship between hedonic motivation and repurchase intention mediated through customer experience.

III. Research Designs and Methods

Measurement

The scales were sourced from existing literature and modified to align with the context of omni-channel retailing. To evaluate the items of utilitarian motivation and hedonic motivation, scale developed by Mei et al. (2001); S. Rose et al. (2012); Tyrväinen *et al*. (2020) were used. To measure customer experience, we used the scales of Tyrväinen *et al*. (2020). And finally, to assess the items of repurchase intention, scales of Tyrväinen *et al*. (2020); Rose *et al*. (2012) were used. Responses were assessed using a five-point Likert scale, spanning from "strongly disagree" (1) to "strongly agree" (5).

Data collection

We chose purposive sampling which involves selecting participants based on particular attributes or traits that are pertinent to the research (Etikan *et al*., 2016). Our study specifically targeted omni-channel shoppers that are defined as individuals who utilise a minimum of two different channels offered by the same retailer throughout their shopping journey. We posed few filter questions to the customers, such as, "Do you use both online and offline channels of the same retailer for shopping for apparels category?" Only respondents who answered positively were included in the primary survey. Firstly, we have conducted pilot study on 100 respondents from Delhi-NCR and Chandigarh. After ensuring reliability and validity using SPSS, a final questionnaire was prepared. Following that, the sample size was determined based on Hair et al. (2006), which says a minimum of five and a maximum of ten respondents should be included for each statement. In our study, there were total 21 statements, so we have taken more than 210 respondents. At first, we contacted 360 customers, but only 300 met the selection criteria due to their failure to answer the filter question satisfactorily. The final sample comprises of 280 responses after 20 being rejected due to missing data. The demographic profile of the respondents is shown in Table I.

Table 1: Demographic profile of respondents

Characteristic	Items	Frequency	Percent
Gender	Male	137	48.9
	Female	143	51.1
Age (in years)	18-24	70	25.0
	25-31	129	46.1
	32-38	33	11.8
	39-45	28	10.0
	Above 45	20	7.1
Education Level	Under graduate	26	9.3
	Graduate	79	28.2
	Post-graduate	129	46.1
	Professional	30	10.7
	Others	16	5.7
Marital Status	Unmarried	179	63.9
	Married and No Children	51	18.2
	Married and Having Children	50	17.9
Occupation	Student	127	45.4
	Self employed	41	14.6
	Govt. employee	53	18.9
	Private employee	32	11.4
	Others	27	9.6
Monthly Family Income	Less than Rs. 50,000	74	26.4
	Rs. 50,001-1,00,000	74	26.4
	Rs. 1,00,001-2,00,000	63	22.5
	Above Rs. 2,00,000	69	24.6

Source: Author's work

IV. Results and Discussion

The data analysis section of the research paper presents a detailed outline of the methodologies employed to analyse the gathered data, the results obtained, and the interpretation of these findings in relation to the research questions and hypotheses. To confirm the reliability and validity of the constructs, we utilised SmartPLS 4.0 and employed the Partial Least Squares-Structural Equation Modeling (PLS-SEM) method to assess the accuracy of both the measurement and structural models. Multi-group analysis was conducted to further explore moderated effects.

Measurement model assessment

For measuring the model, firstly construct reliability was evaluated through composite reliability (rho_c). All the values were above 0.8, which is more than the threshold limit of 0.7

(Hair *et al.*, 2006). After that convergent and discriminant validity was evaluated by considering the factor loadings and average variance extracted (AVE). As per the results, all the values of factor loadings were more than the threshold limit of 0.5 and same goes for AVE (Hair *et al.*, 2006). To establish discriminant validity for the model, we followed the criteria proposed by Fornell & Larcker, (1981), which states that discriminant validity is established when the square root of the AVE or every variable exceeds the correlations between that variable and other constructs. The results of the measurement model is shown in Table II.

Table II: Construct reliability, convergent validity and discriminant validity results

Constructs	Items	Factor Loadings	CR (rho_c)	AVE
Utilitarian Motivation (UM)			0.800	0.573
	UM_1	0.760		
	UM_2	0.817		
	UM_3	0.687		
Hedonic Motivation (HM)			0.909	0.587
	HM_1	0.808		
	HM_2	0.777		
	HM_3	0.796		
	HM_4	0.766		
	HM_5	0.779		
	HM_6	0.688		
	HM_7	0.745		
Customer Experience (CE)			0.913	0.636
	CE_1	0.792		
	CE_2	0.802		
	CE_3	0.732		
	CE_4	0.799		
	CE_5	0.858		
	CE_6	0.796		
Repurchase Intention (RI)			0.892	0.624
	RI_1	0.849		
	RI_2	0.793		
	RI_3	0.807		
	RI_4	0.785		
	RI_5	0.709		

Discriminant Validity:	**Utilitarian Motivation**	**Hedonic Motivation**	**Customer Experience**	**Repurchase Intention**
Utilitarian Motivation	**0.757**			
Hedonic Motivation	0.423	**0.766**		
Customer Experience	0.452	0.433	**0.797**	
Repurchase Intention	0.532	0.656	0.474	**0.790**

Source: Author's work

Assessment of structural model

The Partial Least Squares-Structural Equation Modeling (PLS-SEM) approach was used in the structural model assessment to test the suggested hypotheses and examine the correlations between the constructs. Before assessing the relationships in the structural model, multicollinearity issues should be checked. It is measured by variance inflation factor (VIF). The values of VIF should be less than 3 to avoid the problem of multicollinearity (Hair *et al.*, 2017). The results show that the values of VIF lies between 1.218-1.381 representing no collinearity.

After that to evaluate the results of hypothesis development of both direct and mediation results, we looked at the values of path coefficient of direct, indirect effects, total effects, T and P values. Bootstrapping was performed with 5000 samples at 95% significance level. All the path coefficients are significant and accepted as shown in Table III and Figure II.

Table III: Hypothesis results (Direct and mediation)

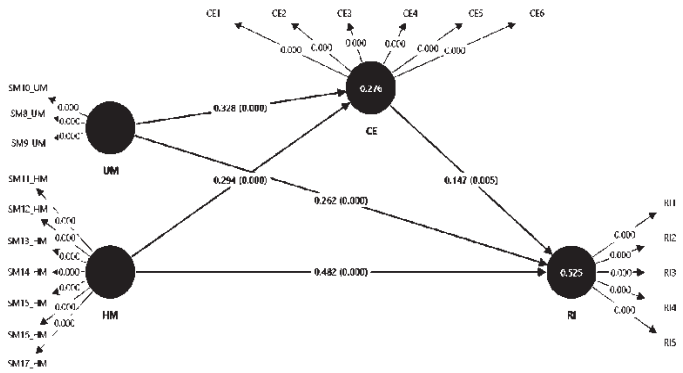
Relationship of Construct value	Beta value (Direct effects)	Indirect effects (through CE)	Total effects	T-value	P	Results
UM → RI	0.262	0.048	0.310	5.279	0.000*	Accepted
UM → CE	0.328	N/A	0.328	5.735	0.000*	Accepted
HM → RI	0.482	0.043	0.525	9.324	0.000*	Accepted
HM → CE	0.294	N/A	0.294	5.659	0.000*	Accepted
CE → RI	0.147	N/A	0.147	2.808	0.005*	Accepted
UM -> CE -> RI	0.262	0.048	0.310	2.329	0.020*	Accepted
HM -> CE -> RI	0.482	0.043	0.525	2.682	0.007*	Accepted

Source: Author's work
Notes: Significance level **<.1, *<.05, ***<.01, N/A= Not applicable
UM -> CE -> RI; HM -> CE -> RI = Accepted as complementary partial mediator

Mediation results

As per the results, customer experience is found to have a complementary partial mediator effect between both relationships. In case of utilitarian motivation and repurchase intention, it has been found that there exists both indirect and direct effect. All the values of direct, indirect and total effect found to be positive (Table III). Hence, we can say that customer experience is playing a complementary partial mediator role between the said relationship, same goes in the case of hedonic motivation as there is both indirect and direct effect between the relationship and all the values are positive as shown in Table III. Hence, customer experience is playing complementary partial mediator role between this relationship also. The results of structural model are shown in figure II.

Figure II: Structural Model Results



Source: SmartPLS output

Moderation results

After analyzing mediation effects, we examined moderation effects. A moderator alters the strength or direction (either positive or negative) of a causal relationship. To check out the moderating effect of gender, we have applied multi-group analysis (MGA) technique with SmartPLS 4.0. But before applying MGA technique, there is a certain procedure one should follow in order to check whether MGA can be performed or not. The procedure is known as "Measurement Invariance of Composite Models (MICOM)."

Measurement invariance analysis

There are certain steps in order to validate invariance by using Measurement Invariance of Composite Models (MICOM). Firstly, the configural invariance needs to be established. It is automatically established by taking same indicators and applying same treatment for both groups. Second step is to examine compositional invariance by applying permutation algorithm. It was determined and validated by looking at whether the computed scores' initial correlation values were greater than the empirical distribution's 5% quantile threshold. This finding was supported by permutation p-values greater than 0.05, indicating ample evidence for compositional invariance (Hair et al., 2017). The third step was to look out whether there is a full measurement or partial measurement invariance. If both the values of original mean and original variance values are within the range of 2.5%-97.5%, then there is a full measurement invariance and if only one of them is within the criteria, then it's a case of partial measurement invariance. Once researchers have confirmed a composite's complete measurement invariance through MICOM Steps 1 to 3, they can proceed to analyse the pooled data. If researchers are unable to obtain this confidence, they must determine that the composite demonstrates (partial) differences, and accordingly, the data should be segmented into groups for multi-group analyses (Henseler *et al.*, 2016). Our study has successfully completed all steps, and the outcomes (Step 2&3) are detailed in Table IV.

Table IV: Measurement invariance analysis (Step-2&3)

Step-2				
Construct	**Original Correlation**	**5%**	**Permutation p values**	**Compositional invariance**
CE	0.999	0.997	0.679	Yes
HM	0.999	0.997	0.745	Yes
RI	0.999	0.995	0.463	Yes
UM	0.995	0.981	0.330	Yes

Step-3								
Construct	**Original Mean**	**2.5%**	**97.5%**	**Permutation p values**	**Original Variance**	**2.5%**	**97.5%**	**Permutation p values**
CE	0.009	-0.234	0.236	0.937	0.122	-0.345	0.319	0.455
HM	-0.038	-0.232	0.237	0.763	0.040	-0.317	0.298	0.817
RI	-0.169	-0.231	0.217	0.155	0.036	-0.371	0.389	0.677
UM	-0.166	-0.250	0.225	0.175	-0.112	-0.358	0.376	0.566

Source: Author's work

Multi-group analysis

After checking the mandatory requirement of measurement invariance, MGA was performed by dividing the data into two groups- male and female. Before applying this technique, firstly it has been checked that whether the moderator is playing its role either on a single relationship or on whole model in order to decide the treatment of the moderator. If the moderator is playing role on a single relation, for instance, between utilitarian motivation and customer experience, then it is treated as an interaction effect. If the moderator is affecting the whole model, then it is treated as multi group analysis. The results of multigroup analysis are shown in Table V.

Table V: Multigroup analysis results

Relationship	**Gender (Male)**	**Gender (Female)**	**PLS- MGA (Multi-group Analysis)**		
	N= 137 Coefficient	N= 143 Coefficient	Path difference (Male-Female)	P	Results
H_8 : UM -> RI	0.389	0.125	0.265	0.013*	Supported
H_9: UM -> CE	0.426	0.281	0.145	0.200^{ns}	Not Supported
H_{10}: HM -> RI	0.525	0.411	0.114	0.286^{ns}	Not Supported

H_{11}:	HM -> CE	0.169	0.398	-0.229	0.041*	Supported
H_{12}:	CE -> RI	0.032	0.295	-0.264	0.020*	Supported
H_{13}:	UM -> CE -> RI	0.013	0.083	-0.070	0.131^{ns}	Not Supported
H_{14}:	HM -> CE -> RI	0.005	0.118	-0.112	0.005*	Supported

Source: Author's work
Notes: Significance level **<.1, *<.05, ***<.01, ns- not significant

Gender is playing significant moderating role between the relationship of utilitarian motivation and repurchase intention (H8). Males exhibit a higher path coefficient, suggesting that they are more rational and goal-oriented in their approach to tasks. Another finding represents that; females have more hedonistic preferences as compared to males for the impact of hedonic motivation on customer experience (H11). These results are consistent with the gender schema theory in which women are more likely to see themselves as social beings and are inclined towards prioritizing social relationships, easily influenced by their assessment of personal interactions. Men typically prioritise comfort, while women tend to focus more on their interactions with service personnel (Danaher *et al.*, 1998).

Another difference in the significance of the relationship is found between customer experience and repurchase intention (H12). Females tend to have higher effect than males in terms of repurchasing after getting a seamless omni-channel retail experience. This is explained by evolutionary psychology and social role theory, which contend that men are generally more willing to accept risks than women (Powell and Ansic, 1997). In our study, gender moderates all relationship except H9 (UM -> CE); H10 (HM -> RI) and H13 (UM -> CE -> RI). In case of utilitarian motivation with customer experience; hedonic motivation with repurchase intention, it can be seen that, moderator lacks to play any role. It simply means that for these relationships, there is insignificant difference in the opinions of male and female.

Moderation mediation results

Our research also assessed gender's moderation effect for the mediation model. The results confirm that gender is playing a significant role as a moderator between the relationship of hedonic motivation on repurchase intention through customer experience, and females have more impact than males, due to the fact that females are more social oriented than males which supports H14. They prefer to shop for entertainment purpose as well, and are more loyal in their retailer choices as compared to males. But, in case of utilitarian motivation with repurchase intention through customer experience, it was found gender is not playing a role of a moderator which means there is insignificant difference in the opinions or responses of male and female. The results of moderation mediation through MGA is shown in Table V. These results affirm our fundamental argument that there exist variations among customers in how they perceive, assess, and respond to their service encounters. Hence, it is crucial for both academicians and practitioners to refrain from treating all customers equally and instead, acknowledge and incorporate these significant differences into their examination of the service evaluation process.

IV. Conclusion

The advent of the omni-channel retail era marks a significant transformation in the way businesses interact with consumers. This strategy combines physical stores, online platforms, and mobile apps to deliver a unified and smooth customer experience. Our study has delved into the impact and implications of omni-channel retailing, highlighting several key findings. This study sheds light on the intricate gender dynamics that influence shopping motivations, customer experience, and repurchase intention. Our findings reveal that giving the customer, a right experience is important as it plays a significant mediator role between the shopping motivations (utilitarian, hedonic) and repurchase intention. By employing a moderated mediation model, we have unveiled the significant roles that gender plays in shaping consumer behavior within the retail environment. According to the study, men and women have distinct motivations for shopping, impacting the entire shopping experience. Their likelihood of making a further purchase from the same seller is greatly impacted by these differences. Retailers can better customize their strategy to satisfy the needs of their diverse customer base by understanding these gender-specific variances. To further understand the intricacies of consumer behavior in many circumstances, future study should keep looking into additional possible moderators and mediators.

Managerial implications

This study offers valuable insights for retailers given the influential role of gender as a moderator in our study and also the role of motivation in shaping a seamless customer experience and further influencing repurchase intention in case of apparel buying. Retailers should prioritise

considering gender differences as a crucial factor when offering services to their customers, as both males and females exhibit distinct perceptions, traits, and goals in their shopping experiences.

As per our results, males have a bigger impact than females when it comes to the impact of utilitarian motivation on customer experience. So, if the retailer has a male oriented apparel store, he should emphasise on enhancing utilitarian motivation by investing in technologies such as mobile apps, self-checkout systems, and inventory management systems to enhance convenience and ultimately utilitarian needs. In the context of the influence of hedonic motivation on customer experience, females exhibit a greater significant role than males. Hence, retailers aiming for a female-oriented customer base should incorporate interactive features such as virtual try-on, augmented reality etc. Retailers need to gather and analyse customer feedback and data from various channels to identify pain points and areas for improvement in the omni-channel customer journey to make their experience more seamless. By continuously innovating and adapting offerings based on evolving customer preferences and market trends, they can drive repeat business which is the ultimate goal of retailers.

Limitations and future research directions

It is important to interpret the study's results while acknowledging several limitations. Firstly, we have undertaken this research within a particular area, so the applicability of the findings to a broader population may be limited. However, this study is focused on the apparels category, so it would be intriguing to explore how consumer behaviour varies across different product categories. In addition, we focused on only a specific categorical variable i.e. gender as a moderator, but future studies should incorporate other categorical and continuous variables. In addition to these constraints, retailers and scholars could extract valuable insights from the discoveries outlined in this study.

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CRYPTO MEETS GREEN FINANCE: ASSESSING THE ROLE OF BITCOIN & ETHEREUM IN ESG PORTFOLIO DIVERSIFICATION IN INDIA

Vansh Bathla* Karam Pal Narwal**

***Purpose**: This study examines whether combining Bitcoin (BTC) and Ethereum (ETH) with Indian ESG indices, specifically NIFTY 100 ESG and NIFTY 100 Enhanced ESG, can enhance portfolio diversification. The analysis evaluates how digital assets contribute to sustainable investment strategies through their return dynamics, volatility behaviour, and portfolio efficiency.*

***Design/ Methodology/ Approach**: The study employs daily data from 2016 to 2024 and utilizes an extensive econometric framework comprising Spearman correlation, Johansen cointegration, VECM, DCC-GARCH, and Granger causality tests. Risk-adjusted performance is evaluated using Sharpe, Sortino, and Value-at-Risk (VaR) metrics. Subsequently, Markowitz's mean-variance optimization is employed to determine the optimal asset allocations.*

***Findings**: The results indicate weak correlations and limited volatility spillovers between cryptocurrencies and ESG indices, confirming their potential for diversification. While long-run cointegration suggests equilibrium linkages, the absence of short-term causality highlights market independence. Portfolio optimisation reveals that ESG assets dominate in stability, while moderate crypto exposure enhances overall efficiency.*

***Originality/ Value**: This study fills the gap between crypto and sustainable finance with providing information on how to build resilient and risk-adjusted portfolios in an emerging market.*

Keywords : *Cryptocurrency, ESG Indices, Diversification, Volatility Spillover, Portfolio Optimization, India*
JEL Code: *C32, G11, G15.Q56*

I. Introduction

The convergence of digital finance and sustainable investing is gaining attention. Bitcoin (BTC), Ethereum (ETH), and other cryptocurrencies have transformed traditional finance through decentralisation and blockchain innovation. In contrast, Environmental, Social, and Governance (ESG) investing has risen amid growing anxiety about climate change and corporate responsibility (Dutta & Paul, 2023). ESG models are centred on incorporating moral principles into investments (Ningthoujam et al., 2022). Although it has long been assumed that the ESG sphere relies on equity and bond instruments, there has been concern that digital assets could be substantial additions to ESG-oriented portfolios (Rabbani et al., 2021). Besides, the short-term correlation between digital assets and green financial instruments is usually low but becomes stronger during market turbulence (Annamalaisamy & Jayaraman, 2024).

Notwithstanding these observations, however, there is an evident gap in the literature on the place of cryptocurrencies in new market ESG schemes, especially in India. The majority of the literature examines the correlation between crypto and international markets or more conventional assets, but not how digital currencies respond to ESG equities on a regional basis. Domestically popular responsibility towards investing can be traced in Indian indexes such as NIFTY 100 ESG and NIFTY 100 Enhanced ESG, which include digital asset diversification, yet research on this issue has not been well conducted so far (Rohilla, 2023; Pancholi et al., 2022). This is an important oversight because ESG funds in India are gaining momentum, and investors are exploring other options to protect their portfolios.

The proposed paper will fill this gap by examining the integration of BTC and ETH into Indian ESG indices, offering new insights into green finance and decentralised digital assets. Unlike previous studies that focused only on developed nations or green bonds, this study examines the

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ESG equities market in India and its relationship with unstable crypto markets, using time-series econometric analysis and risk-adjusted performance indicators.

The primary objective of this study is to examine the diversification benefits of combining cryptocurrencies (Bitcoin and Ethereum) with Indian ESG indices (NIFTY 100 ESG and NIFTY 100 Enhanced ESG) in an investment portfolio. Specifically, the study aims to:

1. Evaluate the correlation between cryptocurrencies and ESG indices.
2. Investigate their long-term relationships through cointegration analysis.
3. Analyses volatility spillovers between cryptocurrencies and ESG indices.
4. Identify causal relationships between asset price movements.
5. Assess portfolio diversification through risk-adjusted performance metrics and optimal asset allocation techniques.

II. Literature Review

Green bonds have garnered significant interest as instruments for diversification within crypto-assets (Annamalaisamy & Vepur Jayaraman, 2024; Anwer et al., 2023; Duan et al., 2023a; 2023b; Lee et al., 2023; Shao et al., 2023; Ul Haq et al., 2023), there is a lack of literature exploring the connection linking cryptocurrency with green equities. During the COVID-19 pandemic, researchers found the connection between digital currencies and environmentally friendly investments. This relationship implies that they can be used to fill the gaps and guard against market shocks (Anwer, 2023). Shao et al. (2023) found that cryptocurrencies are more likely to spill over, whereas green assets are more likely to get more specific in extreme market conditions. According to Duan et al. (2023a), Bitcoin is less related to green and traditional assets than to gold, suggesting that Bitcoin may also serve as a digital investment haven. Based on this, Duan et al. (2023b) found that clean cryptocurrencies do not significantly affect the volatility of traditional and green assets, suggesting that investing in clean cryptocurrencies can be advantageous for diversification and serve as a form of uncertainty insurance.

There is a strong connection between green bonds and sustainability indices. Sustainable cryptocurrencies, on the other hand, have different relationships with sustainability indices. BitGreen, in particular, consistently correlates with sustainability indices (Ul Haq et al., 2023). The researchers have discovered that cryptocurrencies are not well integrated with equity indices in the short term. Nevertheless, they have more links in the medium horizon, especially during the COVID-19 crisis (Annamalaisamy & Vepur Jayaraman, 2024). A recent study by Lee et al. (2023) found that sustainable equity has a stronger relationship with green bonds than with cryptocurrencies. It was found that cryptocurrencies positively influence green and sustainable investments, while digital currencies negatively impact them.

Overall, ESG investing is gaining increasing attention, and the literature on integrating Indian ESG and cryptocurrencies is very sparse. The existing literature largely overlooks the use of innovative financial instruments and often fails to consider the relationship between digital currencies and sustainable investment models. Naeem and Karim (2021) emphasise that Bitcoin volatility risks could be reduced by investing in clean-energy equities. However, its use in short-selling equities is considered unethical. This gap can be addressed by analysing the dynamics of returns and volatility, and the relationships among Bitcoin, Ethereum, and Indian ESG indices, as part of the present study. Later sections describe the methodology, present empirical observations, conclusions and emphasise their practical implications.

III. Data and Methodology

3.1 Data

In order to quantify the relationship between Cryptocurrencies and ESG investments, we utilize publicly available daily prices of Bitcoin and Ethereum, as well as two ESG stock market indices, NIFTY 100 ESG and NIFTY 100 Enhanced, from April 1, 2016, to December 31, 2024. The Bitcoin and Ethereum data are sourced from nseindia.com and tradingview.com. Indian ESG indices were chosen for their relevance in emerging market sustainability analysis. To enable econometric analysis, all price series were transformed into daily log returns, computed as- log (*Pt/Pt*-1), where Pt represents the daily closing price at time t, and Pt-1 denotes the daily closing price at time t-1 for the markets under study. Such a transformation ensures stationarity and

captures percentage changes, making the series suitable for time-frequency wavelet analysis.

3.2 Methodology

This study applies an integrated econometric framework to analyze dependence, long-run equilibrium, short-term dynamics, volatility transmission, causality, and portfolio optimization between Bitcoin, Ethereum, and ESG-based equity indices (NIFTY100 ESG and NIFTY100 Enhanced ESG). All analyses are conducted in Python using statsmodels, arch, NumPy, and Pandas.

The analysis begins with Spearman rank correlation to capture linear and nonlinear dependence among returns, using the coefficient:

$$\rho_s = 1 - \frac{6\sum d_i^2}{n(n^2-1)} \quad (adapted\ from\ Zar, 2005)$$

where d_i represents rank differences. This helps evaluate diversification potential. To test long-run equilibrium, the Johansen cointegration test is employed, based on the VAR representation

$$\Delta X_t = \Pi X_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \mu + \varepsilon_t \quad (adapted\ from\ Liang\ \&\ Schienle, 2019)$$

where X_t is a vector of variables, Π represents the long-run matrix, and Γ_i captures short-run adjustments. If cointegration exists, a Vector Error Correction Model (VECM) is estimated to capture long-run adjustments and short-run dynamics:

$$\Delta X_t = \alpha ECT_{t-1} + \sum_{i=1}^{p-1} \beta_i \Delta X_{t-i} + \varepsilon_t \quad (adapted\ from\ Liang\ \&\ Schienle, 2019)$$

where $ECT_{t-1}+$ denotes the error correction term and α represents the speed of adjustment towards long- run equilibrium. Next, volatility and dynamic correlations are examined through the DCC-GARCH approach. Each return series is first modeled with a univariate GARCH(1,1):

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \quad (adapted\ from\ Engle, 2002)$$

and the standardized residuals are then used to estimate the time-varying correlation matrix:

$$R_t = Q_t^{*-1} Q_t Q_t^{*-1} \quad (adapted\ from\ Engle, 2002)$$

where Q_t is the dynamic conditional covariance matrix. This framework provides conditional volatilities, evolving correlations, and spillover patterns across markets.

Causality relationships are evaluated through the Granger causality test. Formally, Y_t Granger-causes X_t if:

$$Var(Y_t \mid Y_{t-1}, X_{t-1}) < Var(Y_t \mid Y_{t-1}) \quad (adapted\ from\ Dufour\ \&\ Renault, 1998)$$

indicating predictive information flow.

Finally, portfolio performance is assessed using Sharpe Ratio:

$$S = \frac{E(R_p - R_f)}{\sigma_p} \quad (adapted\ from\ Lo,\ 2002)$$

where R_p denotes portfolio return, R_f is the risk-free rate, and σ_p represents portfolio volatility. Optimal asset allocation is derived using Markowitz mean-variance optimization:

$$\min_w w'\Sigma w \quad \text{s.t.} \quad w'\mu = \mu_p, \sum w_i = 1 \quad (adapted\ from\ Kolm\ et\ al.,\ 2014)$$

where w is the vector of portfolio weights, Σ denotes the covariance matrix, and μ_p is the desired portfolio return. Overall, this methodology provides a compact yet comprehensive evaluation of dependence, equilibrium, volatility, causality, and portfolio dynamics between cryptocurrencies and ESG-based assets.

IV. Results and Discussions

4.1 Preliminary Evaluation of Dataset Characteristics

Table 1. Preliminary Evaluation of Dataset Characteristics

Series	Mean	Min	Max	Std Dev	Skewness	Kurtosis	ADF Test
RBTC	0.001691	-0.43371	0.2871	0.03672	-0.5913	10.6555	0.0001***
RETH	0.001773	-0.56308	0.31213	0.050247	-0.5888	9.5374	0.0001***
RNIFTY 100 ESG	0.000374	-0.13445	0.08699	0.008485	-1.6617	33.6568	0.0001***
RNIFTY 100 Enhanced ESG	0.000373	-0.13477	0.08679	0.008475	-1.6808	34.1754	0.0001***

Note: *** denote significance level at 1%.
Source: Computed by author in Python.

Table 1 presents key statistics for BTC, ETH, and ESG indices, while Figure 1 shows price and log-return trends. Price series are non-stationary, with log-returns mean-reverting. Cryptocurrencies exhibit stronger volatility clustering than ESG indices, indicating higher market sensitivity.

BTC and ETH show higher yields (0.00169 and 0.00177) but also higher standard deviations (0.0367 and 0.0502) compared to ESG indices (≈0.00037). Both have negative skewness, implying more downside risk, and high kurtosis (9.5–34.2), indicating fat tails. The ADF test rejects the unit root hypothesis ($p < 0.0001$), confirming stationarity.

These findings highlight that cryptocurrencies are more volatile and asymmetric than ESG indices, supporting further econometric analysis.

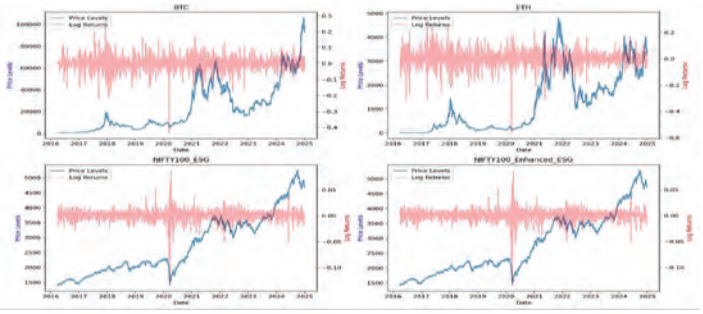

Figure 1. Comparison of Raw Price Levels and Log Returns for Crypto and ESG Indices.
Source: Author's computation (Python output).

4.2 Evidence from Econometric Analysis

4.2.1 Correlation Analysis Using Spearman's Method

Table 2. Spearman Correlation Matrix for Cryptocurrency and ESG Index Returns

Series	RBTC	RETH	RNIFTY 100 ESG	RNIFTY 100 Enhanced ESG
RBTC	1	0.6843	0.0539	0.0517
RETH	0.6843	1	0.0723	0.0692
R NIFTY100 ESG	0.0539	0.0723	1	0.9845
RNIFTY100 Enhanced ESG	0.0517	0.0692	0.9845	1

Note: Spearman's ρ measures the rank-based correlation between asset returns.
Source: Computed by author in Python.

Table 2 indicates Spearman correlation coefficients between cryptocurrencies and ESG indices. Results show that there is a significant positive association among Bitcoin, Ethereum (p = 0.68), and thus, it is highly co-moved, but not entirely dependent, which means that there is little intra- crypto-diversification. On the other hand, the correctness between the NIFTY 100 ESG and the NIFTY 100 Enhanced ESG is almost perfect (p = 0.98), indicating that these indices track almost similar underlying components hence does not provide much diversification benefits. Conversely, the relationships between ESG indices and cryptocurrencies are quite weak (ρ ≈ 0.05–0.07), which highlights their possible use in the diversification of portfolios through decreasing the overall risk exposure. These patterns of correlation support the long-run relationship testing that can be done through the Johansen Cointegration framework, and the VECM Model.

4.2.2 Cointegration Framework: Johansen Procedure and Vector Error Correction Model (VECM)

4.2.2.1 Johansen Approach for Testing Cointegration

Table 3. Johansen Cointegration Test Results

Rank (r)	Eigenvalue	Trace test Value	95% Critical Value	Decision (5% Level)
r = 0 (No cointegration)	0.0569	229.21	47.85	Reject H□
r = 1 (At most 1 vector)	0.0094	42.11	29.8	Reject H□
r = 2 (At most 2 vectors)	0.0037	12.07	15.49	Fail to Reject H□
r = 3 (At most 3 vectors)	0.00008	0.25	3.84	Not considered

Source: Computed by author in Python.

The results of the Johansen cointegration are reported in table 3. The null hypothesis of no cointegration is rejected with a rank of 0 and 1 which proves the presence of two cointegrating vectors between the 4 assets. It means that cryptocurrencies and ESG indices are long-run equilibrium correlated even though they vary in the short run. The higher first eigenvalue (0.0569) shows that the movements of the cryptocurrency, especially Bitcoin and Ethereum, have a serious effect on the long-run adjustment direction of ESG indices. This implies that the price deviations in the short term can be experienced but as time goes the assets will move towards a stable level. Being able to find long-run relationships, the next analysis is the VECM analysis that examines the short-run responses and rate of restoring equilibrium after distortions in these assets.

4.4.2.2 VECM Estimation Results

Table 4. Summary of VECM Results.

Variable	Error Correction Term (ECT□)	p-value	Short-run Dynamics (Selected Significant Lags)	Interpretation
BTC	0.0043	0.002	ETH (-1): -1.3606***	BTC adjusts moderately fast to long-run equilibrium; reacts significantly to ETH shocks.
ETH	-0.1878	0	BTC (-1): 0.927***	ETH shows strong adjustment to deviations, reflecting feedback with BTC.
NIFTY100 ESG	0.0001	0.002	ETH (-1): -0.0794**	ESG index responds weakly; slower adjustment suggests higher stability.
NIFTY100 Enhanced ESG	-0.0092	0.555	BTC (-1): 0.1933*	Adjustment insignificant, indicating relatively independent short-run movements.

Note: ***, **, * denote significance at 1%, 5%, and 10% levels accordingly.
Source: Computed by author in Python.

Table 4 summarises the estimated coefficients from the VECM framework, highlighting both long-term and short-term linkages among cryptocurrencies and ESG indices. The significant error correction terms for BTC (p = 0.002) and ETH (p < 0.001) confirmation of stable long-run relationships, indicating that cryptocurrency prices tend to revert toward equilibrium after temporary shocks. In contrast, the weaker adjustment speeds of the ESG indices suggest greater market stability and lower susceptibility to short-term volatility. Short-term dynamics show ETH has a big effect on BTC, which shows that Ethereum is in charge in the short run. The VECM results show that crypto and ESG

assets are only partially integrated over the long run. The following part looks at how volatility spreads using the DCC-GARCH framework.

4.2.3 Volatility Spillover and Dynamic Correlation Analysis (DCC-GARCH Model)

Table 5: Summary of Conditional Volatility, Dynamic Correlation, and Volatility Spillover Results

Metric / Relationship	Mean Correlation	Volatility Linkage (Spillover)	Interpretation
BTC–ETH	0.707	0.72	Strong co-movement and high volatility transmission between major cryptocurrencies.
BTC–NIFTY100 ESG	0.066	0.2	Weak correlation; limited volatility transmission indicates good diversification potential.
BTC–NIFTY100 Enhanced ESG	0.064	0.2	Similar weak linkage; indicates minimal integration with crypto markets.
ETH–NIFTY100 ESG	0.061	0.19	Low short-term co-movement; ESG market largely insulated from ETH shocks.
ETH–NIFTY100 Enhanced ESG	0.057	0.18	Minimal volatility spillover, confirming stability of ESG assets.
NIFTY100 ESG– Enhanced ESG	0.982	1	Extremely high correlation, reflecting structural overlap between ESG indices.

Source: Computed by author in Python.

The DCC-GARCH models for the BTC, ETH, and NIFTY ESG indexes are shown in Table 5 and Figure 2. BTC and ETH have high GARCH (1,1) volatilities, while ESG indexes have steady volatilities, which means they are less risky. The dynamic correlations show that the correlations between BTC and ETH are high and constant (≈0.70), but the correlations between crypto and ESG are close to zero. This means that there aren't many prospects for integration and diversification. Predictably, both of the ESG indices exhibit almost perfect correlation (≈0.98–0.99).

Volatility spillovers mirror these patterns: BTC and ETH transmit substantial bidirectional shocks (≈0.72), while spillovers between crypto and ESG assets remain minimal (≈0.18–0.20), suggesting ESG markets are mainly insulated from crypto volatility.

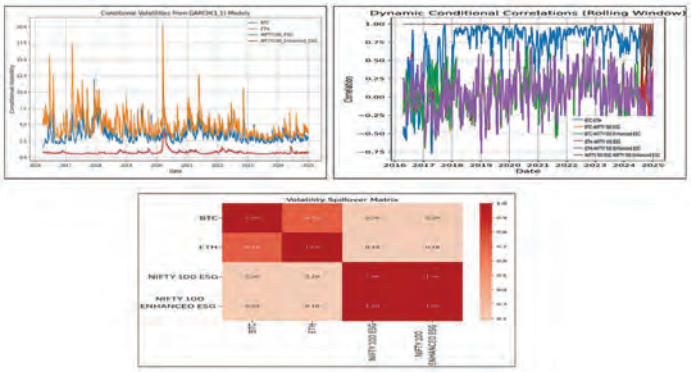

Figure 2. Conditional volatilities from GARCH (1,1) models for BTC, ETH, and ESG indices; Dynamic Conditional Correlations among cryptocurrencies and ESG indices; and Volatility Spillover Matrix across all assets.
Source: Author's computation (Python output).

Altogether, the evidence provided by DCC-GARCH indicates that cryptocurrencies are highly internally related, but not much in terms of connection with ESG equities, which makes ESG assets useful volatility stabilizers. This gives impetus to the further Granger causality analysis.

4.2.4 Causality Assessment via the Granger Framework

Table 6. Granger Causality Test Results (BTC → ETH)

Lag (Order)	p-value	Decision (at 5% Level)
1	0.6764	Fail to Reject H□ (No Causality)
2	0.9213	Fail to Reject H□
3	0.9779	Fail to Reject H□
4	0.9795	Fail to Reject H□
5	0.5116	Fail to Reject H□ (Weak Long-term Effect)

Source: Computed by author in Python.

Granger causality test was applied to predict directional relationships between the returns of Bitcoin (BTC) and Ethereum (ETH). Due to their high co-movement and the long-run integration that was previously determined, the test only considered these cryptocurrencies with the exclusion of ESG indices because they are almost a perfect correlation and they have less new information.

Table 6 shows the p-values of the BTC → ETH test at lag 1-5. The p-values of all lags are significantly greater than 0.05 (between 0.51 and 0.97) so that no statistically significant short-term or medium-term causality between BTC and ETH is shown. The fact that the value is marginally lower at lag 5 (0.512) indicates that it has a weak long-run influence but it is not enough to reject the null hypothesis. In general, the movements of BTC prices do not have a systematic forecast of ETH returns over the course of the study.

4.3 Portfolio Diversification and Risk Metrics Analysis

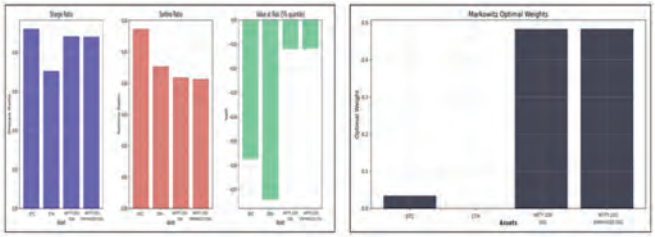

Figure 3: the Sharpe Ratio, Sortino Ratio, and VaR (5% quantile) for each asset; and Optimal portfolio weights derived via Markowitz mean–variance optimisation.
Source: Author's computation (Python output).

Figure 3 shows the Sharpe ratio, Sortino ratio, and VaR for BTC, ETH, and ESG indices. BTC has the highest Sharpe ratio, followed by ESG indices, indicating better risk-adjusted returns with diversification. The Sortino ratio highlights the diversified portfolio's reduced downside risk. VaR (5%), the

potential losses of cryptocurrencies are increased, whereas ESG indices are stable. The outcomes of the mean-variance optimisation indicate that the largest portion of portfolio weight is held by NIFTY 100 ESG (≈0.48) and NIFTY 100 Enhanced ESG (≈0.48), and a small portion by BTC (≈0.04). This allocation balances returns and volatility. Finally, the high Sharpe/Sortino ratios, the lower VaR, and the optimized weights reflect substantial diversification benefits, enhancing the portfolio's resilience and performance.

V. Conclusion and Practical Implications

This study addressed the research problem of whether cryptocurrencies, specifically Bitcoin (BTC) and Ethereum (ETH), can enhance the diversification potential of ESG-based portfolios in India. The primary aim was to assess how the integration of digital assets with sustainable finance instruments affects risk-adjusted performance and long-term portfolio stability.

Key findings indicate that cryptocurrencies exhibit weak correlations and limited volatility spillovers with ESG indices, confirming their potential as effective diversifiers. Johansen cointegration and VECM analyses reveal long-run equilibrium linkages but limited short-run adjustments, implying that while these assets move together over time, they remain partially independent in the short term. The Granger causality test further shows no directional predictability between BTC and ETH, suggesting market-wide rather than asset-specific influence. Finally, portfolio metrics, including Sharpe, Sortino, and VaR, combined with Markowitz optimisation, confirm that portfolios weighted heavily toward ESG indices and modestly toward BTC achieve superior stability and efficient risk–return trade-offs.

The implications of the findings are significant for both investors and policymakers. They demonstrate that a balanced inclusion of cryptocurrencies within ESG portfolios can strengthen resilience and enhance sustainable investment outcomes. The research can help fill gaps in digital finance and green investing within the Indian framework, thereby addressing the current body of literature on hybrid asset diversification. It is a limited study that focuses only on two cryptocurrencies and Indian ESG indices. It would be possible to include global ESG assets, other digital currencies, and macroeconomic or sentiment variables in future studies to gain an even more insightful cross-market understanding. In conclusion, the study highlights that careful incorporation of digital assets into ESG portfolios may improve diversification and stability. Such strategic blending represents a forward-looking approach to sustainable wealth creation in an evolving financial landscape.

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AI TRUST AND USER ADOPTION OF AI-SUPPORTED FEATURES ON INSTAGRAM: A UTAUT FRAMEWORK ANALYSIS

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Purpose: *This study is an attempt to develop and test a model to understand the key factors that have an impact on the adoption of AI-supported features on Instagram, based on an adapted version of the Unified Theory of Acceptance and Use of Technology (UTAUT).*

Design/methodology/approach*: The factors such as facilitating conditions (FC), social influence (SI), performance expectancy (PE), effort expectancy (EE), attitude, and behavioural intentions (BI), along with trust in AI, as an additional factor, were included in the model tested using SMART PLS.*

Findings*: The findings reveal that trust in AI significantly influences attitude, EE, PE, and actual use behaviour (AUB), but does not directly impact BI. Additionally, SI has a critical contribution to forming BI, while attitude influences actual use behaviour rather than intention.*

Originality/value*: The analysis of indirect effects highlights key mediating relationships in the model. Furthermore, mediation analysis revealed that AI trust significantly influences use behaviour through AI attitude, and social influence indirectly affects use behaviour via behavioural intention.*

Keywords : *UTAUT, Meta AI-Supported, Instagram, User Engagement, Artificial Intelligence, AI Trust, PLS-SEM, Mediation.*
JEL Code: *M31, O33, C38*

I. Introduction

In this era, artificial intelligence (AI) and technology have become basic parts of our everyday life, as compared to earlier times when it was limited to solving simple tasks. From transforming industries to getting integrated into our daily routines, AI and technology have revolutionised how we work, communicate, learn, and even think. AI has gradually made us dependent on it by integrating it into our daily routines through smartphones, social media, healthcare, and even basic day-to-day activities.

The way people perceive AI (as a helpful tool vs. a privacy threat) and their attitude toward technology (whether they trust it or feel manipulated by it) heavily influence how actively they use AI-driven features on Instagram. Positive perceptions lead to greater engagement and trust, while negative perceptions can lead to disengagement, resistance, or privacy concerns. Instagram users are gradually increasing their interactions with the support of AI features, such as content recommendations, filters and effects, image and video editing, spam detection, and voice commands. Cardon et al. (2023) explored how AI literacy, comprising four key abilities: application, authenticity, accountability, and agency, impacts the perception of people towards the use of AI. The application referred to understanding AI tools, authenticity emphasised genuine communication, accountability involved ensuring responsible AI use, and an agency focused on maintaining human control over AI-generated content.

AI has significantly contributed to various fields like the adoption of ChatGPT in higher education, mobile banking, agricultural Fintech products, healthcare social products, fashion retail, and e-commerce, etc. (Lai et al., 2024; Sharma et al., 2024; Abdalla et al., 2024; Khalid, 2024). This adoption comes as a result of *Social Influence (SI), Effort Expectancy (EE), Facilitating Conditions (FC), and Performance Expectancy (PE)* that have built trust and a positive effect on the *Behavioural Intentions (BI)* of the users. Trust is an essential driver that can determine or prevent users' adoption

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of AI-supported features. Users must trust that the AI features will work reliably, protect their privacy, and act in their best interest.

In this research paper, we discuss how AI has contributed and how it can further improve Instagram users' experience. If users believe that AI-supported features, such as improved content recommendations or better photo filters, will enhance their experience on Instagram, they are more likely to adopt them. People's perception of Instagram's AI tools will play a major role if they find it user-friendly, and chances are that its adoption will be quick, as people will have to put less effort into learning or using these features. Further, if Instagram's AI features align with users' attitudes (e.g., enriching their creativity, time-saving, and improving customization), it will be the cherry on the cake as users will be more inclined to it. Hence, this study will focus on investigating how users' engagement on Instagram will be impacted after implementing Meta AI-supported features.

II. Literature Review

A comprehensive review of pertinent literature is conducted that covers the underlying constructs and hints at the potential inter-relationships.

Behavioural Intention (BI)

To understand how well undergraduates accept ChatGPT, Lai et al. (2024) put into operation the UTAUT model to study its acceptance. The results indicated that trust was the strongest element of adoption, while moral obligation and perceived risk were major inhibitors. Patil et al. (2020) examined mobile payment adoption in developing economies using the meta-UTAUT model. Their findings revealed a positive influence of attitude, facilitating situations, and SI on BI. On the other hand, personal innovativeness of an individual, anxiety, and trust factor showed an indirect impact on the usage behaviour through attitude.

Al-Adwan et al. (2024) made an effort to integrate the UTAUT-2 model and Dual-Factor Theory to inspect the factors working as enablers and barriers in adoption intentions. The results of this study showed factors like effort expectancy, performance expectation, perceived group behaviour, hedonic motivation, and consumer innovativeness as key enablers. Similarly, Sadiq et al. (2025) integrated UTAUT2 and Social Cognitive Theory to examine social commerce adoption through both technological and human perspectives, and found that habit, motivation, and social influence have a meaningful impact on *BI*.

Actual Use Behavior (AUB)

Ahmed et al. (2019) found that perceived playfulness and ease of use made platforms like Twitter and Facebook feel more useful, and intention to use had a direct effect on actual usage. Kumar et al. (2025) examined how the usability of GPTs, primarily ChatGPT-3.5, affects the attitudes and beliefs of students in Indian higher education. Razi-ur-Rahim et al. (2024) highlighted UPI adoption, addressing a gap by integrating *Actual Use Behavior (AUB)* into an extended meta-UTAUT model. The *PE* significantly influenced *AUB*, while attitude strongly affected *BI*. While *SI, FC*, and institutional support also contributed to *BI*.

AI Attitude

Baudier and Boissieu (2025) examined the rise of SMRs and their credibility in digital marketing. Drawing on source credibility theory, the study found that reliability, proficiency, physical attractiveness, content attractiveness, and anthropomorphic appearance significantly shaped attitudes toward SMRs.

AI Trust

Trust in AI improves users' expectations regarding ease of use and performance, leading to smoother and more efficient experiences (Al-Adwan, 2024). Park et al. (2024) examined user interactions with AI-generated content on Instagram, finding that AI content was perceived as attractive and high-quality, similar to influencer content, suggesting AI's potential to replace human influencers. Lai et al. (2024) identified trust as the strongest determinant of ChatGPT adoption among undergraduates. Sarker et al. (2025) explored trust as a construct within the Meta-UTAUT model, revealing that trust positively influenced consumer attitudes. Patil et al. (2020) incorporated trust into the meta-UTAUT model for mobile payment adoption, finding that trust indirectly impacted usage behaviour through attitude, which was also confirmed by the research of Razi-ur-Rahim et al. (2024).

Effort Expectancy (EE)

The study by Lai et al. (2024) revealed that *EE* has a strengthening effect on students' intentions to adopt ChatGPT. Similarly, a study on user interest and acceptance of Zedemy by Idayani and Darmaningrat (2024) showed a

significant effect of *EE* on behavioural intent through the UTAUT model. Furthermore, Al-Adwan et al. (2024) found that *EE, PE,* hedonic motivation, perceived mass behaviour, and consumer innovativeness have observable effects on adoption intentions. Singh et al. (2023) also identified *EE* as a crucial interpreter of adoption in online learning. Furthermore, Khanchel (2023) extended UTAUT to understand digital social network (DSN) adoption, revealing how *EE* positively influenced BI and DSN user behaviour.

Performance Expectancy (PE)

In their study, Lai et al. (2024) pointed out the effect of *PE* on *BI* to use ChatGPT. While Sarker et al. (2025) found *PE* to be significantly influencing consumer attitudes. Patil et al. (2020) also identified *PE* as a significant predictor of mobile payment usage and in mobile banking. In the Fintech products, Sharma et al. (2024) found that *PE* exerts positive influence on both *BI* and the genuine adoption of agricultural products and services. Idayani and Darmaningrat (2024) stated that performance expectations have a notable effect on behavioural intent in adoption of Zedemy. Furthermore, research by Khanchel (2023) revealed *PE* as a positively influencing factor on *BI* and DSN user behaviour in digital social network adoption.

Facilitating Conditions (FC)

Patil et al. (2020) described that easing situations significantly influenced *BI* in mobile payment adoption, and Razi-ur-Rahim et al. (2024) identified *FC* as a significant contributor to *BI* toward UPI adoption. Idayani and Darmaningrat (2024) also found that *FC* impacted user behaviour in the adoption of Zedemy. Additionally, Abdalla et al. (2024) put forth that *FC* significantly influenced healthcare social workers' intent to adopt data analytics.

Social Influence (SI)

Lai et al. (2024) found that *SI* did not play a major role in the adoption of ChatGPT, indicating that users adopted it independently. While Patil et al. (2020) observed that *SI* positively affected people's intention to use mobile payment systems. Similarly, Idayani and Darmaningrat (2024) noted that social factors had a strong impact on the intention to adopt Zedemy. However, Al-Adwan et al. (2024) reported that subjective norms did not have a meaningful effect, suggesting that *SI* had little importance in certain adoption decisions. Sharma et al. (2024) showed that *SI* contributed to the adoption of agricultural FinTech solutions. Razi-ur-Rahim et al. (2024) identified *SI* as a contributor to *BI* toward UPI adoption. While Sadiq et al. (2025) observed that *SI* was a significant factor in influencing *BI* in social commerce adoption. Singh et al. (2023) found *SI* to be a significant interpreter of online learning adoption. Khanchel (2023) found that *SI* positively influenced *BI* and DSN user behaviour in digital social network adoption.

Despite the growing integration of AI-supported features on social media platforms like Instagram, user adoption remains inconsistent. Existing studies have explored AI-generated content perception (Park et al., 2024), AI trust in social commerce (Sadiq et al., 2025), and AI adoption in language learning (Lai et al., 2024). Nevertheless, limited research has examined the adoption of AI-supported features on Instagram through the UTAUT framework. While factors such as trust, *EE*, and *SI* have been studied in many sectors like e-commerce (Lestari & Sugiharti, 2024) and mobile payments (Alkhowaiter, 2022), their role in AI adoption on Instagram remains unclear. This study fills the gap by investigating these constructs within the UTAUT framework, offering insights into how Instagram users engage with AI features and the role of trust and social impact in their adoption decisions.

Based on the literature review, researchers formulated the following hypotheses to test and establish the relationships between the underlying construct of this study:

H_1: AI Attitude has a significant impact on Behavioural Intention (BI) to use AI-supported features.

H_2: AI Attitude has a significant positive impact on the Actual Use Behaviour (AUB) of AI-supported features.

H_3: AI Trust has a significant impact on AI Attitude.

H_4: AI trust has a significant impact on Behavioural Intention (BI) to use AI-supported features.

H_5: AI trust has a significant impact on Effort Expectancy (EE).

H_6: AI trust has a significant impact on Performance Expectancy (PE).

H_7: AI Trust has a significant impact on the Actual Use Behaviour (AUB) of AI-supported features.

H_8: Behavioral Intention (BI) has a significant effect on the Actual Use Behaviour (AUB) of AI-supported features.

H_9: Effort Expectancy (EE) has a significant impact on Behavioural Intention (BI) to use AI-supported features.

H_{10}: Facilitating Conditions (FC) have a significant impact on the Actual Use Behaviour (AUB) of AI-supported features.

H_{11}: Performance Expectancy (PE) has a significant impact on Behavioural Intention (BI) to use AI-supported features.

H_{12}: Social Influence (SI) significantly impact on the Behavioural Intention (BI) to use AI-supported features.

III. Research Methodology

Sample Description

The convenience sampling method was used for collecting data. The questionnaires were given to the students of UG and PG Programmes through a Google Form link. The total number of respondents was 206, which was used for further analysis. In terms of the composition of gender, 56.8% of participants declared themselves to be females, and 43.2% of participants declared themselves as male. Regarding the distribution of age groups, 25.24% of respondents reported being between 17-20 years old, followed by respondents 21-23 years old, with 54.85%. The respondents aged above 23 years were 30.58% of the total distribution, indicating that the study mostly comprises a younger population. Regarding academic qualifications, the majority are postgraduate students, 60.68% of the sample, while undergraduate students make up 60.68%. The fact that nearly three-quarters of the respondents use the platform multiple times a day indicates a high level of user engagement.

Questionnaire Development

For collecting the data, firstly, the items' adoption and validation are considered. To build on existing knowledge and maintain uniformity across previous studies, the measurement items for underlying constructs were adapted from past studies. Specifically, the survey questions were sourced from earlier research done in social commerce and technology adoption. Specifically, the items capturing *PE*, *EE*, *SI*, *BI*, and *FC* are derived from Venkatesh et al. (2003, 2012).

IV. Results and Analysis

Measurement Model: Convergent Validity Analysis

The assessment of convergent validity involved several metrics, including factor loadings, Cronbach's alpha, composite reliability/CR (both ρ_a and $\rho_{(C)}$), and average variance extracted (AVE). All constructs confirmed strong internal consistency, and they also met the expected level for convergent validity according to established benchmarks. For instance, the *AI Attitude* construct exhibited factor loadings ranging from 0.859 to 0.898, a Cronbach's alpha of 0.936, CR values of 0.937 (ρ_a) and 0.949 ($\rho_{(C)}$), and an AVE of 0.758 (Table 1). These results surpass the recommended thresholds (Cronbach's alpha ≥ 0.70 and AVE ≥ 0.50) as stated by Hair et al. (2017) and Fornell and Larcker (1981).

Similarly, the *AI Trust* construct displayed robust psychometric properties with factor loadings varying from 0.853 to 0.891, a Cronbach's alpha of 0.938, CR values of 0.938 and 0.951, and an AVE of 0.763. *BI* construct further reinforces the strength of the measurement model, with exceptionally high factor loadings (more than 0.945), a Cronbach's alpha of 0.945, a CR of 0.945, and an AVE of 0.901. In addition, constructs such as *EE, FC, PE, SI*, and *AUB* consistently met the established criteria. Notably, the *FC* construct, with an AVE of 0.886 and factor loadings above 0.934, clearly demonstrates the high measurement quality of this model.

Overall, these findings confirm that each construct in the model exhibits adequate convergent validity (Table 1). This strong foundation supports the reliability of the measurement model and justifies its use in PLS-SEM structural analysis to test the proposed relations between the UTAUT constructs and user engagement with Meta AI-supported features on Instagram.

Table 1: Factor Loadings, Reliability Measures, and AVE Results

Constructs	Items	Factor Loadings	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	AVE
AI Attitude	AIAtt1	0.862	0.936	0.937	0.949	0.758
	AIAtt2	0.865				
	AIAtt3	0.869				
	AIAtt4	0.871				
	AIAtt5	0.898				
	AIAtt6	0.859				
AI Trust	AI Trust1	0.891	0.938	0.938	0.951	0.763
	AI Trust2	0.886				
	AI Trust3	0.873				
	AI Trust4	0.853				
	AI Trust5	0.860				
	AI Trust6	0.878				
Behavioural Intention (BI)	BI1	0.946	0.945	0.945	0.965	0.901
	BI2	0.948				
	BI3	0.953				
Effort Expectancy (EE)	EE2	0.860	0.900	0.900	0.930	0.769
	EE3	0.910				
	EE5	0.885				
	EE6	0.852				
Facilitating Conditions (FC)	FC1	0.934	0.957	0.965	0.969	0.886
	FC2	0.946				
	FC3	0.944				
	FC4	0.942				
Performance Expectancy (PE)	PE2	0.812	0.928	0.929	0.942	0.698
	PE3	0.865				
	PE4	0.880				
	PE5	0.853				
	PE6	0.823				
	PE7	0.819				
	PE8	0.792				
Social Influence (SI)	SocInf1	0.836	0.913	0.914	0.931	0.658
	SocInf2	0.878				
	SocInf3	0.747				
	SocInf4	0.783				
	SocInf5	0.879				
	SocInf6	0.786				
	SocInf7	0.761				
Actual Use Behaviour (AUB)	Use1	0.786	0.913	0.914	0.930	0.623
	Use2	0.784				
	Use3	0.785				
	Use4	0.808				
	Use5	0.829				
	Use6	0.768				
	Use7	0.766				
	Use8	0.784				

Source: Primary Data

Discriminant Validity Analysis

The Heterotrait-Monotrait (HTMT) ratios for all construct pairs were substantially under the commonly recommended threshold (typically 0.85 to 0.90), with values ranging from 0.498 to 0.812. These low HTMT values indicate that the constructs share limited variance, thus confirming that each variable is conceptually different from the others (Henseler et. al, 2015). In the Fornell-Larcker check, the square root of each construct's AVE was compared with how much it correlated with the other constructs. For example, the *AI Attitude* demonstrated a square root of AVE of 0.871, which exceeds its correlations with *AI Trust* (0.614), *BI* (0.676), *EE* (0.744), *FC* (0.705), *PE* (0.751), *SI* (0.725), and *AUB* (0.564). Every construct exhibited the same pattern of values, thereby confirming that each construct shares higher convergence with its respective indicators than with external constructs (Fornell & Larcker, 1981). Together, these results provide robust evidence for the discriminant validity of the

measurement model.

Explanation by the model

R-square (R^2) and adjusted R^2 values were used to check how well the structural model explains the results. The results indicate that *BI* has an R^2 value of 0.595 and an adjusted R^2 of 0.584, suggesting that 59.5% of the variance in it is explained by the predictor variable, representing a moderate to substantial level of explanatory power as recommended by Chin (1998). Similarly, *PE* exhibits an R^2 value of 0.453 and an adjusted R^2 of 0.451, indicating that 45.3% of its variance is explained by the independent variables.

AI Attitude and *AUB* show R^2 values of 0.377 and 0.397, respectively, with adjusted values of 0.374 and 0.385. These results suggest that the model moderately explains users' attitudes toward AI-supported features and their actual usage behaviour. *EE* showed a lower R^2 value of 0.304 (adjusted R^2 = 0.300), indicating it has less explanatory power than the other constructs. Still, the value is acceptable for exploratory research, as noted by Hair et al. (2017). Overall, these results indicate that the structural model exhibits moderate explanatory power, particularly in predicting *BI* and *PE*. While some constructs, such as *EE*, display lower explained variance, they still contribute meaningfully to the overall model. These outcomes give strong evidence for the hypothesized relationships and confirm that independent constructs significantly influence user engagement with Meta AI-supported features.

Structural Model Analysis Results

The structural model was evaluated by testing a series of hypotheses that capture the relationships among *AI Attitude, AI Trust, EE, PE, SI, BI*, and *AUB*. The analysis reveals a nuanced picture of how these constructs interact in influencing user engagement with Meta AI-supported features on Instagram. First, the direct path from *AI Attitude* to *BI* was not supported ($\beta = 0.171$, $t = 1.610$, $p = 0.108$), suggesting that an approving stance on AI features does not directly translate into a higher intention to use them. However, results indicated that *AI Attitude* has a notable direct effect on *AUB* ($\beta = 0.245$, $t = 2.841$, $p = 0.005$), showing that favourable attitudes do manifest in actual usage behaviour. *AI Trust* emerged as a pivotal antecedent within the model. It significantly influenced *AI Attitude* ($\beta = 0.614$, $t = 10.076$, $p = 0.000$), highlighting that trust in AI features contributes to shaping users' attitudes. Moreover, *AI Trust* significantly affected *EE* ($\beta = 0.551$, $t = 8.486$, $p = 0.000$) and *PE* ($\beta = 0.673$, $t = 12.267$, $p = 0.000$), suggesting that trust not only enhances perceptions of ease of use but also amplifies expectations regarding performance benefits. In addition, *AI Trust* had a significant direct effect on *AUB* ($\beta = 0.234$, $t = 3.289$, $p = 0.001$), reinforcing its role in driving actual user behaviour. Conversely, the direct effect of *AI Trust* on *BI* was not significant ($\beta = 0.087$, $t = 1.031$, $p = 0.303$), implying that while trust influences perceptions and attitudes, it does not directly alter the intention to use AI features. *BI* was found to be a significant predictor of *AUB* ($\beta = 0.201$, $t = 3.065$, $p = 0.002$), in line with the theoretical propositions of the UTAUT (Venkatesh et al., 2003). However, *EE* did not significantly impact *BI* ($\beta = 0.066$, $t = 0.758$, $p = 0.449$), nor did *PE* ($\beta = 0.165$, $t = 1.642$, $p = 0.101$), indicating that in this context, perceptions of ease of use and performance benefits may not directly translate into the intention to use the technology. Furthermore, *FC* did not have a significant direct effect on *AUB* ($\beta = 0.056$, $t = 0.789$, $p = 0.430$), implying that external support factors may not be as influential in determining *AUB*. Lastly, *SI* reported a considerable effect on *BI* ($\beta = 0.383$, $t = 4.522$, $p = 0.000$), emphasizing the importance of social factors in shaping user intentions.

Mediation Analysis

The analysis of indirect effects highlights key mediating relationships in the model. *AI Trust* significantly influences *AUB* through *AI Attitude* ($\beta = 0.151$, $p = 0.006$), indicating that a positive attitude towards AI strengthens the impact of trust on actual usage. Additionally, *SI* indirectly affects *AUB* via *BI* ($\beta = 0.077$, $p = 0.010$), suggesting that external social pressures shape individuals' intent to use AI, ultimately driving adoption. Furthermore, *AI Trust* exhibits partial mediation through *AI Attitude* in its effect on *BI*. Although the direct effect of *AI Trust* on *BI* is not significant ($\beta = 0.087$, $p = 0.303$), its indirect effect through *AI Attitude* ($\beta = 0.105$, $p = 0.113$) indicates a potential mediating role, albeit not statistically significant. Similarly, *AI Trust* partially mediates *AUB* through *PE* and *BI* ($\beta = 0.111$, $p = 0.107$). The bootstrapping confidence intervals further validate these findings, showing that the *AI Trust* → *AI Attitude* → *AUB* (CI [0.043, 0.262]) and *SI* → *BI* → *AUB* (CI [0.027, 0.144]) pathways are significant. The following results underscore the importance of trust, *SI*, and attitudinal perceptions in shaping AI adoption behaviours.

Discussion

The results demonstrate that AI attitude meaningfully

impacts users' behavioural intention and actual use behaviour of AI-supported features aligning with the study of (Park et al., 2024), which revealed that the content generated through AI is perceived as attractive and high-quality, resulting in higher engagement. The study also highlights the important role of trust in encouraging AI adoption. Users who trust AI systems are more likely to develop positive attitudes and intentions toward using AI, which increases the chances of adopting AI-supported features (Lestari & Sugiharti, 2024). Sadiq et al. (2025) support these findings, showing that trust in AI has a direct impact on how people actually use AI in areas like digital marketing and social commerce. In addition to trust, users' behavioural intentions strongly influence actual usage, showing that motivation plays a key role in AI adoption (Lai et al., 2024). *EE* impacts *BI*, with ease of use increasing AI adoption (Idayani & Darmaningrat, 2024).

The findings indicate that *FC* does not significantly affect Instagram users' use of AI-supported features. This contrasts with the results of Alkhowaiter (2022), which suggest that platform support enhances user engagement. Additionally, the impact of *PE* on *BI* was insignificant, contradicting the conclusions of Khalid (2024), who established that *PE* does influence *BI*. However, social factors affecting the behavioural intentions were significant, aligning with the findings of Sheikh et al. (2017), which demonstrated that social influence plays a crucial role in shaping adoption decisions.

On the whole, these findings highlight the complicated relationship between trust, attitudes, and social influence in shaping both the intention to use and the actual use of Meta AI-supported features on Instagram. The findings of this research are not only limited to supporting established technology acceptance theories, rather it also sheds light on the non-significant effects of *EE* and *PE* on *BI*, where further investigation can be undertaken to have an in-depth understanding of the mechanisms involved in technology adoption.

From a theoretical viewpoint, these results focus on the crucial role of *AI Trust* in influencing perceptions of AI capabilities, effort expectancy, and overall attitudes toward AI systems. However, behavioural adoption of AI seems to be affected by additional factors such as user experience, contextual support, and technological readiness. Considering the practical aspect, the study emphasises the need for AI developers and policymakers to focus on enhancing trust mechanisms, improving system usability, and reinforcing external conditions to encourage actual usage. While *AI Trust* contributes significantly to shaping attitudes and expectations, efforts are still required to bridge the gap between positive perceptions and actual behaviour.

V. Conclusion

This study provides empirical evidence on the relationships between *AI Trust, AI Attitude, EE, PE, BI*, and *AUB*. The results indicate that AI Trust contributes significantly in shaping attitudes and expectations, but has a limited direct impact on behavioural adoption. While the measurement model confirms reliability and validity, the structural model suggests that interventions targeting contextual and behavioural factors may enhance AI adoption outcomes. Future research should explore additional mediators and moderators to strengthen the predictive accuracy of AI acceptance models. Despite the robust findings, the study suffers from some limitations, such as the research being conducted completely based on self-reported data that might have introduced bias, warranting future research to incorporate objective usage metrics. Also, the sample size and demographic distribution may limit generalizability, suggesting a need for cross-industry and cross-cultural studies. Lastly, the potential role of moderating variables, such as technology experience and organizational support, remains unexplored and should be considered in future investigations.

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AN EMPIRICAL VERIFICATION OF WAGNER HYPOTHESIS IN HARYANA (INDIA) : AN ARDL BOUNDS TESTING APPROACH

Vikas* Monika**

Purpose: *This study is empirical verification of Wagner Law in the state of Haryana for a long period of time i.e 1980-2024.*

Design/Methodology/approach: *A long causal relationship between state income and expenditure has been examined with the help of ARDL Model and Granger Causality.*

Findings: *An ARDL model exhibited weak evidence of Wagner Hypothesis during studied period. There has unidirectional causality exists from economic growth to government expenditure which is confirmed by the Granger Causality test.*

Originality/value: *This study is helpful for the state i.e. how to achieve the long run productive gaols of public expenditure without curtail the development expenditure.*

Keywords : *Economic growth, government spending, unit root, ARDL and Cusum test.*
JEL Code: *C4, C5, C32, E62, H50, H76*

I. Introduction

Investigating the association between government spending and state income become an important issue especially in developing state where a larger portion of economic resources are used by the government to create employment opportunities and speed up economic development. The proportion of government spending increases at a pace that exceeds that of national income in developing countries during the pace of development (Wagner, 1883).

A striking feature Haryana economy from 1980s is the rapid growth of public sector. The relative share of government expenditure in the net state domestic product (NSDP) was 22 percent in 1980s; 15.89 percent in 1990s; 56.33 percent in 2000s, with a peak of 120.07 percent in 2006-07 and then reduced to 39.16 percent in the period 2011-18 (Study of State Finances, RBI, various issues). As the net state domestic product of the any state rises over time, the proportion of government spending in context to income will rise and particular behaviour term as Wagner's law, coined by Adolf Wagner in 1883. Growing of economic growth and its relationship with government expenditure has attracted the attention of economists, researchers and policy makers from time to time, however, the growing involvement of state-level spending initiatives has attracted significant interest from scholars and economists after 1991 economic reforms.

Wagner's hypothesis based on the correlation between economic growth and the level of government spending, suggesting that government expenditure increases at a quicker pace than economic growth over time to accommodate the rising needs of industrialization, social welfare, and economic development. In the literature on public finance, Wagner hypothesis has huge importance (Gupta 1967, Musgrave, 1969; Peacock-Wiseman,1979; Mann, 1980). To check the validity of Wagner's Law, numerous studies have been conducted thereafter in different countries and supported the objective of Wagner law (Wagner & Weber, 1977; Oxley, 1994; Chang, Liu, & Caudill, 2004; Akitoby, et. al., 2006; Narayan, et. al., 2012; Tsaurai & Odhiambo, 2013; Atasoy & Gür, 2016; Keho, 2016), however, many have provided significant findings against to Wagner law (Magazzino, Giolli, & Mele, 2015 and Moore, 2016).

Government expenditure enhanced private sector productivity in one hand and on the other hand it may crowed out some private investment, moreover, economic growth has affected positively by government expenditure if government expenditure is complementing to private sector without any reduction of private expenditure (Alesina et al., 2002). A striking feature of Haryana state in the last four decades had increased government spending through worthy growth of state income. The share of Government spending in ratio of NSDP was nearly 22 percent in the decade 1980-90; 21.98 percent during 1990-00, and with a drastic change i.e.

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56.33 percent in the time span of 2001-10, while during 2010 to 2020 it was 37.96 percent. It was 37.91 in the last four year of study i.e 2020-24 The compound annual growth rate of the State economy (measured by NSDP) was 12.58 percent in the 1980s, 15.89 percent in the 1990s, 26.15 percent in the 2000s, 12.20 percent in the period 2010-20 and 3.07 percent in the period 2020-24 (Study of State finances, RBI, various issues). The average fiscal deficit as percentage of NSDP has decreased during the studied period, which is a good symbol for State economy if this is reduce without compromising development and social activities of the states.

Theoretical Framework of Wagner Law

The value of elasticity of government expenditure with respect to output provides the validity of Wagner Hypothesis. As with many hypotheses that are also propounded in general forms, many functional forms of Wagner law have been specified. However, many studies across the world have empirically tested the Wagner's law and have given conflicting output that varies from nation to nation. This study addressed five of these alternative interpretations i.e. Peacock and Wiseman (1961), Peacock and Wiseman share (1961), Gupta (1967), Goffman (1968), Musgrave (1969).

Peacock-Wiseman model advocated that the elasticity between government expenditure and national income should be more than unity. According to the Peacock-Wiseman model, the elasticity of the share of government spending in national income must be higher than zero. According to the Musgrave model, the elasticity between the percentage of government spending in total output and per capita income should be higher than zero. In the words of Gupta (1967) the per capita government expenditure is a function of per capita income. Goffman (1968) proposed additional Wagner law specifications that explain why government spending elasticity as to per capita income is more than one.

The literature on applicability of the Wagner hypothesis is explained in a good manner. Numerous empirical investigations have been carried out worldwide in both developed and developing countries. Wagner and Weber (1977) examined empirically the expansion of government operations in 34 nations during post war era. Wagner Law is a random event and has an equal chance of occurring or not occurring. To overcome the issue of spurious regression, numerous studies conducted in the 1990s employed sophisticated econometric techniques, including causality model, co-integration analysis, and the ARDL model.

Chang et al. (2004) conducted an empirical investigation the applicability of Wagner's Law for ten different countries between 1951 and 1996. They found that, in the newly industrialised nations of South Korea and Taiwan, there was a one-way causal relationship between GDP and government spending, while the US and UK showed evidence in favour of the Wagner hypothesis. However, Australia, South Africa, and Thailand did not show any evidence in support the Wagner hypothesis. Ansari, Gordon, and Akuamoah (1997) verified the Wagner law by testing it against Keynes law in Ghana, Kenya, and South Africa. The study of Ansari, Gordon& Akuamoah (1997) confirms Wagner law for Ghana while there was no evidence of Keynes and Wagner hypothesis for Kenya. However, there was unidirectional causality from government expenditure to total output which supports the Keynesian hypothesis in South Africa. Atasoy and Gür (2016) tested the Wagner hypothesis for China over the period of 1982-2011 and the results of ARDL bound test indicates that 1 % rise in national income will increase government spending by 1.62 percent, confirm the validity of Wagner's Law.

Akitoby et al. (2006) described how national income and government spending are co-integrated in 51 developing nations and Wagner law was valid in 70 percent countries. Karagianni, Pempetzoglou, and Strikou (2002) examined the six alternates of Wagner's hypothesis in European Union-15 countries between 1949 and 1998. The findings suggested the validity of Wagner law. There are many studies in Ireland that could not found evidence in favour of this (Moore, 2016). Abizadeh and Gray (1985) found that Wagner law is applicable for developing countries only.

Empirical Researches in India

The bi-directional causal relationship between government spending and GDP was supported by Singh et al. (1984), who examined the relationship between overall public spending and national income as well as other government spending components in India between 1950 and 1981 i.e. GDP causes government expenditure (Wagner's Hypothesis) and government expenditure causes GDP (Keynesian view). The study of Mohsin et al. (1992) provided strong evidence of one-way causal relationship moving from government expenditure to aggregate income during1950-51 to 1988-89 in India by using co-integration, Granger Causality test and Error Correction Modeling.

Khundrakpam (2003) examined the Wagner Law by using the ARDL model in India during 1960 to 97 by and found

evidence in favour of Wagner hypothesis. Using annual data from 1950 to 2007 in India, Verma and Arora (2010) provided long-term support for the Wagner hypothesis. Narayan et al. (2012) examined the effectiveness of Wagner's law for 15 different states of India with the help of panel co-integration technique and provide evidence regarding long run evidence of this law. Bansal and Shardha (2012) using cross section data for 29 Indian states found that the elasticity of public expenditure is lower than the economic growth which reveals the absence of validity of Wagner's Law. There is bi-directional causality existed between public expenditure and economic growth (Gangal & Gupta, 2013).

Ranjan and Chintu (2013) checked the validity of Wagner's law in India during 1970–71 to 2010–11. The results of the study ensured that economic growth and size of government of government spending are co-integrated with each other and causal relationship between them. Adil et al. (2017) conducted an empirical study that examined the long-term link between government spending and national output in India between 1970 and 2013. The ARDL model's findings indicate long-term association between GDP and government spending. On the basis of existing literature, we can say that there are mixed evidences regarding Wagner's Hypothesis. The following table 1. shows the decade wise trends in growth rate of NSDP, average government expenditure and fiscal deficit as percentage to NSDP of the state of Haryana.

Table 1. Specific Trends in NSDP, Government Expenditure and Fiscal Deficit of Haryana

Decade Wise Analysis	CAGR of NSDP	Average Government Expenditure (% of NSDP)	Average Fiscal Deficit (% of NSDP)
1980-90	12.58	22.32	3.65
1990-2000	15.89	21.98	3.45
2000-10	26.15	56.33	2.62
2010-20	12.20	37.96	3.49
2020-24	3.07	37.21	3.20

Source: RBI, Study of State Finances (various issues).

The average contribution of government expenditure in total NSDP was around 22.32 percent in 1980-90, slightly reduced to 21.98 percent in 1990-00. However, again it showed increasing trend more than double from last decade i.e., 56.33 percent during the period of 2000-2010. In the period 2010-20 and 2020-24 it was 37.96 percent and 37.21 percent respectively. The average fiscal deficit as percentage of NSDP was around 3.50 percent during the study period. The government expenditure have increased faster than national income during the phase of industrialization in many countries across the world (Atasoy & Gür, 2016).

II. Research Design and Methods

Annual time series data from 1980 to 2024 is used for testing the validity of Wagner hypothesis. Total Government expenditure is GE whereas NSDP (Y) is used to determine the economic growth. All the data used in the study is taken from study of state finances issued by Reserve Bank of India. The natural logarithm has been used to transform all of the data. The specification below expresses the relationship:

$$GE = f(Y) \quad \text{..... Eqn (1)}$$

Where GE indicate the size of the government and Y represent the economic growth i.e., NSDP.

The Wagner Hypothesis's validity is examined using the ARDL model. In contrast to Johansen & Juselius (1990) and Engle and Granger (1987), the ARDL approach can be used regardless of whether the model's regress is I(0) or I(1). However, it is important to verify the stationary of the variables because ARDL cannot be used in the presence of I (2). In this study, Phillip Perron (PP) test and Dickey Fuller-GLS, Augmented Dickey Fuller (ADF) test test of unit root are applied to varify whether data are stationary or not. Additionally, the ARDL limits test is predicated on the F-statistic's joint significance is used to find out co-integration between the competing variables. If resulted value of calculated F-statistic is higher than critical value of upper bound (bound test), at that time we will reject the null hypothesis of no co-integration variables are co-integrated and vice-versa.

Wagner Law using ARDL Model

Five functional specifications that have been widely used in Wagner's Law literature have been used to assess the viability of Wagner's Hypothesis. The following are the compelling features of many iterations of the Wagner hypothesis to examine the long-term relationship between the magnitude of state government spending and state income:

1. Peacock- Wiseman version

$$\Delta Log\left(GE\right)_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta Log\left(GE\right)_{t-i} + \sum_{i=0}^{p} \alpha_2 \Delta Log\left(Y\right)_{t-i} + \pi_1 Log\left(GE\right)_{t-1} + \pi_2 Log\left(Y\right)_{t-1} + \mu_t \text{.....eqn.2}$$

Where GE - government expenditure of the state, Y is the Net state domestic product, α_1, α_2 short run elasticity and π_1, π_2 shows long run elasticises. The value of coefficient of Y should be higher than one i.e. . $\pi_2 > 1$.

2. Peacock-Wiseman share version

$$\Delta Log\left(\frac{GE}{Y}\right)_t = \beta_0 + \sum_{i=1}^{p}\beta_1 \Delta Log\left(\frac{GE}{Y}\right)_{t-i} + \sum_{i=0}^{p}\beta_2 \Delta Log Y_{t-i} + \kappa_1 Log\left(\frac{GE}{Y}\right)_{t-1} + \kappa_2 Log Y_{t-1} + \mu_t .....eqn.3$$

Where $\frac{GE}{Y}$ proportion of government expenditure in state income, Y denotes the Net state domestic product, β_1, β_2 short run estimator and κ_1, κ_2 shows long run elasticities. According to Peacock-Wiseman version, the value of coefficient of Y i.e. κ_2 should be greater than 0.

3. Musgrave version

$$\Delta Log\left(\frac{GE}{Y}\right)_t = \chi_0 + \sum_{i=1}^{p}\chi_1 \Delta Log\left(\frac{GE}{Y}\right)_{t-i} + \sum_{i=0}^{p}\chi_2 \Delta Log\left(\frac{Y}{N}\right)_{t-i} + \phi_1 Log\left(\frac{GE}{Y}\right)_{t-1} + \phi_2 Log\left(\frac{Y}{N}\right)_{t-1} + \mu_t .....eqn.4$$

χ_1, χ_2 short run estimator and ϕ_1, ϕ_2 shows long run elasticities and according to this version, coefficient of $\frac{Y}{N}$ i.e. ϕ_2 should be larger than 0.

4. Gupta version

$$\Delta Log\left(\frac{GE}{N}\right)_t = \partial_0 + \sum_{i=1}^{p}\partial_1 \Delta Log\left(\frac{GE}{N}\right)_{t-i} + \sum_{i=0}^{p}\partial_2 \Delta Log\left(\frac{Y}{N}\right)_{t-i} + \sigma_1 Log\left(\frac{GE}{N}\right)_{t-1} + \sigma_2 Log\left(\frac{Y}{N}\right)_{t-1} + \mu_t .....eqn.5$$

Where Y/N – per capita net state domestic product, ∂_1, ∂_2 - short run estimator and σ_1, σ_2 shows long run elasticities and according to this version, coefficient of $\frac{Y}{N}$ i.e. σ_2 should be higher than one.

5. Goffman version

$$\Delta Log GE_t = \psi_0 + \sum_{i=1}^{p}\psi_1 \Delta Log GE_{t-i} + \sum_{i=0}^{p}\psi_2 \Delta Log\left(\frac{Y}{N}\right)_{t-i} + \omega_1 Log GE_{t-1} + \omega_2 Log\left(\frac{Y}{N}\right)_{t-1} + \mu_t .....eqn.6$$

Where ψ_1, ψ_2 short run and ω_1, ω_2 are long run dynamics and according to this version, the value of ω_2 should be greater than Unity.

III. Results and Discussions

The present paper is unique in nature as for the first time; the validity of Wagner hypothesis is tested during the time period from 1980-81 to 2024 in Haryana (India). After 1991 economic reform, Haryana is driven by high growth rate in urbanisation, industrialisation and attracted the large amount of FDI. Additionally, Wagner Law suggests that as the economy becomes more industrialized, the proportion of government activity will grow faster than the growth of national income.

The ARDL bound test should be applied when data is integrated at level or at first difference and stationary test will confirms the variables are not integrated at order two I(2). As proposed by Pearson et.al.(2001), if the variables are stationary at I(2),ARDL bound test can't be used. The results of examining the stationarity of data are presented in Table 2.

The ADF test, PP and DF-GLS test were carried out by including an intercept without trend in the creating equation. All the competing variables are found non-stationary at level but turned into stationary by taking first difference which is confirmed by the all the tests of unit root shows in table 2.

Table 2. Stationary-Unit Root Test

	ADF		PP		DF-GLS	
	Level	First Difference	Level	First Difference	Level	First Difference
Log GE	0.4425	4.4343***	0.4856	4.4343***	0.1662	4.5057***
Log Y	0.197	3.1846**	0.7774	6.6644***	0.1997	1.9493*
Log GE/Y	2.121	4.1806***	1.9169	4.1806***	2.0531**	4.2491***
Log Y/N	0.9313	6.5337***	1.2246	6.5337***	0.1556	1.7465*
Log GE/N	0.4395	4.4334***	0.4946	4.4334***	0.5061	4.5039***

Note: *,**,*** shows significance level at 10%, 5% and 1% respectively.

The stationary test of these variables confirmed that the variables are not I(2) and ARDL model can be execute to investigate co integration among variable. The elasticity among the variables can be find out by using ARDL model. The ARDL model outcomes are given in the Table 3. The F statistics values exceed the higher bound critical values at 5 percent significance in Peacock Wiseman share and Musgrave versions, while Peacock Wiseman, Gupta and Goffman versions are significant at 10 percent level, hence confirmed co integration among the competing variables. The value of R2 & adjusted R2 is also very high. The values Diagnostic test given in table 4 confirms that all the alternative model of Wagner's Law and model is free from auto correlation, heteroskedasticity and serial correlation.

Table 3. Long Run Elasticities Estimates of the selected Model

	ARDL Model							
Wagner's Alternative Version	**ARDL**	**Bound Test (F-statistics)**	**Coefficient**	**T-statistics**	**Prob.**	**R^2**	**Adjusted R^2**	**Durbin Watson**
Peacock Wiseman	(2,0)	3.59*	0.3167	2.2236	0.0344	0.9998	0.9777	2.04
Peacock Wiseman share	(3,0)	4.26**	0.0938	2.2687	0.0318	0.8239	0.7969	2.01
Musgrave	(3,0)	4.25**	0.1106	2.2682	0.0319	0.8239	0.7969	2.01
Gupta	(3,0)	3.99*	0.5038	3.1139	0.0045	0.9769	0.9733	2.07
Goffman	(3,0)	4.11*	0.5768	3.1017	0.0046	0.9818	0.9790	2.07

Note: *,**shows significance level at 10% and 5% respectively.

Table 4. Diagnostic Test

Wagner's Alternative Version	Serial Correlation LM Test F statistics (P value)	Heteroskedasticity Chi Square (P value)	Normality Test Jarque- Bera (P value)
Peacock Wiseman version	1.9131 (0.1284	0.6011 (0.5857)	34.22 (0.0000)
Peacock Wiseman share version	0.3574 (0.7129)	1.2395 (0.2909)	9.7191 (0.0077)
Musgrave version	0.3658 (0.7027)	1.1980 (0.3058)	9.9832 (0.0067)
Gupta version	0.1433 (0.9035)	1.1073 (0.3411)	12.193 (0.0022)
Goffman version	0.1480 (0.8994)	1.0015 (0.3835)	14.18 (0.0008)

Source: Authors own calculation.

Even while the estimated coefficients of all the variants of the Wagner hypothesis described are statistically significant, the computed elasticity values do not match the expectations of the other versions, with the exception of the Peacock-Wiseman share version and the Musgrave version. According to Peacock Wiseman version, Gupta version and Goffman version the required sign of coefficient should be greater than one, however, Wagner hypothesis confirms the limited applicability of Wagner's hypothesis in Haryana. Table 5 presents the findings of the Granger causality test, which was used to determine the direction of causality between them.

The finding of Granger Causality test table 5 shows that one way causality is running from NSDP to government expenditure in all versions (except Musgrave versions and Peacock Wiseman share). No causality was found from government expenditure to economic growth in all the alternative version of Wagner's hypothesis. The alternate version of Wagner's hypothesis, which states that the share of government spending in national (state) revenue rises as state income does over time, supports these findings. The elasticity of coefficient in all the versions is greater than zero indicates the limited effectiveness of Wagner's Law in Haryana between a time period of 1980 to 2024.

Table 5. Granger Causality Test

Granger Causality Variable Pair	lag length (AIC criterion)	F-Statistics	p- value	Direction of Causality
Log GE and Log Y	3	4.2655	0.015**	LY →LGE (unidirectional)
Log Y and Log GE		1.4091	0.2645	
Log (GE/Y) and LY	3	1.9938	0.1418	LGEY ≠ LY (No Causality)
Log Y and Log (GE/Y)		1.4091	0.2645	
Log (GE/)Y and Log (Y/N)	3	1.9351	0.1509	LGEY ≠ LYN(No Causality)
Log (Y/N) and Log (GE/Y)		1.5809	0.22	
Log (GE/N) and Log (Y/N)	3	4.0936	0.0176**	LYN→LGEN(unidirectional)
Log (Y/N) and Log (GE/N)		1.5809	0.22	
Log (GE) and Log (Y/N)	3	4.0808	0.0178**	LYN→LGE(unidirectional)
Log (Y/N) and Log (GE)		1.668	0.2004	

Note: *,** shows significance level at 10% and 5% respectively.

Coefficient Stability Tests

The coefficient stability of any modelis very crucial and which can be tested by plots of cumulative sum (CUSUM), suggested by Pesaran & Shin (1999) which is given in Figure 2 to 6. Straight lines in the graphs indicate significance level at 5 perecnt, as the plot of CUSUM and CUSUM square not crossed the critical limit red line confirms a stable long-run association for all the alternative version of Wagner's Law and stable in the long run.

Figure 2. CUSUM Test for Peacock and Wiseman Version

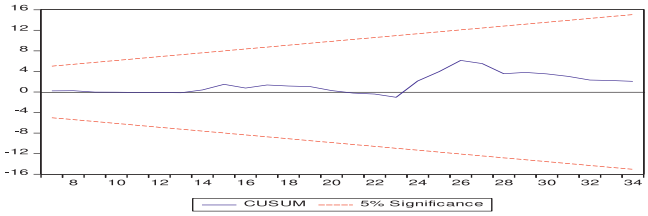


Figure 3. CUSUM Test for Peacock and Wiseman share Version

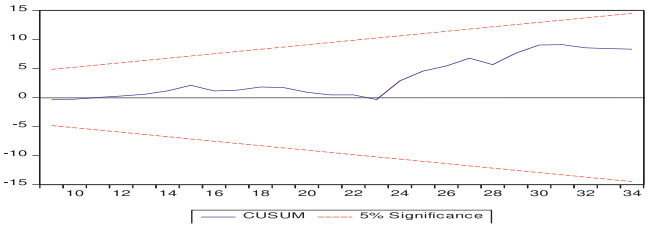


Figure 4. CUSUM Test for Musgrave Version

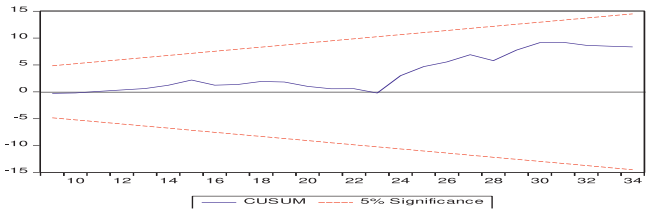


Figure 5. CUSUM Test for Gupta Version

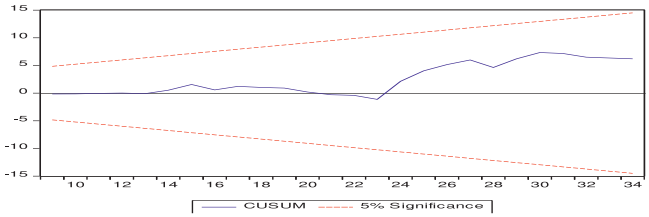
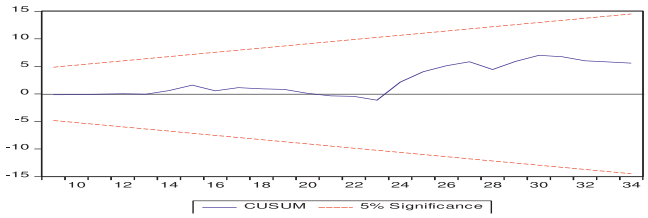


Figure 6. CUSUM Test for Goffman Version



IV. Conclusion and Suggestions

Wagner's law states that government spending rises more quickly than income during the pace of development which is a debatable issue in this world at national and state level. To check the effect of industrialisation and modernisation in Haryana (India), we have taken time period (1980-2024) and investigated the five different specifications of Wagner law in the state of Haryana. Effectiveness of government expenditure on economic growth of Haryana (NSDP) has been investigated by using ARDL bound test approach. The findings of ARDL bound test suggested that there is co-integration between economic growth and government expenditure in Haryana. Nonetheless, over the study period, government spending increased, even at a rate that was not greater than the growth in state income. The values of elasticity in Peacock Wiseman share and Musgrave versions are statistically significant. In every form (except than the Peacock Wiseman share and the Musgrave version), the Granger Causality results support the evidence of unidirectional causality that moves from economic growth to government expenditure.

In line with the study findings, Haryana's public spending should rise as a normal by product of industrialisation. Haryana's rapid economic growth necessitates extensive infrastructure construction, including improvements to public transport, healthcare, education, and welfare programs and all of these will boost government spending growth. In addition to it, fiscal policymakers should prioritise development spending and reduce non-development spending to strengthen the state's finances. Any conversation regarding "the ideal amount of long-term public spending" must also consider the factors that influence the level of public expenditure. Therefore, it is essential to have a thorough comprehension of the long-term connection between state income and public expenditure.

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