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Articles

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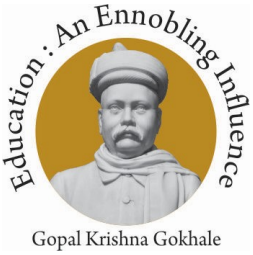

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Artha Vijnana announces the institution of the Gopal Krishna Gokhale Memorial Annual Prize, awarded in recognition of the paper of most outstanding merit appearing in *Artha Vijnana*, irrespective of the author's age. This prize carries an award of ₹10,000, to be shared equally between all authors. In addition, *Artha Vijnana* announces the institution of the Prof. D R Gadgil Memorial Annual Prize, awarded in recognition of the paper of most outstanding merit appearing in *Artha Vijnana*, by a single author of below 40 years of age. This prize carries an award of ₹10,000.

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Household Savings in India: An Empirical Analysis

Jessica Anthony and Ashutosh Raravikar

Household saving is India's major source of financing the investment. It is crucial for sustainable growth. This study empirically examines the determinants of gross household savings in India with a focus on impact of economic and financial uncertainty. The findings highlight the sensitivity of household savings to financial market dynamics in India and significance of maintaining macroeconomic and financial stability along with other measures for growth and inclusive prosperity.

Keywords: Asset price, autoregressive distributed lag, dynamic ordinary least squares, growth, household savings, stability.

I Introduction

The importance of savings and investment in driving and sustaining high economic growth is a central theme in various growth theories. Harrod-Domar model stipulates that economic growth is determined by savings rate in addition to capital-output ratio. Solow's neoclassical growth theory assigns a key role to saving rate in promoting growth in per capita capital and income during transition to steady state[1]. In case of India, investment is a significant component of its GDP growth. Investment is financed by savings – domestic and external. Large reliance on external savings is not prudent for strategic factors such as global or country specific crises, dynamics of external relations and foreign exchange liabilities. Therefore, maintaining a large and growing base of domestic savings is crucial for sustained growth. Household savings[2] constituted 59 per cent of gross domestic savings during 2023-24[3]. Among the contributors of domestic savings, household savings was largest at 18.1 per cent of GDP during 2023-24[4]. It also serves as a source of economic security to lower and middle strata of society. Moreover, it raises the efficacy of monetary policy transmission. Hence the stability and growth of household savings assume significance. For devising the strategies on growth and welfare by policymakers, understanding the factors that impact household savings is important.

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Building on this context, present study explores the dynamic relationship between gross household savings, including physical and financial components, and some key macroeconomic variables selected for their theoretical relevance. Household savings are impacted by macroeconomic uncertainties and volatilities in the return on investments; thus this study tries to capture and integrate wider determinants of household savings moving beyond narrow income based explanations. Major global crises that began since 2008 through COVID-19 and beyond have resulted into instabilities and uncertainties. These were reflected in volatilities of gold and stock prices. These also caused changes in returns on household savings. Accordingly, the variables are incorporated in our model. Using data from 1987 to 2023 which includes the decades marked by economic shifts such as 1991 liberalisation, 2008 global crisis and COVID-19 pandemic, this paper assesses, by deploying autoregressive distributed lag (ARDL) approach, how household savings respond to volatility in asset prices and other macro variables. The rest of the paper is structured as follows. Section II overviews the related theory and literature. Section III provides stylized facts. Section IV presents econometric analysis and its findings. Section V suggests some strategies. Section VI concludes.

II Determinants of Savings

Theoretical Underpinnings

Household saving behaviour has been widely studied, stressing its complex and multifaceted nature. Various theories of saving have attributed savings to different factors and motives. In classical theory prevailing upto mid-1930s, saving was a function of interest rate. Higher rates of interest induced saving more due to higher returns on deposits. J. M. Keynes propounded in the General Theory (1936) that saving is determined by disposable income. As per neo-classical argument, saving is determined by price level. Life-Cycle theory **(**Modigliani and Brumberg 1954) posited that individual saving decisions are influenced by perspectives of smoothing consumption during entire lifetime. Accordingly, higher savings are made during working years, peak earning cycle of youth and dissaving during post-retirement phase. The changes in interest rates impact asset valuations. Decline in interest rates raise the market value of financial instruments such as bonds, thereby raising households' wealth and consumption which reduces the saving rate. Conversely, increase in interest rates increase savings. This is an asset-valuation effect. The lower rates of interest reduce return on investment which either induces the households increase savings rate for future needs or reduce savings rate due to loss of incentive to save due to lower returns. This is an interest income effect. Permanent Income Hypothesis (Milton Friedman 1957**)** argued that saving decisions of individuals are based on their expectations of average long-

term income instead of current one. Their intention is to have stable consumption by taking care of short-term variations in income and make savings accordingly.

Both Permanent Income and Life-Cycle theories assume rational behaviour and perfect capital markets — the assumptions that often do not hold in emerging and developing economies. In such economies, restricted access to credit, informal labour markets and income volatility make households to prioritize precautionary savings. Understanding these theoretical frameworks is essential due to the unique interplay between formal financial systems and traditional saving methods such as gold (Loayza, *et. al.* 2000).

Behavioral Economics has put forth the role of psychological factors including emotions, biases and preference for current happiness over future, behind saving decisions. The examples in present times include the influences of electronic modes like credit cards and tempting digital finance offers that induce young generation save less. Pandemic has increased the people's preference for savings in form of physical assets.

Uncertainty and Volatility

According to Carroll (1997), savings are done by households for buffering against uncertainty and shocks. Unlike the traditional life-cycle model, this framework incorporates macroeconomic shocks (like output gaps) as key drivers of saving behaviour, especially under persistent or anticipated income fluctuations. Moreover, economic uncertainty such as inflation, financial instability or market uncertainty, encourages precautionary saving (Dynan 1993), while stable environments may foster consumption and investment (Otto 2003). Additionally, the share of agriculture in the gross value added (GVA) can also influence household savings. A higher share of agriculture in GVA can increase overall income uncertainty due to weather shocks, price volatility and low diversification. This heightened risk reduces households' ability to save, as they prioritize consumption smoothing and coping strategies over precautionary saving. Vulnerability is especially pronounced in low-income, agriculture-dependent economies (Dercon 2002).

Financial market conditions, including volatility and performance of stock markets, subtly but significantly shape household saving decisions. Dynan (1993) finds that heightened market uncertainty can lead households to increase precautionary savings, as they respond defensively to perceived risks. Conversely, rising stock prices may create a positive "wealth effect," encouraging higher consumption and reducing the need to save. Stock market performance affects household wealth perceptions and preferences for risk (Guiso, Sapienza and Zingales 2005). Macroeconomic factors such as real income, demographics, interest rates and public policy further shape household saving rates (Loayza, Schmidt-Hebbel and Servén 2000, Kim and Lee 2007). For instance, a larger working-age population tends to increase savings. Thus, household saving behaviour is shaped by a combination of demographic trends, policy frameworks,

financial sector developments, cultural norms, uncertainties and broader macroeconomic conditions. A holistic approach is essential to effectively capture the complex and interrelated factors driving saving rates across different economies.

Empirical Literature

Empirical studies on household savings highlight a multifaceted association between income levels, financial market dynamics, cultural preferences and macroeconomic uncertainty, echoing the theoretical discussions outlined above. Among these, income emerges as a fundamental determinant. Higher real income levels typically enhance the capacity to save, while favourable demographic factors like lower dependency ratio reinforce this trend (Loayza, Schmidt-Hebbel and Servén 2000). In this context, response of saving to income changes is also influenced by institutional factors such as financial inclusion, structure of economy and demographic variables including age structure and employment patterns. Cultural and behavioural aspects also influence saving patterns particularly in emerging economies like India. Gold, for instance, occupies a unique position in Indian households, not only as a culturally embedded asset but also as a popular saving tool, serving as a hedge against inflation and currency risks. It is widely perceived as a secure investment especially during periods of financial instability. Baur and McDermott (2010) illustrate gold's role as a "safe haven," noting its inverse relationship with stock market movements and currency values.

Indian Context

In Indian context, empirical research is expanding to reflect the country's evolving financial and demographic landscape. Ghosh and Nath (2021), using data from 1960–2016, find that real income growth and improved access to banking services have a positive impact on household savings. At the same time, inflation and a rising dependency ratio act as constraints. Their study also reveals a nuanced interest rate dynamic: while short-run increases in real interest rates encourage saving, long-run effects may be contractionary, possibly due to reduced investment or consumption incentives. Moreover, Mukherjee and Mukherjee (2018) highlight that rising gold prices lead to increased gold accumulation among middle-income households, often at the expense of financial asset holdings. This behaviour supports the dual role of gold as both a cultural and economic asset in India. Similarly, Dasgupta and Sengupta (2016) link macroeconomic volatility to increased precautionary saving, which can dampen consumption and hamper growth by reducing aggregate demand. Athukorala and Sen (2004), used annual data (1954-1998) and found that higher growth rates and levels of disposable income, inflation, real interest rates and expansion in banking services positively influenced private saving in India. They also observe that public saving has a

crowding-out effect on private saving, though not on a one-to-one basis. Moreover, adverse changes in external terms of trade negatively impact private savings. The study highlights importance of distinguishing between short-term and long-term effects of these variables. Agrawal, *et. al.* (2010), using data from 1960 to 2004, identify per capita income and banking access as crucial drivers of saving behaviour in India. Their findings also show that foreign and public savings tend to lessen private and household savings. Further, in a comparative analysis of India and China, Ang (2009) propounded that higher income growth and inflation pertained to increased household saving in India, while a higher dependency ratio reduced saving. Interestingly, unlike in China, the study showed that expected pension benefits in India had a positive long-term effect on household saving.

Contemporary Factors

Among the recent contemporary factors, growth in retail loans can potentially reduce savings due to increased debt levels. The extremities in climate have increased the volatilities in asset prices, pressures of depreciation and uncertainties that may cause higher savings by households. The investment decisions based on artificial intelligence (AI) have potential to increase the asset price volatilities affecting savings. Initiatives on financial inclusion have increased trust in formal financial system and increased its access inducing higher savings. Government schemes like Pradhan Mantri Jan Dhan Yojana have also increased access and possibly boosted mobilization of savings.

Our Approach

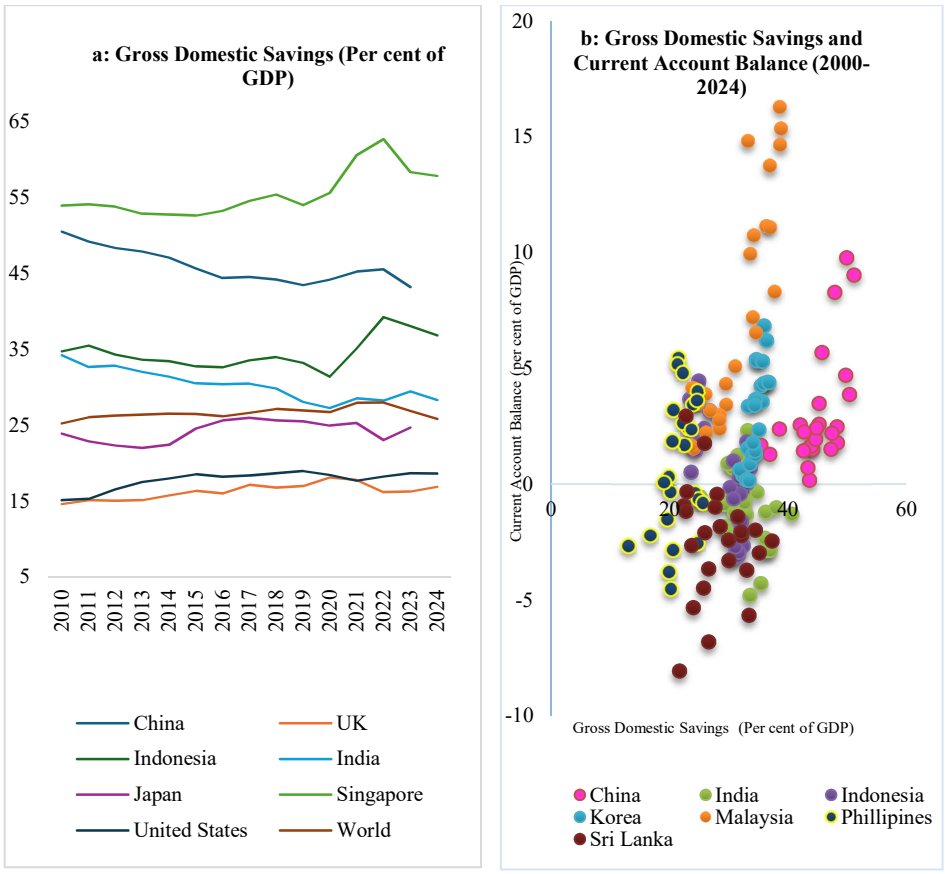
Even with these insights, these studies analyse income, gold and financial market factors in isolation, missing the complex interactions of Indian household savings. This paper attempts to addresses the existing gap by using the ARDL bounds testing approach[5] to jointly assess the impact of real per capita income, stock market and gold price volatility, real interest rates and terms of trade on household savings in India. This method captures both short-term dynamics and long-run relationships, providing a fuller picture of the factors influencing household savings.

III Stylized Facts

India's gross domestic savings rate in 2024 at 28.4 per cent of GDP[6] has been higher than the global saving rate, but lower than that of Asian countries like Singapore and China (Chart 1a). Asia is recognised globally for its high saving rates, driven by demographic trends and cultural preferences. The countries like China, Singapore and South Korea maintain gross domestic saving rates exceeding 35 per cent of GDP, far above global averages. This is attributed to quick income

growth, poor social safety nets (which encourages precautionary saving) and institutional instruments such as Singapore's Central Provident Fund (CPF) which increases the gross household saving rate, as contributions are not immediately consumable. In China, involuntary saving through pension schemes, inadequate consumption opportunities during industrialization and high household income growth have increased long-term saving accumulation[7]. Additionally, Asian societies often emphasize intergenerational accountability and education, motivating households save for the future. There is also an international aspect of high savings rate in Asia. For many Asian markets, the higher savings are not entirely utilised locally. A significant portion is funnelled overseas through positive trade balances (Chart 1b). When a country produces more than it consumes, the balance is characteristically represented as exports to foreign markets. These are largely devoted to overseas sovereign bonds, thus helping to back foreign customers purchase Asian exports[8]. In contrast, developed countries like the US, UK and Japan have much lower saving rates.

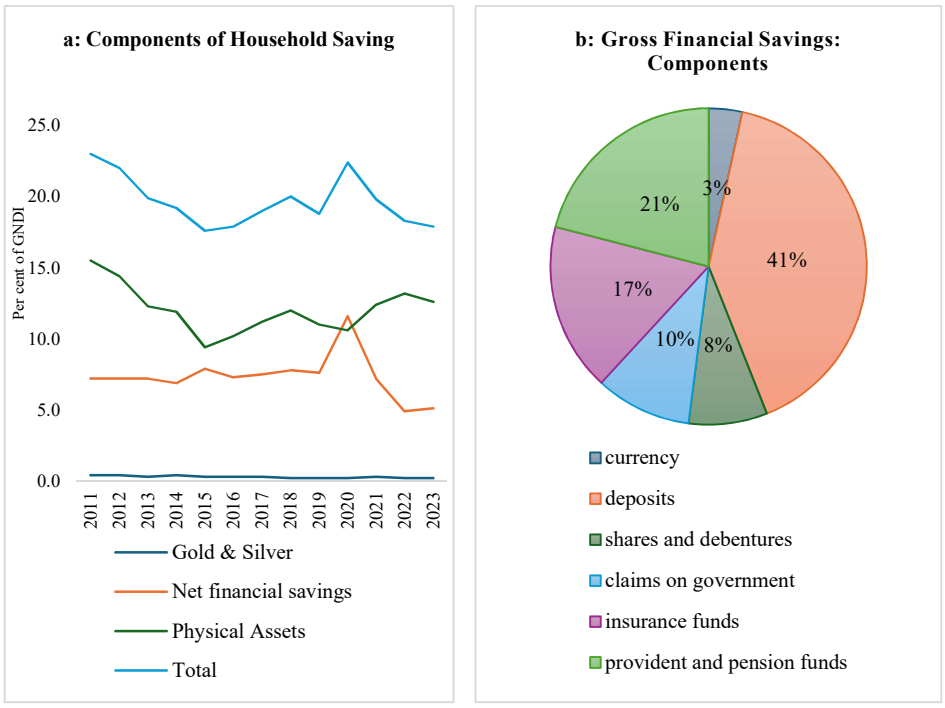
Chart 1: Gross Savings and Current Account Balances



Sources: World Bank and the IMF.

Traditionally, Indian households have been the basis of national savings. Over the last decade, household savings in India have undergone changes, which possibly reflect broader economic shifts, income dynamics, and evolving consumption patterns. Lower unemployment, higher inflation and financial inclusion are the likely factors for rise in household savings (RBI, 2024). Household savings contributed 59 per cent to India's gross domestic savings and constituted 18.1 per cent of India's GDP during 2023-24. Household savings are mainly in physical assets such as land, machinery and inventories, but these have been shifting to financial assets though the trend reversed since pandemic. The proportion of alternative financial instruments increased with declining proportion of deposits (Bhowmick, *et. al.*). Within household savings, the National Statistical Office (NSO) splits data into three broad categories: savings in financial assets, physical assets (primarily real estate), and valuables such as gold and silver ornaments. Financial savings data are computed from gross financial savings with netting financial liabilities. While gross financial savings include household cash balance, deposits and other financial market instruments, financial liabilities include their borrowings from banks and non-banks. The physical assets witnessed some renewed interest post pandemic as an avenue for saving with deposits still having the largest share in financial savings as is observed during 2023-24 (Chart 2).

Chart 2: Components of Saving



Source: MOSPI, Government of India.

There has been a reduction in household financial savings during last decade. At the same time, financial liabilities have risen from 3.2 per cent of GDP in 2013-14 to 6.2 per cent in 2023-24. The decline in overall household savings could mainly be due to rise in small ticket personal loans (up to ₹1,00,000). Fintech companies and other non-banking financial companies are the main providers of such loans and frequently disburse them digitally. Unlike conventional banks, these lenders provide rapid loan availability, which lessens the cost of borrowing, increasing the household debt levels[9].

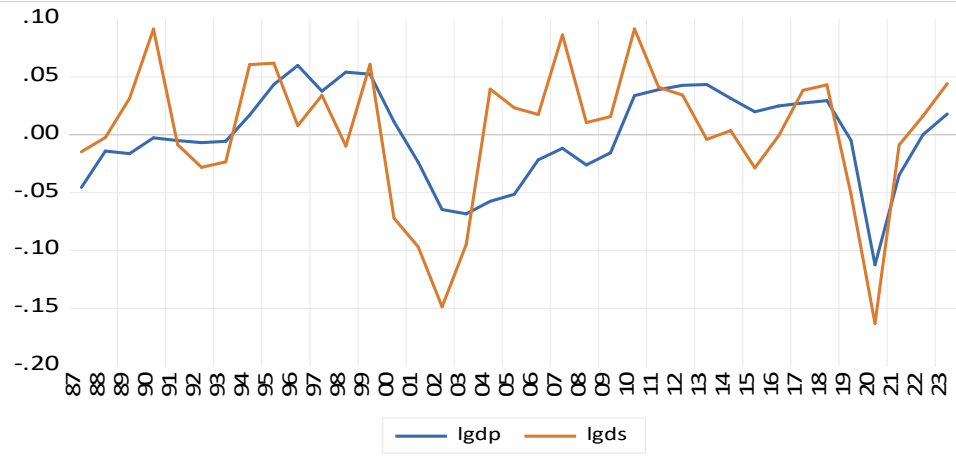
Thus, while the act of saving has traditionally guaranteed resources for future uncertainties, the decline in household savings reflects an echo of larger socio-economic shifts. On the other hand, investment decisions by producers etc. are driven by the expenditure incurred by households. Hence a balanced and stable growth in household savings and consumption is important for sustainable growth. Economic uncertainties affect the balance and make households save much higher due to precautionary motive (as observed during COVID-19 pandemic) and can adversely impact the growth.

IV Empirical Analysis and Findings

Economic Analysis

Given the linkage between economic growth and domestic savings, we try to empirically investigate the precautionary motive associated with uncertainties behind household savings in India. Chart 3 depicts the procyclicality of savings with GDP, where cyclical components of GDP and gross domestic savings (GDS) were attained by detrending the corresponding series, using Hodrick-Prescott (HP) filter[10] from 1987 to 2023. Both GDP and GDS were taken at current prices.

Chart 3: Procyclicality of GDP and Gross Domestic Savings



Source: MoSPI, Government of India and authors' estimates.

The volatility in capital flows may tighten financial conditions posing risks to financial stability as shown by pressures in international equity markets in 2024 (RBI, 2025)[11]. Gold and stock returns reflect macroeconomic and financial market uncertainty, influencing household saving behaviour[12]. Individual participation in Indian equities has increased during last decade (RBI, 2025)[13]. Retail investors are exposed to higher volatility and losses during market corrections. Large, prolonged and severe geopolitical crises pose risks to financial stability through financial markets (IMF, 2025)[14]. Of late, these risks have impacted asset prices. High volatility in returns on savings, through valuation in assets, fluctuations in rates of interest or risks pertaining to climate, induce households to raise precautionary savings, while decreasing the consumption[15]. This is an income effect whereby uncertain or lower returns on savings incentivise them save more for future needs. Changes in prices of assets such as stocks and gold change the portfolio valuations of households. Reduction in asset prices reduce their perceived wealth (as also actual wealth if they sell the assets). This wealth effect induces higher savings by them to protect their precautionary funds. Our analysis is in tune with the various motives behind savings propounded by the Keynesian theory, Permanent Income Hypothesis, Life Cycle theory, behavioral theories and other literature mentioned earlier in this study.

Gold assumes traditional and cultural significance in India. It is utilized during marriages and festivals and used as a store of value. The rise in gold price induces the households increase their purchases either for future gains or for avoiding paying higher price later. This raises their savings in form of gold. Moreover, episodes of high inflation encourage them buy more gold as a hedge against it. Moreover, during global crises, the gold prices tend to increase due to 'safe haven' demand for it. In case of falling prices of gold, they may postpone purchases out of uncertainty thereby reducing the potential or trend savings in the gold. These sharp swings cause volatilities in gold price. Gold price volatilities also result into speculative buying of gold, especially facilitated by digital infrastructure and products like Exchange Traded Funds (ETF).

Data and Variables

The dataset consists of annual data from 1987 to 2023. The dependent variable is total gross household savings as a percentage of gross national disposable income (GNDI) in current prices sourced from Ministry of Statistics and Programme Implementation (MoSPI), Government of India. The study begins with larger number of independent variables before arriving at the final parsimonious model based on the correlation matrix. The details of variables used are given in Table 1. Data are taken from various sources which include MoSPI, IMF and World Bank. These variables have been used in the literature as determinants of household savings, based on which this study attempts to investigate whether macroeconomic uncertainty used in the model through a few variables including income uncertainty represented by output gap (OG)[16] and share of agriculture in GVA

along with volatility in financial markets represented by volatility in gold and stock prices[17], impacts household saving in India. These variables are often used in literature as determinants of household savings.

Table 1: Variable Definitions and Sources

Variable	Definition	Source
Household Saving (HS)	Ratio of Gross Household Saving to GNDI (in current prices)	MoSPI, Government of India
AGED (dependency ratio)	Ratio of dependent people younger than 15 or older than 65 to working age population	World Bank
Agriculture GVA(AGVA)	Share of agriculture in GVA	World Bank
FINANCIAL_DEV (bank credit to private sector) FD	Domestic credit to the private sector as a per cent of GDP	World Bank
Inflation rate (CPI)	Annual growth in consumer price index	International Monetary Fund
Per Capita Income (constant prices) PCYR	GDP per capita in USD	FRED (Federal Reserve Economic Data)
Public Saving (PS)	Public Saving as a per cent of GDP (ratio)	MoSPI, GoI
Real Interest Rate (RIR)	Interest rate adjusted for inflation	World Bank
Trade openness (TO)	Calculated as ratio of a country's total trade (exports plus imports) to its Gross Domestic Product (GDP)	World Bank
Volatility of Gold Prices (VGOLD)	Calculated using standard deviation of gold prices	World Bank and authors' calculations
OUTPUT GAP(OG)	Cyclical component of GDP at constant prices used	MoSPI and authors calculations
Volatility of Stock Prices (VSTOCK)	Calculated using standard deviation of the stock index	BSE India and authors' calculations

Note: Missing data TO and RIR has been generated using average of previous two values.

Model Specification and Methodology

This study utilizes the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration, as outlined by Pesaran, Shin, and Smith (2001). The ARDL method offers several advantages for macroeconomic analysis, particularly in emerging market contexts. A key benefit is its ability to accommodate variables with different orders of integration, specifically I(0) and I(1), without requiring strict pre-testing for unit roots. This flexibility is particularly valuable in dealing with macroeconomic time series that often exhibit mixed integration properties due to structural breaks, shifts in policy regimes, and data limitations (Nkoro and Uko 2016). Another strength of the ARDL framework is its suitability for small sample sizes, which is especially relevant in this study given the constraints of long-term, consistent macroeconomic data in many developing economies. The bounds testing approach allows for the identification of long-run relationships, while also facilitating the estimation of short-run dynamics via the associated error correction model (ECM).

Prior to implementing the ARDL model, a correlation matrix (Table 2) is employed to guide the selection of a parsimonious model specification.

Additionally, the annual data used for India, which follow a fiscal year ending in March, have been harmonized with international data sources to ensure consistency and comparability. Based on the correlation matrix, gross household saving as a per cent of GNDI as dependent variable (HS) and per capita GDP at constant prices (PCYR) as a measure of per capita income, which is a non-negotiable or mandatory dependent variable, we arrive at equation 1.

Table 2: A Correlation Matrix

Variable	HS	PCYR	PS	RIR	VSTOCK	TO
HS	1.00	0.33	-0.49	-0.40	0.43	0.65
PER_CAPITA_INCOME(PCYR)	0.33	1.00	-0.44	-0.53	-0.34	0.79
PUBLIC_SAVING(PS)	-0.49	-0.44	1.00	0.04	0.08	-0.26
Real Interest Rate (RIR)	-0.40	-0.53	0.04	1.00	-0.07	-0.65
STOCK_VOLATILITY(VSTOCK)	0.43	-0.34	0.08	-0.07	1.00	0.09
Trade openness (TO)	0.65	0.79	-0.26	-0.65	0.09	1.00
GOLD_VOLATILITY (VGOLD)	-0.37	-0.05	0.16	0.11	-0.01	-0.12
FINANCIAL_DEV (bank credit to private sector) FD	0.50	0.89	-0.34	-0.59	-0.03	0.93
CPI	-0.21	-0.37	0.25	-0.24	0.28	-0.20
AGRICULTURE GVA(AGVA)	-0.70	-0.82	0.35	0.52	0.00	-0.94
AGED (dependency ratio)	-0.50	-0.97	0.48	0.55	0.21	-0.89
OUTPUT GAP(OG)	-0.15	0.08	0.39	0.13	-0.05	0.01

Variable	VGOLD	FD	CPI	AGVA	AGED	OG
HS	-0.37	0.50	-0.21	-0.70	-0.50	-0.15
PER_CAPITA_INCOME(PCYR)	-0.05	0.89	-0.37	-0.82	-0.97	0.08
PUBLIC_SAVING(PS)	0.16	-0.34	0.25	0.35	0.48	0.39
Real Interest Rate (RIR)	0.11	-0.59	-0.24	0.52	0.55	0.13
STOCK_VOLATILITY(VSTOCK)	-0.01	-0.03	0.28	0.00	0.21	-0.05
Trade openness (TO)	-0.12	0.93	-0.20	-0.94	-0.89	0.01
GOLD_VOLATILITY (VGOLD)	1.00	0.04	0.08	0.22	0.11	-0.12
FINANCIAL_DEV (bank credit to private sector) FD	0.04	1.00	-0.25	-0.89	-0.94	0.01
CPI	0.08	-0.25	1.00	0.39	0.37	-0.18
AGRICULTURE GVA(AGVA)	0.22	-0.89	0.39	1.00	0.92	-0.08
AGED (dependency ratio)	0.11	-0.94	0.37	0.92	1.00	-0.03
OUTPUT GAP(OG)	-0.12	0.01	-0.18	-0.08	-0.03	1.00

Note: RIR and TO data are available till 2022, data for 2023 are the averages of previous two observations.
Sources: MoSPI, GoI, IMF, World Bank.

The equation based on theoretical and statistical backing is specified as:

$$HS = f(PCYR, VGOLD, VSTOCK, RIR, TO) \quad \ldots(1)$$

where: PCYR is GDP at constant prices, VGOLD is volatility of gold prices, VSTOCK is volatility of stock prices, RIR is real interest rate and TO is trade openness index. These variables are mix of I(1) and I(0), thus fulfilling conditions of the Auto Regressive Distributed Lag (ARDL) approach. We log per capita income in the analysis. The liberalisation dummy used for 1990-1991 is found significant in the model. The summary statistics of the key variables of the above functional form is given in Table 3a.

Table 3a: Summary Statistics

Statistic	RIR	HS	GOLD_VOLATILITY	STOCK_VOLATILITY	TO	PER_CAPITA_INCOME
Mean	5.53	0.19	0.04	0.11	33.03	1051
Median	5.75	0.19	0.04	0.1	34.05	866.94
Maximum	9.19	0.24	0.08	0.26	55.79	2236.31
Minimum	-1.98	0.13	0.01	0.03	12.22	438.54
Std. Dev.	2.61	0.03	0.02	0.06	14.37	539.41
Skewness	-0.75	-0.25	0.67	0.96	0.01	0.68
Kurtosis	3.26	2.34	2.68	3.47	1.55	2.16
Jarque-Bera	3.91	1.14	3.16	6.53	3.5	4.24

Source: Authors' calculations.

Upon establishing, through the Augmented Dickey–Fuller (ADF) test (Table 3b), that the variables are not integrated of order two [I (2)], we proceed to investigate their potential long-run interdependence using the bounds testing approach. The results provide strong evidence of a long-run equilibrium relationship among the variables, as indicated by the F-statistic, which is statistically significant at the 1 per cent level (Table 4). Accordingly, the selected variables may be characterised as the 'long-run forcing' determinants of household saving.

Table 3b: ADF Unit Root Test

Series	Level	First Difference*
HS	0.2	-7.06
LOG (PCYR)	1.5	-6.00
VSTOCK	-2.0	-5.50
VGOLD	-2.2	-6.20
RIR	-2.7	-8.70
TO	-0.7	-5.60

Note*: significant at one per cent.

Source: Authors' estimates.

Estimation and Results

We examine the long-term relationship among the variables using the bounds testing approach[18]. The F-test results, which are significant at the one per cent level, provide strong signal of a stable long-run association (Table 4). This suggests that the selected variables meaningfully explain household savings in the long run.

Table 4: F Test results for Long Term Relationship Among Variables

F =4.7, k=5 Sample size 37						
	10 per cent		5 per cent		1 per cent	
Sample Size	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
37	1.8	2.9	2.14	3.34	2.82	4.21

Source: Authors' estimates.

After testing for the long-run relationship, we estimate the long-run relationship to find the long run coefficients. Table 5 gives the long-run values from the ARDL model.

Table 5: Regression Results for Equation 1 (ARDL)

Regressors	Coefficient	Std. Error	t-Statistic	Prob.
LOG (PCYR)*	0.01	0.00	2.7	0.01
VSTOCK*	0.25	0.04	6.7	0.00
VGOLD**	-0.44	0.21	-2.07	0.05
RIR*	0.00	0.00	3.54	0.00
TO*	0.00	0.00	2.44	0.02

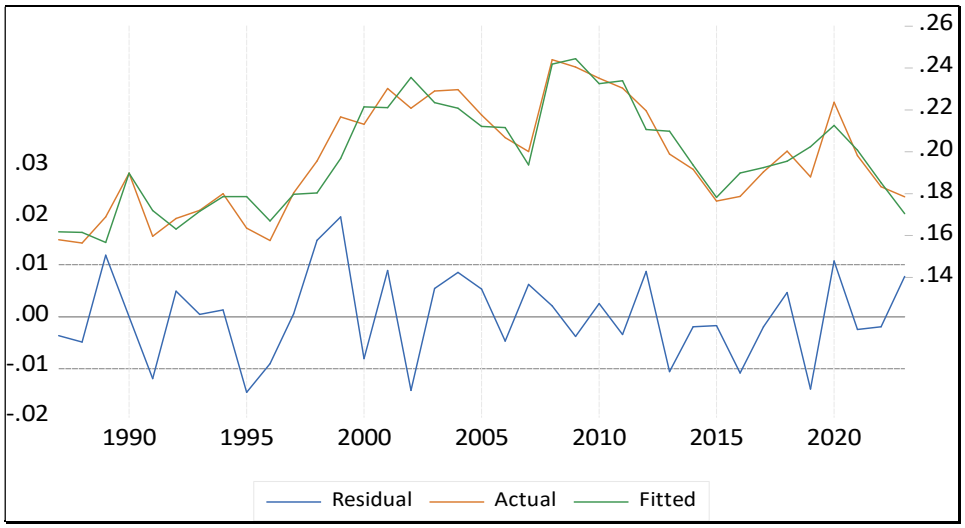
Notes: *, **at one per cent and five per cent significance level, respectively at lag 2 with the ARDL (1,1,1,1, 2, 0) model, Estimates are heteroscedasticity consistent and free from serial correlation.

Source: Authors' estimates.

We observe that volatility of gold and volatility of stock prices have a significant impact on household savings. The graphical presentation of the above model with the actual and fitted values of residuals is given in Chart 4. The model appears to judiciously apprehend the movements in the household saving rate during the sample period. The Error Correction Term (ECT) is -0.45 and highly significant ($p < 0.01$), indicating that 45 per cent of disequilibrium is corrected annually. This reflects a robust reversion to long-run equilibrium.

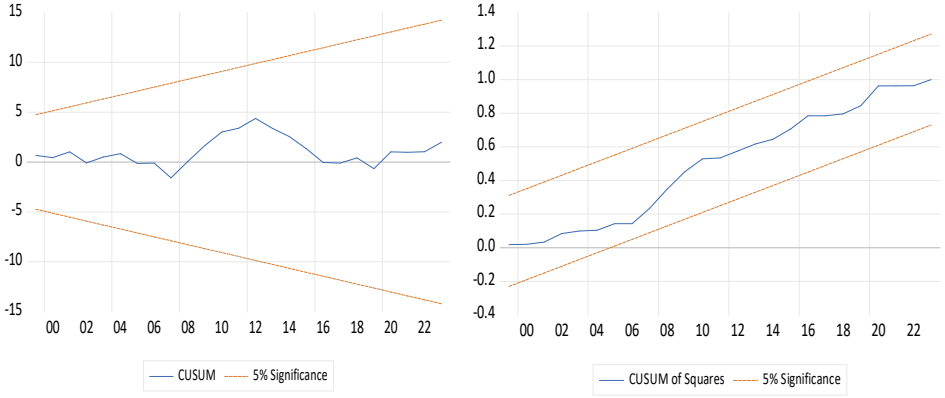
Further, the CUSUM (cumulative sum) and CUSUM of Squares test[19] plot shows the stability of the model. Since the blue line stays within the five per cent significance bounds throughout the sample period, it indicates that there is no structural break or instability in the variance or significant parameter changes across the sample period (Chart 5).

Chart 4: Graphic Presentation of Residuals



Source: Authors' estimates.

Chart 5: CUSUM and CUSUM of Squares Test



Source: Authors' estimates.

Robustness Check: DOLS

The Dynamic Ordinary Least Squares (DOLS)[20] regression was employed to examine the long-run and short-run determinants of household savings (HS) in India as a measure of robustness check. Unlike ARDL, DOLS explicitly controls for endogeneity and serial correlation by including leads and lags of the differenced regressors[21]. Hence, it does not require the assumption of weak exogeneity. This is one of the key advantages of DOLS over ARDL in time series applications, especially when there is suspicion that regressors may be endogenous.

Analogous to the ARDL model, stock volatility shows a strong positive influence ($\beta = 0.43$, $p < 0.001$), suggesting precautionary saving behaviour in response to financial uncertainty. Conversely, gold volatility has a significant negative impact ($\beta = -0.66$, $p < 0.001$), likely reflecting a shift of funds into gold during instability (Table 6).

Table 6: DOLS Results

Variable*	Coefficient	Std. Error	t-Statistic	Prob.
C **(Constant)	-0.2	0.14	-1.5	0.150
LOG(PER_CAPITA_INCOME)	0.05	0.02	2.3	0.030
STOCK_VOLATILITY	0.43	0.08	5.2	0.000
GOLD_VOLATILITY	-0.66	0.13	-4.6	0.000
RIR	0.00	0.00	2.84	0.010
TO**	0.00	0.00	0.18	0.860
D2020	0.03	0.01	3.3	0.009
D89	0.03	0.00	4.8	0.000

Notes: *Newey west errors used and no evidence of serial correlation or heteroscedasticity, ** Variables not significant.

Source: Authors' estimates.

The short-run dynamics are captured via first differences of the regressors (Table 7). The dummy variables D2020 and D89, capturing COVID-era precautionary saving and the post-liberalization shift in 1989 respectively, are both positive and significant indicating changes in household saving motives in response to uncertainty.

Table 7: Short Term Dynamics (First Differences)

Dependent Variable: HS

Method: Least Squares

Date: 07/03/25

Sample (adjusted): 1987 2022

Included observations: 36 after adjustments

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.225016	0.150039	-1.499716	0.1510
LOG(PER_CAPITA_INCOME)	0.054125	0.023601	2.293295	0.0341
STOCK_VOLATILITY	0.435415	0.083805	5.195546	0.0001
GOLD_VOLATILITY	-0.658258	0.141656	-4.646895	0.0002
RIR	0.004080	0.001377	2.961997	0.0083
TO	9.79E-05	0.000779	0.125800	0.9013
D (LOG (PER_CAPITA_INCOME (-1)))	-0.235492	0.100144	-2.351527	0.0303

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (LOG (PER_CAPITA_INCOME (1)))	0.069890	0.069214	1.009767	0.3260
D (STOCK_VOLATILITY (-1))	-0.285248	0.080668	-3.536047	0.0024
D (STOCK_VOLATILITY (1))	0.074442	0.062560	1.189936	0.2495
D (GOLD_VOLATILITY (-1))	-0.150600	0.154339	-0.975778	0.3421
D (GOLD_VOLATILITY (1))	-0.711875	0.135617	-5.249151	0.0001
D (RIR (-1))	0.003762	0.000801	4.693839	0.0002
D (RIR (1))	0.003871	0.001028	3.767238	0.0014
D (TO (-1))	0.004813	0.001002	4.805604	0.0001
D (TO (1))	0.003515	0.000681	5.161116	0.0001
D2020	0.034580	0.010045	3.442632	0.0029
D89	0.028315	0.005904	4.795926	0.0001
R-squared	0.898021	Mean dependent var		0.197605
Adjusted R-squared	0.801707	S.D. dependent var		0.026207
S.E. of regression	0.011670	Akaike info criterion		-5.756764
Sum squared resid	0.002451	Schwarz criterion		-4.965004
Log likelihood	121.6217	Hannan-Quinn criteria		-5.480418
F-statistic	9.323931	Durbin-Watson stat		1.943102
Prob (F-statistic)	0.000010			

Source: Authors' estimates.

The model demonstrates excellent fit ($R^2 = 0.9$) and no major autocorrelation concerns **(**Durbin-Watson = 1.9**)** with normally distributed residuals. Additionally, there is no misspecification of the functional form. While the ARDL bounds test already confirmed the presence of a cointegrating relationship, we also verified the stationarity of residuals from the DOLS estimation. This serves as a robustness check and further validates the long-run association among the variables. Overall, the DOLS model shows that household savings respond significantly to financial market uncertainty analogous to the ARDL model.

V Suggested Strategies

To enhance the stability and growth of household savings, central banks and policymakers should prioritize macroeconomic, financial, external, and price stability, which contribute to stable incomes, asset prices, and expectations. Interest rates may be set at levels that would balance economic growth, consumption and savings, as persistently low rates may lead to reduced consumption, increased precautionary savings, and a shift of funds toward speculative assets such as gold and equities. Strengthening social security systems, offering low-risk but rewarding financial instruments, and supporting income growth through employment and productivity enhancements can help protect vulnerable groups and foster sustainable savings. The introduction of innovative financial products, such as green and inflation-indexed instruments, can hedge

savers against volatility. Deepening financial markets—particularly the corporate debt and gold markets—along with improved transparency, can enhance the efficient allocation of savings. Strategic forex market interventions, continued fiscal consolidation, and the use of advanced technologies by central banks can further support timely policy actions. Finally, expanding financial inclusion with a focus on usage, literacy, and digital security is essential for increasing household participation in formal financial systems and promoting long-term savings behaviour.

VI Conclusion

Savings are crucial for financing investment and attaining sustainable growth. Household savings is a largest constituent of India's domestic savings. It imparts resilience to growth in addition to providing economic security to individuals. This study empirically examines the determinants of gross household savings in India with a focus on the role of macroeconomic and financial uncertainty. The results suggest that stock market volatility is positively associated with household savings, indicating that households react to financial uncertainty. In contrast, volatility in gold prices exerts a negative effect on savings, reflecting gold's role as a substitute asset during periods of instability. Per capita income and trade openness both have positive and significant effects, while the real interest rate also exerts a positive impact. The findings highlight the sensitivity of household savings to financial market dynamics in India including several cautious behaviours amid asset price uncertainty. The saving decisions also reflect income and wealth effects coupled with a few motives arising from cultural and psychological factors. Our analysis adds further dimensions besides being consistent with various standard savings hypotheses, behavioral theories and other literature. These patterns emphasize the interconnectedness between financial conditions and household balance sheet decisions, offering important insights for monetary authorities as also for fiscal policies. Prioritising stability, strengthening social security systems, deepening financial markets, use of advanced technologies and expanding financial inclusion would go a long way in attaining sustainable growth and broad-based prosperity.

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Understanding Environmental Sustainability in India's North-East: A Comparative Study through the SDG Index

Dipankar Saha, Giribabu M. and Ankit Biswas

India adopted the Sustainable Development Goals (SDGs) framework of the United Nation (UN) in 2015 for addressing the sustainable development which is the primary factor for realization of environmental sustainability. Using the SDG Index released by NITI Aayog, an attempt is made in this study to compare the performance of North-Eastern State (NE) of India with the national performance in environmental sustainability, in terms of SDG-6, 7, 11, 12, 13 and 15. The study shows the regional variability in SDG score among North-Eastern Region (NER). It has been evidenced through the study that NER is lagging behind in achieving SDG-11 in comparison to all India performance.

Keyword: United Nation (UN), *Sustainable Development Goals (SDGs), Environment, Environmental Sustainability, SDG Index, NITI Aayog*

I Introduction

"Sustainable development" encompasses a broader concept of "economic development" that surpasses the antiquated notion of economic growth simply measured by per capita GDP growth. However, it adopts a more expansive interpretation of "human development," placing emphasis on the individual as both the agent and recipient of growth. This perspective is assessed by various measures of living standards and quality of life, surpassing the mere monitoring of progress in material possessions (Becker 1964). The SDGs hold significant importance as they offer a worldwide framework for tackling urgent problems like poverty, inequality, climate change, and environmental degradation. The concepts of sustainability and environmental protection are often intertwined. Moreover, the term "sustainable" inherently signifies the enduring self-sustaining viability of any given system, encompassing the endurance of ecological systems, as well as the economic and social framework (Throsby 1997). The Millennium Development Goal (MDG) framework, which has been in place since 2000, has been succeeded

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in 2015 by a new framework of Sustainable Development Goals (SDGs). As per the UN report, published by the World Commission on Environment and Development and also known as the Brundtland report, "Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (WCED 1987). The definition is elaborated upon in the 2030 Agenda for the implementation of SDGs, which aims to end poverty and hunger while addressing environmental concerns without ignoring social challenges related to wellbeing, health, and education (Cörvers et al., 2016). The UN's SDGs are ambitious in that they aim to concurrently achieve significant environmental and human development goals. However, given the potential trade-offs between ecological sustainability and human dimensions, it is also necessary to have comprehensive indicators that can highlight the most promising strategies for enhancing both simultaneously (Henderson and Loreau 2023). The multifaceted concept of the SDGs has been better understood, as it's leading to the identification of several interrelations between the environment, society, and economy (Díaz-Sarachaga, Jato-Espino, and Castro-Fresno, 2018). In order to promote economic, environmental, and social development, the United Nations (UN) created the Sustainable Development Goals (SDG) as a guiding concept. SDGs incorporate 17 broad-based goals and associated 169 targets in an integrated way (Hák, *et. al.* 2016). Environmental sustainability is a crucial requirement for achieving sustainable development. (Leffta, S.J. 2018).

India's North-Eastern Region (NER), which comprises 3.8 per cent of the country's population and covers approximately eight per cent of India's total land area, is a diverse and culturally vibrant region. Despite its natural beauty and cultural past, this region has faced significant challenges in fostering sustainable development. India's endorsement of the United Nations' Sustainable Development Goals (SDGs) in 2015 presented an opportunity to address the challenges and advance the achievement of the SDGs. Numerous studies has been documented the India's performance towards achieving SDGs. However, there has been lack of study in respect of SDGs and its performance in North-Eastern states of India. In this context, this paper has made an attempt to compare the performance of North-Eastern (NE) State of India with the national performance in environmental sustainability, specifically with regard to SDG-6, 7, 11, 12, 13 and 15. The study also aims to identify the constraints to improving the environmental sustainability of the Northeastern states.

II Objectives of the Study

The aim of the study is as follows:

- To compare the progress of NE States with the National average in terms of achieving SDG-6, 7, 11, 12, 13 and 15.
- To study the variability in SDG Scores of NER for the mentioned SDGs.

III Research Methodology

The study is purely based on secondary sources for its data. Data is mainly collected from the SDG India Index and Dashboard 2020-2021 released by NITI Aayog for its analysis on the performance of NE states of India. While SDG-6, 7, 11, 12, 13, 14 and 15 are promoting environmental sustainability, in the present study performance is not analyzed only for the SDG-14 due to the data constraint. The SDG score of NER has been analysed by using tabulation, weighted average, weighted standard deviation and coefficient of variation which performed in the MS Excel software. In addition, necessary information has been gathered from scholarly journals, research papers, government reports, databases, reviews, and other reliable sources.

IV Sustainable Development Goals

The 2030 Agenda for Sustainable Development, sanctioned by 193 Member States during the UN General Assembly Summit in September 2015 and implemented on January 1, 2016, encompasses a total of 17 Sustainable Development Goals (SDGs) and 169 corresponding objectives. According to the United Nations (2015), the key principle behind the global agenda for 2030 is universality, which is referred to as "Leave No One Behind." The government of India has undertaken the integration of efforts towards meeting the Millennium Development Goals (MDGs) with the Sustainable Development Goals (SDGs). The 17 SDGs are as follows:

- Goal 1: No Poverty
- Goal 2: Zero Hunger
- Goal 3: Good Health and Well Being
- Goal 4: Quality Education
- Goal 5: Gender Equality
- Goal 6: Clean Water and Sanitation
- Goal 7: Affordable and Clean Energy
- Goal 8: Decent Work and Economic Growth
- Goal 9: Industries, Innovation and Infrastructure
- Goal 10: Reduced Inequalities
- Goal 11: Sustainable Cities and Communities
- Goal 12: Responsible Consumption and Production
- Goal 13: Climate Action
- Goal 14: Life Below Water
- Goal 15: Life on Land
- Goal 16: Peace, Justice, and Strong Institutions
- Goal 17: Partnerships for the Goals

Source: https://www.un.org/sustainabledevelopment/sustainable-development-goals/

V Understanding of Environmental Sustainability and SDGs Promoting Environmental Sustainability

The environment serves as the fundamental framework for sustaining life on our planet, exerting influence over the survival, growth, and development of individuals and their endeavours. Environmental sustainability refers to the ability to preserve the beneficial qualities of the physical environment (Sutton, 2004). It's also the primary factor influencing the realisation of sustainable development. Environmental sustainability is the process of making choices and acting in ways that advance the preservation of the natural world, with a focus on maintaining the environment's capacity to support human life and ensuring that human activity does not negatively impact the environment (Bilsborrow 1992). It ensures the health and preservation of ecosystems, including forests, oceans, wetlands, and biodiversity. Natural ecosystem capacity, or ecological integrity, refers to the comprehension of landscape and watershed natural system processes that inform the creation of sensible economic development plans that protect these systems (Flint 2004). The SDGs encompass a wide range of subjects, including the management of natural resources, climate change, water-related issues, marine issues, biodiversity and ecosystems, circular economy, environmentally sound waste, and chemical management. Environmental sustainability is no longer a commercial luxury, it is now a civic obligation (Ogori, *et. al.* 2022). It is a prominent aspect for the health of present and future generations. The SDG framework, which supports environmental sustainability by protecting and optimising the resources for future generations. The key SDGs promoting the environmental sustainability are Clean Water and Sanitation (Goal 6) which ensures that everyone has access to clean water and sanitary facilities is emphasized in Goal, Affordable and Clean Energy (Goal 7) mainly focuses on ensuring access to affordable, reliable, sustainable, and modern energy for all, Sustainable Cities and Communities (Goal 11) which promotes waste management, air pollution, urbanization, and access to green places, etc., Responsible Consumption and Production (Goal 12) promotes the use of environmentally friendly techniques, waste minimization, sustainable chemical and waste management, and resource efficiency, Climate Action (Goal 13) focuses on urgent action to combat climate change and its impacts, Life Below Water (Goal 14) and Life on Land (Goal 15) ensures utilization of land and marine ecosystems, respectively, is the focus of both SDGs and Partnerships for the Goals (Goal 17) recognizes the importance of global partnerships in achieving all the SDGs, including environmental sustainability.

VI Results and Discussion

According to the SDG India Index (2020–2021) published by NITI Aayog, India experienced a 6-point increase in its total SDG score, rising from 60 in 2019 to 66 in 2020–2021. The SDG India Index assigns individual scores to each State and

Union Territory Based on the 16 Sustainable Development Goals (SDGs). The scores range from 0 to 100, with a score of 100 indicating that a State/Union Territory has successfully attained the targets set for 2030 (NITI Aayog, 2020). The classification of States and Union Territories is as follows: Aspirant (with an SDG score ranging from 0 to 49), Performer (with an SDG score ranging from 50 to 64), Front-Runner (with an SDG score ranging from 65 to 99), and Achiever (with an SDG score of 100). Performance of India and its North-Eastern States (NE) in respect of SDG-6, 7, 11, 12, 13 and 15 (NITI Aayog 2020).

Table 1: SDG Score of NER and India

AREA	Goal 6	Goal 7	Goal 11	Goal 12	Goal 13	Goal 15
India	83	92	79	74	54	66
Sikkim	89	100	85	76	65	73
Mizoram	85	100	61	87	66	48
Tripura	82	83	67	99	41	69
Manipur	87	96	65	89	57	60
Nagaland	87	69	48	91	69	63
Arunachal Pradesh	67	85	39	77	58	93
Meghalaya	75	50	51	73	62	64
Assam	64	98	55	66	53	78

Source: https://sdgindiaindex.niti.gov.in/#/ranking

Table 1 shows the SDG score of India's average and the north-eastern states of India with respect to SDG-6, 7, 11, 13, 15. According to the comprehensive SDG report of NITI Aayog for 2020-2021, no states are classified as aspirant or achiever. However, it has been observed that states have performed in both categories for the specified SDGs. Further, from the table, there is a state-level variation of NE states with national performance in attaining the SDG.

Table 2: Weighted Average SDG Score of NER

AREA	Goal 6	Goal 7	Goal 11	Goal 12	Goal 13	Goal 15
Arunachal Pradesh	67	85	39	77	58	93
Assam	64	98	55	66	53	78
Manipur	87	96	65	89	57	60
Meghalaya	75	50	51	73	62	64
Mizoram	85	100	61	87	66	48
Nagaland	87	69	48	91	69	63
Sikkim	89	100	85	76	65	73
Tripura	82	83	67	99	41	69
Weighted Average Score of NER	80.53	88.39	61.80	83.53	60.06	70.79

Source: https://sdgindiaindex.niti.gov.in/#/ranking

Figure 1: Performance of NER in respect of SDG-6, 7, 11, 12, 13 & 15

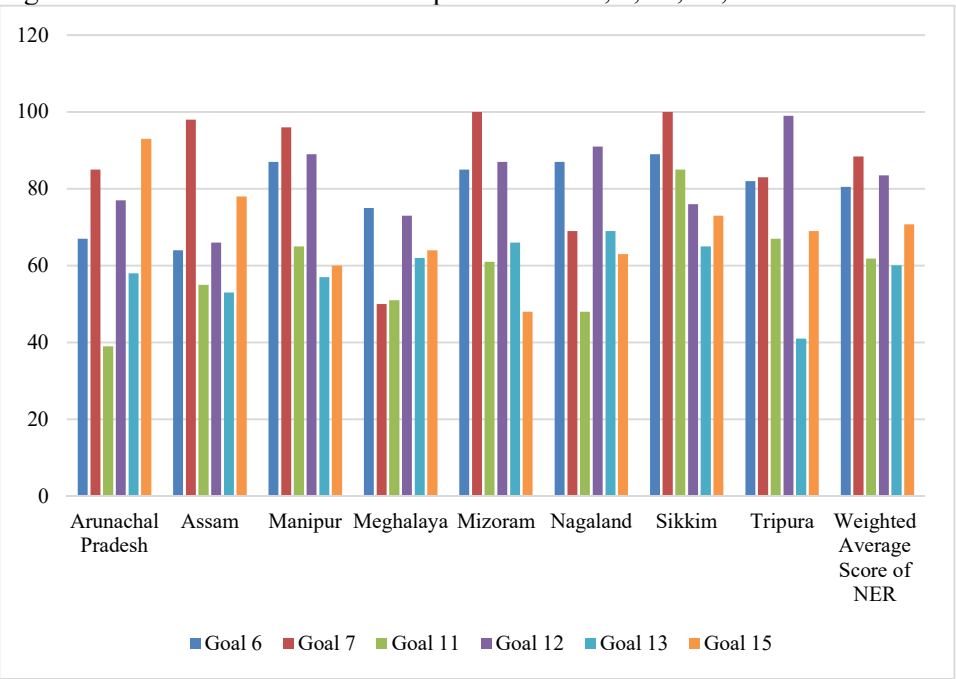

Table 2 and Figure 1 presents the SDG scores for six distinct SDGs in eight states located in India's NER. There is notable variation in the scores seen throughout the region, indicating diverse levels of progress towards achieving the respective goals. Goal 7, which focuses on affordable and clean energy, demonstrates strong progress, with a weighted average score of 88.39. In contrast, Goal-13 (climate action) and Goal 11 (sustainable cities and communities) fall behind with a weighted average score of 60.06 and 61.80, respectively. Sikkim and Manipur demonstrate exceptional performance in multiple objectives, but Arunachal Pradesh and Meghalaya exhibit relatively lower results in specific domains.

Table 3: Average SDG Score of NER and India

AREA	India	Weighted Average Score of NER
Goal 6	83	80.53
Goal 7	92	88.39
Goal 11	79	61.80
Goal 12	74	83.53
Goal 13	54	60.06
Goal 15	66	70.79

Source: https://sdgindiaindex.niti.gov.in/#/ranking and Authors own calculations.

Figure 2: Progress of SDGs in India and NER

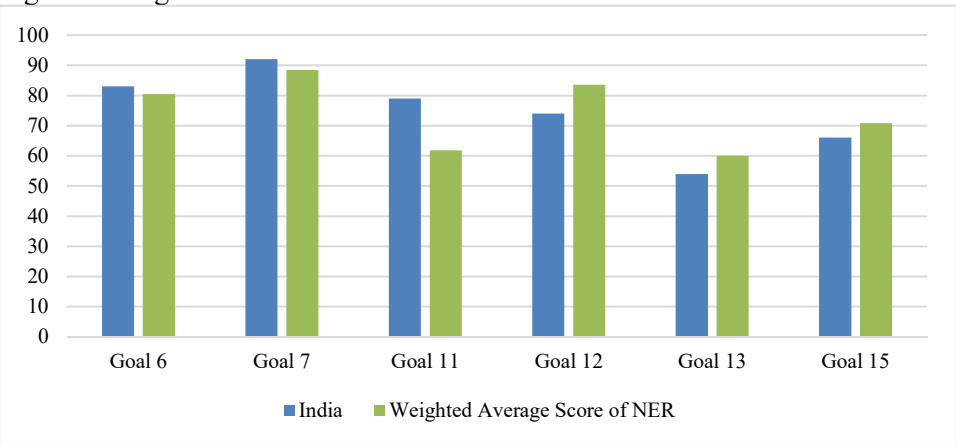

Table 3 and Figure 2 displays the SDG score of India and weighted average SDG score of NER. The comparison reveals that India exhibits superior performance in respect of Goals 6, 7, and 11, with the exception of Goals 12, 13 and 15, wherein the NER scores are much lower than the national performance. Goal 7 (Affordable and Clean Energy) is particularly notable for its significantly higher score in both India and the NER, indicating major advancements in this domain at both levels. However, there is a considerable disparity in performance for Goal 11, where India has achieved significantly greater scores compared to the NER. On the other hand, the performance of the NER is relatively closer to the national progress in Goals 6, 12, and 15.

Table 4: Variation in SDGs Performance in NER

SDG Goals	NER Weighted Average Score	Weighted Standard Deviation	Coefficient of Variation
Goal 6	80.53	9.25	11.49
Goal 7	88.39	15.58	17.63
Goal 11	61.80	14.46	23.40
Goal 12	83.53	10.90	13.05
Goal 13	60.06	8.24	13.72
Goal 15	70.79	13.64	19.27

Source: Authors own calculations.

The Goal-13, 6, and 12 indicate moderate variability from the mean value in the average score of NER. Whereas, in terms of Goal-7, which exhibits a high level of standard deviation, followed by 11 and 15. There is potential and wider variability among the NER, which indicates inconsistent performance among the states for these goals.

Coefficient of Variation (CV) which is used to measure the relative variability in the NER Average Scores for the mentioned SDGs. Goals 11, 15 and 7 exhibit

relatively high coefficients of variation, suggesting significant disparities in progress among NER states in these areas. Conversely, Goals 6, 12 and 13 show lower coefficients of variation, indicating more consistent performance across the region. The CV for the respective goal is used to calculated by using the following formula:

$$CV = \frac{\sigma}{\mu} \times 100$$

CV= Coefficient of Variation
σ= Standard Deviation for the respective goal
μ= Mean value for the respective goal

Findings of the Study

1. Mizoram and Sikkim has achieved a full score of 100 in promoting the SDG-7. Assam and Manipur have also shown progress than the national average.
2. In promoting the SDG-6, Manipur, Mizoram, Nagaland, and Sikkim have shown significant improvement as their score is higher than the All-India Score.
3. Arunachal Pradesh is least performing among NER in promoting SDG-11 followed by Nagaland.
4. There is significant gap of performance in SDG-12 score between the national average and Manipur, Mizoram, Nagaland, and Tripura.
5. Almost all the NER state has great performance in achieving the SDG-13 except Assam and Tripura where there SDG score is less than India average.
6. Arunachal Pradesh has demonstrated significant advancements in SDG-15, not only within the NER but also across other states in India.
7. The NER has performed better than all India as the average SDG score is greater in promoting sustainable consumption and production patterns (SDG-12), climate action (SDG-13) and life on land (SDG-15).
8. Goals 6, 7 and 12 show strong performances of NER and may serve as positive examples for improvement in NER related to other goals.

Challenges Faced by NER and Way Forward

While there have been achievements, the NE states face significant challenges in their efforts to achieve SDG-11 as the performance is below the Indian average. From the studies and relevant literature as well as vision reports of NER states it can be inferred that issues are multifaceted and impede the region's progress toward sustainable development. Deficits in infrastructure are evident, especially when it comes to SDG 11 with sustainable cities and communities. In the quest for sustainable cities and communities, waste management emerges as a significant obstacle. Adopting sustainable consumption habits is hampered by cultural and

customary practices. The NE states are more vulnerable to landslides, floods, and unpredictable weather due to climate change. Further, the current waste management systems are strained by the quick urbanization, which adds to pollution. This vulnerability makes it more difficult to manage agriculture and water resources, as well as efforts towards overall sustainability. The SDGs' effective implementation is hampered by a lack of knowledge and instruction about them.

To overcome the obstacles and continue progress toward the SDGs in the North-Eastern states, several steps can be taken:

1. Utilising the region's natural beauty and cultural diversity to boost sustainable tourism, at the same time, efforts should be made to enhance forest plantation and conservation, promote sustainable management practices, and optimise the utilisation of natural resources.
2. Promoting the use of renewable energy sources, such as solar and wind power, to reduce dependence on fossil fuels. In addition, reducing plastic waste, protecting water supplies, implementing efficient carbon trading in many contexts, and other measures should be prioritised in the battle against climate change.
3. Efforts should be aimed towards ensuring the proper execution of the National Mission for a Green India, Integrated Development of Wildlife Habitats, State Action Plan for Climate Change, and other relevant initiatives in order to safeguard, restore, and advance the sustainable utilization of terrestrial ecosystems, effectively manage forests in a sustainable manner, combat desertification, halt and reverse land degradation, and mitigate biodiversity loss.
4. Promote vocational training and skill development to entrepreneurship in the areas of eco-friendly traditional industries.
5. Focus on promoting sustainable agriculture and rural development. This can be achieved through initiatives that provide farmers with access to resources, such as improved seeds, tools and equipment, and training on sustainable farming practices.
6. Ensuring universal access to pure drinking water and sanitation facilities for all through the national schemes such as Jal Jeevan Mission, Swachh Bharat Mission, PMAY(R&U), and others state initiative programs should be tackled.
7. The schemes such as Deen Dayal Upadhyaya Gram Jyoti Yojana, National Solar Mission, Green Energy Corridor, Green Mission Project, etc., must be strengthened and properly implemented to ensure affordable, reliable, sustainable, and modern energy for households and business enterprises.
8. Efforts should be made to provide housing for all, waste collection at the doorsteps of households in Towns and Cities, solid waste treatment and management at the municipality, to improve urban mobility to promote cities and human inhabitants inclusive, safe, resilient and sustainable.

In the context of achieving the SDGs especially in the NE states the NITI Aayog has made efforts to measure and strengthen the performance at districts level of NE states under the initiatives of North-Eastern Region SDG Index Dashboard, Baseline Report 2021-2022 in alignment with the SDG localization in NER. This Index covers 15 SDGs and rank 120 districts of the region. Further, for identifying the constraints in improving SDGs, NITI Forum for North-East in 2018. SDG scores attained by the states mainly depends on the indicators assigned for the SDGs, the developed indicators should be in accordance with National Indicator Framework, SDG India Index, as well as the State Indicator Framework taking into consideration of availability of data and implementation of the schemes, national level surveys, etc., other benefits extended by the govt. and various institute in relation to SDGs. Overall, solutions that can be proposed to overcome the obstacles to sustainable development in the North-Eastern state is by focusing on sustainable agriculture, investing in modern infrastructure development, and promoting renewable energy, increasing forest coverage, etc., progress can be made towards achieving the SDGs.

Conclusion

The study presents the connection between the environmental sustainability and sustainable development of Northeastern (NE) states. NE states encompass a group of states in various stages of industrialization and economic growth, facing challenges such as income inequality, political instability, and limited access to resources. This study presents a detailed assessment of the SDG Index Score of the 8 NE states, shedding light on the intricate interplay between progress in SDGs and sustainable development. Overall, this analysis underscores the complex and multifaceted relationship between environmental sustainability and sustainable Development of NE states. The progress of the relationship in terms of achieving the SDGs varies from state to state. In certain goals such as SDG-6, 7 and 11 the gap between NER and India is vast which is alarming. Further, from the result, it has been observed that there is an inconsistency among the NER in terms of the progress of the specified areas. This highlights the need for targeted interventions to address disparities and promote more balanced progress towards achieving the SDGs across the NER. Education, together with science and technology, has the potential to serve as the fundamental basis for human development. The teaching of environmentalism has the potential to enhance people's awareness and engagement in safeguarding the environment, disseminate information and expertise in environmental protection, and ultimately attain sustainable development. Integrating the traditional indigenous knowledge with improved science and technology will significantly improve local livelihoods while keeping them balance with the local environment. Efforts should be made by the people as well as the Government of India, Non-Government Organisations working towards environmental sustainability to bring about an improvement in the SDGs of NER as well as India.

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Exploring the Nutritional Status and Nutritional Inequality among Under-Five Tribal Children in Attappady, Kerala

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This study investigates the nutritional status and nutritional inequality among under five tribal children at Attappady, Kerala and identifies factors contributing to malnutrition. Despite governmental efforts, undernutrition, anaemia, and high infant mortality rates remain precariously prevalent in Attappady. The study uses mixed-methods, surveying and measuring children and conducting interviews and focus group discussions. Results highlight the interplay of socio-economic, environmental, cultural, and institutional factors contributing to malnutrition, and suggest targeted interventions and policies. This study contributes to the existing literature on tribal health and informs policy decisions aimed at improving the health and well-being of tribal communities in Kerala.

Keywords: Nutritional status, Nutritional inequality, Tribal children, Attapady, Kerala, Policy implications

I Introduction

One of the key objectives of the Millennium Development Goal-1 (MDG-1) was to reduce the proportion of malnourished children and to eradicate hunger and poverty by halving the prevalence of underweight children by the year 2015. Similarly, Goal 2 of the Sustainable Development Goals (SDGs) aims to end hunger and all forms of malnutrition by the year 2030. However, despite these global efforts, undernutrition continues to be a major contributor to child mortality, causing the loss of approximately three million children every year worldwide. The prevalence of malnutrition is particularly alarming in India, which ranks at the bottom of the Global Hunger Index, 2022, due to factors such as child stunting, wasting, and death, placing India in 107th place out of 121 countries. Within India, the state of Kerala beckons special concern. Despite its impressive human

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development record in non-commodity sectors, known as the 'Kerala Model,' malnutrition and nutritional inequality continue to impact the socio-economic lives of Particularly Vulnerable Sections of society, especially tribal populations. In Kerala, the Attappady region in Palakkad district is the only tribal block, where the most disadvantaged and marginalized tribes reside.

Child malnutrition is a complex issue that can be influenced by a variety of factors, including access to food, consumption patterns, affordability, distribution, nutritional awareness, education, and government policies. According to S.K. Singh, *et. al.* (2020), children from impoverished socio-economic backgrounds are more likely to suffer from undernutrition, and maternal education and other environmental factors play a critical role in determining the prevalence of underweight, wasting, and stunting. Furthermore, practices related to personal hygiene and sanitation are essential to prevent stunting and promote the growth and development of children (Rah, *et. al.* 2015). Ruel and Ndiaye (2005) emphasized that decision-making power and maternal education, as well as the availability and use of toilets inside the house, significantly impact the nutritional status of children. Moreover, Venkata Naidu (2015) confirmed that various diseases, including malaria, jaundice, viral diseases, fungal infections, leprosy, cough and cold, diarrhea, and HIV, are prevalent among tribes in India. Thus, personal hygiene and sanitation practices are crucial to prevent stunting and promote the growth and development of children (Rah, *et. al.* 2015). In short, addressing child malnutrition requires a multipronged approach that considers various factors, including socio-economic status, maternal education, personal hygiene, sanitation practices, and the prevalence of diseases in the community. It is crucial to develop policies and programs that focus on improving the nutritional status of children and providing them with the necessary support and resources to lead healthy and productive lives.

According to 2011 census, the ST population of Kerala was 4,84,839, with 2,46,636 females and 2,38,203 males. The Scheduled Tribes in Kerala are commonly referred to as 'Adivasis', meaning 'original inhabitants' or 'indigenous people'. The majority of the tribal population in Kerala reside in the remote forest areas of the Western Ghats, bordering Tamil Nadu and Karnataka. Kerala has 36 Scheduled Tribe communities, out of which Attappady is the only tribal block with the highest concentration of tribal population, comprising three tribal categories: Irular, Mudugar, and Kurumbar communities. However, compared to the state level, the health, educational, and employment status of Scheduled Tribe communities in Kerala is generally backward. Although Wayanad District records the highest percentage of Scheduled Tribes in Kerala, Attappady is the only tribal block with the highest concentration of tribal population.

The report from the National Rural Health Mission (NRHM) reveals that out of 572 children in Attappady, 127 tribal children are in a doubly critical condition. This is despite the government's efforts, which involved spending more than ₹500 Crore to improve the lives of tribes. The survey also found that 572 children under the age of five in Attappady are still malnourished. The problem of anaemia among

pregnant and lactating mothers in Attappady remains severe, and a study conducted by the National Institute of Nutrition in 2013 found that the infant mortality rate in Attappady was 66, compared to 15 in other states. The 'mother-child tracking system' introduced by the state government in 2013 was ineffective. A UNICEF study reported that the alienation of land among tribes, abject poverty, lack of access to supplementary diets and other health care among pregnant women, malfunctioning of Anganwadis, and uniform distribution of food regardless of local preferences of tribes were the main causes of the poor state of affairs among tribes in Attappady. The community kitchen initiative and the Janani Janmaraksha scheme for pregnant women were also unsuccessful. The Tribal Sub Plan (TSP) implemented for tribes transformed them from being self-independent to supplicants on settlers. Additionally, the misperformance of Attappady Hills Area Development Society (AHADS), weakening of tribal communities, apathy of bureaucracy, and intricacies in executing laws and programmes for disadvantaged tribal groups in Attappady also accentuated the problem.

Malnutrition is caused not only by a lack of access to nutritious food but also by other factors, such as persistent illness, inadequate care practices, and an inability to access health and other social services. The stunting and malnourishment seen among children have roots in their mothers as well. This is particularly evident among tribal communities worldwide and in Attappady. The most devastating issue among tribes is undernutrition. The UNICEF Report (2013) stated that 39 deaths occurred in Attappady tribal block. Although pregnant women and children below the age of six have access to a nutritious meal a day under the community kitchen programme, there was no effective mechanism to address the issue of anaemia among school-going tribal children. The Ekbal Committee Report (2013) expressed concern that in 2013, nearly 30 children lost their lives either within a few hours or after a few days of their birth. Compared to the national average, Scheduled Tribes had high mortality rates. There are studies on the general health issues among tribes such as high anaemia, poor hygiene, and little access to health care utilization, and these same health issues are also compounded among tribes in Attappady. This is accentuated by the high prevalence of malnutrition among tribal children. Like the prevalence of a yawning gap between tribes and non-tribes on their health status, there are severe child health and nutritional gaps within tribal groups, namely Irular, Mudugar, and Kurumbar, across age and gender. Most of the tribal mothers, even during the advanced stage of pregnancy, were forced to immerse themselves in collecting firewood, feeding domesticated animals, feeding the children and elderly, inhibiting the health of newborn babies, according to Basu (1993). Mohanti's (2003) study supports this notion, stating that the exclusion of tribes from socio-economic opportunities spawned serious health divides among tribal groups. Additionally, Mohindra, *et. al.* (2012) reported that existing studies on tribal health are at a macro level or focused on the health issues of a tribal category per se rather than on disaggregating the tribal categories in a region.

Hence a crucial issue that needs urgent attention and intervention is the poor nutritional status of tribal children in Attappady, Kerala. It is, therefore, essential to understand the current situation of child health and nutrition and the socio-economic and institutional factors that contribute to this problem, which will handhold policy makers and other stakeholders in formulating appropriate measures to tackle the issue of malnutrition among tribal children. Therefore, it is imperative to focus on improving the nutritional status of these children to ensure their overall health and well-being.

II Review of Literature

The literature on health inequality applies various theories to address the issue. Woodward and Kawachi (2000) present four arguments regarding child health inequalities that public policy should minimize. Firstly, nutritional and health inequalities are unfair due to the inequitable distribution of social determinants of health. Secondly, health and nutritional inequalities affect everyone because some forms of health inequalities cause externalities on the rest of society. Thirdly, public authorities have various policy options to address health inequalities, and therefore, all types of health and nutritional inequalities should be minimized as part of the public policy agenda. Finally, public health policies aimed at reducing health inequalities must be cost-effective to minimize adverse spill-over effects on people's health.

Child malnutrition is an area that has received significant attention from researchers. UNICEF (1998) introduced a comprehensive conceptual framework to explain child malnutrition and its determinants. This conceptual framework divides the reasons for child malnutrition into three broad categories: basic, underlying, and immediate. The fundamental reasons are specific to socio-religious, cultural, political, and economic processes at a societal level, which limit the utilization of technological, human, and environmental resources. Lack of knowledge and the presence of discriminatory attitudes at the household level limit access to food, water/sanitation, childcare practices, and health services, which contribute to inadequate dietary intake and diseases, ultimately resulting in child malnutrition.

Some studies suggest that health inequalities stem from privatisation, social inequality, job insecurity, unemployment and poverty (Laparra, *et. al.* 2012, Bacigalupe and Pujolar 2014). Despite the establishment of a system for allocating resources and institutional mechanisms for transforming social and individual resources into health in almost all societies, health inequalities persist. The fundamental cause theory proposed by Link and Phelan (1995) identifies poor socio-economic status as the fundamental cause of health diseases. This is because socio-economic factors provide a gateway to measuring the extent to which diseases and their impacts prevail, as well as how far risk factors and their outcomes remain vulnerable in societies and households.

Traditionally, Western models of health have construed sickness and disease as an inevitable outcome of individual factors, such as genetic predisposition and personal behaviour, leading healthcare interventions to focus predominantly on fixing the individual rather than addressing external factors. The World Health Organization's (WHO) Social Determinants of Health (SDH) framework provides a more holistic perspective to ensure and implement interventions at multiple levels to achieve health objectives on an equal basis. According to the WHO, wellbeing and health disparities result from various circumstances in which "people are born, grow, live, work, and age" (Marmot 2011). The WHO framework includes living conditions, arrangements, policies, and, more importantly, education (Reap 2020). In each society, those who are powerful own resources that determine which social conditions and systems should prevail. Typically, such decisions fulfill the vested interests of the power wielders, leaving the dispossessed and marginalized to suffer indiscriminately. The consequences of such injustice ultimately impact their health. It is therefore essential to note that individual health is primarily influenced by systemic social inequities apart from genetics and lifestyle (WHO 2010).

In short, the literature on health inequality presents various theories to explain the underlying causes of health disparities, including socio-economic factors, cultural and political processes, and individual behaviour. To address this issue, public policies must prioritize minimizing health and nutritional inequalities through cost-effective interventions that target the social determinants of health. The WHO's SDH framework provides a more holistic approach that recognizes the role of systemic social inequities in shaping individual health outcomes. Ultimately, reducing health inequality requires addressing fundamental societal issues such as poverty, discrimination, and unequal access to resources, and promoting equal access to education, health care, and social services.

III Objectives of the Study

The research aims to conduct a comprehensive investigation of the nutritional status and nutritional inequality among under five tribal children in Attappady, Kerala. The study also focuses on identifying the various socio-economic, environmental, cultural, and institutional factors that contribute to malnutrition. There is a pressing need for a more nuanced understanding of these factors, as existing studies have reported high rates of undernutrition and anaemia among pregnant women and children, as well as a high infant mortality rate. The study also explores the impact of government interventions and policies aimed at improving the nutritional status of tribal population in Kerala. The findings of the study are expected to contribute to the existing literature on nutrition and tribal health and enable the government to have informed policy decisions to stem the tide of the malnutrition crisis among Attappady tribal communities. To achieve the objectives of the study, a mixed-method approach is used, combining quantitative data collection through surveys and anthropometric measurements

with qualitative data collection through in-depth interviews and focus group discussions. The study includes a sample of under-five tribal children and their caregivers in Attappady, whose responses provide insights into the socio-economic, environmental, cultural, and institutional factors contributing to malnutrition among under five tribal children in Attappady. The study also proposes policies that can help overcome the malnutrition crisis in Attappady's tribal communities.

IV Research Method

Data

The study is conducted in the Attappady Block of Mannarkkad Taluk, Palakkad district, Kerala, where a large number of tribes face various socio-economic issues, particularly undernutrition. Over the past five years, more than 114 infants have reportedly died due to malnutrition in Attappady. The study collected primary data from 800 cross-sectional units using a multi-stage stratified random sampling method from the Attappady block. The UNICEF Report (2013a) held that 39 deaths happened in Attappady tribal block. The Times of India (2013) reported that malnutrition took a heavy toll of 58 deaths at Attappady. This underscores the urgent need for a comprehensive study to address the malnutrition issues among Attappady's tribal children. The study collected a sample of 800 cross-sectional units using the Maccor sample size formula. The sample was selected using a multi-stage stratified random sampling method from the Attappady block in the first stage, Palakkad district was selected because it has the third highest concentration of tribal population (10.10 per cent) according to Census 2011. The second stage involved selecting the Attappady block, which is the only tribal block area in Kerala state. In the third stage, households were identified based on information collected from Anganwadis in three Panchayaths: Agali, Puthur, and Sholayur. To ensure that the sample represented the population, 50 per cent (i.e., 400) of the sample was taken from the more populated Agali Panchayath, while 25 per cent (i.e., 200) was taken from each of the other two Panchayaths. This resulted in a total sample size of 800 cross-sectional units.

Measuring Malnutrition

The study used the WHO classification of child nutritional status, which includes four indices: Stunting, Wasting, Overweight, and Underweight. However, as the tribal children at Attappady did not suffer from overweight, the study only focused on Stunting, Wasting, and Underweight as indicators of malnutrition. These three indicators are included in the WHO's Global reference list of 100 significant health indicators. The definitions of these indicators are as follows:

Stunting: This refers to a height-for-age Z score (HAZ) that is below -2 SD of the WHO Child growth standards median.

Wasting: This refers to a weight-for-height Z score (WHZ) that is below -2 SD of the WHO Child growth standards median.

Underweight: This refers to a weight-for-age Z score (WAZ) that is below-2 standard deviations (SD) of the WHO Child growth standards median.

Using the formulas provided, the nutritional status of tribal children can be classified into five categories: Very Low, Low, Medium, High, and Very High, according to the WHO's classifications. The cut-off ranges for each category are shown in Table 1.

Table 1: WHO Classification of Malnutrition

Classification	Very Low	Low	Medium	High	Very High
Stunting	< 2.5 %	2.5 to <10	10 to <20	20 to <30	≥ 30 %
Wasting	< 2.5 %	2.5 to <5	5 to <10	10 to<15	≥ 15 %
Underweight	< 2.5 %	2.5 to <10	10 to <19	20 to <29	≥ 30 %

Source: UNICEF, WHO, World Bank 2018.

Empirical Strategy

This study aims to estimate the Recentered Influence Function (RIF) regression model proposed by Firpo, *et. al.* (2009) to identify the determinants of nutritional status among children under five years old. The dependent variable is composite index of malnutrition. The extant study combined three anthropomorphic indicators (Stunting, Wasting, and Underweight) using the Simple Average Formula to estimate an aggregate index of malnutrition status among tribal children in Attappady. This approach enabled the researchers to evaluate the overall nutritional status of children and identify potential areas for intervention and improvement.

The independent variables considered in the model include socio economic, environmental, cultural, and institutional factors.

The RIF regression model is a method that substitutes the level of nutritional status with the Recentered Influence Function, RIF(N;v), of the distributional parameter such as Gini and Variance coefficients. The sum of the distributional statistic v and the influence function IF(N;v) delivers RIF: RIF(N;v) = v + IF(N;v).

The conditional expectation of RIF(N;v) can be expressed as a linear function of the covariates, obtaining the RIF regression:

$$[(N;v)|X] = X\gamma v$$

where γ is the coefficient of the marginal effect of the covariates X on the distributional statistic v. The coefficient can be estimated using Ordinary Least Squares (OLS).

V Results

Socio-demographic Characteristics and Living Conditions of Tribes in Attappady

This study examined the socio-demographic characteristics of the sample tribes in Attappady. The data revealed that the majority of families are joint families (57 per cent), with a smaller proportion of nuclear families (41 per cent). The use of firewood was prevalent among the tribes (58 per cent), along with kerosene (27 per cent), while access to electricity and gas was limited (15 per cent). This suggests that LPG/biogas may not be affordable for many tribal families. Approximately 75 per cent of tribal families have access to electricity, while more than 50 per cent of tribes have to walk more than 15 kilometres to obtain drinking water, indicating the severity of the problem. Only 37 per cent of tribes have access to water in their homes, and 87 per cent of tribes do not have access to purified water, which is indicative of chronic health issues. As a result, 75 per cent of tribes are forced to defecate openly without their own toilet facilities, triggering off the spread of contagious diseases. The possession of cultivable land is also a significant issue, with only 38 per cent of tribes owning such land, while the remainder either leases land (20 per cent) or are completely landless (42 per cent). The traditional occupation of tribes has been farming, with 72 per cent of them engaged in it. However, 28 per cent do not farm at all. In terms of household waste management, it was found that 69 per cent of tribes dump waste in open spaces, while only nine per cent dispose of it scientifically. Additionally, 23 per cent of tribes were found to be disposing of their waste in their neighbours' areas. The practice of dumping debris in open spaces is common among 69 per cent of households.

Nutritional Status of Attappady Tribal Children

Table 2 provides a detailed analysis of the nutritional status of tribal children under the age of five in Attappady. The table presents the percentage of children in each scale of stunting, underweight, and wasting.

Stunting refers to a child's height being significantly lower than the expected height for their age. Underweight refers to a child's weight being significantly lower than the expected weight for their age. Wasting refers to a child's weight being significantly lower than the expected weight for their height.

As regards Table 2, the majority of children fall into the middle scale, with 28 per cent being stunted, 19.38 per cent being underweight, and 18.75 per cent

being wasted. This indicates that a significant proportion of children in Attappady are malnourished. In contrast, only 9.75 per cent of children fall into the low scale, and even fewer, 2.63 per cent, fall into the very low scale. These children have a relatively better nutritional status than those in the middle and higher scales. The table also shows that a significant percentage of children, up to 40.75 per cent, are wasted in the very high scale. This indicates that these children are severely malnourished and require immediate attention and intervention. The data in Table 2 highlight the critical need to address the issue of malnutrition among tribal children in Attappady.

Table 2: Child Nutritional Status of Attappady

Scale	Indicators	Stunting	Underweight	Wasting
1	Very High	241 (30.12)	320 (40)	326 (40.75)
2	High	236 (29.5)	282 (35.25)	276 (34.5)
3	Middle	224 (28)	155 (19.38)	150 (18.75)
4	Low	78 (9.75)	35 (4.38)	30 (3.75)
5	Very Low	21 (2.63)	8 (1)	18 (2.25)
	N =800			

Source: primary data.

Table 2 provides information on the gender-wise difference in the nutritional status of children under the age of five in Attappady. The table is divided into five scales, ranging from very high to very low, based on the percentage of children in each category of stunting, underweight, and wasting. The table also shows the percentage of male and female children in each category.

The table 3 reveals that there is a gender disparity in the nutritional status of children in Attappady. Overall, female children are more likely to experience ‘very high’ and ‘high’ stunting and underweight, while male children are more likely to experience ‘very high’ wasting. For example, in the very high scale, 32 per cent of female children are stunted compared to 28 per cent of male children. In contrast, 49 per cent of male children are wasted, compared to only 34 per cent of female children. Similarly, in the high scale, 30 per cent of female children are stunted, while only 29 per cent of male children are stunted. Additionally, 35 per cent of female children are wasted compared to only 34 per cent of male children. In the middle scale, 29 per cent of female children are stunted, while 26.48 per cent of male children are stunted. Moreover, 14.38 per cent of female children are wasted, while 24 per cent of male children are wasted. In the low and very low scales, the gender disparity is more pronounced. For instance, only seven per cent of female children are stunted in the low scale, compared to 13 per cent of male children. Similarly, only two per cent of female children are wasted in the very low scale, compared to four per cent of male children.

In short, Table 3 highlights the differences in the nutritional status of male and female children in Attappady, indicating the need for targeted interventions to address the gender disparities and improve the overall nutritional status of children in the region.

Table 3: Gender-Wise Difference in Child Nutritional Status

Scale	Indicators	Stunting		Underweight		Wasting	
		Male	Female	Male	Female	Male	Female
1	Very high	100 (28.16)	141 (31.68)	98 (27.60)	140 (31.46)	175 (49.30)	151 (33.94)
2	High	103 (29.01)	133 (29.88)	108 (30.42)	134 (30.11)	120 (33.80)	156 (35.05)
3	Middle	94 (26.48)	130 (29.22)	90 (25.35)	128 (28.77)	86 (24.22)	64 (14.38)
4	Low	45 (12.68)	33 (7.42)	49 (13.80)	35 (7.86)	17 (4.78)	13 (2.92)
5	Very Low	13 (3.66)	8 (1.77)	10 (2.8)	8 (1.79)	10 (2.82)	8 (1.78)
	No =800	355	445	355	445	355	445

Source: Primary data.

Inequality in Nutritional Status

The study used RIF regression of Firpo, *et. al.* (2009) to analyse the inequality in nutritional status among children below the age of five in Attappady, Kerala. The dependent variable in this regression was the child nutrition index, while the independent variables included tribal groups, household income, family size, parents' education, age at marriage, habit of narcotic drinks, water quality, birth order, recurring illness, birth interval, breast feeding, food taken, fruits during pregnancy, distance to health centre, and access to government schemes.

The study employed two RIF distributional statistics, namely variance and the Gini index, to measure the level of inequality for both male and female children. The RIF regression estimates the partial effect of the distribution of independent variables on the distributional statistics (variance, Gini and quantile) of the dependent variable. Table 4 presents the results of the RIF regression analysis on the nutritional inequality between male and female children, focusing on various independent variables.

First, regarding the tribal group, the results show that for children under the age of five, belonging to the Irular and Mudugar communities leads to higher levels of nutritional inequality compared to the reference category, Kurumbar. Specifically, both male and female children from Irular and Mudugar communities have higher variance and Gini nutritional inequality than Kurumbar children. This suggests that the nutritional status of children in these communities needs special attention.

Second, household income has a significant impact on the nutritional inequality of both male and female children. An increase in household income reduces the level of nutritional inequality, as higher income leads to increased

spending on nutritional items. Moreover, the income effect is greater for male children than for female children, suggesting that improving household income can be particularly beneficial for the nutrition of male children. Third, family size is positively associated with nutritional inequality, with larger families having higher levels of nutritional inequality. This effect is greater for female children than for male children, suggesting the presence of gender discrimination in tribal communities. Fourth, the education of parents plays a crucial role in determining the nutritional status of children. Children whose parents have less than an eighth-grade education have higher levels of nutritional inequality, as measured by variance and the Gini index, highlighting the importance of parental education in improving child nutrition. Fifth, a higher age at marriage of parents is associated with higher levels of nutritional inequality among their children, possibly due to a decline in reproductive capability and the associated impact on child health. Sixth, parental habits such as drinking alcohol have adverse effects on the nutritional inequality of their children. Similarly, the intake of contaminated water has a greater adverse effect on female children's nutritional inequality than on male children's. Seventh, birth order and birth interval are positively associated with nutritional inequality, with higher birth order and shorter birth intervals leading to higher levels of nutritional inequality. This suggests that spacing between births is an essential factor to consider for improving child nutrition. Eighth, both recurring illness and irregular breastfeeding lead to higher levels of nutritional inequality, especially among male children. Ninth, irregular food and fruit intake during pregnancy is associated with higher levels of nutritional inequality for both male and female children, with a greater impact on male children's nutritional inequality. Finally, distance to health centres is positively associated with nutritional inequality, with children who live farther from health centres experiencing higher levels of nutritional inequality. Additionally, lack of access to government schemes leads to higher nutritional inequality, especially among male children.

The average RIF inequality value in Table 4 shows that female children have higher levels of nutritional inequality than male children, as measured by the variance inequality index and the Gini inequality index. The findings suggest that a combination of various interventions, such as improving household income, parental education, access to health care, and government schemes, can help reduce nutritional inequality among tribal children, with a particular focus on female children.

Table 4: Determinants of Child Nutritional Inequality-RIF Regression of Inequality measures for Male and Female

	Inequality measures	Variance		Gini	
		Male	Female	Male	Female
1	Group: Irular	.0223 ***	.0351 ***	.0019 ***	.00115 ***
		(.00280)	(.0065)	(.0003)	(.00075)
2	Group: Mudugar	.00021 ***	.0004 ***	.000015 ***	.00001 ***

	Inequality measures	Variance		Gini	
		Male	Female	Male	Female
		(.00004)	(.00008)	(.00000)	(.0000107)
3	Income	-.0700 *	-.0549	-.01049 *	-.00511
		(.02467)	(.076159)	(.032306)	(.0101)
4	Family size	.5310 **	1.011 **	.05359 **	.0957 **
		(.0647)	(.1863)	(.0068)	(.0198)
5	Father education (less than 8th std=1;above=0)	.3263 **	.4550 **	.0291 **	.0351 **
		(.0535)	(.0162)	(.0556)	(.01602)
6	Mother education(less than 8th std=1;above=0)	.5424 ***	.2162 *	.05617 ***	.02603 *
		(.1578)	(.0595)	(.0138)	(.00434)
7	Age at marriage	.5217	.1393936	.0465	.00428
		(.744828)	(.1425864)	(.78251)	(.58204)
8	Parents' habit of narcotic/drinking(yes=1; no=0))	.717 ***	.442 **	.0651 ***	.0380 *
		(.074)	(.0028)	(.0087)	(.0322)
9	Water (not purified water=1;purified=0))	.4018 **	.302 *	.0371 ***	.0246 *
		(.088)	(.109)	(.0092)	(.013)
10	Birth order(second and above=1;below=0)	.854 ***	.5478 ***	.1036 ***	.0871 ***
		(.0796)	(.0987)	(.0077)	(.0123)
11	Recurring Illness of children (yes=1;no=0))	.9140 ***	.6064 ***	.11362 ***	.0992 ***
		(.0673)	(.0989)	(.0076)	(.01209)
12	Birth interval (below 24 months=1;above=0)	.676 **	.261 *	.1391 **	.1840 ***
		(.083)	(.1570)	(.009)	(.0189)
13	Breast feeding (irregular=1;regular=0)	.5424 **	.2162 *	.05617 **	.0260 *
		(.1578)	(.055)	(.0138)	(.0434)
14	Mother's intake of food (irregular=1;others=0)	.521 ***	.1394	.0465 ***	.00428
		(.074)	(.1425)	(.0079)	(.0158)
15	Fruits during pregnancy (irregular=1;others=0)	.7175 ***	.442	.0651 ***	.0380
		(.0743)	(.2890)	(.0087)	(.0322)
16	Distance to health centre	.617 **	.333 *	.0222 ***	.0343 *
		(.0643)	(.0345)	(.0087)	(.0112)
17	Access of Government schemes (no =1; yes=0))	.5217 ***	.1393936	.0465 ***	.0042816
		(.0744)	(.1425)	(.0078)	(.0158)
	Constant	.676 *	.2619457 *	.1391 ***	.1840 ***
		(.089)	(.1579)	(.0093)	(.0189)
	Average.RIF	.54606	.65784	.10842	.14651
	Observations	355	445	355	445
	R squared	0.3087	0.3349	0.2196	0.1991
	F value	92.37	28.35	137.06	31.27

Notes: (i) Bootstrap Standard errors (50 replications) in parentheses; (ii) *p<0.10; **p<0.5; ***p<0.1.
Source: Authors' calculations based on Primary survey, 2021-22.

VI Discussion

This article explores the nutritional status of under fie tribal children and findings sheds light on the major factors contributing to malnutrition among under-five tribal children in Attappady, Kerala. The socio-demographic characteristics reveal the stark realities of limited access to basic amenities such as electricity, clean water, and sanitation facilities, emphasizing the urgent need for infrastructure development in these tribal communities. Analyzing the nutritional status of children, the results highlight alarming levels of stunting, underweight, and wasting, particularly in the very high scale, indicating severe malnutrition. The

discussion emphasizes the critical need for targeted interventions, focusing on the most vulnerable children requiring immediate attention and resources. The identified gender disparity in nutritional inequality underscores the importance of tailored policies, ensuring equal access to resources and healthcare for both male and female children. The findings align with existing literature on health disparities among tribal populations, emphasizing the need for holistic approaches that address socio-economic, cultural, and environmental determinants. In considering the inequality in nutritional status, the study highlights key determinants such as tribal group, household income, family size, and parental education. The study suggests that interventions targeting specific socio-economic and cultural aspects can effectively reduce nutritional inequality, with a focus on improving household income, parental education, and access to healthcare.

The issues of health status, nutritional status, and nutritional inequality among tribes at Attappady require significant policy interventions to ensure sustainable improvements. One crucial aspect is the need to build necessary social and physical infrastructure, including motorable roads, to guarantee access to basic amenities like healthcare, education, and nutritious food. The government should redouble these efforts to address the current disparities in health and nutrition among tribal communities. Moreover, it is essential to recognize that the challenges facing tribal communities are diverse and vary across different categories. Therefore, it is critical to undertake a thorough study of the heterogenous behavioural patterns of each tribal community to develop tailored interventions that address their unique needs. This will require restructuring the government's service delivery mechanisms to cater to the specific needs of each tribal community. Additionally, bringing all the hamlets of Attappady under the Forest Rights Act can ensure the protection of tribal rights and provide them with access to resources like water and land for agriculture. This can help address the issue of food and nutritional insecurity, a pressing concern among tribal communities. Furthermore, the financial burden of hospitalization of tribal children is an obstacle to seek medical care. Therefore, providing financial assistance to the guardians of hospitalized children can help alleviate this issue and ensure that sick children receive necessary medical care without causing significant financial distress to their families. Lastly, conducting regular medical camps in remote hamlets can help identify health problems early and prevent more severe complications. The government should prioritize such initiatives to ensure that tribal communities have access to regular healthcare services.

VII Conclusion

Addressing the health and nutritional disparities among tribal communities in Attappady requires a comprehensive approach that encompasses building necessary infrastructure, implementing tailored interventions, protecting tribal rights, providing financial assistance, and ensuring regular access to healthcare services. By adopting an exemplary crisis management approach, coupled with a

follow-up strategy, the government can bridge the significant disconnect with tribes and enhance the health, well-being, and sustainable development of tribal communities in Attappady.

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Environmental Sustainability in India: The Crucial Role of Government Expenditure and Trade

Abhishek Singh and Karuna Shanker Kanaujiya

This research undertakes a comprehensive examination of the impact of government expenditure and trade on environmental sustainability in India from 1995 to 2022. ARDL bounds test reveals a robust, long-term correlation between environmental sustainability, government expenditure, and trade volumes, marked by adverse and statistically significant effects. An Impulse Response Function (IRF) analysis reveals that a government expenditure shock leads to delayed increases in CO_2 emissions, while trade consistently raises emissions. Inflation has both short and long-term impacts, with monetary policy adjustments mitigating its effects. Therefore, enacting effective taxation policies and rigorously enforcing environmental laws are critical mechanisms for enhancing environmental sustainability.

Keywords: Government expenditure, CO_2 emission, Sustainability, Trade, ARDL

I Introduction

The pursuit of sustainable development has rekindled interest in studying the connection between economic activity growth and environmental sustainability (Sharma 2011, Al-Mulali 2012, Khan, *et.al.* 2014). This renewed interest is owing to the observed rise in economic activity throughout the world, as well as the related increase in carbon emissions. Figure 1 generated by the European Union's publication facility regarding the Emissions database for Global Atmospheric Research (EDGAR), presents the level of the top-6 countries, including India, emanating high volumes of carbon (CO_2) in the atmosphere. The top ten emitter countries are responsible for 67.6 per cent of global emissions. China has been generating more CO_2 compared to any other country since 2006 (Bradsher and Friedman 2018). However, to make an in-depth assessment of the benefactions, emissions in terms of CO_2 per person must be collated, given China also has the planet's largest concentration of individuals (Ritchie, *et.al.* 2020). In terms of CO_2

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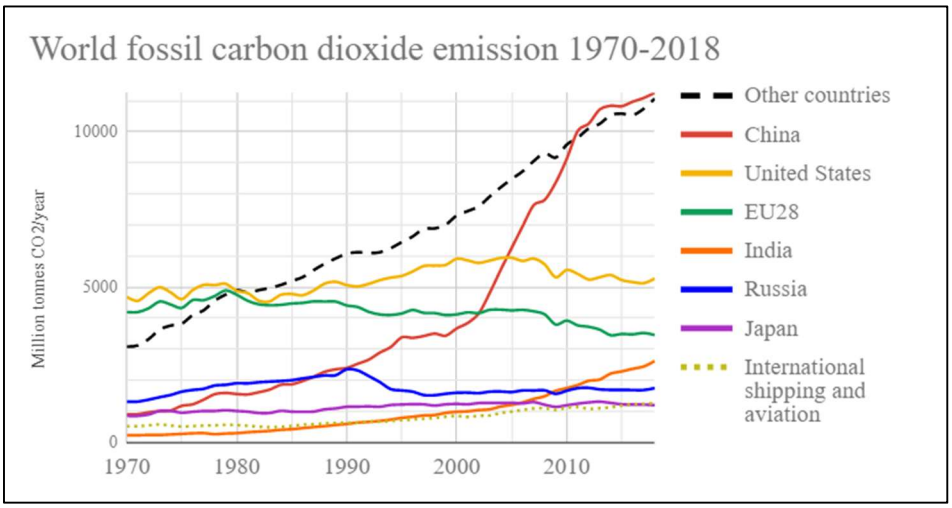
emissions per person, China is less than half the size of the United States (the second most significant producer of CO_2 emissions) and around one-eighth the size of Palau (the top CO_2 emitter per person) (Crippa, *et. al.* 2020).

According to the 2022 EDGAR (Emissions Database for Global Atmospheric Research) report, India has not released as much carbon into the atmosphere as China, the European Union (EU), and the United States. Still, it has exceeded Japan and other emerging countries (Figure 1). According to the Environmental Performance Report (2022), India's performance has deteriorated in some of the forty-four categories, resulting in a score of 18.9 on a scale of 100, placing it last (180th rank) in the comparison table of nations. A new study that underpins this index reveals that only a few nations, such as Denmark and the United Kingdom, are now on track to achieve greenhouse gas neutrality by 2050. Many other countries are on the wrong path, with significant emitters of greenhouse gases, such as China, India, and Russia, quickly increasing.

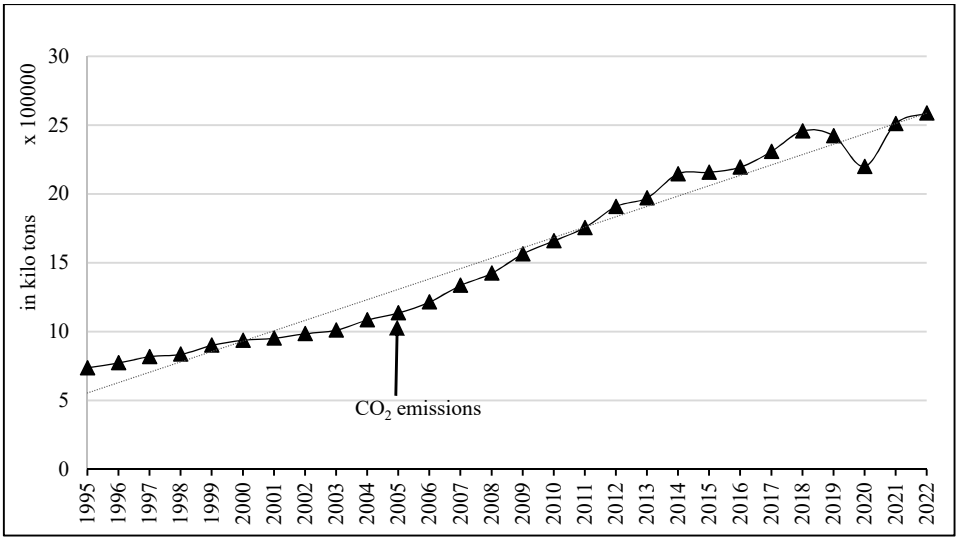
Figure 1: World Fossil Carbon Emission



Source: EDGAR Report 2022.

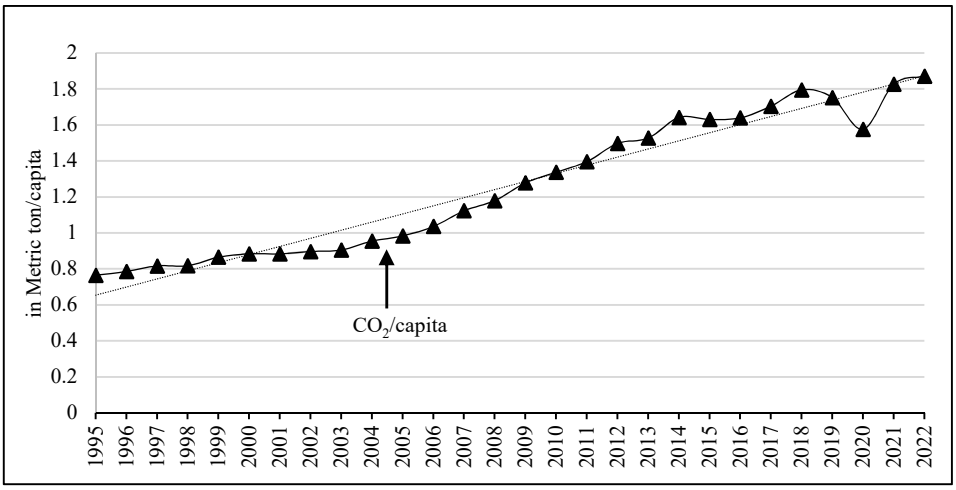
Figures 2 and 3 illustrate India's carbon emissions rates in kilo tons and metric tons per capita, respectively. These numbers indicate that India has undergone substantial developmental changes over the past 28 years, from 1995 to 2022, by increasing its productive capacity, albeit at a high cost in terms of environmental sustainability. Due to the unsustainable consumption habits of most citizens, per capita carbon emissions increased over the research period. Commercialisation may be blamed for this growth, as it increases aggregate consumer demand, which activates industrial processes that, in turn, require non-renewable fuels like coal and petroleum for power generation to produce a range of products.

Figure 2: Carbon Emissions (CO_2) Trend in India



Source: Author's construction using WDI database.

Figure 3: Per Capita CO_2 in India



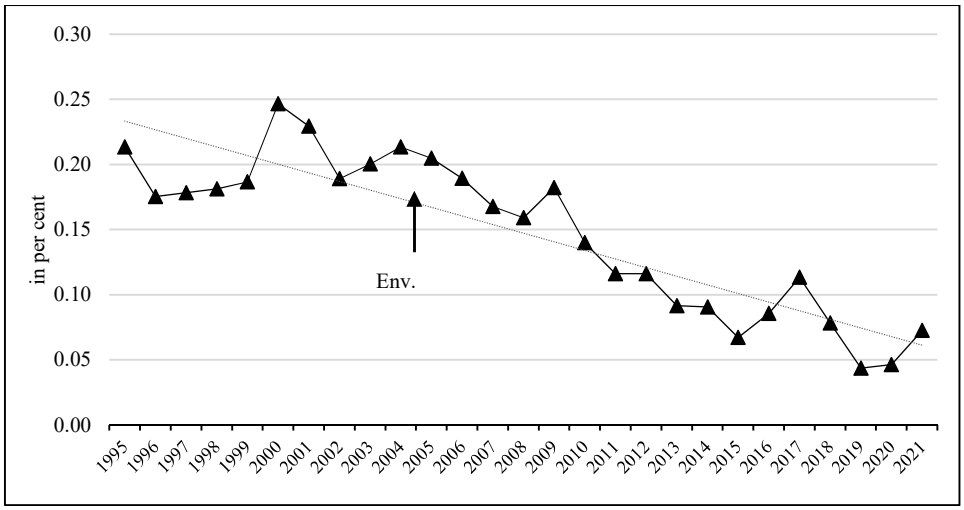
Source: Author's construction using WDI database.

Every year, the Ministry of Finance in India announces the budget. Still, the Ministry of Environment and Forest receives 0.159 per cent on average, far less than any other ministry for carrying out its functional activities. As a matter of security from foreign threats, the defence sector in India receives the most funding. However, it would be difficult to justify this allocation because a nation is made up of people, and if people within the country are suffering from an increase in the number of natural calamities each year, increase in the level of pollution leading to an unhealthy environment and increase in the health expenditure of both

government and private individuals, then this allocation is not justified. Therefore, the question of protecting the country from the outside environment becomes redundant when its internal environment is being disregarded and negotiated.

Figure4 depicts the government's expenditure on the environment as a percentage of the total expenditure carried out by it for all other economic and non-economic activities. The figure shows a declining trend in environmental expenditure, which is not a good sign for an economy like India, which still has a naturally rich environment. A fall in expenditure in future will lead to an increase in the abatement cost of different calamities brought down by nature. The neglect of environmental problems will create further chaos and lead to internal disorder, ultimately having a negative impact on the country's development.

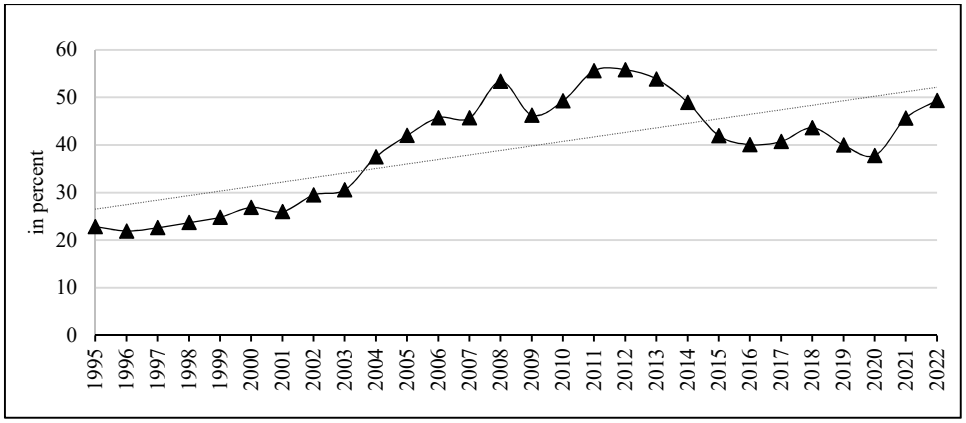
Figure 4: Environmental Expenditure (as % of Total Expenditure) in India



Source: Author's construction using MoEF, India database.

Figure 5 shows the participation of international trade (both exports and imports) as a percentage value of the gross domestic product (GDP) of the country. The figure shows that the overall quantum of trade increased during the study period with minor ups and downs on average. A prominent change took place after 2003 as India had just entered into the millennium era. Since 2003, this change has maintained a positive upward trend until 2012, but then took a detour and returned to a growth paradigm in 2018. The annual average rate of increase was 38.77 per cent during the study period. The increase in the annual average rate indicates that trade has facilitated the country's economic cycle and contributed to an improvement in its developmental performance. This increase also indicates that production activities were rampant during the study period, which has adversely affected environmental quality. The recovery cost will be an unforeseen and unaccounted burden on the country's individuals in the future.

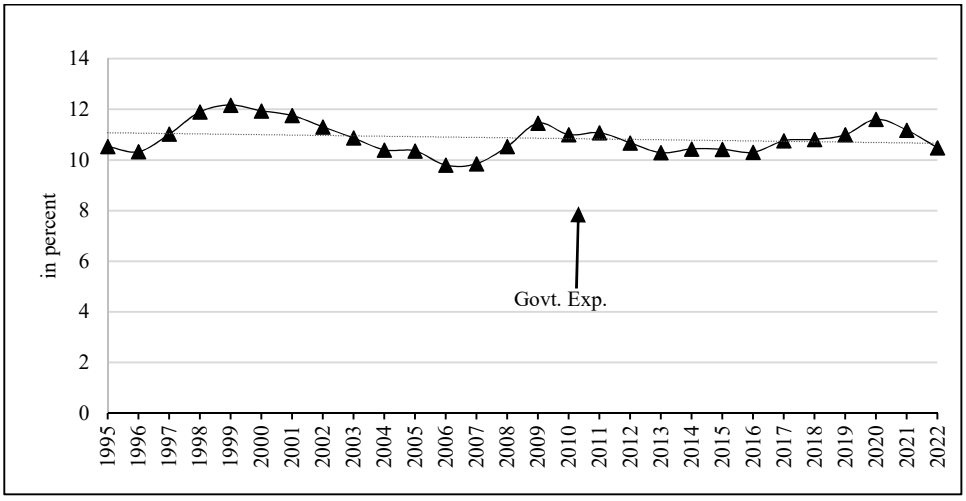
Figure 5: Trend of Total Trade (as % of GDP) in India



Source: Author's construction using WDI database.

Figure6 depicts the aggregate level of government expenditure or spending as a percentage share value of gross domestic product (GDP). Government expenditure across different economic activities has increased during the study period, with an average rate of 15.43 per cent. This further explains the detrimental effects of these activities on the environmental sustainability of the country. The increase in government expenditure is having a direct impact on the level of CO_2 emissions. This rise in government expenditure initiates an increase in the aggregate or effective demand of the consumers.

Figure 6: Trend of Government Expenditure (% of GDP) in India

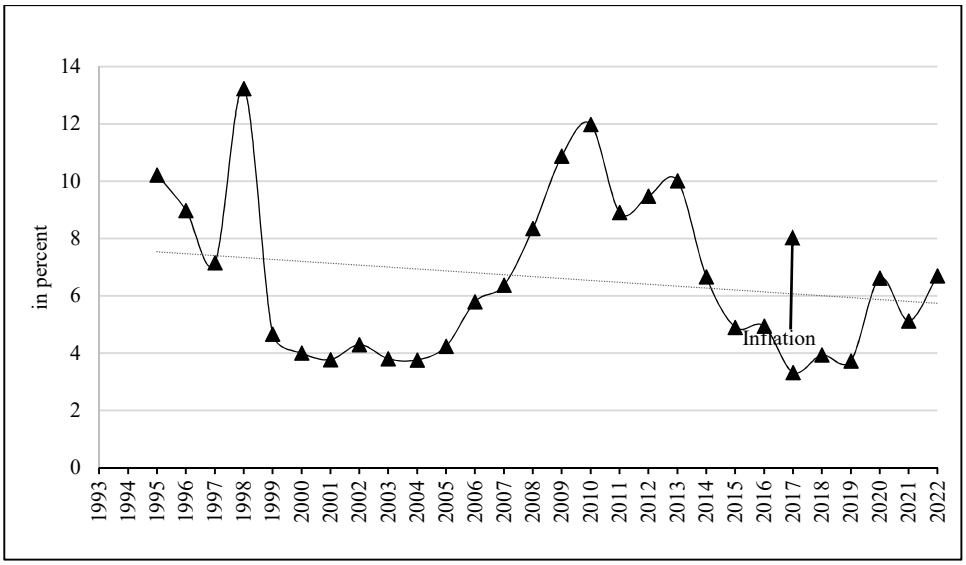


Source: Author's construction using WDI database

Furthermore, Figure 7 explains the aggregate level of inflation in the consumer demand prices during the study period. The average rate of inflation in

the country, as per the World Bank data, has been 6.70 per cent during the study period. Inflation has an inverse effect on the level of CO_2 emissions because the empirical findings of several studies concluded that inflation volatility boosts environmental performance, indicating that higher price instability produces ambiguity that dampens development funding and also influences the consumption patterns of the masses, which further enhance the environmental sustainability. Nonetheless, the study's outcomes implied that financial development promotes pollution emissions and reduces ecological sustainability. Therefore, inflation can be used as a tool to regulate environmental sustainability or quality (Waheed, *et. al.* 2020).

Figure 7: Inflation (in %) Trend in India



Source: Author's construction using WDI database.

Government Expenditure and CO_2 Emissions

Adewuyi (2016) investigated the influence of household, firm, and government expenditures on aggregate and sectoral carbon emissions in the global economies from 1990 to 2015. The adjusted heterogeneous panel data methodology was employed to estimate both CO2 emissions and income models, from which the direct and indirect impacts of expenditure categories, as well as long-run and short-run analyses, were derived. Empirical findings indicate that, in the long term, the negative direct effect of government expenditure is offset by positive indirect effects, resulting in a net positive impact on aggregate carbon emissions. Household expenditure harmed sectoral carbon emissions, whereas private investment had a positive effect, and state expenditure had a mixed result. The

regulatory lessons include the obligation to assess the environmental impacts of pollution from every expenditure strategy along the value chain.

A very different aspect of the same problem was brought out in the study done by Mukherjee and Chakraborty (2015), who discovered that countries distribute subsidies for a variety of reasons, such as promoting industrial growth, facilitating innovation, supporting national champions, and ensuring redistribution. Subsidies decentralisation may also stimulate economic activity, contributing to climate change problems if economic activities are done beyond a sustainable threshold. A cross-country empirical examination of 131 countries from 1990 to 2010 reveals that more proportionate devolution correlates to higher CO_2 emissions. It was also discovered that nations with a high tax-to-GDP ratio have lower per capita CO_2 emissions. Altogether, a newer aspect of the problem was introduced by Waheed, *et. al.* (2020), who explored the relationship between inflation instability and the environment in their study. According to the empirical findings, inflation instability is associated with improved environmental performance. Financial development, on the other hand, increases pollutant emissions and degrades environmental conditions. Halkos and Paizanos (2013) analyzed the direct, indirect, and total impacts of government expenditure on pollutants in their study. The dynamic nature of the linkages, as well as potential endogeneity, was considered. They discovered that government expenditure had a negative and significant direct influence on SO_2 emissions. The form of the overall impacts was dictated by indirect effects, which were income-dependent. The policy consequences varied depending on the pollutant and income level.

A different study done by Halkos and Paizanos (2015) investigates the influence of fiscal policy on carbon emissions using the VAR method on quarterly data for forty years (1973-2013). They concentrated on the short- and medium-term relations concerning fiscal policy and CO_2 emissions, and also discovered the policy shocks using sign constraints. The findings show that implementing expansionary fiscal expenditure reduces carbon emanations from both forms of effluences. However, deficit-financed tax cuts mount consumption-stimulated carbon emissions. The precise pattern of the consequence is determined by the cause of the emission, the fiscal policy situation in action, and the operational class of public expenditures that is raised.

Similarly, Asif M. Islam and Ramón E. López (2015) used a freshly built data set of government expenditures to analyze the influence of the mix of federal and state government expenditure on numerous key air pollutants in the United States. The findings show that reallocating state and local government expenditure from private goods to social and public goods decreases air pollution concentrations, but changes in the composition of federal expenditure had little effect. A one-standard-deviation increase in state and local government expenditure on social and public goods decreases sulphur dioxide concentrations by two to three per cent, PM2.5 concentrations by three to five per cent, and ozone concentrations by two to six per cent of their respective standard deviations. The results withstand numerous sensitivity tests.

Furthermore, a study conducted by Fan, *et. al.* (2020) on the Chinese economy found that China has secured an agreement on comprehensive regulation of carbon dioxide (CO_2) emissions; nonetheless, regional emission disparities persist. Carbon emissions reduction is a public benefit with a significant positive externality that is challenging to address within the market. This paper's findings give suggestions for the government to establish carbon emission reduction quotas and implement acceptable differentiated emission reduction programmes.

Trade and Carbon Emissions

The influence of international trade on carbon emissions is a multifaceted subject characterised by a nuanced interplay of factors. Numerous empirical investigations have scrutinized this intricate relationship, revealing that the impact of trade on carbon emissions is contingent on a myriad of variables. Södersten, *et. al.* (2018) conducted a notable study, demonstrating that global emissions linked to international trade may surge by as much as 11 per cent. This study additionally revealed that incorporating capital within input-output models results in a substantial tripling of the carbon footprint associated with specific product categories.

Mundaca, *et. al.* (2021) concentrated their research on the ramifications of carbon pricing on international transport fuels. Their analysis revealed an inverse relationship between fuel cost escalation and trade activity, as indicated by weight-time-distance metrics for traded goods and carbon emissions associated with sea freight. Elasticity's ranging from -0.03 to -0.52 underscore that augmented fuel costs may lead to diminished trade volumes and reduced carbon emissions from maritime transport. Bai, *et. al.* (2023), on the other hand, executed a comprehensive assessment, discerning the confluence of international trade on both environmental and employment dimensions. While they ascertained that international trade has contributed to global carbon emission reductions since 2003, the study elucidated a mixed impact within global value chains (GVCs), yielding emissions savings and job displacement. Thus, a delicate equilibrium emerges, suggesting a trade-off between reducing carbon emissions through GVC integration and preserving employment.

Du, *et. al.* (2022) delved into the dynamic sensitivity of global CO_2 emissions to trade restrictions over a temporal spectrum. Their simulated scenarios elucidated substantial ramifications on carbon emissions contingent on trade conditions. These findings highlight the time-dependent nature of trade-induced carbon emissions fluctuations, which are influenced by ever-evolving trade dynamics and emission intensities. Whereas Hu, *et. al.* (2020) added to this discourse by highlighting the spatial shift in carbon emissions incited by international trade. Their research posits that international trade has extensive and enduring repercussions on global carbon emissions and spatial configurations, suggesting a transformative influence on the distribution of carbon emissions across countries and regions.

II Data and Methodology

This study adopts a macro-level perspective, simplifying the complex relationship and applying principles of time series analysis to assess the overarching impact of trade on carbon emissions. The current study aims to investigate the impact of government expenditure and trade on environmental sustainability, specifically in terms of CO2 emissions, within the geographical context of India. Therefore, selecting appropriate proxies to measure the above phenomena is exceptionally crucial, as only the relevant proxies will explain the research objectives. The study is based on 28 observations each for every variable mentioned in Table 1 from 1995 to 2022, leading to 112 observations in total to meet the objectives of this research. For measuring the environmental sustainability, the data for consumption-based carbon emissions (CO_2), government expenditure (GE) and total trade (TT), both as a percentage share value of the total gross domestic product in their respective years, have been extracted from World Development Indicators (WDI) of the World Bank. However, the aggregate level of inflation (INF) per year, calculated as the annual percentage share value of consumer prices of goods and services, has also been extracted from the World Bank database. We employ the Autoregressive Distributed Lag (ARDL) methodology to investigate both long-term and short-term relationships. Furthermore, the study applies the Variance Decomposition Method (VDM) to dissect and delineate the causal relationships at play. The Impulse Response Function (IRF) is subsequently employed to elucidate the transient dynamics that emerge in response to exogenous shocks.

Table 1: Data Description and Sources

Variable Name	Acronym	Description	Measurement	Data Source
Environmental Sustainability	CO_2	CO_2 emissions per year as a measure of sustainability	in Kilo Tons (kt.)	World Development Indicators (WDI)
Government Expenditure	GE	Overall governmental expenditure per year on economic activities	as percentage of GDP	
Total Trade	TT	Quantum of trade of goods and services per year	as percentage of GDP	
Inflation	INF	Aggregate level of inflation per year calculated as the increase in the annual percentage of consumer prices	in percentage	

Source: Authors' construction.

Furthermore, some relevant information and data have also been used from the Ministry of Environment and Forest, Reserve Bank of India-DBIE (Data Base on Indian Economy) and the Environmental Performance Index Report (2022) for manifold investigations.

Model Description

The relationship between the dependent and the independent variables is econometrically expressed using equation 1:

$$lnCO2 = \beta_0 + \beta_1 lnGE + \beta_2 lnTT + \beta_3 lnINF + \mu \quad \ldots(1)$$

where the prefix "ln" is employed for the natural logarithm of the time series variables, and $\beta_0$represents the intercept value and the symbols $\beta 1$, $\beta 2$, and $\beta 3$ signify the elasticity coefficients of carbon emissions (CO_2) as a proxy of environmental sustainability in relation to government expenditure on economic activities (GE), total trade (TT) and the inflation level (INF), respectively. "μ" is the error term.

III Results and Discussions

Descriptive Statistics

Table 2 presents the descriptive statistics of the variables, including the mean, standard deviation, minimum, maximum, and Jarque–Bera test results. The Jarque–Bera test results showed that all of the variables had a p-value greater than 0.05, which means we cannot reject the null hypothesis that the variables are normally distributed. Therefore, we can conclude that the time-series variables (CO_2, GE, TT, and INF) are normally distributed.

Table 2: Descriptive Statistics of the Variables

Variable	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob
ln CO_2	14.18	14.22	14.77	13.51	0.42	-0.11	1.51	2.65	0.27
ln GE	2.38	2.38	2.50	2.28	0.06	0.32	2.39	0.91	0.64
ln INF	1.81	1.80	2.58	1.20	0.42	0.26	1.76	2.10	0.35
ln TT	3.63	3.72	4.02	3.09	0.31	-0.54	1.89	2.80	0.25

Source: Authors' calculations.

Unit-Root Estimation

In this study, the Augmented Dickey-Fuller (ADF) test is used to determine whether the data is stationary or non-stationary. Since most economic variables are non-stationary at level, the study examines each variable for the presence of unit roots. If any variable has unit roots, then its related series is considered non-stationary. Estimating non-stationary series can lead to spurious regression (Granger 1969). Table 3 presents the estimated results of the ADF test, which indicate that CO_2, GE and INF are stationary at level I (0) and TT is stationary at first-order difference I(1). This further suggests that we will apply the ARDL

method of time series estimation to understand the long- and short-run relationships between the cointegrated endogenous variables.

Table 3: Augmented Dickey-Fuller (ADF) Test Results

Variables	Level I(0)			First Order Difference I(1)		
	Intercept	Intercept and Trend	No Intercept and Trend	Intercept	Intercept and Trend	No Intercept and Trend
ln CO_2	-1.4487 (0.5390)	-3.4119 (0.0754)*	1.1313 (0.9274)	-1.4481 (0.5393)	-1.4893 (0.8006)	-0.8673 (0.3284)
ln GE	-3.1155 (0.0377)**	-3.5007 (0.0620)*	-0.0660 (0.6517)	-3.3886 (0.0208)**	-3.3564 (0.0795)*	-3.4649 (0.0012)***
ln TT	-1.4371 (0.5493)	-1.1602 (0.8988)	1.4471 (0.9595)	-4.3677 (0.0021)***	-4.4975 (0.0073)***	-4.0480 (0.0003)***
ln INF	-4.1722 (0.0041)***	-3.9380 (0.0277)**	-0.7357 (0.3883)	-3.2908 (0.0263)**	-3.2337 (0.1008)	-3.3721 (0.0016)***

Notes: *, ** and *** indicate significance at one per cent, five per cent, and 10 per cent critical value levels respectively.

Source: Authors' calculations.

ARDL Bounds Test

To investigate the long-run relationship, the ARDL bounds test based on F-stat is used first (Table 4). As the calculated value of F-stat is greater than the critical values at 10 per cent, five per cent, and 2.5 per cent levels of significance, this confirms the existence of a long-run relationship among the endogenous variables.

Table 4: ARDL Bounds Test Results

Significance	I(0)	I(1)
10 per cent	2.01	3.1
5 per cent	2.45	3.63
2.5 per cent	2.87	4.16
1 per cent	3.42	4.84
Critical value bounds, F-Statistic = 4.19,k = 3		

Source: Authors' calculations.

Long-run Equilibrium Relationship

Table 5 presents the outcomes of a long-run equilibrium relationship analysis using the log values. The coefficient for GE is statistically significant at the five per cent level and indicates that a one per cent increase in GE will increase CO_2 by 2.73 per cent. This signifies a robust and positive long-run relationship between GE and CO_2. Similarly, trade (TT) demonstrates a robust and positive long-run relationship with CO_2 and is statistically significant at the five per cent level. This suggests that a unit increase in TT corresponds to a 2.32 per cent increase in CO_2. In contrast, inflation (INF) exhibits no significant long-run relationship. The

coefficient of INF is negative (-0.08), suggesting a negligible but insignificant impact on CO_2, with a p-value of 0.78, which exceeds the typical significance threshold of 0.05.

Table 5: Results of Long-run Equilibrium Relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ln GE	2.73***	0.52	5.29	0.00
ln TT	2.32***	0.36	6.46	0.00
ln INF	-0.08^{NS}	0.29	-0.29	0.78

Notes: *** Denotes statistical significance at one per cent; NS denotes not significant.
Source: Authors' calculations.

Short-run Adjustment Relationship

In the short-term analysis, as presented in Table 6, the lagged Error-Correction Model (ECM) emerges as a pivotal component with a negative and statistically significant coefficient at the one per cent level, signifying that deviations from the long-run equilibrium, such as those occurring in the previous period, are swiftly corrected at a rate of 10 per cent within the current year, thus upholding the robustness of the long-term equilibrium. Focusing on individual variables, a one per cent increase in Government Expenditure (GE) appears to correspond to a 0.24 per cent short-term increase in CO_2 emissions. Yet, this relationship lacks statistical significance, with a probability exceeding the five per cent threshold. Conversely, Trade Volume (TT) exerts a discernible impact in the short run, with a one per cent augmentation resulting in a statistically significant 0.22 per cent rise in CO_2 emissions at the five per cent significance level. Inflation (INF) displays a short-term negative impact on CO_2 emissions, being statistically significant at the five per cent level. These findings, along with the model's robustness denoted by an R-squared (R2) value of 0.62 (62 per cent), an adjusted R-squared (Adj. R2) value of 0.49 (49 per cent), and the absence of serial correlation as indicated by the Durbin-Watson statistic (D-W stat) value of 2.13, bear substantial relevance for informed policy formulation and decision-making processes.

Table 6: Results of Short-Run Relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(lnGE)	0.24^{NS}	0.20	1.21	0.25
D(lnTT)	0.22***	0.07	3.12	0.00
D(lnINF)	-0.05**	0.02	-2.65	0.02
CointEq(-1)*	-0.10***	0.02	-4.48	0.00
R^2= 0.62, Adj. R^2= 0.49, D-W stat= 2.13				

Notes: ** Denotes statistical significance at five per cent and *** denotes it at one per cent; NS denotes not significant.
Source: Authors' calculations.

Variance Decomposition Results

The generalized variance decomposition method (VDM), applied within the vector autoregressive (VAR) framework (Stock and Watson 2001), has been employed to assess the degree of relationship among crucial factors of environmental sustainability, government expenditure, trade volume, and inflation. This method enables a nuanced examination of the allocation of predictive error variance for a given period, disentangling the contribution of innovations in each independent variable over a decade. The insights gleaned from Table 7 highlight the distribution of explanatory power within this intricate web of relationships. Notably, our analysis reveals that a substantial proportion, amounting to 61.97 per cent of the variance in environmental sustainability, can be attributed to its own innovative shocks. However, the influence of government expenditure, trade volume, and inflation on environmental sustainability is comparatively modest, accounting for 0.36 per cent, 35.68 per cent, and 1.99 per cent, respectively. Conversely, our investigation shows that government expenditure, trade volume, and inflation are considerably more responsive to innovative shocks in environmental sustainability, with corresponding explanatory percentages of 13.76 per cent, 22.76 per cent, and 8.37 per cent.

The findings emphasize the potential for targeted policy interventions to reshape the environmental landscape. Specifically, policies aimed at improving the efficiency and sustainability of government expenditure can have substantial positive impacts by mitigating the adverse effects associated with production and consumption, thereby addressing the issue of rising carbon emissions. This aligns with the research conducted by Guerrero and Castaneda (2022), who argue that simply increasing government expenditure, even with substantial budgets, may not suffice to enhance environmental sustainability and bridge the gaps between Sustainable Development Goals (SDGs). Instead, complementary micro-policies are essential to address structural long-term challenges and promote environmental sustainability effectively. They also note that particular environmental concerns, such as clean air, can be significantly improved with increased funding, while others necessitate well-designed government programs to redirect historically ineffective policies (Guerrero and Castaneda 2022). Moreover, optimizing trade practices through advanced supply chain management and leveraging block chain technology are vital strategies in the global fight against climate change, given the pivotal role of carbon emissions in environmental degradation (World Economic Forum and Boston Consulting Group 2020, 2021).

Table 7: Variance Decompositions from the Recursive VAR Ordered as CO_2, GE, TT, INF

Forecast Horizon	*Variance Decomposition (per cent points)*			
	CO_2	*GE*	*TT*	*INF*
Variance Decomposition of CO_2				
1	100.00	0.00	0.00	0.00
5	79.83	0.01	16.01	4.15
10	61.97	0.36	35.68	1.99
Variance Decomposition of GE				
1	5.85	94.15	0.00	0.00
5	13.58	70.77	5.34	10.31
10	13.76	65.70	7.63	12.90
Variance Decomposition of TT				
1	25.68	2.17	72.15	0.00
5	24.96	1.55	69.63	3.85
10	22.76	3.68	68.70	4.86
Variance Decomposition of INF				
1	11.88	1.76	6.22	80.14
5	8.67	1.47	21.39	68.47
10	8.37	1.69	27.57	62.38

Source: Authors' calculations.

Impulse Response Function

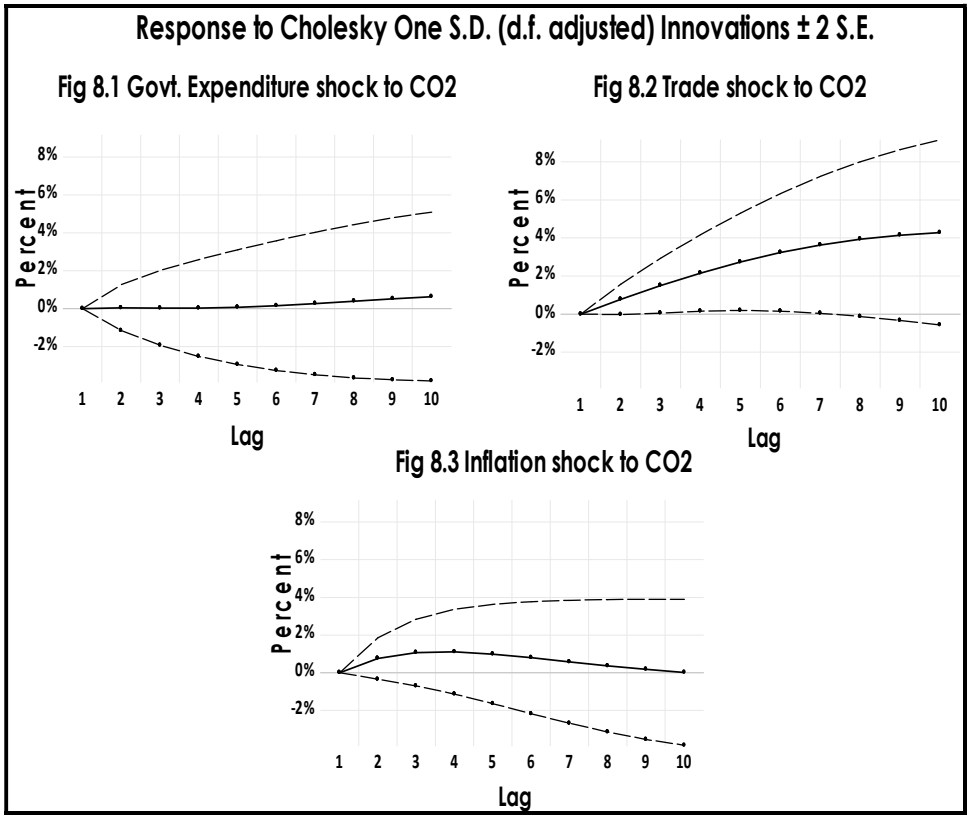
The Impulse Response Function (IRF) is a valuable tool for assessing the immediate impact of a one-unit shock within a dynamic system, revealing intricate interdependencies among variables. In Figure 8, we present the outcomes of a time-series analysis involving four variables: Carbon Dioxide (CO_2), Government Expenditure (GE), Trade Volume (TT), and Inflation (INF). These results have been obtained through the application of the Cholesky decomposition method, a well-established technique (Benoit 1924) widely used in Vector Autoregressive (VAR) models to examine the dynamic relationship among variables. The analysis spans ten discrete periods.

When a one-standard deviation (1 S.D.) shock or innovation occurs in government expenditure within economic activities, an intriguing dynamic unfolds. Initially, CO_2 remains stable, but beyond the fifth period, a notable increase in CO_2 surpassing its steady state value is observed. This rise can be attributed to the stimulatory effect of increased government expenditure on production activities. Consequently, resources are mobilized for energy generation, resulting in a sustained increase in carbon emissions over the long period of time. Trade volume (TT) exhibits a consistently positive influence on carbon emissions (CO_2) both in the short term and the long term. This phenomenon can be attributed to the energy requirements associated with trade practices such

as exports and imports. The production of goods and services, as well as their transportation and distribution, necessitates energy usage, contributing to the sustained elevation of carbon emissions.

However, in the case of inflation (INF) shocks, there is a positive short-term and long-term effect on carbon dioxide emissions (CO_2). However, it is noteworthy that in the very long term, CO_2 levels gradually return to their steady-state values. This phenomenon can be ascribed to the adjustments and tightening of monetary policies undertaken by the federal system of the country. These measures, implemented over time, effectively mitigate the inflation-induced impact on carbon emissions. Conclusively, our analysis indicates that Government Expenditure (GE), Trade Volume (TT), and Inflation (INF) exert significant contemporaneous effects on carbon dioxide emissions (CO_2) over the long run. These findings have substantial implications for policymakers and researchers seeking to understand and address the complex dynamics between economic activities and environmental consequences, particularly concerning carbon emissions and sustainability.

Figure 8: Impulse Response Function



Note: Cholesky Ordering[1]: LNCO2LNGELNTTLNINF, Standard Errors[2]: Analytic.
Source: Author's construction.

Residual Diagnostics

Serial correlation LM Test: Serial correlation is a statistical concept that describes the link between the present value of a variable and the lag value of the same variable from earlier periods. Since the p-value of the Breusch–Godfrey serial correlation LM test is greater than 0.05, we conclude that there is no serial correlation in the model (Table 8).

Heteroscedasticity Test: Since the p-value of the Breusch–Pagan-Godfrey probability is more than 0.05, we can reject the presence of heteroscedasticity in the model (Table 9).

Table 8: Serial Correlation LM Test-Breusch-Godfrey

Criteria	Prob. Value	H_0: Null Hypothesis	Interpretation
B-G Serial Correlation LM Test	0.7303	Accept	No Serial Correlation

Source: Authors' Calculations.

Table 9: Heteroscedasticity Test Results

Criteria	Prob. Value	H_0: Null Hypothesis	Interpretation
B-P-G Heteroscedasticity Test	0.2456	Accept	No Heteroskedasticity

Source: Authors' calculations.

IV Conclusion and Recommendations

The study's findings align with previous research conducted by scholars such as Halkos and Paizanos (2013), Adewuyi (2016), Hu, *et. al.* (2020), and Sun, *et. al.* (2021). It was observed that the cumulative magnitude of government expenditure exhibits a negative and substantial correlation with environmental sustainability in India, albeit exclusively in the long term. In contrast, the influence of trade was significant, demonstrating a negative association with environmental sustainability in both the short and long run. This implies that when both government expenditure and trade experience growth, they tend to stimulate higher economic investment, subsequently resulting in diminished levels of environmental sustainability. Additionally, the speed of adjustment, as determined by the error correction term (ECT), is 10 per cent annually, which means that short-run deviations will be corrected at this rate annually and will ultimately lead to equilibrium in the long run.

Conversely, the study examined the annual inflation rate, a key economic indicator. The analysis revealed a negative but modest (-0.08 per cent) long-term impact, while the short-term effects were statistically insignificant yet similarly negative (-0.05 per cent). This suggests that the nation's inflation rate has not been a pivotal contributor to the deterioration or improvement of environmental

sustainability, primarily due to the strategic adjustments made in the country's monetary policy, as elucidated by Wu, *et. al.* (2021).

Generalized VDM reveals that environmental sustainability largely depends on its own innovations (61.97 per cent variance), with government expenditure, trade volume, and inflation playing relatively more minor roles (0.36 per cent, 35.68 per cent, and 1.99 per cent, respectively). Conversely, government expenditure, trade volume, and inflation are more responsive to innovative shocks in environmental sustainability (13.76 per cent, 22.76 per cent, and 8.37 per cent, respectively). Furthermore, Impulse Response Function (IRF) ensued that a one standard deviation shock in GE, led to a delayed increase in CO_2 emissions. In contrast, TT consistently elevated CO_2 emissions, reflecting the energy requirements of trade activities. INF shocks had a short-term and long-term positive effect on CO_2 emissions, but long-term adjustments in monetary policies mitigated this impact.

Nonetheless, it is imperative to acknowledge India's robust economic progress during the study period, marked by substantial increases in GDP, heightened trade activities with other nations and bolstered domestic production capacities. While this transition has propelled economic growth, it has concurrently imposed a strain on the country's environmental resources, a phenomenon akin to the Environmental Kuznets Curve (EKC) postulated by Simon Kuznets in the mid-20th century. The EKC posits that environmental quality tends to deteriorate as economic development advances until a certain income threshold is reached, after which environmental degradation begins to ameliorate (Grossman 1991, Shafik 1994, Yasin, *et. al.* 2021).

In conclusion, this study sheds light on India's strategic prioritization of the industrial sector to bolster production and attract foreign investments, consequently leading to amplified volumes of imports and exports. Nonetheless, this heightened economic activity raises concerns about its potentially adverse impact on environmental sustainability. Therefore, it underscores the imperative of vigilant monetary oversight, with a particular focus on the foreign exchange market and inflation, to safeguard currency stability and maintain sustainable consumption patterns. Additionally, the study underscores the necessity for a comprehensive and multidimensional approach to fortify environmental sustainability within the Indian context. This multifaceted strategy encompasses critical elements, including budgetary realignment, the adoption of sustainable production practices, the promotion of environmental education, the implementation of effective tax policies, and the enforcement of stringent environmental regulations. By integrating these measures into policy formulation and implementation, India can strive toward a more sustainable future without compromising its pursuit of economic growth and development.

Endnotes

1. The Cholesky Ordering specifies the order in which the variables are stacked in the VAR model. In this analysis, CO_2 is placed first, followed by GE, TT, and INF. This ordering helps in interpreting the causal relationships between variables.
2. The standard errors represent the uncertainty or margin of error associated with the estimated coefficients. Analytic standard errors are calculated using mathematical formulas and are used to test the statistical significance of the coefficients. Smaller standard errors indicate more precise estimates, while larger standard errors suggest greater uncertainty.

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Disaggregated Development Expenditure and Economic Growth: A Second-Generation Panel Data Analysis of Selected Indian States

Shilpa Chhabra and Greeshma Manoj

This paper used panel data to analyse the impact of the disaggregated development expenditure (social and economic services expenditures) on economic growth for the fourteen major States of India, categorised into high and low-income States. The timeline of the study is between 1990-1991 to 2020-2021. The results of Panel DOLS revealed that, in general, the economic services expenditure contributes more to economic growth than the social services expenditures and makes a difference between the income levels of the States. The Granger causality test (Dumitrescu and Hurlin) results showed that the Wagner and Keynesian laws hold good in the short run.

Keywords: Second-generation panel data analysis, economic and Social services expenditure, Wagner's law, Keynesian law, Major Indian States

I Introduction

The sustainable growth of the economy prominently depends upon government expenditure. "To obtain economic growth, the government harmonies conflict between private and social interests; prevents the country from foreigners' exploitation; and assures an increase in productive investment and a socially optimal direction (Biswas and Ram 1986)." The sub-national governments complement the Union government with different laws and responsibilities in attaining Economic Growth (hereafter, EG). Generally, neither the State government's expenditures nor its impact on EG is uniform at the sub-national level.

The concept of public expenditure and EG nexus has been subjected to exploration. Theoretically, there are primarily two frameworks in this respect; one is Wagner's, and the other is the Keynesian approach. Various studies based on different regions, periods, and methodologies support the Wagner approach, which emphasizes the importance of EG over public expenditure to maintain economic equilibrium (Kalam and Aziz 2009, Bedir 2016, Dkhar and Kumar 2018, Wu,

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Tang Lin 2010). Contrarily, the research that supports the Keynesian framework states that government expenditure is the principal determinant stimulating EG (Gangal and Gupta 2013, Gurgul, Lach, Mestel 2012, Loizides and Vamvoukas 2005, Dash and Sahoo 2010, Dogan and Tang 2011). Studies have also found a feedback relationship between government expenditure and EG (Kumari and Sharma 2017, Tiwari and Shahbaz 2013, Ziramba 2008). The empirical literature has also focused on the association of EG with the functional classification[1] of the public expenditure given by the International Monetary Fund (IMF). A plethora of literature shows contradictory results regarding the association between EG and the functional classification of budgetary spending (Demiral and Alper 2016, Frank 2018, Gajurel 2021, Ray and Sarangi 2021). Hence, the existing literature lacks a consensus regarding the direction of causality and the nature of the association between the functional classification of budgetary expenditure and EG. Additionally, to the best of the authors' knowledge, hardly any study has been done so far showing the relationship between EG and components of both social and economic services expenditure, i.e., development expenditure, especially a comparison between the panels of major Non-Special Category[2] (hereafter, NSC) Indian States, based on their income levels. Moreover, while working on the panel dataset, the researchers overlooked testing the cross-section dependence and slope heterogeneity characteristics of the dataset, which are imperative for determining suitable estimation methods to obtain non-spurious results.

The present research tries to address these gaps by examining the short-run (hereafter, SR) and long-run (hereafter, LR) relationship between EG, i.e., Net State Domestic Product (hereafter, NSDP), and the components of development expenditure. The components of development expenditure are social services expenditure[2] and economic services expenditure[3]. Unlike the previous studies based on the Indian States, this study focuses on only NSC States rather than a mix of both NSC and Special Category States, which should not be considered together technically. Moreover, for a comprehensive understanding, the States are divided into two panels, i.e., high-income States (hereafter, HYS) and low-income States (hereafter, LYS), with respect to the average income of India during the study period. The comprehensive results obtained from the study could be helpful in understanding which expenditures are making a difference in the income level of the States. The results could also help to understand and re-strategise the expenditures that are not contributing to or impeding the EG at the sub-national and eventually at the country levels.

This paper is organised as follows: Section I overviews the nexus between public expenditure and EG in the existing literature. Section II mentions the data, model and estimation methods. The empirical findings are presented in Section III, and Section IV discusses the results and their policy implications. The paper ends with a conclusion in Section V.

II Data, Model, and Estimation Methods

The secondary data for the dependent variable, i.e., per capita real NSDP, which serves as a proxy for EG, are obtained from the Handbook of Statistics on Indian Economy, an annual publication by the Reserve Bank of India (RBI). The data for States' expenditure, i.e., sub-components of development expenditure, is obtained from the annual and occasional publications by the Reserve Bank of India, i.e., The State Finances: A Study of Budgets, Handbook of Statistics on State Government Finances- 2004, and Handbook of Statistics on State Government Finances- 2010. The balanced annual panel data is used for the fourteen major NSC sub-nationals of India[5] for thirty-one years from 1990-1991 to 2020-2021. To better understand, the sub-nationalities are categorised into two panels, i.e., high- and low-income States, with respect to India's average income during the study period. The independent variables considered for the study include both the components of the development expenditure, i.e., Social Services Expenditure (hereafter, SSE) and Economic Services Expenditure (hereafter, ESE). The five components of total[7] SSE include, Education, Sports, Art and Culture (S_ESA), Medical and Public Health (S_MPH), Housing (S_HOU), Welfare of SC's, ST's, OBC's (S_WEL), Social and Security Welfare (S_SSW) and the five components of total[5] ESE include, Agriculture and Allied Activities (E_AAA), Irrigation and Flood Control (E_IFC), Industry and Minerals (E_IM), Transport and Communications (E_TC), and General Economic Services (E_GES). The remaining variables are excluded due to inappropriateness or lack of data[8]. The selection of the variables is based on the consistent availability of data. The selected variables have a prominent share of the social and economic services expenditures, which represent the development expenditures of the States. The selected five components of SSE range between 67 per cent to 87 per cent average share in the total SSE among States (see Appendix A). The selected five components of ESE range between 53 per cent to 81 per cent average share in the total ESE among States during the study period (see Appendix B). Out of five selected SSE components, S_ESA expenditure has the highest average percent share in the total SSE, which ranges between 40 per cent to 57 per cent. However, the average percent share of S_HOU is least varying from one per cent to four per cent in total SSE (see Appendix C). Similarly, among five selected ESE components, E_IFC expenditure has the highest average percent share in the total ESE, which ranges between nine per cent to 36 per cent. However, the average percent share of E_IM is least varying from two per cent to seven per cent in total ESE (see Appendix D). All the selected variables are taken in Per Capita (hereafter, PC) and natural logarithm (hereafter, ln) form. The log transformation produces efficient results and reduces the dispersion in the data. Using State-level deflators, i.e., the Gross State Domestic Product (GSDP) deflator, the State government expenditure variables are converted into real terms.

Model Specification

In this study, we attempted to analyse the impact of the sub-components of state government development expenditure on EG. The baseline Model is represented by the following equation 1:

$$lnNSDP_{it} = \alpha_0 + \beta_1 lnX_{1it} + \beta_n lnX_{nit} + \mu_{it} \quad \ldots(1)$$

Here, $NSDP_{it}$ is the dependent variable, which measures EG for the 'i' sub-national in the 't' time period. The pre-fix 'ln' represents the natural logarithm form of the dependent and independent variables. α_0 represents the intercept. X_{1it} and X_{nit} show independent variables, government expenditure for the 'i' sub-national in the 't' time period. β_1 and β_n are the respective coefficients of the independent variables. Two log-log endogenous models have been used in this study and are represented by the following equations 2 and 3:

$$Model - I: lnNSDP_{it} = \int (lnS\_ESA_{it};\ lnS\_MPH_{it}; lnS\_HOU_{it};\ lnS\_WEL_{it};\ lnS\_SSW_{it}) \quad \ldots(2)$$

$$Model - II: lnNSDP_{it} = \int (lnE\_AAA_{it};\ lnE\_IFC_{it}; lnE\_IM_{it};\ lnE\_TC_{it};\ lnE\_GES_{it}) \quad \ldots(3)$$

The above two models explain the sub-components of the States' development expenditure separately for better understanding. Model I explains the effect of the components of the SSE, whereas Model II shows the impact of the components of the ESE on the EG of the States.

Estimation Methods

The analysis for the balanced panel data starts with summary statistics. It describes the basic properties of the selected variables in the study for the two categorised HYS and LYS panels (For results, *see* Appendix E). Then, we checked the Cross-Section Dependency (CSD) property for all the selected variables. To select further the appropriate unit root tests, LR and SR estimators, i.e., first or second-generation methods, and prevent spurious results, the pre-requisite of the panel data analysis is to ascertain the presence or absence of CSD among the cross-section units (Meo, Sabir, Arain, Nazar 2020). Ignoring CSD and proceeding with the standard first-generation methods can lead to deception and inconsistent outcomes. To check the existence of the CSD, we applied the (Pesaran 2004) CSD test. The (H_0) of the test assumes the cross-section independence (For results, see Appendix F). Similar to the CSD test, it is imperative to check the Slope heterogeneity (S-H) of the panel data set. For this purpose, Hashem Pesaran and Yamagata (2008) S-H test is used. The (H_0) of the test assumes slope homogeneity.

This test is suitable for the CSD cross-sections (For results, *see* Appendix G). Once confirming the presence of CSD and S-H, the analysis progresses to check the correct integration order of the variables. In the presence of CSD and S-H, the reliability of the results depends upon choosing the suitable unit root test (Zafar, Saud, Hou 2019). Consequently, second-generation unit tests are applied instead of traditional unit root tests, which control for CSD. The present research uses Cross-Sectional Augmented IPS (CIPS) and Cross-Sectional Augmented Dickey-Fuller (CADF) tests (Pesaran 2007). The (H_0) is a non-stationary variable series against (H_1) of stationary sections (For results, *see* Appendix H). In the presence of CSD in the dataset, we applied the Panel Dynamic Ordinary Least Square (P-DOLS) method to check the variables' LR interaction. This method is superior to traditional methods. Because this method takes care of CSD in the panel data set, works well with the mixed integration order, i.e., I (0) and I (1), and overcomes the endogeneity problem of the dataset. A panel Granger causality test is used to check the SR mechanism among the analysed variables, also known as Dumitrescu and Hurlin (D-H) test. This test is suitable for cross-section dependent and slope heterogenous cross-section units. It gives reliable and robust results for large periods and small heterogeneous balanced panel data sets, i.e., T>N. The (H_0) of the test assumes no causal mechanism between the variables and vice-versa for the (H_1). The findings of the estimation methods are presented in the next section.

III Empirical Results

Long-Run Estimates Results

The outcome for the LR estimates using P-DOLS method between disaggregated States' development expenditure and EG is depicted in Table 1. For the panel of HYS, results for Model - I, which showed the effect of the components of the SSE on EG, demonstrated that a one per cent rise in PC real S_ESA expenditure results in a 0.46 % rise in PC real NSDP. This result is significant at a one per cent level. Similarly, for the LYS panel, results showed that a one per cent rise in PC real S_ESA expenditure results in a 0.36 per cent rise in PC real NSDP. This result is significant at a five per cent level and supports the arguments of Saad and Kalakech (2009), where they found a direct relationship between education expenditure and EG. The result also demonstrated that a one per cent rise in PC real S_MPH expenditure results in a 0.29 per cent rise in PC real NSDP. This result is significant at a five per cent level for the HYS panel. The results are consistent with the findings of Piabuo and Tieguhong (2017), which also showed a positive association between healthcare expenditure and EG. However, it is positive but insignificant in the case of the LYS panel. For the HYS and LYS panels, PC real S_HOU expenditures are significant at 10 per cent, which is 0.06 per cent and 0.04 per cent, respectively. The PC real S_WEL expenditure is negative and insignificant for both the panels of the States. The last variable of the Model – I shows that a one per cent rise in PC real S_SSW expenditure results in a 0.17 per

cent rise in PC real NSDP. This result is significant at a five per cent level for the HYS panel. Similarly, for the LYS panel, it results in a 0.18 per cent rise in PC real NSDP at a one per cent significance level. The results are supported by the findings of Demiral and Alper (2016), who found the positive impact of security welfare expenditure on EG.

The impact of the components of the ESE on EG is given in Model - II. In the HYS panel, a one per cent rise in PC real E_AAA expenditure results in a 0.52 per cent rise in PC real NSDP. This result is significant at a one per cent level and consistent with the arguments of Dkhar and Kumar (2018), where a positive relation is found between agriculture expenditure and EG. However, it is positive but insignificant in the LYS panel. The results confirm the findings of Ebong (2016), wherein a negative correlation is found between agriculture expenditure and EG. The PC real E_IFC expenditure is negative and insignificant in both the States' panels. The results are inconsistent with the results of Fan and Savedoff (2014). A one per cent rise in PC real E_IM expenditure results in a 0.16 per cent rise in PC real NSDP for the HYS panel. This result is significant at a 10 per cent level. However, it is negative and insignificant in the LYS panel. In the case of PC real E_TC expenditure, the States' panels are significant at a one per cent and five per cent significance level, which is 0.58 per cent and 0.21 per cent, respectively, for the States panel. These results confirmed the findings of Norman, Richard,, Ismael (2012), which found a positive association between transport and communications expenditure and EG. The last variable of Model - II, PC real E_GES expenditure, is negative and insignificant in the HYS panel. However, for the LYS panel, it is significant at a one per cent level of significance, which is 0.30 per cent.

Table 1: Results of Panel DOLS

Dependent: lnNSDP	High-Income States		Low-Income States	
	Model - I	Model - II	Model - I	Model - II
lnS_ESA	0.4628 *	--	0.3568 **	--
lnS_MPH	0.2947 **	--	0.0003	--
lnS_HOU	0.0625 ***	--	0.0390 ***	--
lnS_WEL	(-)0.1095	--	(-)0.0494	--
lnS_SSW	0.1657 **	--	0.1782 *	--
lnE_AAA	--	0.5157 *	--	0.1434
lnE_IFC	--	(-)0.0479	--	(-)0.0117
lnE_IM	--	0.1600 ***	--	(-)0.0301
lnE_TC	--	0.5803 *	--	0.2101 **
lnE_GES	--	(-)0.0022	--	0.3030 *

Notes: *, **, and *** represent significance at the one per cent, five per cent, and 10 per cent levels, respectively.
Source: The authors' calculation based on the RBI database.

Short-Run Estimates Results

Table 2 shows the panel causality test result for disaggregated development expenditure and EG. In the SR, both panels have a unidirectional relationship from EG to the PC real S_ESA expenditure. The result confirmed the findings of Tang (2010). On the other hand, PC real S_HOU and S_SSW expenditures have a bi-directional causal relationship with the PC real NSDP for both the States' panels. The PC real S_MPH expenditure has a bi-directional relationship for the HYS panel. However, it is unidirectional in the case of the LYS panel. These findings supported the findings of Ye and Zhang (2018), where a one-way relationship is found between healthcare expenditure and EG. The PC real S_WEL expenditure is unidirectional in the case of HYS; however, it is bi-directional for the LYS panel. There is a unidirectional relationship from the PC real NSDP to the PC real E_AAA, E_IFC, and E_IM for the HYS panel. The results support Dkhar & Kumar (2018) findings. However, these relationships are bidirectional for the LYS panel. The PC real E_TC expenditure has a bi-causal relationship in both the States' panels. In comparison, there is a unidirectional causal relationship from EG to the PC real E_GES expenditure in both the States' panels.

Table 2: Results of (D-H) Panel Causality Test

Causality and Direction	High-Income States			
	$\overline{W}$	$\bar{Z}$	*p*-value	Relationship
lnS_ESA → lnNSDP	1.2325	0.465	0.642	Uni-causal
lnNSDP → lnS_ESA	7.264 *	12.528	0.000	
lnS_MPH → lnNSDP	3.6992 *	5.3984	0.000	Bi-causal
lnNSDP → lnS_MPH	8.1322 *	14.2644	0.000	
lnS_HOU → lnNSDP	2.2347 **	2.4694	0.0135	Bi-causal
lnNSDP → lnS_HOU	5.0072 *	8.0145	0.000	
lnS_WEL → lnNSDP	1.4100	0.8201	0.4122	Uni-causal
lnNSDP → lnS_WEL	8.6298 *	15.2595	0.000	
lnS_SSW → lnNSDP	3.8177 **	2.5706	0.0102	Bi-causal
lnNSDP → lnS_SSW	11.428 *	20.856	0.000	
lnE_AAA → lnNSDP	1.6128	1.2256	0.2204	Uni-causal
lnNSDP → lnE_AAA	8.8522 *	15.7044	0.000	
lnE_IFC → lnNSDP	1.3223	0.6446	0.5192	Uni-causal
lnNSDP → lnE_IFC	2.9359 *	3.8718	0.000	
lnE_IM → lnNSDP	1.2949	0.5898	0.5553	Uni-causal
lnNSDP → lnE_IM	4.6657 *	7.3315	0.000	
lnE_TC → lnNSDP	5.0024 *	8.0048	0.000	Bi-causal
lnNSDP → lnE_TC	3.5173 *	5.0347	0.000	
lnE_GES → lnNSDP	1.6182	1.2364	0.2163	Uni-causal
lnNSDP → lnE_GES	17.0384 *	32.0767	0.000	

Contd…

Table 2: Results of (D-H) Panel Causality Test

Causality and Direction	High-Income States			
	$\bar{W}$	$\bar{Z}$	*p*-value	Relationship
lnS_ESA → lnNSDP	0.9435	(-)0.0978	0.9221	Uni-causal
lnNSDP → lnS_ESA	8.4591 *	12.9196	0.000	
lnS_MPH → lnNSDP	0.4084	(-)1.0247	0.306	Uni-causal
lnNSDP → lnS_MPH	6.439 *	9.4206	0.000	
lnS_HOU → lnNSDP	4.2388 *	2.742	0.006	Bi-causal
lnNSDP → lnS_HOU	6.5491 *	9.6113	0.000	
lnS_WEL → lnNSDP	8.3002 *	7.7161	0.000	Bi-causal
lnNSDP → lnS_WEL	3.8289 *	4.8997	0.000	
lnS_SSW → lnNSDP	3.7885 *	4.8298	0.000	Bi-causal
lnNSDP → lnS_SSW	5.3683 *	7.5662	0.000	
lnE_AAA → lnNSDP	4.933 *	3.5921	0.000	Bi-causal
lnNSDP → lnE_AAA	6.1119 *	8.854	0.000	
lnE_IFC → lnNSDP	6.7966 *	5.8746	0.000	Bi-causal
lnNSDP → lnE_IFC	35.0597 *	16.5706	0.000	
lnE_IM → lnNSDP	2.3615 **	2.3582	0.0184	Bi-causal
lnNSDP → lnE_IM	2.1754 **	2.0359	0.0418	
lnE_TC → lnNSDP	7.4572 *	6.6837	0.000	Bi-causal
lnNSDP → lnE_TC	3.2615 *	3.9171	0.000	
lnE_GES → lnNSDP	1.8517	1.4753	0.1401	Uni-causal
lnNSDP → lnE_GES	5.0668 *	7.0438	0.000	

Notes: *, **, and *** represent significance at the one per cent, five per cent, and 10 per cent levels, respectively.
Source: The authors' calculation based on the RBI database.

IV Discussion and Policy Implications

Components of Social Services Expenditure: SR and LR Relationship

The average percent share of S_ESA expenditure is highest in the total SSE, irrespective of the income level of the States. However, the SR estimator shows that the PC real S_ESA expenditure in the SR does not impact the EG of either of the States' panels. One plausible explanation may be that the gestation period of returns from education, sports, and art & culture is long. It is supported by our LR estimators' results, which depict a positive significant impact of PC real S_ESA expenditure on PC real NSDP for both the States' panels. It is noteworthy that the HYS are drawing more economic benefit from this expenditure than the LYS. Considering the LR significant impact, the results suggest that the State governments, irrespective of their income level, should continue spending a

substantial amount on education, sports, art, and culture - the crucial human capital development factors.

Followed by S_ESA expenditure, S_MPH expenditure has the highest average percent share in the total SSE, irrespective of the income level of the States. However, the results show that PC real S_MPH expenditure has a significant impact on the PC real NSDP both in the SR and LR only for HYS. The results of the study recommend that LYS should monitor their expenditure carefully on the medical and public health infrastructure and also the public healthcare providers. This could accelerate the EG of the States in the LR by enhancing labour productivity and their quality of work because a healthy mind resides in a healthy body.

The average percent share of S_HOU expenditure in total SSE is the lowest among the selected five SSE components in the total SSE, irrespective of the State's panel. However, the analysis showed that PC real S_HOU expenditure impacts the EG both in the SR and LR, irrespective of the income level of the States. This study result indicates the governments under both income panels should continue spending on housing development, keeping in view the contribution of S_HOU expenditure to the output level of the States out of least expenditure.

The results of the Granger Causality test revealed that PC real S_WEL expenditure impacts the PC real NSDP of LYS only in the SR. However, this expenditure impedes the EG of both the States' panels in the LR. It highlights an urgent need for the State governments to re-strategise their S_WEL expenditure and closely monitor the fund release and execution for the socio-economic welfare of SC, ST, and OBC for overall economic progress, irrespective of their income level of the States.

The analysis showed that PC real S_SSW expenditure impacts the EG both in the SR and LR, irrespective of the income level of the States. It is noteworthy that the LYS panel is drawing more economic benefit from this expenditure than HYS. This study result indicates the governments under both income panels should continue spending on social security and welfare, keeping in view the considerable contribution of S_SSW expenditure to the EG of the States.

Components of Economic Services Expenditure: SR and LR Relationship

The average percent share of E_AAA expenditure is significant in the total SSE, irrespective of the income level of the States. The results of SR estimates show that E_AAA expenditure significantly impacts the EG of LYS only. However, the LR results of E_AAA expenditure showed that it has a significant economic benefit on the EG of the HYS only. One of the plausible reasons may be a better implementation of technical know-how by the HYS in the agricultural field, which government officials impart for the better health and productivity of the soil. Being

dependent more relatively on the primary sector, the LYS should rely more on modern rather than traditional farming.

The expenditure on E_IFC has the highest average percent share in the total ESE in both the States' panels. This expenditure only impacts the LYS panel in the SR. However, the study found that in the LR, the E_IFC expenditure has a negative impact on the EG of both HYS and LYS panels. Hence, both the income level State governments should re-strategise the spending on the E_IFC, which has contributed to negative or impeded EG.

The expenditure on E_IM has the lowest average percent share in the total ESE, irrespective of the income level of the States. The results of SR estimates show that E_IM expenditure significantly impacts EG of LYS only. However, the LR results of E_IM expenditure showed that it has a significant economic benefit on the EG of the HYS only. Hence, the LYS governments should re-strategise these expenditures to improve their impact on the EG.

The expenditure on E_TC has both SR and LR impacts on the EG of both of the States' panels. These results highlight the importance and need for connectivity by raising transport and communications expenditure for the EG of States and the nation. Therefore, both the income-level States should continue focusing on building and maintaining the transport and communications infrastructure.

V Conclusion

The development expenditure is more than 61 per cent of the total States' expenditure compared to the non-development and other expenditures (RBI, 2023). The present article focuses on examining the effect of disaggregated development expenditure on EG for the fourteen major NSC sub-nationals of India for the period of thirty-one years from 1990-1991 to 2020-2021. Development expenditures are analysed under social and economic services expenditures for a comprehensive understanding. Similarly, the selected sub-nationals are categorised into HYS and LYS panels with respect to India's PC income during the study period. The SR and LR association between EG and the components of States' SSE and ESE are measured using the Dumitrescu and Hurlin (DH) Granger Causality test and the Panel Dynamic Ordinary Least Square technique, respectively. The overall results using Panel DOLS show that, in general, the ESE contributes relatively more than the SSE and helps generate more economic output in the HYS. Specifically, the expenditures on S_MPH, E_AAA, and E_IM have a significant impact only on the HYS and bring huge differences between the income levels of the two States' panels during the study period. Hence, the States under the LYS panel need to re-strategise and formulate spending policies more mindfully towards these particular expenditures to raise the economic prosperity of the States and could also help in achieving the Sustainable Development Goals by 2030.

Endnotes

1. According to the Government Financial Statistics database of the IMF, the functional classification of government expenditure is based on the functions of the expenditure, i.e., social services, economic services, general services, and others. The present study focuses on the social services and economic services expenditures which are the components of the development expenditure.
2. Unlike Special Category (SC) States, NSC States do not receive exceptionally generous grants from the Union government due to social, economic, and geographical backwardness.
3. The Social services expenditure is the sub-component of development expenditure and has sub-categories: Education, Sports, Art and Culture, Medical and Public Health, Family Welfare, Water supply and Sanitation, Housing, Urban Development, Welfare of SC's, ST's, OBC's, Labour & Labour welfare, Social and Security Welfare, Nutrition, Relief on account of natural calamities and Others.
4. The Economic services expenditure is also a sub-component of development expenditure and has sub-categories: Agriculture and Allied Activities, Rural Development, Special area programmes, Irrigation and Flood Control, Energy, Industry and Minerals, Transport and Communications, Science, Technology & Environment and General Economic Services.
5. The fourteen major States of India taken for the study are Haryana (HR), Maharashtra (MH), Punjab (PB), Karnataka (KA), Kerala (KL), Tamil Nadu (TN), Gujarat (GJ), Andhra Pradesh (AP), Rajasthan (RJ), West Bengal (WB), Orisha (OR), Madhya Pradesh (MP), Uttar Pradesh (UP), Bihar (BR).
6. During the period of study, the average income of the high-income States, i.e., HR, MH, PB, KA, KL, TN, GJ, and AP, is more than the country's per capita income, and vice-versa for the case of low-income States named BR, UP, MP, OR, WB, and RJ.
7. Total here refers to the aggregate of revenue and capital account expenditures.
8. The excluded social services expenditures are Family Welfare, Water Supply and Sanitation, Urban Development, and Others. Similarly, excluded economic services expenditures are Rural development, Special Area Programmes, Energy, Science, Technology and Environment. These variables have been missing for most of the sample States for many years.

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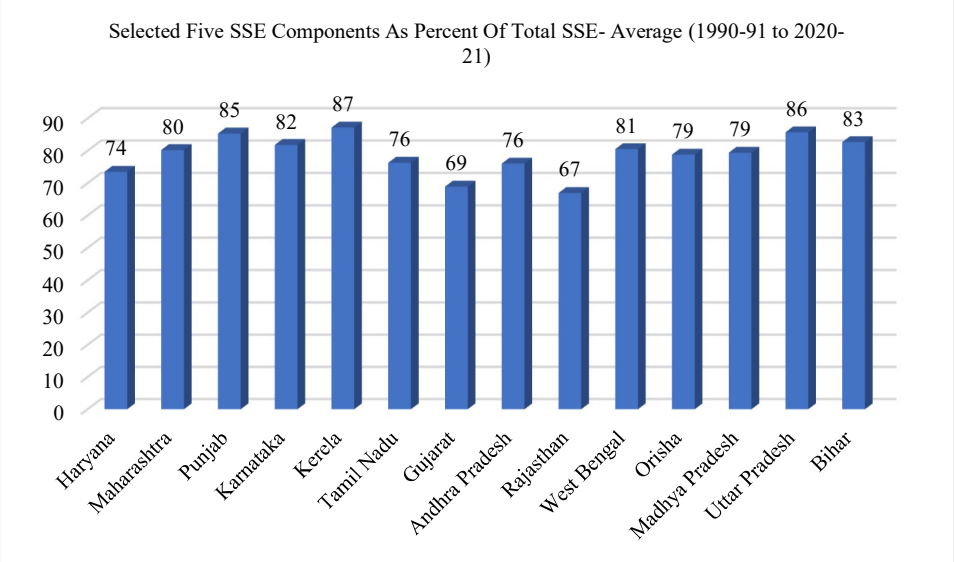
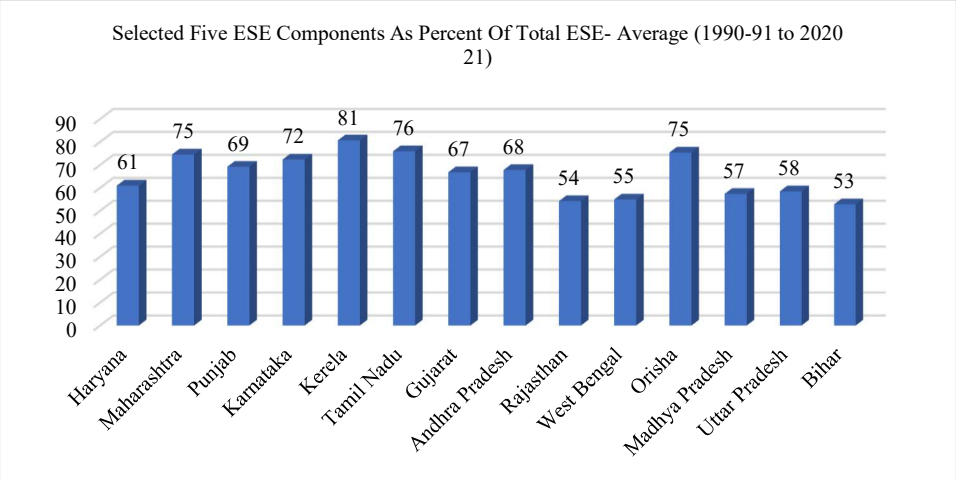
Appendix

Appendix A: Average Per cent Share of Selected Five SSE Components in Total SSE (1990-91 to 2020-21)



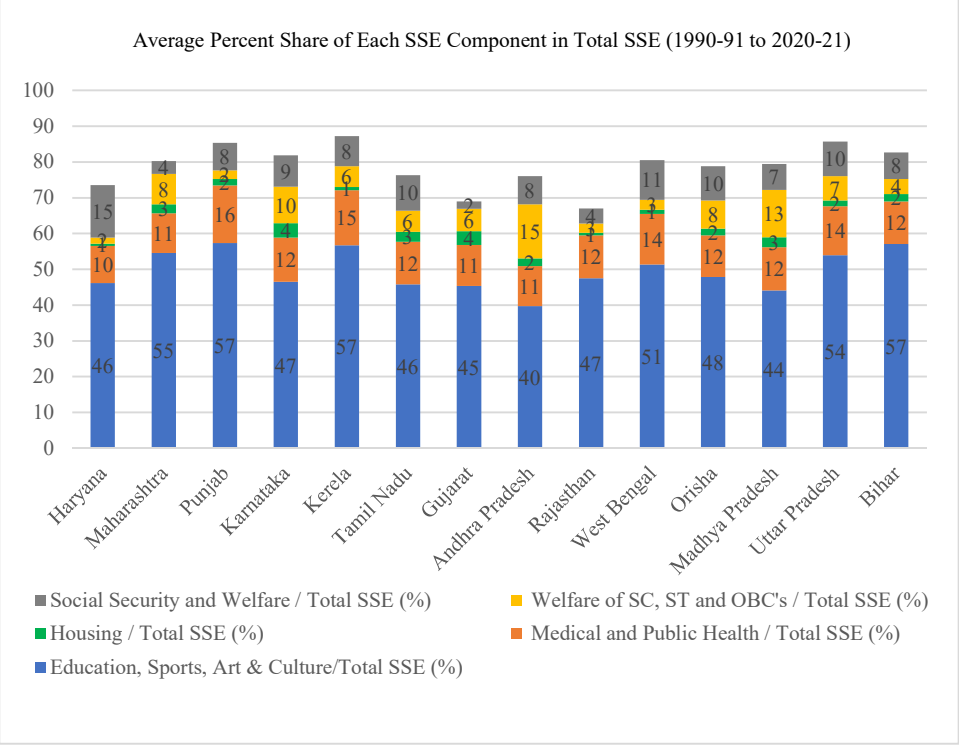
Source: The authors' calculation based on the RBI database.

Appendix B: Average Per cent Share of Selected Five ESE Components in Total ESE (1990-91 to 2020-21)



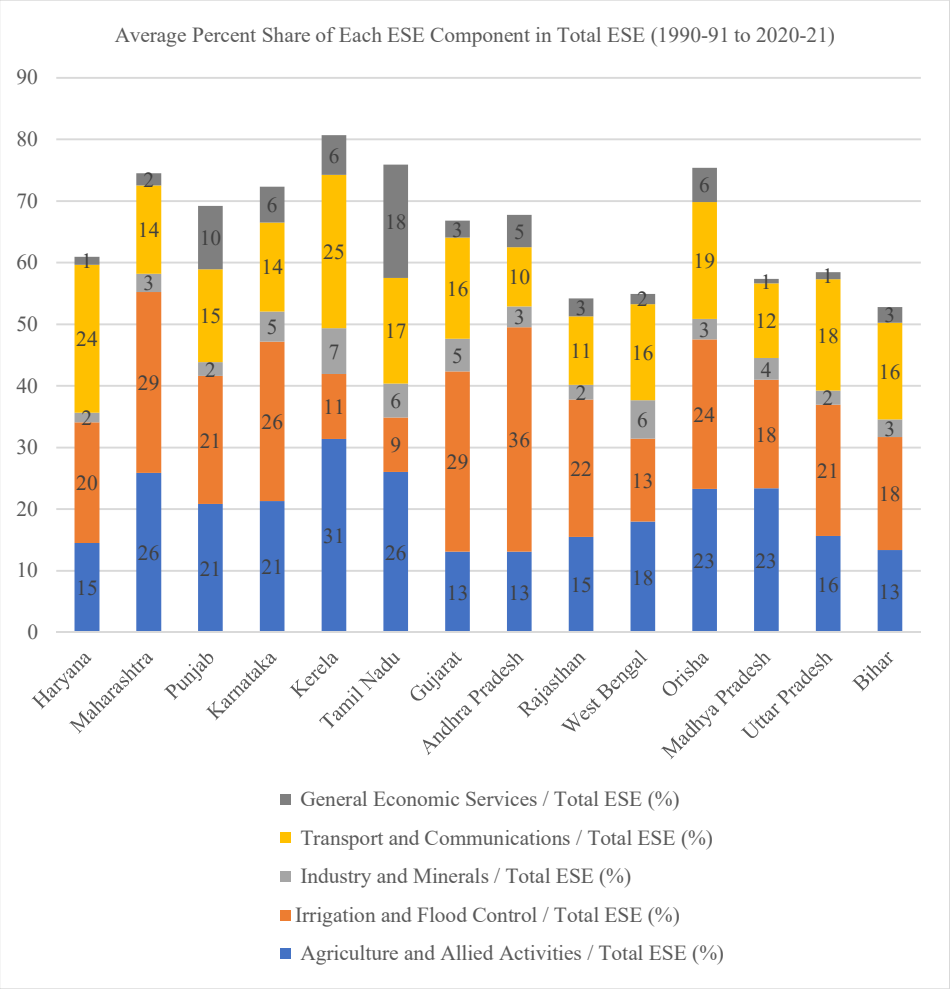
Source: The authors' calculation based on the RBI database.

Appendix C: Average Per cent Share of Each SSE Component in Total SSE (1990-91 to 2020-21)



Source: The authors' calculation based on the RBI database.

Appendix D: Average Per cent Share of Each ESE Component in Total ESE (1990-91 to 2020-21)



Source: The authors' calculation based on the RBI database.

Appendix E: Summary Statistics Results

The summary statistics for both the States' panels showed high accuracy as the average values are within the minimum and maximum range. The standard deviation is also within the acceptable range, wherein lower values indicate values in the dataset scattered closer to its mean. On the contrary, higher values of standard deviation indicate values are scattered farther from the mean.

Results of Summary Statistics

Variables	lnNSDP	lnS_ESA	lnS_MPH	lnS_HOU	lnS_WEL	lnS_SSW
High-Income States						
Mean	11.07	7.40	6.02	4.05	5.22	5.35
Median	11.01	7.34	5.92	3.99	5.08	5.22
Min	10.07	6.53	5.26	(-)0.08	2.78	3.09
Max	12.04	8.30	7.31	6.25	7.93	7.95
Std. Dev.	0.50	0.45	0.50	1.06	1.01	1.05
Skewness	0.12	0.15	0.51	(-)0.23	0.11	0.23
Kurtosis	1.91	1.82	2.16	3.25	2.54	2.28
Observation	248	248	248	248	248	248
Low-Income States						
Mean	10.31	6.98	5.58	2.97	4.69	4.98
Median	10.26	6.88	5.51	3.014	4.78	4.79
Min	9.13	6.25	4.54	(-)1.47	2.92	3.10
Max	11.24	8.08	7.05	6.59	6.29	7.19
Std. Dev.	0.49	0.45	0.50	1.49	0.79	1.04
Skewness	(-)0.11	0.46	0.62	(-)0.40	(-)0.06	0.18
Kurtosis	2.55	2.17	3.07	3.42	1.98	1.90
Observation	186	186	186	186	186	186

Variables	lnE_AAA	lnE_IFC	lnE_IM	lnE_TC	lnE_GES
High-Income States					
Mean	6.78	6.35	4.56	6.15	4.80
Median	6.72	6.48	4.67	6.15	4.88
Min	(-)0.00	4.56	1.90	4.74	2.34
Max	8.14	8.42	6.70	7.31	6.92
Std. Dev.	0.61	0.76	0.80	0.65	1.08
Skewness	(-)5.44	(-)0.17	(-)0.50	(-)0.12	(-)0.18
Kurtosis	63.11	3.01	3.30	1.93	2.30
Observation	248	248	248	248	248
Low-Income States					
Mean	5.66	5.69	3.84	5.48	3.42
Median	5.59	5.71	3.88	5.39	3.19
Min	4.18	4.19	1.82	3.41	2.06
Max	7.52	7.38	5.98	7.55	5.83
Std. Dev.	0.66	0.56	0.73	0.76	0.93
Skewness	0.44	0.16	0.03	0.31	0.83
Kurtosis	3.02	3.28	3.04	2.95	2.65
Observation	186	186	186	186	186

Source: The authors' calculation based on the RBI database.

Appendix F: Cross-Section Dependency Test Results

The outcome rejects the null hypothesis and endorses that the selected variables, i.e., lnNSDP, lnS_ESA, lnS_MPH, lnS_HOU, lnS_WEL, lnS_SSW, lnE_AAA, lnE_IFC, lnE_IM, lnE_TC, and lnE_GES are CSD for both the States' panels at a 1 % significance level. However, E_IFC expenditure is an exception. The CSD indicates that States are highly reliant on each other, and the shocks and stimulations easily disperse from one State to another.

Results of the CSD Test

Variable	High-Income States		Low-Income States	
	CD Stat.	*p*-value	CD Stat.	*p*-value
lnNSDP	29.27*	0.000	20.99*	0.000
lnS_ESA	28.38*	0.000	20.28*	0.000
lnS_MPH	27.43*	0.000	19.06*	0.000
lnS_HOU	11.44*	0.000	5.63*	0.000
lnS_WEL	25.32*	0.000	13.34*	0.000
lnS_SSW	26.80*	0.000	19.56*	0.000
lnE_AAA	20.39*	0.000	15.84*	0.000
lnE_IFC	4.37*	0.000	1.57	0.116
lnE_IM	13.77*	0.000	5.68*	0.000
lnE_TC	16.80*	0.000	17.99*	0.000
lnE_GES	10.78*	0.000	15.56*	0.000

Note: * represents significance level at the one per cent.
Source: The authors' calculation based on the RBI database.

Appendix G: Slope Heterogeneity (S-H) Test Results

The outcome of the S-H test rejects the null hypothesis at a one per cent level of significance and concludes that heterogeneity is present in both the models and States' panels. Thus, one should proceed with the second-generation rather than the first-generation panel techniques for a robust result.

Results of the S-H Test

Models	Statistic	High-Income States	Low-Income States
		Value	Value
I	Delta_tilda	7.708 *	7.819 *
	Adjusted Delta_tilda	8.761 *	8.887 *
II	Delta_tilda	11.143 *	5.618 *
	Adjusted Delta_tilda	12.664 *	6.385 *

Notes: * represents significance level at the one per cent level.
Source: The authors' calculation based on the RBI database.

Delta_tilda and Adjusted Delta_tilda represent the 'simple' and 'mean-variance bias adjusted' slope homogeneity tests, respectively.

Appendix H- Panel Integration/ Unit Root Tests Results

Once the selected variables' properties, CSD and SH, were confirmed, the analysis proceeded to check the order of integration of all the variables. The results of the second generation integration tests, i.e., CADF and CIPS, confirmed that all the variables are stationary either at level, i.e., I (0), or the first difference, i.e., I (1), for both the categories of the States. It also ensured that no variable selected for the study is stationary at the second difference, i.e., I (2), which is a mandatory condition to proceed with analysis for the selected variables.

Results of Second-Generation Integration/Unit Root Test

Variables	High-Income States		Low-Income States	
	I (0)	I (1)	I (0)	I (1)
Cross-Sectionally Augmented Dickey-Fuller (CADF)				
lnNSDP	(-)2.862 **	--	(-)2.600	(-)4.082 **
lnS_ESA	(-)2.065	(-)4.105 **	(-)2.605	(-)4.348 **
lnS_MPH	(-)2.732	(-)4.602 **	(-)2.568	(-)3.831 **
lnS_HOU	(-)2.459	(-)4.809 **	(-)2.289	(-)3.977 **
lnS_WEL	(-)3.133 **	--	(-)3.392 **	--
lnS_SSW	(-)2.875 **	--	(-)2.364	(-)4.041 **
lnE_AAA	(-)2.513	(-)4.863 **	(-)2.600	(-)3.923 **
lnE_IFC	(-)2.243	(-)3.903 **	(-)2.547	(-)3.571 **
lnE_IM	(-)2.975 **	--	(-)3.389 **	--
lnE_TC	(-)2.914 **	--	(-)3.137 **	--
lnE_GES	(-)3.375 **	--	(-)2.947 **	--
Cross-Sectionally Augmented IPS (CIPS)				
lnNSDP	(-)2.886 **	--	(-)3.303 **	--
lnS_ESA	(-)2.277	(-)5.379 **	(-)3.063 **	--
lnS_MPH	(-)2.861 **	--	(-)3.009 **	--
lnS_HOU	(-)3.185 **	--	(-)2.667	(-)5.719 **
lnS_WEL	(-)3.221 **	--	(-)3.680 **	--
lnS_SSW	(-)3.055 **	--	(-)2.640	(-)5.345 **
lnE_AAA	(-)3.302 **	--	(-)3.672 **	--
lnE_IFC	(-)2.879 **	--	(-)2.715	(-)5.112 **
lnE_IM	(-)3.457 **	--	(-)3.469 **	--
lnE_TC	(-)3.369 **	--	(-)3.202 **	--
lnE_GES	(-)3.653 **	--	(-)3.216 **	--

Notes: ** represents significance at the five per cent. A constant and trend is included in the Pesaran (2007) tests. The results are reported at lag one at Schwartz Bayesian Information Criterion (SBIC).

Source: The authors' calculation based on the RBI database.

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Understanding Spatial Inequalities in South Indian Cities: Exploring Residential Segregation Based on Caste

Neeha Susan Jacob

This paper examines how caste plays a role in generating and perpetuating spatial inequalities in 108 Class-1 towns in five south Indian states. It explores this through the phenomenon of caste-based residential segregation, viewed in two dimensions: the degree of unevenness and exposure. While both dimensions independently contribute to segregation, the combined effects exacerbate the phenomenon. Caste remains a significant factor in spatial segregation in urban India. Larger cities exhibit lower segregation levels compared to smaller ones. However, a clear correlation between population size and residential segregation was not observed. Higher degrees of evenness in the distribution in a city across communities do not ensure there will be more interaction and lesser segregation, and vice versa.

Keywords: Residential segregation, Spatial inequality, Caste, Urbanisation, South India

I Introduction

Economic literature often explores inequalities in various economic and social characteristics, mostly temporally. Viewing inequalities from a spatial perspective emerged in the late 1950s after Kuznets' (1955) and Myrdal's (1957) discussions on regional inequalities of development. While the economic attributes like income or industrialisation were observed spatially in the following years, there was scant literature in Economics viewing inequalities spatially based on non-economic components. In addition, most of these studies were across nation states, rather than sub-national or local spaces. In this regard, the paper attempts to view spatial inequality in class-1 cities in South India based on the social identity of caste. We use residential segregation as an indicator to understand the degree of spatial inequality in these cities.

Residential segregation is a kind of spatial inequality. Brun (1994) defines it as the ''spatial distinctions among the residential zones of population groups living in the same [urban] agglomeration''. Where people live shape their social interactions and social networks, health outcomes and sense of self (Park 1925).

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Residential segregation creates a neighbourhood-based social identity which can lead to discrimination (Ismail 2006). Many empirical studies across the world show that residential segregation can systematically undermine the social and economic well-being of the segregated, as well as lack access to their social capital (Massey and Denton 1988, Fischer, Stockmayer, Stiles, and Hout 2004, Lehman-Frisch 2011, Scarpa 2015). It can reinforce the social stratification like caste hierarchies that existed in the society (Sidhwani 2015).

Urban sociological theories claim that as society and people acclimate to developing city life, earlier forms of social organization fade away (Park 1937, Wirth 1938). The existing social structures in Indian cities were supposed to erode with increasing urbanization in the country (Rao 1974). Ambedkar (1948) encouraged the movement of the Scheduled Caste (SC) population from villages to cities, where there would be less communalism and segregation. However, literature identifies that caste and similar social structures continue to prevail even in urban India impacting schooling decisions, educational outcomes, likelihood of securing jobs and choice of residential locations (Munshi and Rosenzeveig 2006, Thorat and Newman 2010, Vithayathil and Singh 2012).

Building on existing literature on these ideas, the paper tries to look at how the identity of caste plays a role in creating residentially segregated spaces, in cities of South India. While most studies focused only on the 'evenness' dimension of residential segregation, we also explore the dimension of 'exposure' across social groups in this paper. In addition, the paper also attempts to provide insights into how this segregation varies with differing scales of urbanisation across the cities under study.

II Review of Literature

The preferences of people for deciding the location of their residences are heterogeneous in nature. There are socio-economic, socio-cultural and socio-demographic factors that play a dominant role in housing decision-making (Petkar and Macwan 2013, De and Vupru 2017). Sometimes these decisions could be forced due to institutional guidelines or policies (Pearce 1979). The decision of residential location not only determines the connection between the household with the rest of the urban environment and their neighbourhood, but also influences the household's perceived well-being (Bhat and Guo 2007).

Most literature on residential segregation and spatial inequalities in the West were on segregation based on ethnicity or colour, especially on segregation in African American ghettos and its consequences on the socio-economic lives of people living in these areas (Massey and Denton 1988, Woo 2012, Duncan and Duncan 1957). Similar studies in the Indian context pointed out the spatial nature of segregation in cities, particularly faced by the SCs. Most of these were city specific and mostly anthropological. Mehta (1969) identifies the patterns of spatial segregation based on caste and religion in Pune, mentioning that it is similar to the centralisation of the elite population in other countries in the 1960s. Dupont (2004)

observes that the spatial segregation in Delhi follows the processes of social selection discussed by the Chicago Urban Ecologists (Burgess 1928). The studies on people working in Faisalabad Stone Quarries in the outskirts of Delhi (Mendelsohn and Vicziany 1998) and the manual scavengers in Uttar Pradesh (Singh and Ziyauddin 2009) are two case studies indicating spatial segregation based on caste and related occupational identities. Gupta, Arnold, and Lhungdim (2009) adds that historically disadvantaged castes live disproportionately in the slums. Sapovadia (2007) talks about the ghettoization in Ahmedabad of the Harijan population. Clarke and Landes (2010) identified that Brahmins clustered around the same postal address in Kolkata, while Vanneman, Noon, Sen, Desai, and Shariff (2006) indicates the clustering of residences based on caste and naming of streets based on the occupations attached to each caste. Vithayathil and Singh (2012) compared the degree of caste-based residential segregation across seven major cities in India for the first time. Using data from the Census of India, they found that caste-based segregation in severe in India's bigger cities. Singh, Vithayathil, and Pradhan (2019) observes a very slight improvement in the levels of segregation over time between 2001 and 2011 in many Indian cities. They also compare the degrees of segregation across city-sizes. Bharathi, Malghan, and Rahman (2018, 2023) and Bharathi, Malghan, Mishra, and Rahman (2020, 2021) moves further ahead exploring residential segregation at the neighbourhood level, arguing that the ward-level macro analysis of segregation can hide the realities within the wards in a city. Adukia, Asher, Jha, Novosad, and Tan (2022) also used Enumeration Block (EB) level analysis in rural and urban regions in India to identify that most regressive segregation is observed at the neighbourhood level in cities. Most of these Indian empirical studies were on caste-based residential segregation.

A few recent studies of this kind looked beyond the dimension of caste. Bhan and Jana (2015) and Sidhwani (2015) looks at the spatial unevenness in Bangalore based on socio-economic status, wealth, housing, asset ownership and provision of services. Susewind (2017) observes residential segregation based on religion in 11 cities in India, using the electoral data, identifying the levels of segregation of Muslims in these cities. Vakulabharabanam and Motilal (2023) explored residential segregation based on caste (including Other Backward Castes) and religion through primary surveys in Hyderabad and Mumbai. Using a socio-spatial methodology, they added that there is lesser segregation at higher spatial scales.

This paper adds to the literature on caste-based residential segregation in India, viewing from the dimensions of evenness and exposure – across states and city sizes.

III Data and Method

This paper looks into spatial segregation[2] in class-1 cities of five south Indian states. There are 110 class-1 towns in these five states, having a population above one lakh as per the 2011 Census[3]. The state of Telangana was not formed in 2011

and the cities currently in Telangana were part of Andhra Pradesh in the past Census. But in this study, we include them under Telangana. While all of these cities are statutory towns, one is a Township (Neyveli, Tamil Nadu) and another one is a Cantonment Board (Secunderabad, Telangana). We are considering only Municipal Corporations, Municipalities and City Municipal Councils for our study and therefore the total number of towns analysed in this paper reduces to 108. The analysis is limited to quantitative treatment of data, using the secondary data from the Census of India, 2011. The study uses ward level population data of Scheduled Castes (SC), Scheduled Tribes (ST) and others from the Primary Census Abstract (PCA), Census of India 2011.

Spatial segregation is a multidimensional phenomenon and need to be viewed in more than one perspective (Massey and Denton 1988). Most of the existing studies uses only the popular dimension of unevenness. However, an even distribution of a social group in a city does not ensure their better interactions with other social groups in the city. Hence, using only the dimension of evenness might not capture the actual degree of residential segregation in a city. Massey and Denton (1988) suggested five dimensions to capture RS in a city – evenness, exposure, centralisation, clustering and concentration. Due to the lack of availability of secondary data for analysing all five measures, we restrict our analysis to two dimensions – evenness and exposure. Correspondingly, we use two measures of segregation – Dissimilarity Index (DI) and Exposure Index (EI). The two indices are highly correlated but they are conceptually different viewing spatial segregation in different dimensions. Both indices range from zero to one. When multiplied by 100, the index values yield the corresponding percentage values.

DI, a widely used index in literature, measures the degree of evenness (or unevenness) in the distribution of different social groups in an area unit in a city. DI between two groups X and Y is calculated as:

$$\mathrm{DI} = \frac{1}{2}\varepsilon\left|\frac{X_i}{X} - \frac{Y_i}{Y}\right|$$

where, X_i is the ward population of group X in ward i and Y_i is the ward population of the group Y in ward i. X is the total population of group X in the city and Y is the total population of group Y in the city. DI of a social group gives the proportion of population that is unevenly distributed in a city which needs to be relocated to attain an even spatial distribution of that group in a city. Larger values of DI denotes greater degree of residential segregation in a city. There is spatial segregation in a social group if they are unevenly distributed (Blau 1977 as cited in Massey and Denton1988).

EI measures the degree of interaction between these groups. While evenness captures the departure from an ideal pattern of distribution, exposure measure tries to see how people in a social group experience the segregation (Fosset and Warren 2005). EI between groups X and Y is calculated as:

$$EI = \sum \left[\frac{X_i}{X}\right] * \left[\frac{Y_i}{T_i}\right]$$

where T_i is the total population (of X+Y) in ward i. X_i, X and Y_i are similar to the variables stated above in the case of DI. Even if a group is evenly distributed in a city, there could be a lesser proportion of either of the groups in the city resulting in a lesser degree of interaction between them (Blau 1977). Larger values of EI indicate greater interaction across groups, which can bring down the levels of residential segregation in the city.

Since both the indices are bivariate and measured relative to another group, the paper uses a two-group classification for the analysis - SC and non-SC. Following the conventional practice in similar studies, the SC group includes both SC and ST population. Non-SC group includes all the other population groups.

IV Class-1 Cities of South India: Context

While all cities under the class-I category have a population of more than one lakh, there are wide variations within their population sizes, ranging from one lakh to more than a million. The Census of India 2001 classified the Class-1 cities further into seven sub-categories (M1 – M7) (Table 1). Figure 1 shows the distribution of the 108 class-1 towns in our study across these subcategories. Around half of the cities (47 per cent) in the study had less than 2 lakhs population size as per 2011 Census. Another 47 per cent were in M2-M4. There were only 7 per cent of the class-1 cities in our study having more than a million population. The largest cities in these five states were Hyderabad and Bangalore – both in M7 – followed by Chennai falling in the M6 subcategory.

Table 1: Sub-Categorisation of Class-1 Towns according to Population Size, Census of India 2001

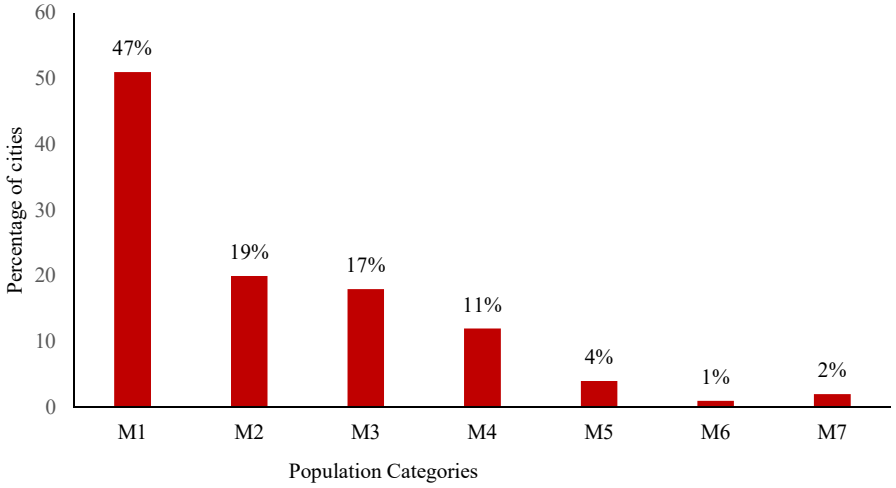
Categories	Population Size	Number of towns in the study under each category
M1	1,00,000 – 1,99,999	51
M2	2,00,000 – 2,99,999	20
M3	3,00,000 – 4, 99, 999	18
M4	5,00,000 – 9,99,999	12
M5	10,00,000 – 19,99,999	4
M6	20,00,000 – 49,99,999	1
M7	>50,00,000	2

Source: Census of India 2001.

Table 2 show the number of class-1 cities among the five south Indian states. Tamil Nadu and Andhra Pradesh had 31 cities in Class-1, with more than one lakh population[4], followed by Karnataka (26 cities). However, around half of these cities were M1 cities with less than two lakhs population (Table 2 and Figure 2).

Telangana also had more than half of its class-1 cities belonging to M1 category. Though Kerala had less than ten cities, only one-third (33 per cent) of them were in M1.

Figure 1: Percentage Distribution of the Cities in the Study in Subcategories M1-M7



Source: Author's own calculation using Census of India 2011, based on Table 1.

All states had most of their remaining cities in the mid-sized categories – in M2.M3 and M4. While Karnataka had 50 per cent of its cities in one of these three sub-categories, Andhra Pradesh (42 per cent), Tamil Nadu (43 per cent) and Telangana (42 per cent) had lesser then 45 per cent of their cities having a population size between two lakhs and ten lakhs. All the remaining cities of Kerala (67 per cent) that did not belong to M1 were middle-sized class-1 towns belonging to M2, M3 and M4. Kerala did not have any towns with population above 10 lakhs in the Census of India 2011.

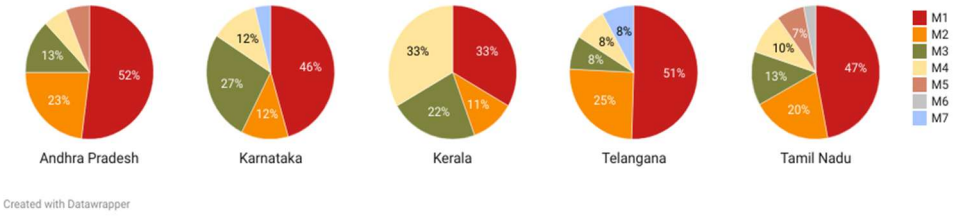
Table 2: State Wise Number of Cities and Their Sub-Categorisation

States	M1	M2	M3	M4	M5	M6	M7	Total cities in the state
Andhra Pradesh	16	7	4	2	2			31
Karnataka	12	3	7	3			1	26
Kerala	3	1	2	3				9
Telangana	6	3	1	1			1	12
Tamil Nadu	14	6	4	3	2	1		30
Total cities in each subcategory	51	20	18	12	4	1	2	108

Source: Calculated from Primary Census Abstract, Census of India 2011.

All other south Indian states had million plus cities having more than 10 lakhs population, with Hyderabad in Telangana and Bangalore in Karnataka with more than 50 lakhs population. It is in such a context of class-1 cities of diverse population sizes that we try to capture the degrees of residential segregation due to caste.

Figure 2: Proportion of Class-1 Cities in Sub Categories – State Wise



Source: Author's own calculation using data from Primary Census Abstracts, Census of India, 2011.

V Measuring Unevenness and Interaction Indices in South Indian Cities: Observations

DI values portray the unevenness in the spatial distribution of SC population compared to that of the non-SC population in the cities under study. However, a higher evenness does not ensure a better interaction. The values of EI indicate that the degree of interaction between SC to non-SC population in a city. A higher interaction implies the likelihood of sharing a closer neighbourhood, whether evenly distributed or not. The two dimensions together helps in capturing the degree of residential segregation in the cities. Lesser DI values and higher EI values imply less spatial segregation.

Most cities in the study have their caste based DI between 20 per cent and 60 per cent indicating varying degrees of unevenness in the distribution of SC and non-SC population across cities. A redistribution of residential locations of 20 to 60 per cent of SCs across wards within the cities is required to attain an even spatial distribution of the two population groups. Figure 3 (a) shows the distribution of cities according to their DI values. Most number of cities under study (around 40 per cent – 43 out of 108 cities) have a DI of 30 to 40 per cent.

The EI values indicate higher interaction among the SC and non-SC population in most of the cities. Figure 3 (b) shows the distribution of EI values in the 108 cities under study. Most cities in the study – 86 of 108 – have their exposure index values above 70 per cent. The EI values also range widely – the highest degree of interaction is in Alappuzha, Kerala (95.21 per cent) while the least is experienced in Robertsonpet in Karnataka (32.4 per cent).

For further analysis, we group the DI and EI values into seven different categories, as shown Table 3. Cities in D1 have the highest DI values indicating greater unevenness and therefore higher degrees of segregation. Those in D7 have

the least DI values and therefore least unevenness. Similarly, cities in E1 have greater interaction compared to other cities and the degree of interaction falls as we move from D2 to D7. A higher level of interaction also denotes less spatial segregation.

Figure 3: Histogram of DI and EI Values among the 108 Cities in the Study

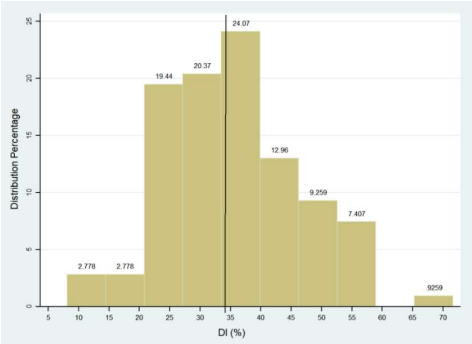


Fig 3 (a)

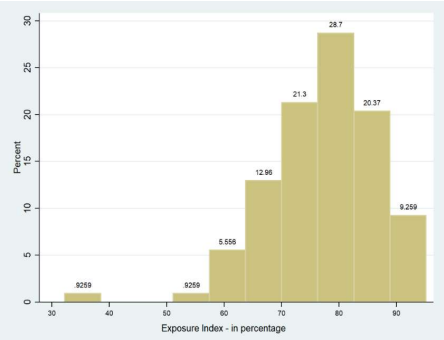


Fig. 3 (b)

Source: Author's own calculation using data from the Primary Census Abstracts, Census of India, 2011.

Table 3: Categorisation of DI and EI Values into Groups

Categorisation of DI values		Categorisation of EI values	
DI values	*Group*	*EI values*	*Group*
Greater than 70%	D1	Greater than 90%	E1
60% - 70%	D2	80% - 90%	E2
50% - 60%	D3	70% - 80%	E3
40% - 50%	D4	60% - 70%	E4
30% - 40%	D5	50% - 60%	E5
20% - 30%	D6	40% - 50%	E6
Less than 20%	D7	Less than 40%	E7

Source: Author's own categorisation using data from the Primary Census Abstracts, Census of India, 2011.

State-Wise Patterns of DI and EI

There are eleven cities in groups D1, D2, and D3 where more than 50 per cent of the SC population is unevenly distributed, demonstrating higher levels of residential segregation within these communities. Tamil Nadu and Andhra Pradesh were the only two states having cities with DI values greater than 50 per cent. Nine out of the eleven cities with high DIs were in Tamil Nadu and the remaining two were in Andhra Pradesh. Rajapalayam in Tamil Nadu had the largest DI value – the only city falling in D1 – where 72 per cent of the SC population were unevenly distributed. Only 14 per cent of the total population in Rajapalayam were SCs and when 72 per cent of them are unevenly distributed,

there is a high a probability of them being confined to certain pockets within the city contributing to severe degrees of caste-based residential segregation. Table 4 gives the state-wise number of cities in each DI classes.

Table 4: State-Wise Number of Towns in Each DI Category

States	D1	D2	D3	D4	D5	D6	D7	Total
Andhra Pradesh	0	0	2	10	13	6	0	31
Karnataka	0	0	0	4	15	7	0	26
Kerala	0	0	0	0	2	7	0	9
Telangana	0	0	0	0	2	6	4	12
Tamil Nadu	1	0	8	8	11	1	1	30
Total	1	0	10	22	43	27	5	108

Source: Author's own calculation.

All states had most of their cities in D4, D5, and D6, with many of them having DIs between 30 and 40 per cent. All cities in Kerala, except Palakkad, were in D6 – having DIs lesser than or equal to 30 per cent. Overall, a greater unevenness in the distribution of SC population in the cities in urban Tamil Nadu indicate higher degrees of caste-based residential segregation in most cities of the states. While the cities in Andhra Pradesh and Karnataka follow Tamil Nadu, this unevenness is lesser in the cities of Kerala and Telangana.

Among the states, the case of Tamil Nadu is interesting since its cities had varying degrees of unevenness. In Singh, Vithayathil, and Pradhan (2019) also, Tamil Nadu emerges as the state with the highest degree of unevenness as per the 2011 Census. While in Rajapalayam the DI value was 72 per cent, in Avadi, it was only 14 per cent. This could be due to the large number of Class-1 towns in Tamil Nadu, but Andhra Pradesh also had similar number of cities and they do not show such a spread. Therefore, it raises a question whether such DI values is due to varying overall population size or the proportion of SC population in these cities. This also gains relevance since the DI calculation is using the population sizes of groups of communities. This is discussed in detail in section V, sub section 2.

In the case of interaction index, six cities in the study had their EI values above 90 per cent indicating greater degree of interaction between the two groups (Table 5). Among them, five cities were from Kerala and the sixth one is Mangalore in Karnataka. The four remaining cities in Kerala also had high degree of interaction above 85 per cent. Thus, Kerala has the least experience in spatial segregation when viewed through the measure of interaction between SC and non-SC population.

While in the other states, most cities had higher interaction among SC and non-SC population, Tamil Nadu had two cities – Ambur and Rajapalayam – in E5 having comparatively lesser degree of interaction between the two groups. Karnataka was the only state where one city had its EI value were below 50 per cent. In Robertsonpet in Karnataka, more than half of the SC population – 69 per

cent of the SC population in the city – had any interaction or exposure to the non-SC population in the city. The experience of spatial segregation reflected through EI was severe in Robertsonpet.

Table 5: State-Wise Number of Cities in Each EI Category

States	E1	E2	E3	E4	E5	E6	E7	Total
Andhra Pradesh	0	10	14	7	0	0	0	31
Karnataka	1	6	12	6	0	0	1	26
Kerala	5	4	0	0	0	0	0	9
Telangana	0	8	3	1	0	0	0	12
Tamil Nadu	0	11	12	5	2	0	0	30
Total	6	39	41	19	2	0	1	108

Source: Author's own calculation.

Population-Wise DI and EI Analysis

There was no clear correlation observed between DI values and percentage of SC and ST population in a city (r = -0.03); nor between DI and the total city population size (r = -0.18). Table 6 shows the number of towns in different DI groups (as in Table 3) mapped against their population size sub-categories (as in Table 1). Here, we observe that most of the highly populated cities (groups M5 and above having more than 10 lakhs population) had DI values lesser than 50 per cent. In contrast, the cities that had high levels of unevenness (higher DI belonging to classes D1, D2 or D3) were the smaller class-1 cities having less than five lakhs population. Seven out of 11 cities that had DI values above 50 per cent had less than two lakhs population, belonging to the M1 category. With increasing population size of the city, the degree of unevenness is showing a decreasing pattern, despite lacking a strong correlation coefficient.

Table 6: Population Size Based Mapping of DI Values

Class-1 Sub categories	Dissimilarity Index groups						
	D1	D2	D3	D4	D5	D6	D7
M1	1	0	6	13	20	9	4
M2	0	0	2	5	9	2	2
M3	0	0	2	2	8	6	0
M4	0	0	0	1	3	7	1
M5	0	0	0	1	2	1	0
M6	0	0	0	0	1	0	0
M7	0	0	0	0	0	2	0

Source: Author's own calculation using data from the Primary Census Abstracts, Census of India, 2011.

On the contrary, no such patterns were observed between EI and population sizes of the cities (Table 7). The correlation co-efficient between the two variables was also weak – only around 13 per cent (r = -0.13). There was a high degree of interaction between SC and non-SC groups irrespective of the city population sizes. All million plus cities in groups M5 and above had high EI values above 70 per cent. However, none of them had an EI greater than 90 per cent. The cities in E1 having more than 90 per cent level of exposure between the two social groups were smaller cities having a population less than six lakhs, except Kozhikode in Kerala where the total population was around 6.3 Lakhs. There were only three cities with EI values less than 60 per cent which were also in M1.

Table 7: Population Size Based Mapping of EI Values

Population sub-categories	Exposure Index groups						
	E1	E2	E3	E4	E5	E6	E7
M1	2	17	20	11	2	0	1
M2	1	6	9	4	0	0	0
M3	1	8	6	3	0	0	0
M4	2	5	4	1	0	0	0
M5	0	2	2	0	0	0	0
M6	0	0	1	0	0	0	0
M7	0	2	0	0	0	0	0

Source: Author's own calculation.

Converging the Two Dimensions of Evenness and Exposure

Combining the two dimensions of segregation we look at the patterns and levels of residential segregation based on caste in the cities under study. Table 8 shows a joint distribution of the two indices taken together. Corresponding to the categories of DI and EI values in Table 3, in Table 8 we add verbal gradients combining these categories. A high DI combined with the least EI imply greater residential segregation of SC group in the city. Similarly, a high EI combined with the least DI indicate more congregation and heterogeneity in the city.

Table 8: Number of Cities Under Combined Gradients of DI and EI

Levels and categories of DI →			Dissimilarity Index			
			High	Medium	Low	Least
Levels and categories of EI ↓			D1, D2	D3, D4	D5, D6	D7
Exposure Index	High	E1, E2	0	7	35	3
	Medium	E3, E4	0	23	35	2
	Low	E5, E6	1	1	0	0
	Least	E7	0	1	0	0

Source: Author's own calculation.

Once combined, we find that the degrees of segregation are lesser in most of the cities. Seventy out of the 108 cities – 65 per cent – had a low DI along with a high or medium EI. Rajapalayam in Tamil Nadu emerges as the city with the highest residential segregation for the SCs with high unevenness and the least exposure. Ambur in Tamil Nadu and Robertsonpet in Karnataka also had relatively higher degrees of segregation with medium DI and lesser interaction across the two population groups. There were five cities showing better congregation between SCs and non-SCs with the least DI and high/medium EI. Out of this, four cities were from Telangana and one is Avadi in Tamil Nadu. While Kerala had all of its cities with the highest degrees of exposure between SCs and non-SCs (as discussed in Section V sub section 2), their DIs are in D5 or D6 and therefore do not fall in the least segregated bucket.

VI Discussion and Limitations

The identity of caste generates and perpetuates not only social inequalities, but also spatial inequalities resulting in urban residential segregation. The unevenness in the distribution of the SC population, as well as their varying degrees of interaction with the non-SC population, reflects such caste-based inequalities. There were no cities in the study with no degrees caste-based residential segregation. Either of the two dimensions contributed to spatial segregation in the cities. While in some cities like Rajapalayam, both unevenness and lack of exposure contributed to exacerbating spatial segregation in the city, in other cities there were varying degrees of such segregation. A high exposure between SC and non-SC groups do not imply an even distribution of the two population groups in a city, and vice versa. None of the cities in this study had low/least unevenness having a low EI.

Exploring the unevenness in the distribution of SC and non-SC population in the cities, we find DI falling with increasing population size. There is lesser unevenness among the million plus cities. Higher degrees of DI were observed in the cities below two lakhs population. This goes in line with Desai and Dubey (2011) who argue that caste inequalities were higher in larger villages and smaller towns[5] in India. However, this observation cannot substantiate the expectations of increasing urbanisation reducing caste-based inequalities in city spaces since we have not analysed the segregation measures temporally. Bharathi, *et. al.* (2021) and Singh, Vithayathil and Pradhan (2019) do not find variations in the degree of segregation with increasing population growth in cities.

Comparing DI in diverse city sizes does not come without limitations. Singh, Vithayathil and Pradhan (2019) avoided a comparison of DI across cities of classes I to VI due to the difference in median ward sizes across cities, which could affect the DI calculation. Acknowledging this issue, we do the comparison since we restrict the analysis to Class-1 category. Nevertheless, since there is no upper threshold for this category it results in stark differences in city sizes as mentioned

in Section III. We continue the comparison within class-1 to throw light on the differences in population within the class-1 category.

This range in the diversity of the population sizes among the class-1 towns in urban India raises questions on the generalisation of findings and subsequent policy formulations. Most studies on residential segregation have focused only on the larger cities, or pockets within larger cities. What we observe for a larger class-1 town might not apply for a smaller class-1 town due to the stark difference in their population sizes. In addition, since population is the main constituent in defining urbanisation in India, such differences in city sizes provokes the need to question categorisations and the need to look beyond population sizes in defining urbanisation.

The other major limitation in the study is capturing residential segregation using ward level data. The use of neighbourhood data (Enumeration Block level) gives a more detailed picture of residential segregation in the cities, revealing the degrees of segregation within the wards which gets obscured when we use ward-level data in studying residential segregation (Bharathi, *et. al.* 2018, 2020, Adukia *et. al.* 2022).

VII Conclusions and the Way Forward

The paper tried to understand residential segregation in 108 class-1 towns of south India based on caste. The study demonstrates that residential segregation can be viewed in two dimensions: unevenness and exposure. It suggests that either of these dimensions can independently contribute to understanding residential segregation in a city, but their combined effect exacerbates the phenomenon further. Among the 108 cities studied in the paper, larger million plus cities had lower levels of residential segregation than the smaller ones having less than two lakhs population.

Caste is the only identity used as a basis of residential segregation in this paper. Various other identities, like religion and linguistic identities, contribute to residential segregation in cities. There are anthropological and qualitative studies that have examined spatial segregation based on these identities (Susewind 2017). But there is a lack of secondary data at the ward level for many of these identities, which limits our studies to caste based residential segregation. Similarly, there are other dimensions of segregation discussed by Massey and Denton (1988). However, most data for calculating these indices are unavailable in Indian databases, limiting studies to more than these two dimensions.

It also becomes important to examine the microdata at the enumeration block level to gain a deeper understanding of residential segregation at the neighbourhood level within a city (as done for Bangalore by Bharathi, *et. al.* 2018, 2020, 2021, 2022). Due to the vast number of EBs across the 108 class-1 cities in India, we were unable to include it in this paper, but it will be discussed in upcoming papers in this area.

Endnotes

1. They identify distance to work location as a major factor in deciding where to locate their residences.
2. The terms residential segregation and spatial segregation is used interchangeably in this paper
3. We include the population of the outgrowth in a city in calculating its total population. This is because the Census considers outgrowths as wards in these cities.
4. Since we did not include Neyveli in our study, the number of class-1 towns in Tamil Nadu is 30 in Table 2. Similarly, since Secunderabad is not included in this study, Telangana has one city less in Table 2.
5. Smaller towns referred in Desai and Dubey (2005) were those in classes below Class-1. However, in this paper the comparison is within class-1.

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An Analysis of the Labour Market Outcomes of Muslim Women in India

Zeeshan Mir and Tasleem Araf Cash

Using NSS employment and unemployment surveys and PLFS data for 2017-2018, this study investigates the labour market outcomes of women from the Muslim community in India. The paper examines the LFPR, WPR, and unemployment rate among Muslim women in India. The paper shows that the labour force participation rate and the worker population ratio of Muslim women are low and have been declining, while their unemployment rate has been going up. Using the Multinomial probit Model, the paper shows how education, social belonging, age, household characteristics and location play significant roles in determining the labour market outcomes of Muslim women in India. The paper argues for strengthening measures to create decent employment avenues for women from the marginalized Muslim community. The paper also argues for improving the education and skill levels of Muslim women so as to bridge the gap between their educational attainment and the job requirements of the Indian labour market.

Keywords: Employment, Muslim, FLFPR, WPR, Unemployment rate

I Introduction

Women make half of the population in India but are underrepresented in politics, governance, and economics of the country (Saeed 2001). Therefore, women's productive employment in an economy becomes imperative to reduce the level of poverty and inequality. Women play an important role in the household economy by contributing to household income (Rushidan, *et. al*. 2013). Women's care work inside the household does not get accounted in the national statistics and also does not help these women become financially independent, because it is in its very nature unpaid, thus restraining their capabilities and stopping them from realizing their full potential. In the Indian labour market only 17 per cent of the women participate (Periodic labour force survey 2017-2018). Women's workforce participation is also low and only 14.8 per cent of Indian women are employed as per PLFS 2017-18 in comparison to men whose WPR is 51.67 per cent as per PLFS 2017-18. The unemployment rate for women is also at a percentage of 5.6 per cent (PLFS 2017-18). Women's decision to participate in the labour market is

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influenced by various factors interacting with each other in a very complex manner. Social, religious, cultural and economic factors all influence the labour market decisions of a woman (Jayachandran 2021). The cultural burden of household work, the primary responsibility of childcare, other caregiving responsibilities inhibit the participation of women in the labour market (Deshpande, *et. al.* 2001). Other than this gender-based discrimination, fear of sexual harassment at the workplace, and personal safety also act as constraints on the labour force participation of women (Boker 2017). It is in this light that this study aims to look at the labour market outcomes of Muslim women because Muslims form one of the marginalised communities in the Indian labour market (Khan 2019). The literature in the field suggests that very few studies have been carried out to investigate the socio-economic conditions of Muslim women in India. Their low participation in the labour market is attributed to the attitudinal bias prevailing among Muslims. The status of women in this community therefore, merits an in-depth analysis. There needs to be a better understanding of various socio-economic factors other than cultural and religious norms that determine the labour market activity of Muslim women.

II Review of Literature

In this section we discuss some of the studies that have been carried out to study the labour market participation of women in the labour market. A study conducted by Saeed (2001) finds that Muslims in India form one of the marginalized communities. They also happen to be one of the lowest paying communities in the Indian labour market. Another study conducted by Sarikhani (2008) finds that Muslims exhibit low worker population ratio and Muslim women have low participation rates in the labour market. Foroutan (2008) using the Australian Census data finds that low labour force participation of Muslim women is because of the seclusion norms prevailing among Muslims. The study also finds that Muslim women are discriminated in the labour market due to significant cultural differences, religion and adopting certain religious symbols like headscarf, veil, etc. Verick (2014) finds that labour force participation of women in developing countries exhibits a U-shaped relationship with the economic growth of the country. Das, *et. al.* (2015) find that labour force participation of women has a negative relationship with the income of the household. The study also finds that marriage has a negative impact on the labour force participation rate of women. Another study conducted by Klasen and Peters (2015) find that labour force participation rate of women is negatively related to the educational status of the household head and income status of the household. Ghai (2018) concludes that culture and social norms do influence the labour market participation of women in Indian labour market. Also, the study finds that better education increases the employability of women thus, increasing their labour force participation. Fletcher, *et. al.* (2018) find that on the supply side, societal norms and the primary responsibility of housework and caregiving hinder the participation of women in

the labour market. While, on the demand side of the labour market, legal constraints and economic constraints limit their capacity to work. Islam, *et. al.* (2014) find that majority of Muslim women belong to economically downtrodden and socially marginalized sections of the society. The study concludes that in rural areas, the labour force participation rate of Muslim women is low due to their little engagement in agriculture. Jayachandran (2020) finds that, there is an increase in female employment with an increase in the education level of women because higher education fetches good jobs and there is less stigma attached to service sector jobs that higher education enables women to take up. The study also finds that with an increase in the household income, females drop out of the labour market because of child rearing and other household responsibilities. As per the study, the practice of purdah system and seclusion norms prevailing among certain communities like Muslims and upper-class Hindus also acts as a deterrent to the labour force participation of women. Deshpande and Singh (2021) concludes that that the labour force participation of women has been declining in India due to the demand -side constraints like the unavailability of jobs and women have little attachment with the labour market. The study finds that women move in and out of the labour market multiple times because they are unable to find continuous employment. It becomes evident from the literature that labour market outcomes of Muslim women have not been studied thoroughly. Therefore, this study adds to the existing body of literature by studying different labour market outcomes if Muslim women and also investigating the determinants of their labour market outcomes.

III Data Sources and Methodology

This study uses the Employment Unemployment surveys 2004-2005 and 2011-2012, and the Periodic Labour Force Survey (PLFS) for 2017-2018. This study uses multinomial probit model to examine the determinants of labour market outcomes for Muslim women. Periodic Labour Force Survey data 2017-2018 have been analysed to study the labour market activity of Muslim women. The independent variable used in the model is Labour market activity of Muslim women (Employed, unemployed and inactive). The dependent variables used in the model are: Sector, Level of education, Marital status, Household size and Log MPCE (monthly per capita expenditure).

IV Empirical Analysis

Labour Force Participation Rate

In this section, we discuss the labour force participation rate of women and the various patterns associated with it.

Table 1: Labour Force Participation Rate of Muslim Women in Per cent

	2004-05	2011-12	2017-18
Muslim women	16.66	14.17	9.87

Source: Author's estimation based on the calculations of unit level data of NSS 61st,68th round and PLFS 2017-2018.

The labour force participation rate of Muslim women has declined from 16.6 per cent in 2004-2005 to 14.7 per cent in 2011-2012, and further to 9.87 per cent in 2017-2018. This decline has been in trend with the overall decline of LFPR among women in India. Chatterjee, *et. al.* (2018) find that the decline in female labour force participation of women is due to both demand and supply-side factors. On the demand side, very few jobs have been generated that can accommodate the skill sets possessed by Muslim women or women in general. Labour force participation of women in India has also declined due to the lack of jobs, stagnation of agriculture, lack of jobs outside the agricultural sector (Kannan, *et. al.* 2012). While on the supply side, culture, religion, caste, household wealth, education of spouse influences the participation of women in the labour market. The cultural norm of the purdah system and female seclusion prevailing among Muslims in India leads to their low labour force participation. (Sarkar, *et. al.* 2017). An increase in the household income and an increase in the educational attainments of the spouse lead to a decline in the labour force participation of women. However, contrary to the effects of educational attainments of the spouse, an increase in the educational attainments of a woman has no significant impact on her labour market decisions. It has been observed that the labour force participation of women and household income are negatively related, as the income of households increases, their chances of joining the labour market decreases (Sorsa, *et. al.* 2015). The norm that women should do the bulk of household work and provide childcare leaves fewer hours for work (Sayer 2005), and without a flexible work schedule and a constrained ability to leave home, women drop out of the labour force.

Table 2: Labour Force Participation Rate of Muslim Women for Rural and Urban Areas

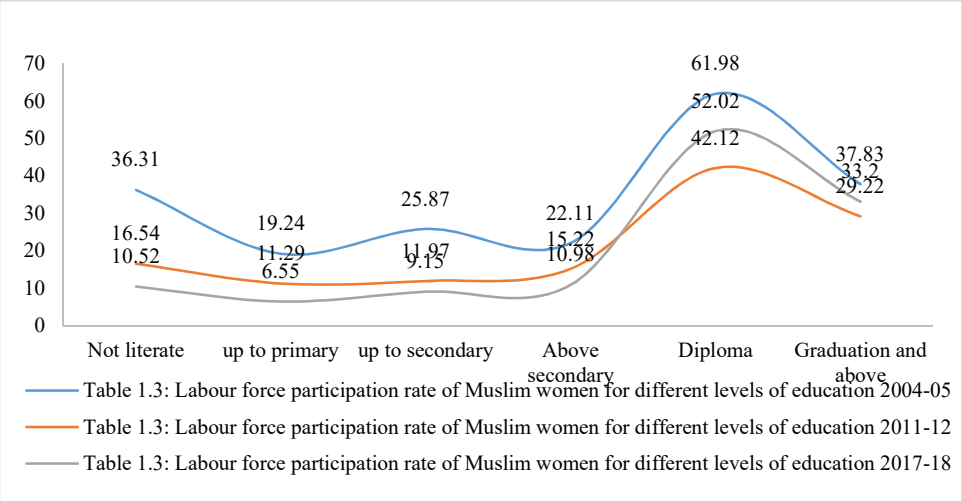
	2004-05	2011-12	2017-18
Rural	18.5	15.92	10.52
Urban	12.8	10.94	8.80

Source: Estimation based on calculations from 61st, 68th NSS unit level data and PLFS data for 2017-2018.

Labour force participation rate of Muslim women from rural and urban areas is depicted in table 2. It can be observed from the table that, LFPR of Muslim women has declined for both the rural and urban areas. However, the decline in LFPR is more in rural areas than it is in urban areas. LFPR of Muslim women has declined from 18.5 per cent in 2004-2005 to 15.92 per cent in 2011-2012 to 10.52

per cent in 2017-2018 in rural areas. In urban areas, it has declined from 12.8 per cent in 2004-2005 to 10.94 per cent in 2011-2012 to 8.8 per cent in 2017-2018. Women in rural areas exit the labour market with an increase in household income. Urban areas exhibit low LFPR for Muslim women because of underreporting of women's work in urban areas as Muslims are mostly engaged in self-employment enterprises where women's work is seen as part of the household chores (Saeed 2005). Women in the export sector have been employed as unskilled workers, with low wages and are predominantly self-employed in the manufacturing sector in subsidiary capacity (Sona Mitra 2003). Labour force participation rates of rural women are significantly higher than participation rates of urban women. The higher participation rate of rural women doesn't indicate their better well-being per se. It is many times distress-driven and does not indicate better employment prospectus in rural areas (Srivastava, *et. al.* 2009)

Figure 1: LFPR of Muslim Women for Different Levels of Education



Source: Estimation based on calculations from 61st, 68th NSS unit level data and PLFS data for 2017-2018.

Table 3: LFPR of Muslim women for different education levels

	2004-05	2011-12	2017-18
Not literate	36.31	16.54	10.52
upto primary	19.24	11.29	6.55
upto secondary	25.87	11.97	9.15
Above secondary	22.11	15.22	10.98
Diploma	61.98	42.12	52.02
Graduate and above	37.83	29.22	33.2

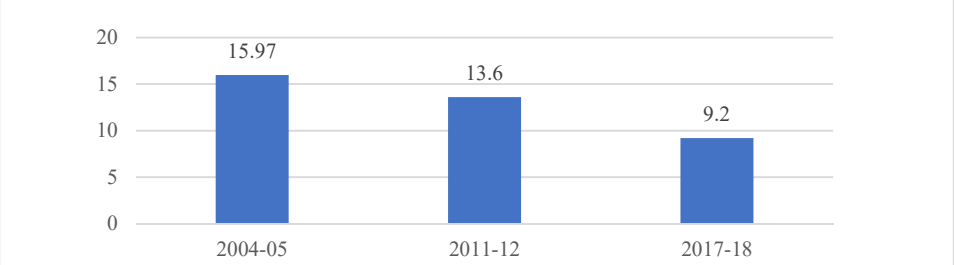
Source: Estimation based on calculations from 61st, 68th NSS unit level data and PLFS data for 2017-2018.

Figure 1 and table 3 offers insights of the labour market behaviour of Muslim women for different levels of education. Labour force participation has declined across all education levels for the years in consideration. However, one interesting aspect of LFPR among Muslim women is LFPR for different education levels exhibits a non-linear U-shaped (Non-linear) pattern. It is initially high for illiterate women due to their participation in subsistence activities. It can be observed from table 3 that labour force participation rate of women decreases with an increase in education from primary to secondary. It then increases with the level of education progressing from secondary to tertiary. This is because women with higher levels of education enter the labour market when they can afford to do so and once, their wages increase due to better employment outcomes for high education, they join the labour market. This can be understood in the context of an increase in growth of family income. At low levels of economic growth, there is little to no investment in education. Women join the labour force to support family income but as household income increases, women withdraw from the market. But at a higher level of education due to better employment prospects, they join the labour market. Chatterjee, *et. al.* (2018) in their study find that the initial decline in labour force participation is due to the increase in household income. Women with a higher level of education join the labour market for white-collar, well-paying jobs (Ghai 2018).

Worker Population Ratio of Muslim Women

In this section, we discuss the worker population ratio of Muslim women, various trends associated with it.

Figure 2: WPR of Muslim Women



Source: Estimation based on calculations from 61st, 68th NSS unit level data and PLFS data for 2017-2018.

Figure 2 illustrates that worker population ratio has shown a decline from 15.9 per cent in 2004-2005 to 13.6 per cent in 2011-12 and 9.2 per cent in 2017-2018. This decline mirrors the decline in LFPR of Muslim women and has been has been on account of women dropping out of the labour market due to various social, and cultural norms. (Jayachandran 2020) Another reason for this decline has been an increase in household income and a decline in the employment

opportunities for women with higher levels of education. The mechanization of agriculture which used to be labour-intensive and have now become more automated also explains this decline (Afridi, *et. al.* 2020). Srivastava, *et. al.* (2010) argue that employment opportunities have not grown in rural India, and this has also contributed to decline in the worker population ratio. Low demand for labour is also one of the reasons due to which the worker population ratio of Muslim women has declined in India.

Table 4: Worker Population Ratio of Muslim Women for Rural and Urban Areas

	2004-05	2011-12	2017-18
Rural	17.83	15.92	18.45
Urban	12.07	10.94	7.53

Source: Estimation based on calculations from 61st, 68th NSS unit level data and PLFS data for 2017-2018.

Worker population ratio of Muslim women from rural and urban areas is illustrated in table 4. It can be observed from the table 4 that WPR has declined for both rural and urban areas, but rural areas have a higher worker population in comparison to urban areas indicating a significant gap between the two. This is primarily due to the engagement of women in agricultural sector in the rural areas where women work for economic need in subsistence activities, to support family income, and the unavailability of such work in urban areas (Srivastava 2010). There has been a decline in the demand for labour in agriculture due to mechanisation of agriculture. In urban areas, the worker population ratio is less because Muslims are largely engaged in self-employment (SCR 2006) in urban areas. These self-employment avenues due to their informal nature consider women's work as a part of household chores. Thus, there is underreporting of women's work in these enterprises. The worker population ratio has also declined for urban areas from 12 per cent in 2004-2005 to 7.53 per cent in 2017-2018. Part of this decline is attributed to an increase in household income, unemployment affordability by these women, and the unavailability of jobs compatible with other care services that women provide (Deshpande, *et. al.* 2021).

Table 5: Worker Population Ratio of Muslim Women for Different Levels of Education

	2004-05	2011-12	2017-18
Not literate	19.75	16.34	10.48
Up to primary	10.78	11.16	6.39
Up to Secondary	13.45	10.76	8.41
Secondary and above	10.12	12.63	8.35
Diploma/Certificate course	44.43	35.14	30.08
Graduation and above	29.11	23.03	20.26

Source: Estimation based on calculations from 61st, 68th NSS unit level data and PLFS data for 2017-2018.

Worker population ratio of Muslim women for different levels of education is depicted in table 5 and it can be seen from the table that, WPR has also declined

for the period in consideration from 2004-2005 to 2017-2018 across all education levels and exhibits a U-shaped pattern for different educational categories as level of education progresses from primary to secondary to tertiary. Initially, Sharma, *et. al.* (2005) attribute this to the engagement of women in low-paying unskilled jobs that do not require education at low levels of income. There is a decline in female employment at higher levels of income due to an increase in household income. Women's work is governed by social norms and there is a stigma attached to women working outside. Therefore, as household income increases, the extra money that these working women bring home starts having diminishing returns and becomes less valuable. And dropping out of the labour market to avoid being stigmatized becomes affordable (Jayachandran 2020). Worker population ratio of women increases at higher levels of education due to better job prospectus and less stigma attached to the white-collar service jobs. Women also quit the labour force at the initial level of economic development due to the income effect and the norm of being primarily responsible for child-rearing (Jayachandran 2020). Women work in low-paying jobs at initial levels of development because these jobs require no education. With an increase in income of the spouse or any male family member, these women no longer need to work in low-paying unskilled jobs to provide for their families and unemployment becomes affordable. As the education level of these women increases and the opportunity cost of staying out of the labour market becomes high enough to offset the income effect generated due to growth in household income. These women join the labour market for better-paying jobs.

Unemployment Rate of Muslim Women in India

In this segment, we analyse the trends in the unemployment rate of Muslim Women in India:

Unemployment Rate of Muslim Women

Figure 3: UR of Muslim Women

Source: Estimation based on calculations from 61st, 68th NSS unit level data and PLFS data for 2017-2018.

Figure 3 illustrates the unemployment rate of Muslim women It can be observed from the figure that unemployment rate has slightly declined initially among Muslims from 4.13 per cent in 2004-2005 to 4.03 per cent in 2011-2012 but this trend has later reversed and shown an increase to 8.65 per cent in 2017-2018. Mitra (2003) attributes this increase in unemployment rate to the decline in employment opportunities post-liberalization. Export-oriented industries that were opened up after the liberalization policies during the '90s provided employment avenues to women (Sharma, *et. al.* 2005) due to which the unemployment rate declined slightly initially but later showed an increase as the export-oriented industries failed to expand and create more jobs for women (Klasen, *et. al.* 2015). Kanan, *et. al.* (2012) find that stagnation of agricultural sector and the unavailability of non-farm jobs has also led to an increase in unemployment among women. Muslim women exhibit higher unemployment rates because they perceive discrimination in the labour market because of their religious identity (Khan 2019). The unemployment rate has shot up to 8.65 per cent among Muslim women in PLFS 2017-2018. This increase is attributed to the economic shock that was created after the demonetization policy was announced by the Indian government in 2016 when 86 per cent of the cash circulating in the economy was declared illegal tender overnight. Since much of the economy in India is informal in nature and this informal sector is heavily dependent on cash. Once the cash was withdrawn, this sector witnessed a drastic setback (Deshpande 2021). Chodrow-Reich, *et. al.* (2020) find that demonetization led to a fall in the growth rate of GDP by 3 percentage points and due to this, employment fell by three percentage points. Muslims that are involved in the informal sector were hit hard due to this move. Women in the informal sector of the economy with no social security and safety net were the largest casualties of this move.

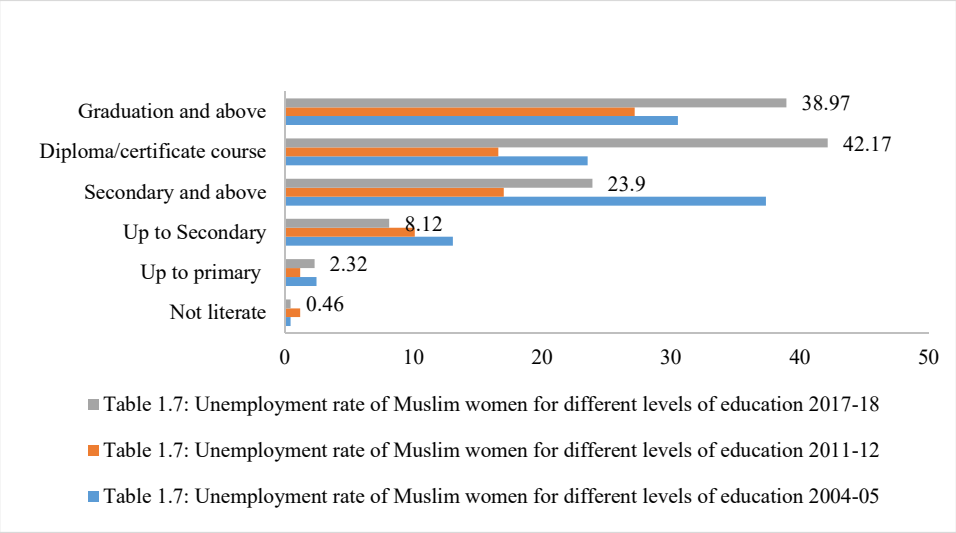
Table 6: Unemployment Rate of Muslim Women for Rural and Urban Areas

	2004-05	2011-12	2017-18
Rural	3.60	3.90	5.74
Urban	5.73	4.37	14.49

Source: Estimation based on calculations from 61st, 68th NSS unit level data and PLFS data for 2017-2018.

The unemployment rate of Muslim women for rural and urban sectors is given in table 6. It is evident from the table that, the unemployment rate has risen in both rural and urban areas, but this increase has been more in urban areas in the year 2017-2018 due to an increase in the overall unemployment rate that happened post demonetization in the informal sectors which rely heavily on cash (Chodrow-Reich, *et. al.* 2020). This decrease in labour force participation of Muslim women in urban areas should have meant lower rates of unemployment but the unemployment rate has shot up to 8.65 per cent for these women. This indicates that Muslim women are most vulnerable to economic shocks in the Indian labour market.

Figure 4: UR of Muslim Women for Different Levels of Education



Source: Estimation based on calculations from 61st, 68th NSS unit level data and PLFS data for 2017-2018.

Table 7: UR of Muslim Women for Different Education Levels

	2004-05	2011-12	2017-18
Not literate	0.45	1.21	0.46
Up to primary	2.46	1.19	2.32
Up to secondary	13.06	10.09	8.12
Secondary and above	37.37	17.00	23.90
Diploma	23.53	16.58	42.17
Graduate and above	30.54	27.17	38.97

Source: Estimation based on calculations from 61st, 68th NSS unit level data and PLFS data for 2017-2018.

The unemployment rate of Muslim women for different levels of education is depicted in figure 4 and table 7. It is evident from the figure that, for Muslim women for different levels of education, the unemployment rate has initially shown a decline from 2004-2005 to 2011-2012 for all levels of education. This may be due to the decline in labour force participation of these women from 16.6 per cent in 2004-2005 to 14.7 per cent in 2011-2012. The decline in labour force participation of Muslim women should have meant a lower unemployment rate but it has instead shown an increase in 2017-2018 despite a decline in labour force participation. The unemployment rate has shown an increase as the level of education increases from primary level to graduation and above. This indicates demand and supply mismatches in the labour market. Chowdhury (2014) finds that there is an incessant skill gap in the Indian labour market. The education system has failed to meet the requirements of the labour market in India. Skill sets exhibited by the people with a higher level of education are different from those

required by the labour market thus rendering them unemployable. The education system has failed to provide skills that can be employed in the labour market. World Bank Report (2006) points towards the high unemployment rate among the educated is an indication of the skill mismatch in the labour market.

Determinants of Labour Market Activity of Muslim Women

Variable Description

Table a1 gives the variable description of our model

Table a1: Variable Description for Estimating the Determinants of Labour Market Activity among Muslim Women

Variables	Description
Dependent variable	
Labour market outcome	=1 if unemployed = 2 if Inactive Employed= Reference
Explanatory Variables	
Regional characteristic	
Sector	= 1 if Urban = 0 otherwise Rural = Reference category
Individual Characteristics	
Level of Education	= 0 if illiterate Reference category = 1 if the level of education up to primary 0 otherwise = 1 if secondary 0 otherwise = 1 if higher secondary 0 otherwise = 1 if diploma/certificate course 0 otherwise = 1 if graduate 0 otherwise = 1 if postgraduate and above 0 otherwise
Marital Status	= 0 If never married = 1 if currently married 0 otherwise = 1 if divorced/Separated 0 otherwise = 1 if widowed 0 otherwise
Age	Age of the person in number
Household characteristics	
Household size	Number of persons in the household
Log MPCE	Monthly per capita expenditure

Discussion and Findings

In this section, we discuss the findings of our multinomial probit model.

Table 6: Marginal Effects for Multinomial Probit Model (PLFS 2017-2018)

Variables	Unemployed	Inactive	Employed
Sector, Reference category: Rural			
Urban	0.005 **	0.059 ***	-0.063 ***
	(0.002)	(0.005)	(0.005)
Education level, Reference: Illiterate			
Up to primary	0.007 ***	-0.038 ***	0.031 ***
	(0.002)	(0.006)	(0.006)
Up to secondary	0.020 ***	-0.052 ***	0.033 ***
	(0.002)	(0.006)	(0.005)
Higher secondary	0.057 ***	-0.119 ***	0.061 ***
	(0.006)	(0.011)	(0.010)
Diploma/Certificate course	0.244 ***	-0.494 ***	0.250 ***
	(0.037)	(0.045)	(0.043)
Graduate	0.142 ***	-0.301 ***	0.158 ***
	(0.011)	(0.016)	(0.015)
Postgraduate and above	0.161 ***	-0.566 ***	0.405 ***
	(0.019)	(0.026)	(0.027)
Marital status, Reference: Never married			
Currently married	-0.027 ***	0.031 ***	-0.003
	(0.003)	(0.007)	(0.007)
Widowed	-0.032 ***	0.009	0.023 *
	(0.005)	(0.013)	(0.012)
Divorced/ Separated	-0.015	-0.174 ***	0.189 ***
	(0.011)	(0.038)	(0.038)
Age	-0.000 ***	-0.001 ***	0.001 ***
	(0.000)	(0.000)	(0.000)
House Size	-0.001 *	0.008 ***	-0.007 ***
	(0.000)	(0.001)	(0.001)
MPC	-0.000	0.000 ***	-0.000 **
	(0.000)	(0.000)	(0.000)

Notes: Standard errors are given in parentheses *, ** and *** indicate statistical significance at the 10 per cent, five per cent and one per cent levels, respectively.

Source: Estimation based on calculations PLFS data for 2017-2018.

Sector: The coefficient of unemployment given in table I (Appendix), for urban Muslim women is both positive and significant indicating that urban Muslim women have more chances of staying unemployed and have lesser chances of finding employment. The marginal effect given in table 6 for employed is negative and significant indicating that urban Muslim females have 6.3 per cent lesser chances of being employed than rural Muslim women. This is because of the underreporting of women's work in home-based enterprises in urban areas and because work in rural areas is often distress driven where women work in

agricultural sector as casual labourer. The marginal effect given in table 6for inactive status is positive and significant indicating urban Muslim women are 5.9 per cent more likely to be inactive than rural Muslim women.

General Education: The coefficient of unemployment for all educational categories is positive and significant and increases in magnitude as the level of education progresses from primary level to post-graduation and above indicating educated Muslim women are more likely to be unemployed and have lesser chances of finding employment as jobs creation has failed to keep up with the increase in the level of education of Muslim women. The marginal effects given in table 6 show that Muslim women with a level of education up to the primary are 0.7 per cent more likely to be unemployed in comparison to illiterate Muslim women. Muslim women with an education level of post-graduation and above are 16.1 per cent more likely to be unemployed than those with no education again indicating the fact that job growth in the country has failed to keep up with growth in levels of education. Marginal effects for inactive status also indicate that women with a level of education up to primary are 3.8 per cent less likely to be inactive than illiterate Muslim women. The marginal effect for Muslim women with education level of post-graduation and above for the status inactive shows their probability of being inactive is 56.6 per cent less than those with no levels of education. This may be due to more educated women entering the labour market. The coefficients for inactivity status for all educational categories are negative and significant indicating educated Muslim women are less likely to be inactive. The marginal effects for the employed category of Muslim women with a level of education up to primary indicate that they are 3.1 per cent more likely to be employed than illiterate Muslim women. The marginal effect for the category employed show that Muslim women with education level of post-graduation 40.5 per cent more chances of finding employment than those with no education. This shows that educational attainment improves the chances of Muslim women finding employment.

Marital Status: The coefficient for unemployment among married Muslim women given in table I Appendix is negative and significant indicating that married Muslim women have lesser chances of staying unemployed and more chances of having a job because taking some financial responsibility becomes compulsory for married people (Bairagya 2018). Similarly, the coefficients for widowed and divorced women given in table I Appendix are also negative and significant indicating that widowed and divorced Muslim women have lesser chance of being unemployed because divorced and widowed women in absence of a male partner become the primary bread earners of their family and therefore have to take up work for financial support. The marginal effect for unemployment among currently married Muslim women given in table 6 shows that they are 2.7 per cent less likely to be unemployed than never-married Muslim women. The Marginal effects for unemployment among divorced and separated women given in table 6

are also negative and significant showing divorced Muslim women are 1.5 per cent less likely to be unemployed than never-married Muslim women and widowed Muslim women are 3.2 per cent less likely to be unemployed than never-married Muslim women because these women take up work for supporting their family. Table 7 shows that the coefficients for Inactive status among Muslim women with marital status as currently married and widowed is insignificant and for divorced/separated it is negative and significant indicating that divorced Muslim women have lesser chances of staying inactive again because these women have to join the labour market to shoulder financial responsibility. Marginal effects given in table 6 also indicate that divorced women are 17.4 per cent less likely to be inactive than never-married Muslim women.

Age: The coefficients for both unemployed and inactive status given in table I Appendix are negative and significant suggesting that younger Muslim women have more chances of being unemployed than older Muslim women. This is because of an increase in the enrollment ratio of young women in the country and because as people tend to age, they look for some kind of financial stability and move towards permanent settlement by starting up their own enterprises, working as self-employed own account workers or find some regular employment (Bairagya 2018). The marginal effect given in table 6 for both unemployed and inactive is also negative and significant indicating older Muslim women have lesser chances of staying unemployed and inactive than younger Muslim women. The marginal effect for employed given in table 6 is positive and significant which also indicates that Muslim women from older age groups have more chances of having a job than younger Muslim women.

Household Size: The coefficient for the inactive status of household size given in table I Appendix is positive and significant indicating that Muslim women from bigger households have more chances of staying inactive. This is due to the involvement of other family members in employment and also due to additional caregiving responsibilities of women at home which deter them from entering the labour force. The marginal effect for employed given in table 6 for Muslim women from bigger households is negative and significant. This indicates that Muslim women from bigger households are 0.7 per cent less likely to be employed than those from smaller households. The marginal effect for the inactive status given in table 5.3 for Muslim women from bigger households shows that these women have 0.8 per cent more chances of staying inactive than those from smaller households because women from bigger households have additional caregiving responsibilities and can afford unemployment because some other household member is engaged in the labour market.

Log MPCE: The coefficient associated with unemployment given in table I Appendix is insignificant and for inactive, it is positive and significant because Muslim women from households with more consumption expenditure have higher

chances of staying inactive because women from wealthier households can afford unemployment and not entering the labour market for financial support. The marginal effect given in table 6 for inactive status and employed also shows that women from wealthier households have more likelihood of staying inactive and unemployed than women from households with less monthly per capita expenditure.

Conclusion and Suggestions

Despite being the largest minority in India, Muslim women exhibit disproportionately high rates of unemployment. The high unemployment rate and low labour force participation rate among Muslim women are a major policy concern. To promote inclusive economic growth, Muslim women should be incentivised to join the labour market. Rapid employment creation for an increasingly large population is necessary to harness the demographic dividend and set the country on a path of inclusive growth. There is also a mismatch between the skills imparted at educational institutes and the necessary skills required to perform a job due to which Muslim women with higher education are unable to find jobs. This gap needs to be bridged by an expansion of skill-development programs, such as Skill India, which will impart the necessary skills to enhance the employability of young people, especially Muslim women. Steps must be taken to bridge the gap that exists between labour supply and demand.

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Appendix

Table I: Multinomial Probit Model Coefficients for Determinants of Labour Market Activity among Muslim Women, PLFS 2017-2018

Variables	Unemployed	Inactive
Sector, Reference Category: Rural		
Urban	0.476 ***	0.446 ***
	(0.071)	(0.033)
Level of Education, Reference: Illiterate		
Up to Primary	0.863 ***	-0.252 ***
	(0.191)	(0.045)
Up to Secondary	1.417 ***	-0.282 ***
	(0.167)	(0.041)
Higher secondary	1.926 ***	-0.519 ***
	(0.176)	(0.066)
Diploma/certificate course	2.384 ***	-1.737 ***
	(0.254)	(0.179)
Graduate	2.204 ***	-1.149 ***
	(0.177)	(0.072)
Postgraduate & above	1.707 ***	-2.226 ***
	(0.201)	(0.108)
Marital Status, Reference Category: Never Married		
Currently married	-0.730 ***	0.080
	(0.083)	(0.050)
Widowed/	-1.111 ***	-0.093
	(0.300)	(0.082)
Divorced/separated	-0.956 ***	-0.957 ***
	(0.297)	(0.162)
Age	-0.021 ***	-0.009 ***
	(0.004)	(0.001)
House Size	0.009	0.051 ***
	(0.015)	(0.007)
MPC	-0.000	0.000 ***
	(0.000)	(0.000)

Notes: Standard errors are given in parentheses *, ** and *** indicate statistical significance at the 10 per cent, five per cent and one per cent levels, respectively.

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Factors Determining Women's Work Force Participation in Kashmir: An Empirical Analysis

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Gender equity in all socio-economic processes is an important component of human development. The reports of various organizations have confirmed that compared to men, women have lesser opportunities for economic participation, less access to basic and higher education, larger health and safety risks, and least political representation. This holds true across nations, cultures, communities, castes and categories. One of the measures to remove the growing disparity and economic inequality is to amplify women job opportunities through an enabling socio-cultural environment. Against this backdrop an effort has been made in the present study to find out factors affecting women participation of in labour force of Kashmir valley. Study is mostly based on primary data collected during March- June 2022 through a comprehensive field survey. Findings indicate that the socio-economic and demographic variables have significant effect on work participation of women in Kashmir.

Keywords: Gender, Socio–economic and demographic factors, Work force participation, Empowerment

I Introduction

The World Health Organization (WHO) defines the word 'Gender' as "the socially-constructed roles and responsibilities that societies consider suitable for men and women". They are both part of the system which is based on the relations of class, race and caste but women are at disadvantage in many respects in any society, compared to men. The reason for this lies in gender-based discrimination within these relations. John Stuart Mill's essay *The Subjugation of Women* (1869) is considered as the first attempt to institutionalize the concept of gender equality. However, after more than three centuries since the beginning of this struggle only small progress has taken place in their status and position in the society. This is true across cultures, communities, castes and categories. Assuring the rights of women and giving them opportunities to reach their full

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potential is important not only for attaining gender equality, but also for meeting the agenda of Millennium Development Goals[1] which were succeeded by SDGs 2030. The overall SDG index of India was 61.1 and the specific SDG5 index 33.2, as per Sustainable Development Report (2019) compared to Finland's 82.8 and 89.2 respectively. These figures clearly signify a glaring gender gap in all the four domains used to construct Global Gender Index (Kundu 2021). According to Global Gender Gap Report (2022), even after 75 years of independence, India is still struggling to reduce this sizeable gender gap. A cursory look at the ranking of India in the four sub-indices based on which the overall ranking was determined reflects a very woeful picture, especially in the domain of economic participation and opportunities.

Table 1: India's Gender Score According to Global Gender Gap Report 2022

India	Rank 2022
Global Gender Gap Index	135
Economic Participation and Opportunity	[illegible]
Educational Attainment	107
Health and Survival	146
Political Empowerment	48

Source: Global Gender Gap Report Geneva, Switzerland (2022). World Economic Forum.

The international organizations like World Bank, ILO, etc. also present a dismal picture of women labour force participation (WLFP). In 2023 global WLFP was 48.7 percentage points against 73.2 per cent men labour force participation (MLFP). This shows a difference of 24.5 percentage points, with some regions facing a gap of beyond 50 per cent.[2] The overall situation in India is no different from rest of world. The women labour force participation rate has increased from 23.3 per cent in 2017-2018 to 37.0 per cent in 2022-2023. However, male labour force participation rate has increased from 75.8 per cent to 78.5 per cent during the same period. If we look at state-wise data, some of the top performers were Himachal Pradesh (71.4 per cent), Sikkim (68.6 per cent), Nagaland (65.2 per cent) and Meghalaya (60.9 per cent). Jammu and Kashmir (50.2) was among the states which has improved its performance in WLFP rate from last many years (Annual Bulletin of periodic labour force survey 2022-2023). The characteristics and the pattern of Indian women work participation is significantly different from those of males (Beneria and Sen 1981). In India, the society is structured in a manner that leaves very limited scope for women to leave home for work (Khan 2007, Sarikhani 2008). Due to the traditional role of women in managing the household and caring for others, working women have to meet the burden of multiple roles, which significantly impacts their decision to participate in paid activities outside their homes. This, in turn, differentiates the labour market in the country from that of other developed economies. To get an insight of the work participation scenario of females both at national and international levels, a brief review of literature is presented below.

II Review of Related Literature

The review of literature apparently shows that role of women in society is clearly defined (Beutel and Axinn 2002). The other opinion is that, while participation is biased in favour of the male members of the society, females are not lagging much behind as work participation of females especially in the developed countries, has shown improvements in the positive direction (Ehrenberg and Smith 2000). However, the reasons behind declining WLFP vary from country to country. There are different factors in play that determine women work across the nations and socio-economic categories. Hafeez and Ahmad (2002), analysed different financial and demographic variables and found that the education level of husband and wife, family unit structure, family income, and residential area of women have a direct impact on the choice of educated married women to participate in the labour market. The results further show that level of education is the strongest determinant of WLFP. However, factors like availability of number of workers in household and financial assets were inversely related. Jaumotte (2003) evaluates the role of numerous factors which determine the pattern of female participation rates in OECD countries. The main focus of the study was on married women with children, who gave lowest preference to actual labour force participation. Lisaniler and Bhatti (2004) found that the decision of women to participate in workforce is determined by the presence of patriarchal and strong cultural factors. That is, before a woman decides to join the workforce, she first considers the societal and household norms. This result is in line with Becker's household production model (Becker 1965) that decision of woman to participate in labour force is impacted by decision taken by entire family. For other women who were not seeking jobs, the reasons include care taking responsibility of the children and elderly, household chores and disapproval of their husband for seeking employment.

Rangarajan and Seema (2011) argued that the low level of education has been the major reason for women to remain confined to either domestic chores or improve their skill level so that they can opt for job that fetch a dignified income. Klasen and Pieters (2015) propose the policies for female employment in public sector that recognize their domestic responsibilities and provide safety nets accordingly. Such policies will increase the number of women into the workforce. Fletcher, *et. al.* (2017) have suggested five descriptive facts about female labour force participation in India to identify constraints to high participation of women in labour market. Firstly, there is major demand for jobs by women but currently there are no jobs available which are conducive for them. Second, women who are willing to work have difficulty in finding their preferred jobs. Third, possibilities of obtaining vocational training which increases the chances of getting a job and earning a suitable livelihood are missing. Fourth, women suffer due to wage differentials. Finally, there are no female-friendly policies, to increase their participation in all sectors. To Kanjilal and Pastore (2018), education has been the main factor to influence women

labour force participation. They believe that probability of women to enter into paid job market increase with an increase in her level education. Gul and Khan, (2014) establish a direct link between gender equity in education and WLFP and hence, women empowerment. The study finds that lack of basic and skilful education among women hinders their career opportunities. Mehrotra and Sinha (2017), highlighted the significance of wide-range of socio-economic and cultural factors that determine the declining trend of women workforce participation in India. They recommend crucial macroeconomic reforms to create employment opportunities for women of all categories through an improved policy environment. Vocational education especially for girls, skill development measures and non-form activities need to be promoted to improve employability in rural areas. Along with skill training in upcoming trades, the seed capital and institutional support for self-employment schemes must be put in place in rural as well as urban areas under proper supervision and mentorship of agencies identified by local, state and union government. It is against this backdrop that present study attempts to:

III Objective and Hypotheses

Objective: To study the factors that determine women's workforce participation in the Kashmir valley.

Hypotheses: Socioeconomic and demographic variables have a significant impact on the work participation of women in Kashmir.

IV Methodology

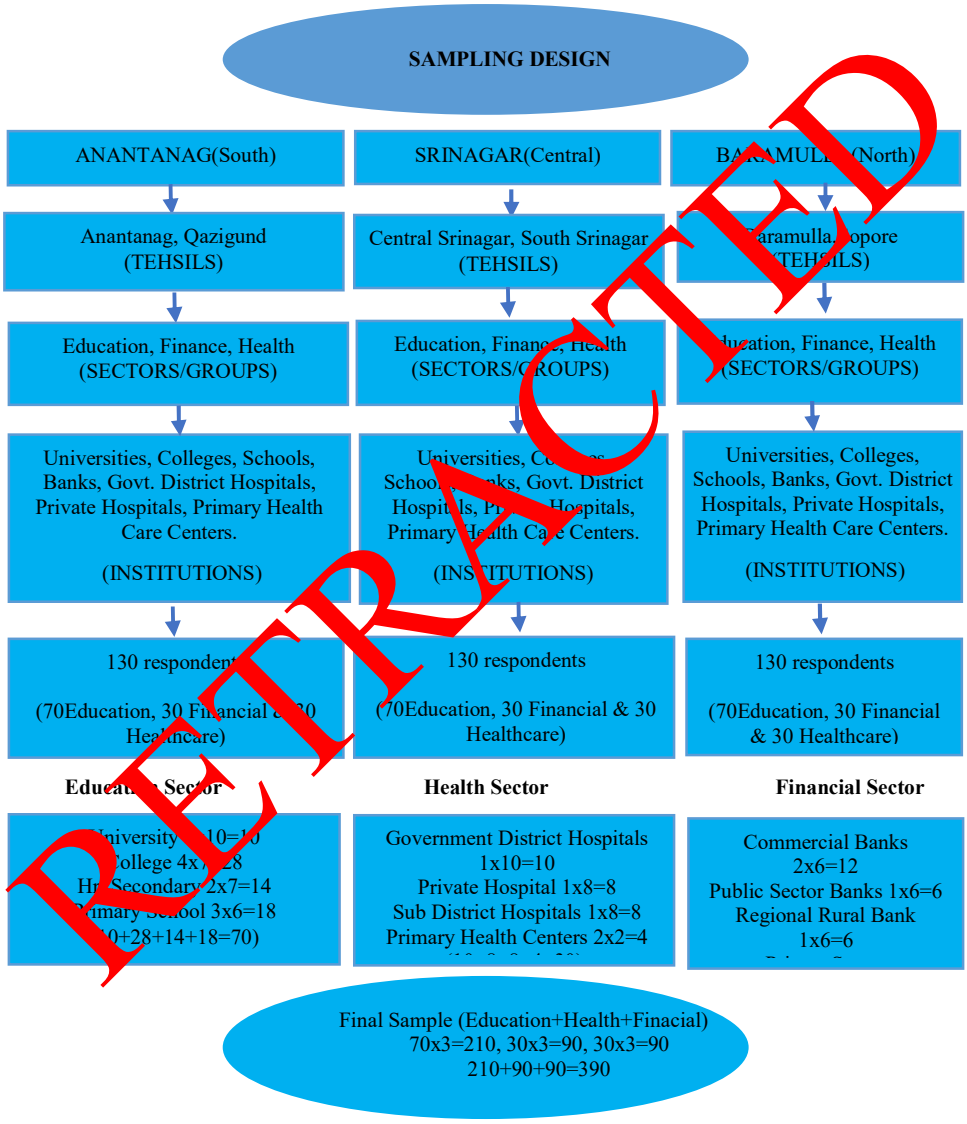
This paper is primarily based on primary data collected through a well-structured, pre-tested questionnaire. The field survey was conducted in 2022 in three districts: Baramulla, Anantnag, and Srinagar, providing due representation for north, south, and central Kashmir. SPSS version 22 and Microsoft Excel has been used to analyse the data. Proper statistical tests, such as the Chi-square test and Cramer's V value, have been used to test relationships and measure the associations between the variables selected for the study. The socio-economic variables used included marital status, age, educational qualification, residence, parents education and occupation, husband's education, family structure, type of family and family income.

Sampling Technique and Structure

The reliability of any study depends invariably on the size of the sample. The total number of females working population (main workers + marginal workers) for district Srinagar is 74037, for district Anantnag, it is around 145652 and

54619 for district Baramulla respectively (Census 2011). Using the Cochran formula, $no = z^2pq/e^2$ [3] the sample size which is the number of working women surveyed across the urban and rural areas of the different districts in Kashmir is 385. However, to keep a margin for the probability of non-response the sample size was increased to 390. The description of the sample is given below:

Figure 1: Structure of the Sample



Data and Its Analysis

Socio-economic conditions of a person do play a crucial role in achieving any goal in life. Data related to socio-economic indicators of respondents collected through field survey has been presented, analysed and interpreted in the following pages in the form of tables/graphs. The original data sets and additional material related to the study are available with the author.

Table 2: Socio Economic Profile of Respondents (N=379)

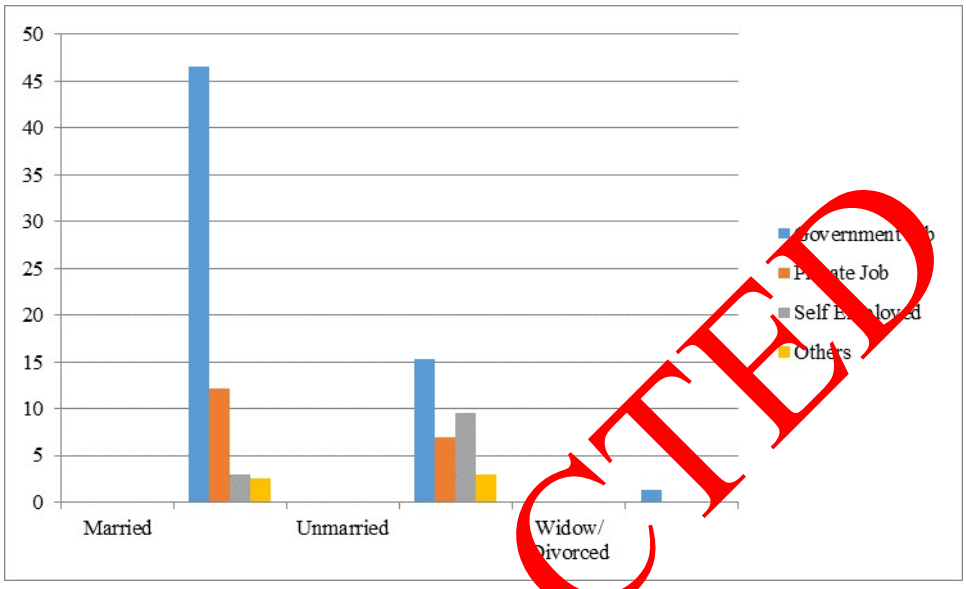
Variable	Classification	Frequency	Per cent
Age (in years)	15-25	31	8.2
	26-35	215	56.7
	36-45	93	24.5
	46-55	30	7
	56-65	10	2.6
Institution	Education	187	49.3
	Health	90	23.7
	Financial	102	26.9
Educational_ status	Post Graduate	276	72.8
	Graduate	41	10.8
	Higher /Primary School	3	0.5
	Any other	59	15.6
Marital_ status	Married	244	64.4
	Unmarried	130	34.3
	Divorced/Widow	5	1.3
Sector	Rural Sector	162	42.7
	Urban Sector	217	57.2
Income	Below 1 lac	62	16.4
	1lac-3lac	54	14.2
	3lac-5lac	59	15.6
	5lac-7lac	56	14.8
	Above 7lac	148	39.1

Source: Field survey

Majority of respondents in the age group of 26-35 years possess higher levels of education as presented in table 2. So for as income is concerned it's found that almost 70 per cent respondents belong to well off families. The institutions selected for primary survey were the department of Health, Education and Banks. The women working in the educational institutions and banks responded well while as those working in health sector took time to respond. This can be attributed to their hectic work schedule and patient rush.

Contrary to WHO norm of one doctor for 1000 people we find that J&K has one doctor for 1880 people (NSSO latest round).

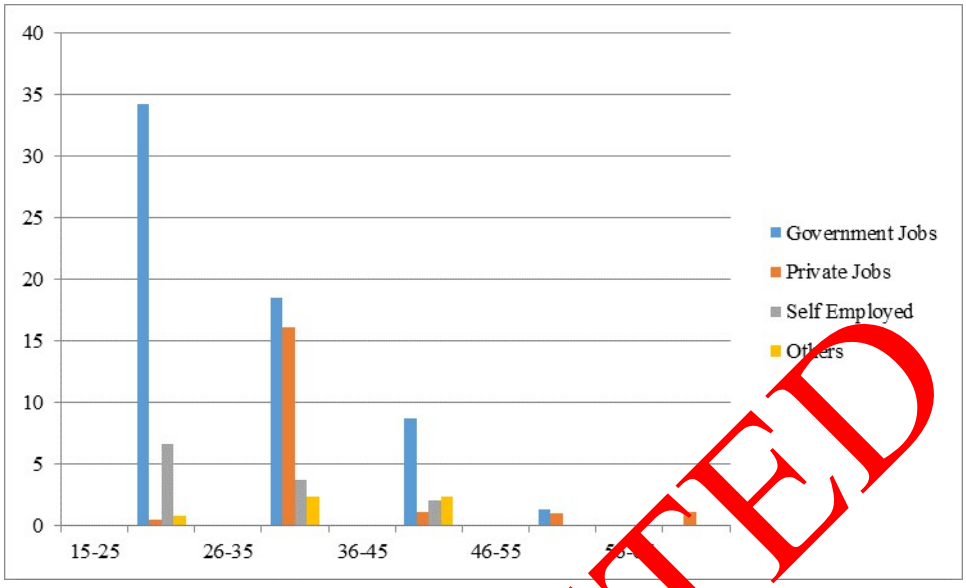
Figure 2: Marital Status and Occupational Distribution of Working Women (N=379)



Source: Field survey.

The relation between marital status and labour force participation differs for men and women across the nations. It has been found that in comparison to unmarried men, married men are more likely to participate in the labour force, whereas among women, the trend is reverse; married women are less likely to participate in the labour force than unmarried women. The above figure (2) also presents a similar picture. Almost 65 per cent respondents are married. These women are mostly into government services because of various factors like job security, preferences for a particular job, non-availability of well-organised private sector, etc., whereas, it has been found that around 10 per cent of unmarried women are self-employed. This small shift from traditional job patterns among unmarried women depicts the beginning of an entrepreneurship culture among educated young women, which is a healthy trend. This group was established in the education sector, where highly educated women successfully ventured to establish private schools. The widows or divorced women who participated in the survey were employed in the government sector only. The value of Chi-square shows a significant association between marital status and occupational distribution of women in Kashmir.

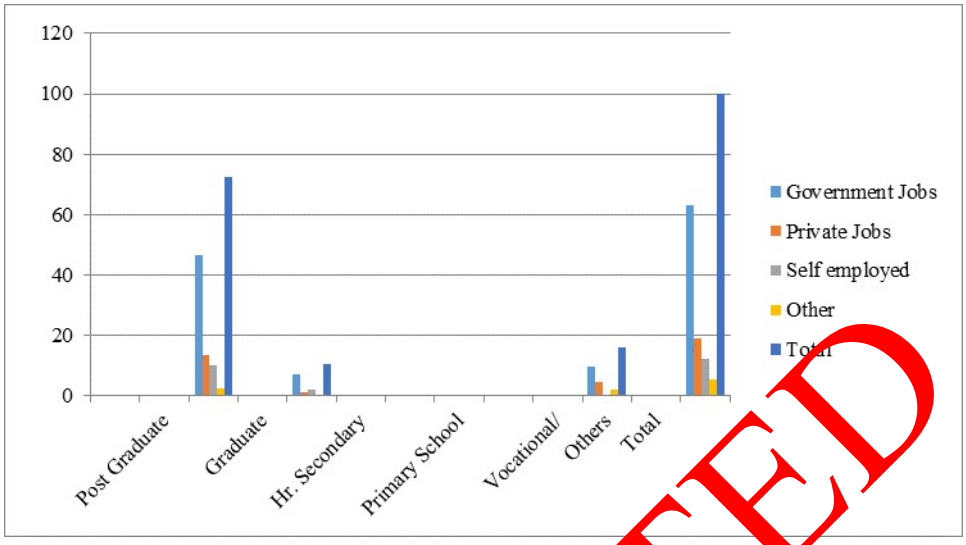
Figure 3: Age and Occupational Pattern of Working Women (N=379)



Notes: Chi-square value=193.3 (p-value=0.00)***.
Source: Field survey.

Pattern of workforce participation is different among women during different phases of their lives. Their labour force participation rate is high after attaining higher level of formal education but falls soon after their marriage due to responsibilities of motherhood. Hart (1997) finds that child care is one of the most significant factors affecting women's workforce participation. In contrast to other places women in Kashmir prioritize employment and higher education over marriage (Greater Kashmir, 30 April 2021). Over the period of time, it has been observed that a job and earnings have become a prerequisite for getting married to a suitable partner at the proper age in both men and women in Kashmir. Many studies attribute unemployment as the main cause of late marriage among women in Kashmir. The findings of present study are completely in accord with the above remark. This is one of the reasons for having a significant number of women working in government sector. This wait for government job most of the times ends up in late marriages. These results indicate that very few women participate in daily wage or contract-based jobs. The incentives like maternity, childcare leaves and other benefits and securities are the major sources of attraction for government job. Age and level of employment were found to be highly associated. This result indicates that women in Kashmir up to the age of 45 want to work, but the non-availability of high-paid jobs and a strong preference for government jobs restrict their participation in the labour market.

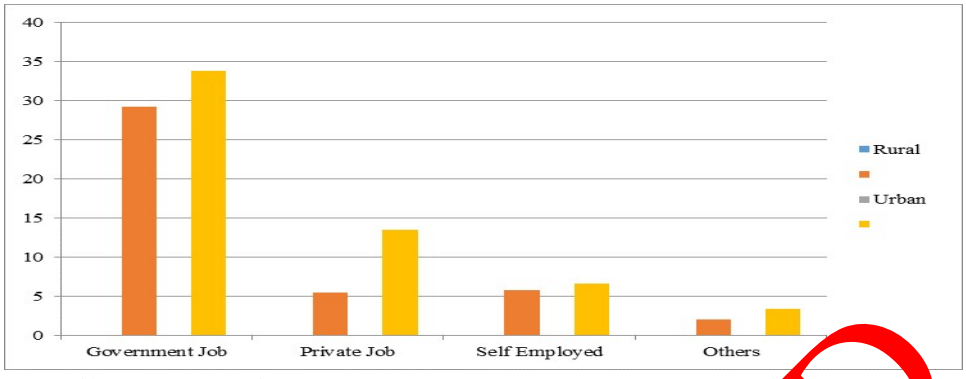
Figure 4: Educational Level and Employment of Working Women (N=379)



Source: Field survey.

The theories of human capital underline the importance of education in employment outcomes and conclude that, the overall educational attainment has a great influence on an individual's decision to participate in the labour market (Tansel 2001). According to Ejaz (2007), high level of educational attainment leads to high employment and hence increased output in the nation. But in today's labour market, having skill full knowledge is a boon. The results presented in Figure 4 also reflect a direct relation between the levels of education with the level of employment in Kashmir. It was found that only 16 per cent of the sample respondents had the opportunity to get skill development training which enhanced their chances of employment. These results correspond with New Education Policy (NEP 2020), attaining higher education with additional skills boosts the participation rate in labour market. However, this does not always hold good in case of female labour force participation in every situation. Generally, in developing countries, this relationship is often found to be U-shaped, which reveals that poorly educated women accept any low-paid employment just to support their families under stressful, compelling conditions and do not derive any satisfaction from such jobs. In contrast, better-educated women seek better job opportunities with higher wages, free from any stigmas associated with such employment (Klasen and Pieters 2012).

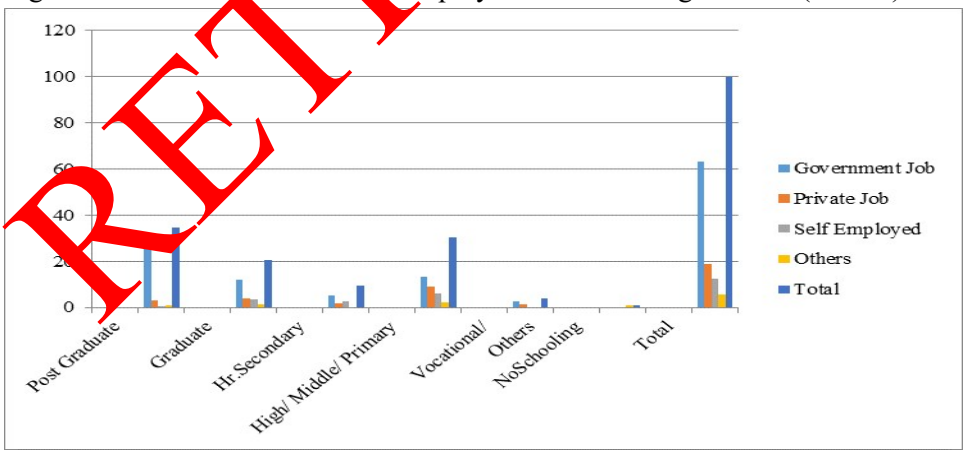
Figure 5: Residence and Employment Status of Working Women (N=379)



Notes: Chi square=21.5 (p-value<0.05).
Source: Field survey.

The geographical and demographic differences matter a lot in our day to day life. The rural-urban setup differs in many important aspects like physical and social infrastructure, basic amenities and avenues of employment. The structure of employment does not change in a linear way through rural-urban migration. People shift from rural to urban and semi-urban areas in search of better job opportunities. The results indicate that compared to rural areas women participation in private sector and self-employment scheme has been high in urban areas. The rural-urban migration among educated couples in Kashmir like other parts of the country is motivated by economics factors i.e., search for job and other income earning activities besides better schooling of children. The results indicate a significant association between residential status and employment of women.

Figure 6: Father's Education and Employment of Working Women (N=379)

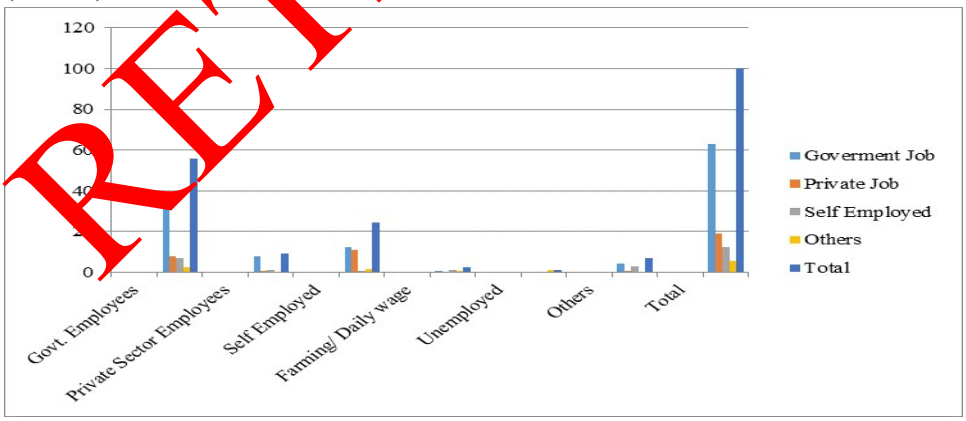


Notes: Cramer's Value= 0.42 Chi-Square =201.7(p-value = 0.00)**.
Source: Field survey.

The contribution made by parents plays a dominant role in academic achievement and career building of a child. A positive correlation has been witnessed in number of studies between fathers encouraging approach and education of their wards (Ridge N. and S. Jeon 2020). The results presented in figure 6 indicate that fathers of almost 35 per cent of women employees were highly qualified having a government job. There were around about 16 per cent of women who were either self-employed or doing contract based or daily wage kind of jobs. Ridge, *et. al.* (2020) observed that boys are mostly inclined to pursue the career that aligns with their father's occupations but females consider multiple fields and possible career paths. The results of present study also coincide with above statement. Highly qualified fathers encourage their daughters to opt specifically for government jobs. This can be cited as one of the reasons of having comparatively less women participation in private sector or self-employed.

Besides education, the occupation of the father also has a huge influence on their daughter's employment position. In the 20th century, the labour markets have witnessed a significant increase in female labour force participation. One potential implication of increased female labour force participation is that it has changed the perception of fathers towards the education of their daughters. The fathers started to invest in education of their daughters and prepare them for specific careers. Many studies including (Hellerstein and Morrill 2011) observe that the likelihood that a woman enters her father's occupation is around 20 per cent higher than that of entering in any other occupation of her own choice. This observation is validated by figure 7, which shows that only 7.1 per cent of respondents were such whose fathers were not doing any specific job. The fathers of rest of the respondents were mostly in government service- the preferred employment option of women in Kashmir.

Figure 7*:* Father's Occupation and Employment Status of Working Women (N=379)

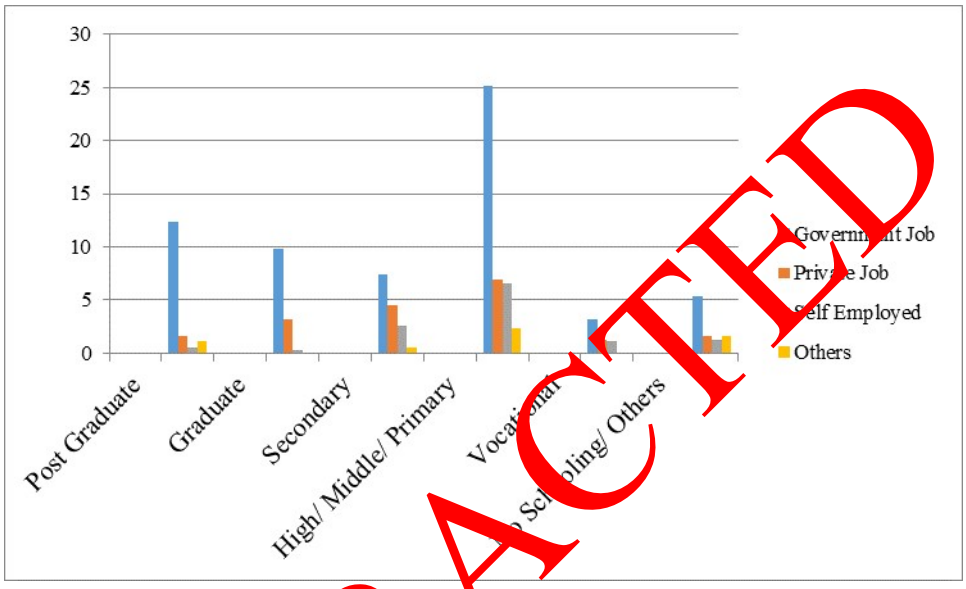


Notes: Cramer's value=0.39; Chi square=176.4 (P-value=0.00)**.

Source: Field survey.

Private sector operations in Kashmir are still in infancy due to various reasons which are beyond the scope of present study. Under such conditions, government sector is only viable source of employment in Kashmir valley. The results reveal a significant association between father's occupation and employment position of women.

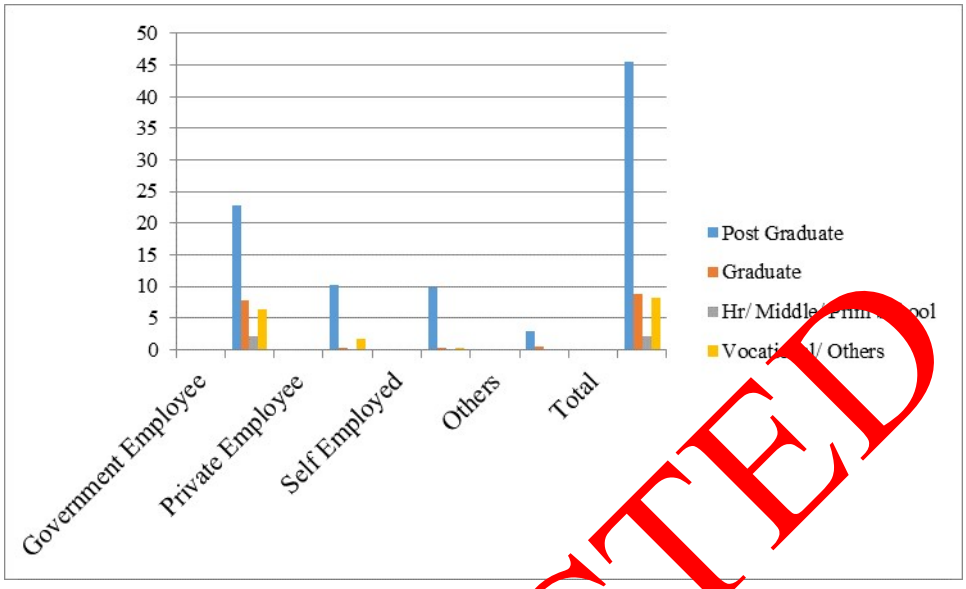
Figure 8*:* Education and Employment Status of Mothers of Working Women (N=379)



Notes: Chi-Square =176.4 (p-value = 0.0[illegible]* Cramer's V=0.39.
Source: Field survey.

Mother is the first school of a child. The purpose to collect this set of data was to see how far educational level of a mother impacts the entry of their daughters in job market. It is clear from the figure 8 that mothers of respondents are mostly less educated. Only 15 per cent respondents were such whose mothers had attained the educational level up to graduation or above. According to Augustine (2014), the less educated women cannot contribute much to child's overall development and ends up in lowest quality parenting, but the findings of present study present a different picture. Similarly, mothers either educated or not, do encourage their daughters to participate in labour market and become self-dependent. The value of Chi square at 127.85 and p-value at 0.00 indicate a significant association between mother's education and employment condition of their daughters. The Cramer's value is 0.33 which shows the strength of the association is moderate.

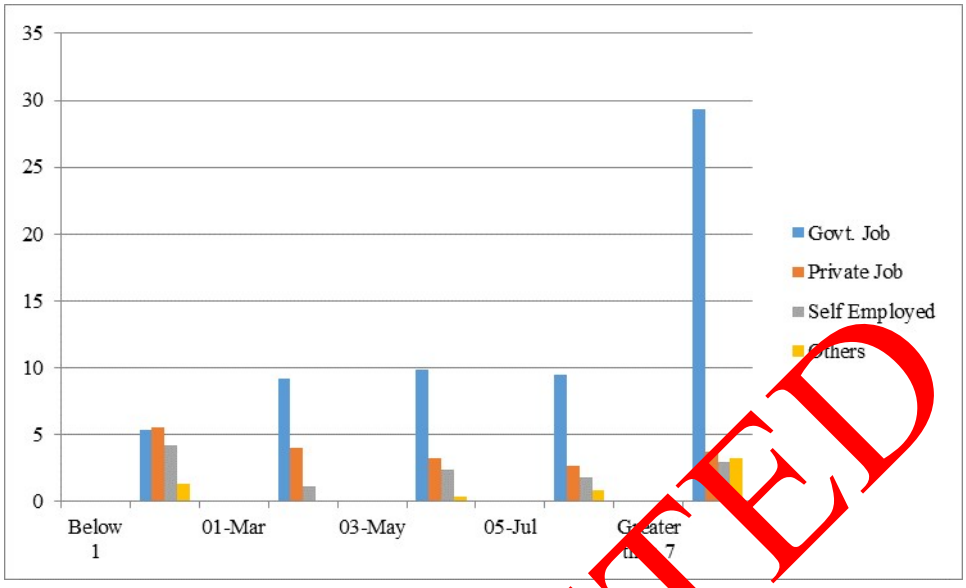
Figure 9: Husband's Education and Employment Status of Working Women (N=245)



Notes: Chi-Square =42.28 (p-value = 0.001)** Cramer's V=0.19.
Source: Field survey.

As discussed earlier, there is a positive correlation between education level of a women and employment. Conventionally it has been observed that level of education and earning capacity of spouse is likely to reduce labour force participation rate of their wives. This is called 'income effect' when higher education level of the husband increases his income and reduces the need for the wife to work. Quoting the example of Philippines, Khandker (1987) finds, the chances of getting a working wife are nine per cent less in case of a secondary school–educated person than a person with no education. Cameron J.E., R.N. Lalonde and Worswick Christopher (2001) also subscribes to it by stating that, with a higher household income, the wife is less likely to be in the labour market. However, a different view is presented in present study as we move along the data, it shows that highly qualified and working men prefer to marry women of their own status in terms of education and employment and less educated husband have inclination for women who are not employed. The figure (9) given above shows those 45.6 per cent respondents had highly qualified husband. The value of Chi square shows a significant association between husband's education and employment status of women. However, The Cramer's value depicts the strength of the association is weak.

Figure 10: Family Income and Occupational Status of Working Women (N=379)

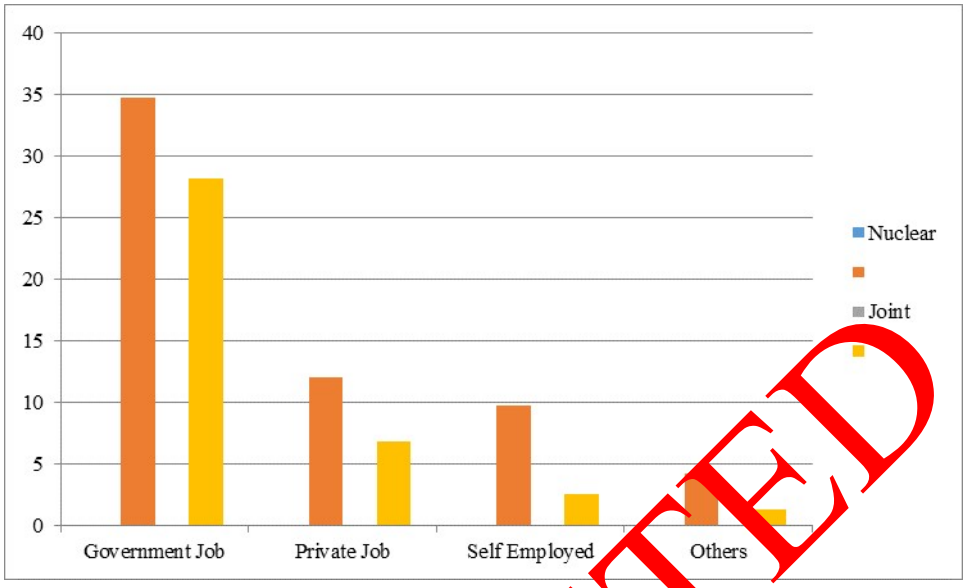


Notes: Chi-Square =49.75 (p-value = 0.00)** Cramer's Value=0.2
Source: Field survey.

A number of studies reveal that rising household income is also a reason which leads to declining female participation in the labour force (Chand and Srivastava 2014, Klasen and Pieters 2012). However, present study does not subscribe to this view point. The Figure 10 divulges that about 40 per cent working women belong to high income group families. The value of Chi square shows a significant association between family's annual income and employment of women.

By and large, rural Kashmir still upholds traditional values and follows joint family culture. Women in such families share the maximum responsibility of raising children and taking care of elderly hence, misses the opportunity to participate in labour market. Number of working hours outside home in paid economic activities is comparatively less than inside the home for women of joint families. Such conventional roles lead to lowering women's decision-making power and mobility in general. The findings of present study are somewhat similar to viewpoint of Dhanaraj and Mahambare (2019), who stated that, women of smaller families are more participatory in labour markets compared to those who belong to joint families. The value of Chi square (11.83 and p-value 0.008) which is less than 0.05 shows a significant association between family type and occupation of the women.

Figure 11: Family Type and Occupational Status of Working Women (N=379)



Notes: Chi square is 11.83 and p- value is 0.008.
Source: Field survey.

V Conclusion

The findings of the present study indicate that the socio-economic variables, which include marital status, age, educational background, residence, education of parents, occupation of father, husband's education, financial position of the family, access to educational facilities, family support and freedom to work, have a significant impact on women's participation in labour market in case of Kashmir. Hence, the hypothesis that "the socio-economic and demographic variables have a significant effect on work participation of women in Kashmir" holds true. The results show a strong association between the respondent's age, marital status, father's education, and work participation of women. Additionally, variables such as parents' education, husband's education, and family income of the respondents also impact job participation, although the association is relatively low. Thus, it can be concluded from the above discussion that financial independence is the first step towards women's empowerment.

To achieve this goal, allocation of funds through gender budgeting should be increased for education and health, which may have a positive impact on the financial position of women in the long run. Further, given the situation in the public sector job market, there is a dire need to create alternatives by way of creating awareness for women entrepreneurship, skill development, and women-specific employment schemes to increase women's work participation in places where women have achieved high levels of education but are unable to find lucrative employment. The policymakers need to re-imagine villages and towns

to make them more women-friendly, which has a direct connection to their ability to work. Schemes like microcredit through SHGs have a huge potential to uplift women with low level of education.

Endnotes

1. *The United Nations Millennium Development Goals (MDGs), signed in September 2000, commits world leaders to combat poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women by 2015. The Sustainable Development Goals (SDGs) succeeded the MDGs in 2016.*
2. https://data.worldbank.org/indicator/SL.TLF.CACT.MA.ZS
3. Cochran formula: $no = z^2pq/e^2$ has been adopted to calculate an ideal sample size.

   Where:

   - e is the desired level of precision (i.e., the margin of error),
   - p is the (estimated) proportion of the population which has the attribute in question,
   - q is 1 – p.

   So, p = 0.5 at 95 per cent confidence, and at least five percent plus or minus accuracy. A 95 per cent confidence level gives us Z values of 1.96 per the normal tables, so we get $(1.96)^2$ (0.5) (0.5) / $(0.05)^2$ = 385.

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Book Review

Ritu Dewan (Lead Anchor) with Swati Raju, *India Gender Report: Feminist Policy Collective*, Feminist Policy of India, New Delhi, 2024, p. 320, Price not mentioned.

The India Gender Report (IGR), conceived by the Feminist Policy Collective (FPC), was published in December 2024 to present an account of the actual status of women in India in the last decade or so. The FPC has defined its vision as "contributing to policies and practice on transformative financing for gender justice that advances the rights of women in all their diversity." The report features a diverse collection of articles by several scholars and activists who have contributed to the formulation and implementation of gender-just policies.

This is a comprehensive report with five sections addressing critical issues, including transformative financing and development, work, labour, and livelihoods; gender, health, and well-being; gender- and sexual based violence; and education and skilling. Moreover, there are three important information boxes in the report that summarise the "voice from the field" and also suggest a few actionable steps to improve accountability and justice. In particular, these information boxes cover 'Dalit Feminist Movement', 'The Ground Realities of Queer and Trans Persons and the Gaps in Promises made by the State', and 'Gender Based Violence and Disability'.

The lead anchors of this report are Ritu Dewan and Swati Raju. In her introductory section, Ritu Dewan states, "the purpose of IGR is not merely to present trends, but to analytically scrutinise the extent of fulfilment of gender rights and the levels of attainment achieved…".

Unfortunately, the common conclusions of all the chapters of IGR are – the reinforcement of gender inequality, intensification of patriarchal rigidities, the deepening of economic and non-economic divides and increased exclusion of vulnerable and marginalised groups.

On reflection, these "conclusions" are not surprising. While India has made rapid strides in overall economic progress, it is often considered a relatively late entrant in adopting a well-crafted, gender-responsive strategy across all sectors. For example, the concept of gender budgeting was first introduced by Australia in the 1980s, but India framed its first gender budget as late as the fiscal year 2005-2006.

Even the most recent Gender Gap report of the World Economic Forum for 2025 ranked India at 131 out of 148 countries. In sequential terms, rather than showing any improvement, India's relative position has declined by two notches in 2025, with a gender parity score of just 64.1 per cent - one of the lowest in South Asia.

India's gender-responsive strategies have not delivered sufficiently over the years due to several reasons, including inadequate allocations and tracking, the absence of granular data, and uneven adoption at subnational levels. It has been repeatedly pointed out by scholars that Indian efforts in gender related aspects are primarily "symbolic" and not adequately supported by structural reforms needed to address the problem of gender gap comprehensively.

The main findings of the various chapters/sections of the IGR can be summarised as follows.

- The chapter on "gender responsive budgeting" highlights the need to have sex segregated data in India in all aspects, which is important for mainstreaming women in the process of development. It also highlights the lack of robust mechanisms to monitor the implementation of gender-responsive budgeting.
- The chapter on "gender, taxes and revenue mobilisation" highlights the prevalence of gender insensitivity in the imposition of indirect taxes in India. It states that "gender sensitivity in revenue generation" is a precondition for achieving "gender sensitivity with respect to expenditure".
- The chapter on "gender and banking" shows that while the efforts of the past three decades in enhancing financial inclusion have improved access for women to services of various kinds, they hardly address the real constraints that women face to participation in markets, financial or otherwise.
- The chapter on "monetary policy and women" shows the link between monetary policy and labour and credit markets and how adverse outcomes in these markets affect women more with growing responsibilities at home like unpaid work, child-care and elderly care.
- The chapter analysing the impact of "trade liberalisation on Indian agriculture" shows how the effects of trade liberalisation in agriculture are significantly worse for women farmers, as the majority of them do not have land titles and are not even recognised as farmers. It highlights how women in agriculture face higher cultivation costs, higher credit costs, limited access to inputs and crop markets, and greater gender gaps in paid work.
- The chapter analysing "trends in women's workforce participation" identifies many causes for a lower workforce participation of women in India, like lack of job security, alienation from basic social security provisions even for regular workers, predominance of unpaid helpers in household enterprises, inadequate public transport facilities, domestic and care burden, discriminatory recruitment practices, etc.
- The chapter on "social group dimensions of women's employment" points to the need to focus on social structures and their new manifestations. It is argued that policies aimed at improving female employment should extend beyond traditional male-female differences, taking into account the social identities of women and their unique challenges.

- The chapter on "women and migration" shows that the "piece-rated" work through the employment of "family unit" rather than an individual worker, enables women to be seen as independent earners.
- The chapters on "women in MSMEs", "new and emerging sectors of labour absorption" and "decoding the labour codes" aptly describe the challenges faced by women entrepreneurs, factors affecting women's entry into jobs and the gender-based digital divide, safety issues in the workplace, denial of social security benefits to women, etc., and also suggest solutions that can enhance women's potential.
- The section on "gender, health and wellbeing" has analysed health policy and financing in India from a gender perspective. It has touched upon many critical issues having bearing with women's health like nutrition, women's inferior status within the family, hazardous work environment for women, gender insensitivity in designing policies that deal with infectious and non-communicable diseases, and the issues pertaining to reproductive and sexual health. This section provides a comprehensive overview of the key policy issues impacting the health of women in all their diversity.
- The section on "gender and sexual-based violence" examines various forms of sexual and gender-based violence in India and analyses the challenges in implementing laws on these aspects. The theme of harassment at work is also dealt with in great detail in this section. There is also a chapter in this section entitled as "resistance, resilience, and organising", which presents the analysis of collective action by the most marginalised women, who have challenged the status quo and made their demands of equal citizenship visible.
- The last section on "education and skilling" provides a decadal review of gender equality in education and skill development. It makes a case for increasing financial support to incentivise girls' access to secondary education and also for extending the right to education (RTE) to secondary education. It has recommended both technical and soft skill-related courses for female students to address gender biases in higher education. States are advised to have more flexibility in responding to women's needs. A chapter on "making skill development more gender sensitive" suggests well-crafted, specific measures to create sustainable employment for women.

India Gender Report (December 2024) has done a good job in showing how India has not made any genuine progress in achieving gender parity despite the past many decades' ambitious plans to reduce the gender gap in critical areas like education, economic participation and health. India still lacks actionable strategies that are hands-on and results-oriented. Our gender-related policies have not succeeded in breaking down real barriers that women face at home and in workplaces. And this is equally true for both the rural as well as urban areas. While India has taken many laudable initiatives to narrow the gender gap, a close monitoring and oversight is required to ensure meaningful impact. Given India's wide cultural diversity, "diverse" approaches are needed as against one-size-fits-

all solutions. Efforts towards women empowerment should go beyond reservations and subsidies and tackle systemic issues that are blocking women from entering labour-force or politics. The focus of legal reforms should be on enforcement and there should be an active involvement of communities in fostering equality.

India Gender Report (December 2024) has succeeded in scrutinising the extent of fulfilment of gender rights in India in both economic and non-economic domains. However, its success will depend on the effective translation of its recommendations into concrete, actionable steps.

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Book Received

Yagati Chinna Rao and Raj Sekhar Basu (Ed.), *dentity, Conflict, and Counter-narratives: Dalit Experiences in Culture, Politics, and Stigmatisation*, Orients Blackswan Private Limited, Noida, 2025, pp. 342, Price ₹1160/-.

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