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Rabindra Bharati University Journal of Economics is a referred Journal published annually. Initially, the research articles were published in the journal under the title 'Occasional Papers' and fourteen such volumes of this journal were published earlier. Presently the articles relating to research papers in Economics and allied subjects have been considered for publication in this journal.

This volume contains 7 (seven) research articles of the Ph.D Scholars of our University and other University.

We are grateful to the contributors and all others who have helped in one way or other in the preparation of this volume. The Editorial Board will not be responsible for the views expressed by the authors in their articles.

At the end, I would like to extend m whole-hearted thanks to the members of the Editorial Board and especially to 'The Saraswati Printing Works' for bringing out the present volume despite of many constraints.

December, 2021

Prankrishna Pal
Editor

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Macro Risk Sharing in a Coordinated Policy Regime

Neeta Majumder[1]

Abstract

Aggregate income in all countries is in flux due to unforseen shocks. Robert Shiller has proposed a measure to share aggregate income risk among countries through trading of income-indexed perpetual claims. The feasibility of the proposal is impeded by barriers. One obvious hurdle is currency fluctuations which alter expected returns. Individual country policymaking might entail negative externalities that obstruct the attainment of the objective of country-wise risk sharing. Exchange rate targeting as a coordination device is suggested.

Keywords: ***International risk sharing, GDP-indexed bond, Exchange rate targeting, policy coordination***

JEL Code: E44, F42, G15

1. Introduction

Any measure of risk sharing, by definition, is intended to enable people to escape risks that are concentrated on them and share the risks over a population. Risks do not disappear. They are spread over many people and their baneful effects become less catastrophic. Recently, one such innovation in theoretical finance is the exploration of the hedging of country-specific income risk. The concept can be illustrated by an example. Consider two countries of about the same size, country A and country B. If people in country A are subject to substantial risks to their economy that are independent of the risks that face people in country B, then even without doing anything to eliminate the causes of these risks, people in both countries can be made better off by pooling these risks so that individuals' portfolios are more diversified. This pooling could easily be achieved if there were new liquid, international markets; markets for claims on the national income of these countries themselves. The financial managers for people in country A could take short positions in these new financial assets corresponding to claims on country B's income, while the financial managers in country B would do the opposite. Markets would clear, since for every short there would be a long in the other country. There is no

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reliance here on monetary or fiscal policy or a new productive opportunity opening up to produce welfare gains. If people in each country hedged half of their own national income risks, then after hedging, each country would be effectively exposed only to the income risk of the two countries combined. Robert Shiller (1993) has christened such markets "Macro Markets". Through trading in macro markets, everyone would achieve a share of global income and would hedge his or her country-specific income risk. Therefore, macro markets would essentially perform the prime task of equalizing wealth across nations, although it may not accelerate average global income.

G P Olivei (2000) is a supporter and prognosticates that twenty years hence portfolios would be better diversified internationally by the continuing process of global financial integration. Majumder & Majumder (2002) addressed the issue of the efficient trading methodology of the proposed risk-sharing market. In their study, measuring country-specific income risk was a critical input in the promotion of the macro market. Consequently, the risk in GDP was estimated by the procedure of Value at Risk (VaR). The advantage of VaR is the estimation of adequate capital which might be insured through an international risk-sharing market. Policymakers may take decisions about the optimal volume of bonds traded in such a way that the future expected returns would equalise with adequate capital measured by the VaR. That study did not consider the exchange rate risk involved in international trading as well as the role of the monetary authority. As income accrues in different currency values, the change in the nominal exchange rate influences the actual return from this hedging market.

We proceed by motivating the idea of an international risk-sharing market (macro market). A GDP-indexed perpetual claim may seem identical to an inflation-indexed bond. The only difference is that the coupon would be indexed to a measure of aggregate income rather than to the consumer price index (CPI). In international risk-sharing markets, traders will take short positions in their country's markets and long positions in the markets of all other countries implying a complete hedging strategy. After hedging, every country would achieve a share of world income. The expected per capita GDP of the domestic country (GDP_p) can be assumed as the world's per capita GDP (GDP_W) minus the departure of domestic country's GDP from the world GDP (Dp):

$$GDP_P = GDP_W - D_P$$

D_P may be positive or negative. It will be positive when the economy's performance is worse than that of the world and will be negative in the opposite case. Through the

macro market, the domestic economy may hedge uncertainty about the country's per capita GDP through a hedging instrument with a yearly payoff D_p. A country that is performing well, whose growth rate is higher than the world's average growth rate, would also benefit as the macro market is an insurance against economic slack. A dilemma for the monetary authorities that may arise is that countercyclical policy may generate negative externalities that impact on the return from the market. The objective of achieving international risk sharing may be threatened. If the prime objective of the monetary authority is reduction in the variance of aggregate income and the proposed market fulfils that aim, then the monetary authorities will be supportive. Thus, it is appropriate to examine how the actions of the monetary authority connect with establishment of risk-sharing financial markets. This study explores the role of the monetary authority in the promotion of these new markets.

One counterexample to received wisdom in international economics is the extent to which countries exploit the gains from international diversification in financial assets. Several studies (Kang and Stultz, 1997; Tesar and Werner, 1997) have documented the 'home country bias', that domestic investors hold too little of their portfolios in foreign assets due to the volatility of asset returns (Stehle, 1977; Jorion and Schwartz, 1986; Korajczyk and Viallet, 1989; Harvey, 1991). One of the critical determinants is fluctuation in currency values (Dumas and Solnik (1995); Ferson and Harvey (1994)). Adding to their choice set, countries have to choose their exchange rate regimes in a way that reduces the adverse impact of currency fluctuations. Countries do not explicitly commit to levels of either the nominal exchange rate or the real exchange rate. The exchange rate regime is officially denominated as managed floating. Our motivation is the setting up of a managed floating regime as a remedy to a barrier to the promotion of international risk-sharing markets.

This study is organised as follows. In Section 2 we describe the potential barrier that stands in the way of the institution of the macro market in the form of exchange rate fluctuations. Section 3 derives the strategies to overcome the hurdle. Section 4 concludes.

2. Barriers to the promotion of an international risk-sharing market

The most common impediments to the institution of macro risk sharing are sizable start-up costs and contract enforcement difficulties. The feasibility of any contract depends upon the rules of settlement, contract size and margin requirements. While these are

general factors, some hindrances which are market-specific are also important. The measurement issue is one of the problems in implementing international risk sharing. The measurement of per capita income is essential as each risk-sharing contract would cash settle based on a measure of per capita income of home and foreign. A universally accepted and unique measure for per capita income is needed. Shiller (1993) advanced the theory of index numbers to address the issue. He proposed several chain indices that are relatively robust to revision, and adjustment to national income measures could be made along these lines. Therefore, the standardization of the indices is essential to creating liquidity in this market. Earlier researchers have addressed these important issues but there has not been enough work on subjects like exchange rate bubbles. Adverse movements of the exchange rate may be a tax on the return from a risk-sharing market. Another problem is the lack of any efficient trading strategy which concerns the proportion of income that would be transferred through the trading. We describe the two constraints below and the strategies to overcome them are derived in the subsequent sections.

2.1 Exchange rate fluctuation

The variability of international risk-sharing market returns is greatly influenced by exchange rate fluctuations. However, the proposed market differs from traditional markets in two senses. The trader is effectively the country itself where the financial instrument can be regarded as a public good. Therefore, the welfare of the country would largely depend on the return from the market. In the familiar case, the traders are individuals or institutions and the financial instruments are private goods. Trading business need not be regular and traders can quit from the business easily whereas international risk-sharing markets suggest a continuous trading strategy. A quit strategy would be detrimental to the achievement of the goal of country-wise risk sharing. At the same time, in view of the routine trading the returns would be volatile due to the exchange rate risk. In the next section, we describe how the monetary authority can use its instruments to reduce exchange rate risk.

3. Strategies to overcome exchange rate risk

3.1 Targeting the exchange rate as a coordination device

If the fluctuations of the exchange rate exceed some thresholds, then the negative impact may impede the objective of macro risk sharing. Monetary policy may be designed to restrain the volatility of the exchange rate. If the volatility of the exchange rate (V_t)

crosses some tolerance level (V^*), the monetary authority intervenes. In our scenario, the authority may target macro variables other than the exchange rate if V_t is less than V^*. If V_t is greater than V^* then the monetary authority targets the exchange rate and output, choosing the exchange rate (e) and the money supply (m) as policy instruments. The equilibrium policy rules are described below.

Let us assume that the world economy is made up of two countries, the home country, H, and the foreign country, F. The exchange rate is a common price and is targeted through coordination among H and F.

The Private Sector

The private sector's behaviour in the home economy is characterised by the following set of linear equations:

$$\left(Y_t^H\right)^d = -a_1 r_t^H + a_2 q_t^H + a_3 Y_t^F \tag{1}$$

$$\left(Y_t^H\right)^s = b_1\left(p_t^H - E_{t-1}p_t^H\right) \tag{2}$$

$$\left(m_t^H\right)^d = p_t^H + c_1 Y_t^H - c_2 i_t^H \tag{3}$$

$$i_t^H = r_t^H + E_t p_{t+1}^H - p_t^H \tag{4}$$

$$q_t^H = e_t - \left(p_t^H - p_t^F\right) \tag{5}$$

$$i_t^H = i_t^F + \left(E(e_{t+1}) - e_t\right) \tag{6}$$

$$\left(Y_t^H\right)^d = \left(Y_t^H\right)^s = Y_t^H \tag{7}$$

$$\left(m_t^H\right)^d = \left(m_t^H\right)^s = m_t^H \tag{8}$$

The demand and supply for goods (in logs) are $\left(Y_t^H\right)^d$ and $\left(Y_t^H\right)^s$ respectively and $\left(m_t^H\right)^d$ and $\left(m_t^H\right)^s$ are the demand for money and supply of money respectively. The two markets are assumed to be clear. (Equation (7) and (8). r_t^H, i_t^H, q_t^H and p_t^H are the real interest rate, the nominal interest rate, the real exchange rate and the price level

respectively. Y_t^F, p_t^F and i_t^F represent output, the price level and the nominal interest rate for the foreign country. E_t is the expectations operator.

Equation (1) corresponds to the standard aggregate demand (or open-economy IS) function which shows that aggregate demand in each country depends on the interest rate, the real exchange rate, and income abroad. Equation (2) is the aggregate supply equation. Since p_t is the actual price level, different from the prior expectation formed, $E_{t-1}p_t$, the monetary authority will have the power to influence output in the short run. Equation (3) describes the demand for money, increasing in income and decreasing in the nominal interest rate. Equation (4) is Fisher's Identity. Equation (5) and (6) correspond to Purchasing Power Parity and Interest Rate Parity respectively. All parameters are positive.

Recall that the return on our bond is based on an index of GDP. Through the macro market, the domestic country would sell N perpetual claims on domestic per capita GDP and buy N perpetual claims on foreign per capita GDP where each claim has the same price. The net income received at time t by the home country through the risk-sharing market is the net dividend of the GDP-indexed perpetual claim, which is as follows:

$$X_t^H = \lambda Y_t^F \exp(e_t) - \gamma Y_t^H \tag{9}$$

where λ, γ are the proportions of GDP transferred from foreign country to home and home to foreign respectively. Shiller (1993) pointed out that individuals of the domestic country would achieve a share of global income which is proportionate to X_t^{11}. Consequently, any gain or loss in the macro market would increase or reduce the home country's consumption and investment proportionately to X_t^H. Thus, the IS function can be rewritten as follows.

$$Y_t^H = -a_1 r_t^H + a_2 q_t^H + a_3 Y_t^F + a_4 X_t^H \tag{10}$$

The only difference from the traditional IS model is the term $a_4 X_t^H$.
Similarly for the foreign country the basic relations are as follows:

$$\left(Y_t^F\right)^d = -d_1 r_t^F + d_2 q_t^F + d_3 Y_t^H + d_4 X_t^F \tag{11}$$

$$\left(Y_t^F\right)^s = e_1\left(p_t^F - E_{t-1}p_t^F\right) \tag{12}$$

$$m_t^F = p_t^F + f_1 Y_t^F - f_2 i_t^F \tag{13}$$

$$i_t^F = r_t^F + \left(p_t^F - p_{t-1}^F\right) \tag{14}$$

$$q_t^F = -e_t - \left(p_t^F - p_t^H\right) \tag{15}$$

$$\left(Y_t^F\right)^d = \left(Y_t^F\right)^s = Y_t^F \tag{16}$$

$$\left(m_t^F\right)^d = \left(m_t^F\right)^s = m_t^F \tag{17}$$

The system of equations represented above for the foreign country is identical to the home country. The term of IS equation (11) is similar to the term of the IS relation of the home country. The equivalent relationship of (9) is as follows.

$$X_t^F = \gamma Y_t^H \exp\left(-e_t\right) - \lambda Y_t^F \tag{18}$$

We have neglected the interest rate parity equation for the foreign country as it would be redundant. In a two-country model, the real exchange rate for the domestic economy, equation (5), is the negative of the real exchange rate for the foreign economy, equation (15).

Upon substitution of the equation (5) and (11) into the IS equation of home country (equation 10) and considering the LM curve (equation 5), the condition for equilibrium in the home goods market can be written as:

$$\left(m_t^H\right)^d - p_t^H + c_2 i_t^H = -k_1 r_t^H + k_2\left(e_t - \left(p_t^H - p_t^F\right)\right) + \left(a_4 X_t^H + d_4 X_t^F\right)$$

In similar way we can write the condition for equilibrium on the foreign goods market as:

$$\left(m_t^F\right)^d - p_t^F + f_2 i_t^F = -k_1^* r_t^F - k_2^*\left(e_t - \left(p_t^H - p_t^F\right)\right) + \left(a_4 X_t^H + d_4 X_t^F\right)$$

Combining the system of equations (1) to (10) and (11) to (18) through consolidating parameters:

$$r_t^H = u_1 m_t^H + u_2 p_t^H + u_3 Y_t^H \tag{19}$$

$$m_t^H = v_1 p_t^H + v_2 Y_t^H + v_3 m_t^F + v_4 p_t^F + v_5 e_t \tag{20}$$

$$m_t^F = w_1 p_t^F + w_2 Y_t^F + w_3 m_t^H + w_4 p_t^H + w_5 e_t \tag{21}$$

$$Y_t^H = G_t^H + \alpha_1 m_t^H + \alpha_2 e_t \tag{22}$$

$$Y_t^F = G_t^F + \beta_1 m_t^H + \beta_2 e_t \tag{23}$$

Here G_t^H and G_t^F are the parameters which contain λ and γ, the proportions of GDP transferred from home (foreign) country to foreign (home) country at period t through GDP-indexed bonds. Without loss of generality we have assumed e_t is less than one, so in the limiting sense it can be approximated as $\exp(e_t) \approx e_t + 1$ and $\exp(-e_t) \approx -e_t + 1$.

International Policy Coordination

In this section we analyse how the exchange rate between the central banks of H and F can be coordinated. While the exchange rate is an exogenous variable for an individual country, it is an endogenous variable for two countries.

The Monetary Authority

We assume that each monetary authority is concerned about achieving, on the one hand, output stability and on the other hand, ensuring a stable exchange rate. The loss functions of both countries is given below:

$$L_t^i = \left(y_t^i\right)^2 + \alpha^i \left(\tilde{e}_t^i\right)^2 \qquad \text{for i = H \& F} \tag{24}$$

The term y_t^i is the departure of output level, Y_t^i, from a target value Y^{i*}, that is $y_t^i = \left(Y_t^i - Y^{i*}\right)$. Similarly, $\tilde{e}_t^i = \left(e_t^i - e^{i*}\right)$, is the deviation of the exchange rate from its targeted level. The non-negative parameters α_i, i = H or F, represent the degree of commitment to those target values. The coordinated policy can be determined by minimising the sum of the countries' respective loss functions, i.e.,

$$\underset{e_t, m_t^H}{\text{Min}}\, L_t \qquad \text{where } L_t = L_t^H + L_t^F \tag{25}$$

The joint loss, L_t, would be minimised with respect to e_t and m_t^H considering the value of Y_t^H and Y_t^F determined by equations (22) and (23) respectively. The equilibrium solutions are given below:

$$\hat{e}_t^C = \frac{\varphi_1 + \varphi_2 + \alpha^H e_t^{H*} + \alpha^F e_t^{F*}}{\left(\alpha_2^2 + \beta_2^2\right) + \left(\alpha^H + \alpha^F\right)} \tag{26}$$

and

$$m_t^{II} = \frac{\alpha_1\psi_1 + \alpha_2\psi_2}{\left(\alpha_1^2 + \beta_1^2\right)} \tag{27}$$

where,

$$\varphi_1 = -\left\{G_t^H + \alpha_1\hat{i}_t^H - Y^{H*}\right\}(\alpha_2)$$

$$\varphi_2 = -\left\{G_t^F + \beta_1\hat{i}_t^H - Y^{F*}\right\}(\beta_2)$$

$$\psi_1 = \left\{Y^{H*} - G_t^H - \alpha_2 e_t^C\right\}$$

$$\psi_2 = \left\{Y^{F*} - G_t^F - \beta_2 e_t^C\right\}$$

3.1.1. Why exchange rate targeting?

Our goal has been to investigate a policy regime which is favourable to promoting an international risk-sharing market. We display in general terms the parsimony of exchange rate targeting. In our two-country model, we assume that the policy targets of home and foreign are x_{II}^* and x_F^* respectively which are two-element vectors each, the 'full employment' level of output and the targeted exchange rate of equation (24). The policy rules are z_{II} and z_F respectively, two-element vectors again, the exchange rate and the money supply. In this policy regime, the exchange rate would be a linear function of z_{II}, z_F and x where x is the vector of other variables which influence the exchange rate and can be solved from the macro model introduced in the previous section. We can write:

$$e = \alpha_1 z_{II} + \alpha_2 z_F + \alpha_3 x \tag{28}$$

where α_1 and α_2 are domestic and foreign policy responses to the exchange rate and α_3 is the coefficient of x. On the other hand, choice of an optimal exchange rate by Home cannot be unilateral, by definition. It must be identical to the optimal exchange rate by Foreign. The exchange rate targets of both must be identical. The scheme can be represented as follows:

$$e = \beta_1 e^* \tag{29}$$

where e^* is the coordinated exchange rate arrived at and β_1 can be called the 'degree of coordination' parameter. The payoffs for each country is freedom of control over domestic money supply for closing the output gap. The variance in e in equation (28) is absent in equation (29).

In sum, we recall the return from risk-sharing markets to the home and foreign country.

These returns are $\left[\lambda Y_t^F \exp(e_t) - \gamma Y_t^H\right]$ and $\left[\gamma Y_t^H \exp(-e_t) - \lambda Y_t^F\right]$ respectively. It is obvious that the returns would be volatile if the exchange rate fluctuates frequently. It can therefore be inferred that exchange rate targeting policy eases the formation of the macro market.

3.1.2. Is policy coordination needed?

There has been an extensive discussion concerning whether cooperative policy regimes deliver superior economic outcomes to regimes that function autonomously (Hughes Hallett 1993; Jensen 1999). The target zone literature does not arrive at any conclusions (Krugman, 1991). Improvements in particular episodes may be recorded but it is difficult to show sustained gains from cooperation for all participants over time (Hughes Hallett, 1992). The burden of proof rests on us.

First, we consider a noncooperative set up where each country minimises a separate loss function to determine their respective policy rules under an exchange rate-targeting regime. Using the relationship of Y_t^H and Y_t^F of equation (22) and (23) we minimise the loss functions, L_t^H and L_t^F to obtain the policy rule of two countries. The policy decision rules are worked out as below.

$$\left(\hat{e}_t^{NC}\right)^H = \frac{\varphi_1 + \alpha^H e_t^{H*}}{(\alpha_2)^2 + \alpha^H} \tag{30}$$

$$\left(\hat{e}_t^{NC}\right)^F = \frac{\varphi_2 + \alpha^F e_t^{F*}}{(\beta_2)^2 + \alpha^F} \tag{31}$$

$$\left(m_t^H\right)^H = \frac{\alpha_1 \psi_1}{\left(\alpha_1^2\right)}$$

$$\left(m_t^H\right)^F = \frac{\alpha_2 \psi_2}{\left(\beta_1^2\right)}$$

$\left(m_t^H\right)^H$ and $\left(m_t^H\right)^F$ are noncooperative solutions of m_t^H evaluated by the home and the foreign country respectively. Equations (26), (30) & (31) highlight the difference between coordinated and noncooperative solutions. Policy targets are different. As appreciation of the exchange rate for one country implies depreciation for the other, one country

gains in welfare to the extent that the other country loses. As the weights α and β are not jointly determined, one country's action must be disadvantageous for other. In a coordinated policy regime, the sum of the loss functions are minimised, so the outcome is likely to be Pareto superior. Coordination would be advantageous for both countries if the weights α and β are chosen by mutual consent from the following equation:

$$\min_{\alpha,\beta} L\left(e^{*}\right)$$

where L (e^{*}) is the optimum value of the joint loss and e^{*} is the coordinated solution of e.

4. Conclusions and Policy Implications

The major focus of this study has been the investigation of the barriers to the macro market and constructing policy weapons to address them. We have explored the possibility of active intervention of the monetary authority in the proposed risk-sharing market.

This study analyses the important links between macroeconomic policies and the international risk-sharing market. We have displayed the effects of the risk-sharing market on the equilibrium policy rule under the exchange rate targeting regime of monetary policy. The returns from the above market will be a share of global income. Thus, the country which participates in the risk-sharing market will face an alteration in its aggregate demand owing to the return from the market. The return would reduce the variance of aggregate demand. Monetary policy also has an impact on risk-sharing markets. Similar to traditional international financial markets, the volatility of the return from the proposed markets also depends on exchange rate bubbles. The basic difference is that here traders would be the country itself instead of any private institution or individual and everyone would earn a share of global income. Well-designed joint monetary policy might restrain the volatility of the exchange rate. In the non-cooperative regime, exchange rate changes are zero sum, an appreciation for one country is a depreciation for the other. Country-wise risk-sharing is surely a superior solution.

There are several serious criticisms of exchange rate targeting for emerging market economies. Episodes in East Asia and Mexico where the weakness of the banking sector and the speculative attacks on the currency tipped their economies into financial crises illustrate how dangerous exchange rate targeting can be for emerging market countries. On the other hand, flexible exchange rates negatively impact on international financial markets and especially on the proposed risk-sharing market under conditions of extreme

volatility. We have proposed a sort of managed floating regime where the exchange rate would be free to float within tolerance bounds. If the volatility breaks the bounds, the monetary authorities will follow the coordinated policy rule considering the exchange rate as a target variable. The policy rule prescribed here is advantageous in two aspects: Exchange rate risk would be controlled more efficaciously and the exchange rate targeting will not be a cause of inefficiencies.

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Determinants of Digital Transaction: A Theoretical Approach

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Abstract

The economic cost of a payment system could be considerably reduced if it is shifted to electronic modes. We develop a theoretical framework aimed to model the transaction cost of cash and cashless transaction (debit card) from the buyer's perspective over a period of time and the market domain in which these cashless transactions will be used in an environment where debit cards and currency (the legal tender) are competing payment media. We also investigate the effect of education and income behind the selection of payment mode between cash and cashless transaction through the analysis of the changes in the transaction cost of cash and cashless transaction with the changes in the level of income and education. The theoretical analysis found that education has a strong positive influence on the selection of cashless mode of payment and if the buyer has a higher level of income beyond a threshold level he will choose cashless transaction, but with a very high level of income but zero level of education then he will always choose cash transaction. So, the level of education is dominating variable over the level of income in the case of selecting a cashless mode of payment.

Keywords: Cashless Transaction, Cash, Payment cards, Payment, Technology use, Transaction cost, Education, Income.

JEL Code: E42, G21

1. Introduction

RBI report[1] on "Deepening of Digital Payments" states that "Digital Transaction means a payment transaction in a seamless system effected without the need for cash at least in one of the two legs, if not in both. This includes transactions made through digital / electronic modes wherein both the originator and the beneficiary use digital / electronic medium to send or receive money".

[1] The report of the 'The High-level Committee on Deepening of Digital Payments' (2019)

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The resource cost of a nation's payment system can account for as much as 3 per cent of its GDP (Humphrey, Pulley, and Vesala (2000)). Electronic payment system enjoys two clear advantages over cash-based or paper-based non-cash (cheque) payment systems. First, since most electronic payments cost only around one-third to one-half as much as a paper-based non-cash payment, the economic cost of a payment system could be considerably reduced if it is shifted to electronic modes. Secondly, since under cashless transactions the documentation of each transaction is complete and accurate when compared to cash transactions, the possibility of the creation of black money gets reduced, thereby increasing transparency and increasing tax compliance.

In the present paper, we are trying to establish a theoretical relationship between the distribution of an individual's choice of payment medium between the cash and cashless mode of payment and its determinants. The motivation of the paper is as follows: the transaction cost of different payment modes may vary across individuals with different levels of income and education. For instance, benefits of using a debit card may differ across different income levels because there is an annual cost of availing debit cards. So, for a person with a very lower income, the gain in the interest he will get by keeping his income in a bank account might be outweighed by the annual charge of maintaining a debit card. Also, the skill required to carry out digital payment is closely related to the level of education, for example, with a low level of education, it is much difficult for them to complete a cashless transaction as the possibility of making technical faults are much higher in their cases, which creates a psychological barrier as well. The paper aims to establish theoretically the influence of education and income over the selection of transaction mode.

The paper is organized as follows. In section 2 we discuss existing literature empirical as well as theoretical and gap in this area of research. In section 3 we discuss the theoretical model with assumptions, and the equilibrium conditions. In section 4 we discuss the results with policy implications. finally, section 5 concludes.

2. Literature Review

In this section we discuss the existing literature on digital transactions, which includes both empirical as well as theoretical literature.

2.1. Empirical Literature

Following are the existing literature based on empirical data analysis.

Khare and Singh (2017) analyse the factors that affect credit card use in India. The purpose of this paper is to understand the effect of some attributes along with age, and gender in credit card use among Indian customers. The variable education and level of income is missing in this paper. The research examines the impact of "lifestyle" variables (convenience, use patterns, and status) on credit card use. Use and convenience emerged as the major determinants of credit card use among Indian customers. Young customers were likely to use credit cards.

The next study is a Denmark regional study based on the survey carried out by the national statistics institute in Denmark by Xiao, Hedman, Runnemark (2015). They provide an explanation about the relationship between consumers' perceptions of different consumption values such as functional value, social value, emotional value, epistemic value, and conditional value associated with a certain payment technology and controls variables like age, gender and income with their choice to use the technology, between three well established payment technologies: cash, payment cards, and Internet banking.

In a study, based on primary survey data from Udaipur region Motwani (2012) analyses the customer adoption of internet banking service & their satisfaction level. The objective of his paper is to identify the factors affecting preference for Internet Banking services used by customers, to find out major obstacles which prevent customers from adopting Internet Banking, to check the significant difference between the satisfaction levels of public & private bank customers towards Internet Banking and to measure the impact of gender, age & education level on the usage rate of Internet Banking. The analysis concludes that there is no significant difference between the satisfaction level of public & private bank customers towards the Internet Banking. The usage rate of Internet Banking is affected by age & educational qualification of customers, while gender differences don't have any impact on use of Internet Banking.

Scholnick, Massoud, Saunders, Carbo-Valverde, Rodr'guez-Fernández (2007) provide a critical survey on credit cards, debit cards and ATMs. A large number of questions are examined in this survey, including the pricing of credit cards, the impact of networks on the provision and pricing of ATMs, as well as the trade-offs that consumers make between different types of payment mechanism, including debit cards, credit cards and ATMs. Importantly, this paper is based on bank level data (from Spain). they conclude that point of sale (debit card) and ATM transactions are substitutes, and that ATM surcharges impacts point of sale volume significantly.

Some existing literature mentioned above which study the relationship between education, age and income with the cashless transaction but those studies are limited to some region or states based on empirical data.

2.2. Theoretical Literature

In the present section, we discuss the existing theoretical literature.

Kim, Lee (2010) providean explanation for both the rapid growth in the use of debit cards over time and the cross-sectional difference in the use of debit card using a search theoretic model. The trade-off between cash and a debit card as means of payment is incorporated such that a buyer incurs disutility cost proportional to the amount of cash holdings, while a seller accepting a debit card bears a fixed record-keeping cost regardless of transaction amount. As record keeping cost decreases with the development of information technology over time, disutility cost of cash holdings required for pairwise trade eventually exceeds record-keeping cost so that all the agents with different wealth levels choose to use a debit card as a means of payment. Also, they find that across income classes the rich use a debit card more frequently than the poor. They provide two distinct mechanisms that improve welfare as record-keeping cost decreases: one is to reduce deadweight loss from holding cash and the other is to reduce its distortionary effect on output produced in pairwise trade.

Bolt & Chakravorti (2008) present a theoretical model explicitly considering how consumers' utility and merchants' profits increase from additional sales resulting from greater security and access to credit linesthrough credit cards. How the cost of the payment service is shared between the merchant and the customer, is determined by the level of the bank's cost to provide payment services. They construct a model of payment instruments where consumers and merchants benefit from greater consumption and sales that arise from transactions that would not occur in a cash-only economy.

Chakraborty and To (2007) analyse the equilibrium conditionof acceptance of credit card between buyer, merchant and issuer of the credit card using the game theoretic two period model. They found that if the issuer's cost of funds is not too high and the merchant's profit margin is sufficiently high, a credit card equilibrium exists. Second, the issuer's ability to charge higher merchant discount fees depends on the number of customers gained when credit cards are accepted. Finally, they show that there is an externality where merchants find themselves in a prisoner's dilemma situation. In equilibrium, each merchant chooses to accept credit cards. However, when all merchants accept credit cards, they are all worse off.

Shy and Tarkka (2002) develop a theoretical framework aimed to model the pricing of electronic cash cards and the market domain in which these cards will be used in an environment where charge cards and currency (the legal tender) are competing payment media. They also investigate whether the simultaneous adoption of the various payment media generates an underutilization or overutilization of the electronic cash cards relative to currency. They find that the transaction domains of the different payment instruments

are as follows. The smallest transactions will be paid for with electronic cash cards. However, extremely small transactions, such as transactions with values close to the smallest legal tender, may be paid with coins if annual fees on electronic cash cards are high. The medium- sized transactions will be paid for with currency, although under certain parameter range currency may vanish entirely. The largest transactions will be paid for with ac- count-based media such as charge cards and check.

Wright (2003) evaluates the social optimality of privately set interchange fees[2]and the adoption of a rule by payment systems to prevent merchants surcharging[3] for card transactions using two extremes of merchant pricing—monopolistic pricing and perfect competition.

Bolt, Humphrey, Tallahassee, (2007) study the cross-border inter-operability for electronic payments. They find, card transactions will increasingly replace cash and checks for all types of payments. Using different methods, they estimate card and other payment network scale economies for Europe. These indicate substantial cost efficiency gains occurred if processing is consolidated across borders rather than onto existing national operations. Cost reductions likely to induce greater replacement of small value cash transactions are also illustrated.

We haven't come across any study that has developed theoretically the relationship between level of income, education and selection of different payment mode at the time of purchase between cash and cashless payment (using debit cards) by analysing the transaction cost of different mode of payment from the buyers' perspective. So, in the present paper we attempt to fill that literature gap. We develop a theoretical model to establish the influence of level of income and education behind the selection of three types of payment modes including cash and cashless transactions. Our analysis will help in policy making to increase the cashless transactions specially for the developing countries.

3. Theoretical Model

3.1. Description of the Model

The assumptions of the model we develop are as follows:

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[2] An interchange fee is the fee charged by banks to the merchant who processes a credit card or debit card payment.

[3] A surcharge. also known as checkout fee. is an extra fee charged by a merchant when receiving a payment by cheque. credit card. charge card or debit card (but not cash) which at least covers the cost to the merchant of accepting that means of payment. such as the merchant service fee imposed by a credit card company.

Assumption 1 : There is no savings. Buyer will be spent all of his income to purchase commodities and services.

Assumption 2 : Buyer will get the income at the beginning of the period and will spend his income over the period. Generally, individuals get their income in the first week of every month and spend that income over the month to meet their expenses for that month. However, the case where an individual gets paid more frequently, can be accommodated in our frame work.

Assumption 3 : The analysis is concerned with one representative period and the period is divided into t parts of equal interval and. buyer will make transaction t times over the period Here 't' is constant at every level of income and education.

Assumption 4 : Every time buyer will spend an amount C, and C is an increasing function of income this assumption is motivated by the fact that, as income increases the level of expenditure also increases due to the inclusion of more expensive commodities as well as inclusion of greater varieties in the consumption basket .

Assumption 5 : For each transaction, the buyer can pay either with cash or with debit card; there is no other payment option available.

Assumption 6 : Payment technology is unchanged over the period. i.e. no easier payment technology becomes available over the period of analysis.

Assumption 7 : Daily interest is available in the bank accounts.

Assumption 8 : There is zero probability of theft from house.

Now one individual can complete their total expenditure of that period in three ways

Case 1 : He can withdraw his or her total expenditure of the period at the beginning of the period from the bank account and then he can pay in cash each time of the purchased. (Called cash transaction of A type).

Case 2 : She can withdraw c amount each time from his/her account to pay for his/her expenses each time in cash (Called cash transaction of B type).

Case 3 : He can spend the amount every time using debit card directly at the time of purchase. (Called Debit card transaction).

Transaction cost of any type of payment mode involves two types of transaction cost,

one is transaction cost at the shop floor and second is the other type of cost but not occurred at the shop floor.

Now considering cash transaction of A-type the buyer has to face two types of transaction cost one type is the transaction cost at the shop floor and 2nd is the 'other costs' associated with A-type cash transaction which are not occurred at the time of transaction at the shop such as transportation cost of withdrawing money from bank, inconvenient cost of carrying cash to the shops etc.

The first transaction cost associated with cash transaction of A-Type at the shop floor is Loss of time and handling cost to transact each unit of money with cash with zero level of education at the time of purchasing goods and services each time, denoted by τ_R, which is the value of time associated with giving currency notes and coins, counting it, checking for counterfeits. This time loss and handling cost for each unit of money will reduced with the increase in level of education at the rate; e_R. In other words, e_R is coefficient of education i.e. with the increase in 1 year of education the handling cost and time loss for each unit of money will reduce by e_R proportion, where **E** denotes level of education. So, the total time loss and handling cost to transact **Y** amount of money over that period with **E** level of education will be $(\tau_R - e_R E)Y$.

However, a very high level of education is not required to complete a cash transaction most efficiently. So we assume that beyond a certain level of education E_R improvement in education do not have any further effect on cost of transaction. That is beyond this level the time loss and handling cost can't be reduced further. At any education level less than E_R, time loss and handling cost is a decreasing function of level of education but beyond education level E_R time loss and handling cost will be constant at $\left(\tau_R^B - e_R E_R\right)$ per unit of money. Let us call this level $\overline{\tau_R}$. So, the transaction cost of cash transaction at the shop floor is closely associated with the level of education.

The other type of cost associated with cash transaction of A-type other than the cost at shop floor is an inconvenience costassociated with the carrying cash to the shop from house (assuming zero probability of theft from house) here ∅ **denotes** thecoefficient of inconvenient cost. Inconvenient cost of carrying cash is an increasing function of amount of transaction **(c).** But it will happen **t** times, so total inconvenient cost will be $\varnothing c.t$, which we can write as $\varnothing Y$ (by putting the value of t as $\frac{Y}{C}$, as the consumer spend all of his **Y** income by spending **C** amount each time over the period). Where **Y** is the total

income of the buyer and buyer will spend his entire income over that period. So, here we consider inconvenience cost is an increasing function of income.

Othe type of cost associated with cash transaction of A type is the loss of interest by the amount $i.Y$, for withholding all his/her income in cash at the beginning of that period. where i denotes rate of interest and which is compounded on daily basis.

Last component of other types of cost is the transportation cost of withdrawing money from the bank account, which is denoted as $\mathbf{TP_R}$, as we assume that buyer will get his entire income for that period in his bank account at the beginning of that period. This transportation cost includes transportation cost as well as time loss and all other cost associated with withdrawing money from bank account and which is constant each time.

So the total transaction cost function of Cash transaction of A type ($\mathbf{TC_{Ra}}$) by combining all the four types of cost mentioned above is

$$TC_{Ra} = \begin{bmatrix} (\tau_R - e_R E)Y + \varnothing Y + i.Y + TP_R \\ (\tau_R - e_R E_R)Y + \varnothing Y + i.Y + TP_R \end{bmatrix} \begin{matrix} for\ E < E_R \\ for\ E \geq E_R \end{matrix}$$

(Where **R** in the subscripts of above cost function denotes cash transaction)

Now in case of cash transaction of B-Type the total transaction cost could be divided in two parts also, one is cost at the shop floor and other cost. The transaction cost at the shop floor in case of cash transaction of B-type is same as the transaction cost at shop floor in case of cash transaction of A-type.

The only difference is that the interest loss and transportation cost of withdrawing money from bank is different compare with the cash transaction of A-type.Here in case of cash transaction of B-type interest gain has been occurred here, as all the money income are not being withdrawn from the bank account at the beginning of the period butt times over the period between constant intervals, which is explained below.

If the buyer will withdraw C amount each t times then the 1st c amount will not get any interest but the 2nd C withdraw will get interest by the amount $c\left\{\left(1+\frac{i}{t}\right)^{t}-1\right\}$

And the 3rd c withdraw will get interest by the amount $c\left\{\left(1+\frac{i}{t}\right)^{2}-1\right\}$

Similarly, the 4th c withdraw will get interest by the amount $c\left\{\left(1+\frac{i}{t}\right)^{3}-1\right\}$

And t th$c$ withdraw will get interest by the amount $c\left\{\left(1+\frac{i}{t}\right)^{(t-1)}-1\right\}$

So, the total interest gain will be

$$=c\left\{\left(1+\frac{i}{t}\right)-1\right\}+\left\{\left(1+\frac{i}{t}\right)^{2}-1\right\}+c\left\{\left(1+\frac{i}{t}\right)^{3}-1\right\}+...+c\left\{\left(1+\frac{i}{t}\right)^{(t-1)}-1\right\}$$

$$=c\left[\left(1+\frac{i}{t}\right)+\left(1+\frac{i}{t}\right)^{2}+...+\left(1+\frac{i}{t}\right)^{(t-1)}-(1+1+...+1)\right]$$

$$=c\left[\frac{\left\{\left(1+\frac{i}{t}\right)\left(1-\left(1+\frac{i}{t}\right)^{(t-1)}\right)\right\}}{\left\{1-\left(1+\frac{i}{t}\right)\right\}}-(t-1)\right]$$ (Using G.P series summation formula)

$$=c\left[\frac{t+i}{i}\left(1-\left(1+\frac{i}{t}\right)^{(t-1)}\right)-(t-1)\right]$$ (After simplifying)

So total interest loss should be the difference between the interest gain from keeping all of his/her income into the bank account for that total period and the total interest s/he get after withdrawing some money each time over the period, i.e. total interest loss will be

$$\left\{y.i-c\left[\frac{t-i}{i}\left(1-\left(1+\frac{i}{t}\right)^{(t-1)}\right)-(t-1)\right]\right\}$$

The last other type of cost is the transportation cost, as the buyer is withdrawing money t times from the bank and each time the constant transportation cost is denoted as $\mathbf{TP_R}$, so the total transportation cost of withdrawing money t times from the bank is $TP_R.t$.

So, the total transaction cost function of cash transaction of B-type $\mathbf{TP_{Rb}}$ is as follow

$$TC_{Rb} = \begin{bmatrix} (\tau_R - e_R E)Y + \varnothing Y + \left\{ y.i - c\left[\frac{t+i}{i}\left(1 - \left(1 + \frac{i}{t} \right)^{(t-1)} \right) - (t-1) \right] \right\} + TP_R t & for\ E \le E_R \\ (\tau_R - e_R E_R)Y + \varnothing Y + \left\{ y.i - c\left[\frac{t+i}{i}\left(1 - \left(1 + \frac{i}{t} \right)^{(t-1)} \right) - (t-1) \right] \right\} + TP_R t & for\ E > E_R \end{bmatrix}$$

Now if he pays for goods and services each time with debit card every time directly, then the following transaction cost are there

τ_D is the time loss and handling cost whichincludes the cost of technical fault[4] and mistakes associated with the transaction with debit card at the shop floor when level of education is zero. τ_D is an increasing function of amount of transaction each time, this could be a physiological cost or could be an actual cost if some mistakes could happen in real.This is the cost of fear of sending money to wrong account no. which will increase if the amount of transaction is much higher compare to the cost of fear in case of very little amount of transaction, this cost associated with handling a debit card transaction. This cost could reduce with the increase in the level of education. Here in TC_D cost function e_{D1}, e_{D2} both are coefficients of education related to debit card transaction. Where $\mathbf{e_{D1}} < \mathbf{e_{D2}}$ means when the level of education is lower than the E_{D1} then the marginal effect of 1-year extra education on the reduction in handling cost of debit card transaction ($\mathbf{e_{D1}}$) is much less than the marginal effect of 1-year extra education on the reduction of handling cost ($\mathbf{e_{D2}}$) beyond the education level E_{D1} but lesser than E_{D2}.

So, $(\tau_D - e_{D1}E)$ is the amount of time loss, handling cost and inconvenient cost of any technical fault related to each unit of money transacted using debit card each time at E level of education which is lesser than E_{D1} level of education. If 'c' amount of money will

[4] cost of technical fault means if money will go to a different account due to mistake in typing the wrong account no. and so on or any type of technical miss lead.

transact using debit card each '*t*' time then total cost of handling debit card transaction of that period will be

$$(\tau_D - e_{D1}E).\ c.t$$

$$Or,\ (\tau_D - e_{D1}E).Y \quad [\text{as t = Y/c}])$$

When the level of education is more than E_{D1} level but lesser than E_{D2} thentime loss, handling cost and inconvenient cost of any technical fault related to transact Y amount of income using debit card. Will be $(\tau_D - e_{D2}E)Y$ which is lesser than $(\tau_D - e_{D1}E)Y$.

The minimum level of education required to complete a debit card transaction most efficiently with minimum time loss and handling cost is denoted as E_{D2}. So, $(\tau_D - e_{D2}E_{D2})$ denotesthe minimum time loss and handlingcost of debit card transaction to transact a unit of money which is constant and let us called it as $\overline{\tau_D}$. To transact Y level incomewith debit card the minimum amount of time loss and handling cost will be $(\tau_D - e_{D2}E_{D2})Y$ or $\overline{\tau_D}.Y$ when level of education is at least equal to E_{D2} level or more than that.

Other cost associated with debit card transaction is Interest loss which is same like in the 2nd case because s/he will be debiting exactly equal amount as in the case of cash transaction of **B-type** from the bank account each time using debit card.

The last other type of cost associated is annual fee for availing debit card facility which is denoted as f_A.

So, the total transaction cost function of debit card transaction is

$$TC_D = \begin{bmatrix} (\tau_D - e_{D1}E)Y + i.Y - c\left[\dfrac{t+i}{i}\left(1-\left(1+\dfrac{i}{t}\right)^{(t-1)}\right)-(t-1)\right]+f_A & for\ E < E_{D1} \\ (\tau_D - e_{D2}E)Y + i.Y - c\left[\dfrac{t+i}{i}\left(1-\left(1+\dfrac{i}{t}\right)^{(t-1)}\right)-(t-1)\right]+f_A & for\ E_{D1} < E < E_{D2} \\ (\tau_D - e_{D2}E_{D2})Y + i.Y - c\left[\dfrac{t+i}{i}\left(1-\left(1+\dfrac{i}{t}\right)^{(t-1)}\right)-(t-1)\right]+f_A & for\ E \geq E_{D2} \end{bmatrix}$$

The subscript D denotes debit card transaction

Assumption 9 : $E_R < E_{D2}$. It implies that, to handle cash transaction efficiently with

minimum time loss and handling cost, the minimum level of education requires (E_R) is lesser than the minimum education require to minimise time loss and handling cost in case of debit card transaction (E_{D2}). The basis of this assumption is that The basis of this assumption is that to complete cash transaction efficiently much higher level of education is not required, for instance, sometime basic primary education is sufficient to do the cash transaction efficiently, but in case of debit card transaction basic primary education couldn't be sufficient to complete a debit card transaction and handle it's related activities efficiently, much higher level of education compare with the case of cash transaction is require to complete a debit card transaction most efficiently with minimum time loss and handling cost.

Assumption 10 : $e_{D1} < e_R < e_{D2}$. It implies that with the increase in one extra year of education till E_{D1} level initially marginal effect of one extra year of education on the reduction in handling cost of debit card transaction is lesser than the marginal effect of one-year extra education on the reduction in handling cost of cash transaction. This is because with a very low level of education it is more difficult to deal with debit card transaction related activities i.e. dealing with the pin, OTP, SMS, email notifications technical fault etc. In contrast when the individual crosses a level of education which is higher than E_{D1} level but lesser than E_{D2} (as per our model) then the marginal effect ofone-year extra education on the reduction in handling cost of debit card transaction is higher than the marginal effect of one extra year of education on the reduction in handling cost of cash transaction.

Assumption 11 : $\tau_R > \tau_D$, it indicates that at zero level of education the time loss and handling cost of debit card transaction (τ_D) is higher than the time loss and handling cost of cash transaction (τ_R). This assumption is motivated by the fact that with zero level of education it is very much harder to do a Debit card transaction because of the huge fear of technical fault, rigidity of technical knowhow etc. but due to the familiarity with the currency since childhood and universal acceptability, handling the currency transaction is easierthan handling debit card transaction even at the zero level of education.

Assumption 12 : $\overline{\tau_R} < \overline{\tau_D}$ implies that after achieving minimum education require for each type of transaction the minimum time loss and handling cost is lower in case of debit card transaction than in case of cash transaction. As currency transactions involve taking money out of the purse which may involve using two different wallets, a wallet for currency notes, and a wallet for currency coins. The cashier then counts the money (notes and coins), and checks for counterfeits. The cashier then sorts notes and coins and places them separately

into the drawer of the cash register. The cashier then has to sort out notes and coins and hand them back to the buyer as change. The buyer has to count the change (notes and coins) in order to make sure that he was not cheated. In contrast, debit card transactions require only insertion and punching in a four-digit code (if any). As with the education the inconvenient feeling of sending money into wrong account no. gets reduced which reduce the overall handling cost of debit card transaction.

Assumption 13 : $\{\tau_R + TP_R + \varnothing + D\} < \tau_D$; it implies that the cost of handling each unit of money using debit card at zero level of education (τ_D) is higher than the summation of handling cost of each unit of cash transaction at zero level of education (τ_R), transportation cost of withdrawing money from bank (TP_R), inconvenient cost of carrying one unit of money in cash (and interest gain from one unit of money each time (D).

Where $D = \frac{1}{t}\left[\left(\frac{t+i}{i}\right)\left(1-\left(1+\frac{i}{t}\right)^{(t-1)}\right)-(t-1)\right]$. **'D'** could be interpreted as the interest gain over the period when **c** amount of money is being withdrawn each '**t**' times between a fixed interval.

This assumption basically describes that the access to the bank is easy so the transportation cost to withdrawing the money from bank account is much lower (TP_R) . The inconvenient cost of carrying one unit of cash to the shop is also much lower ($\varnothing$) and the interest gain from one unit of income (D) is also much lower. And that's the reason the summation of these three with the handling and inconvenient cost of one unit of cash transaction at zero level of education (τ_R) is much lower than the handling cost of one unit of debit card transaction at zero level of education (τ_D) , because at zero level of education the handling cost including fear of technical cost is much higher compare to the above mentioned three cost related to the cash transaction, as usually individuals are more familiar with the cash transaction since childhood.

3.2. Equilibrium Education :

In this section, we establish the existence of an equilibrium level of education among the three types of transactions mentioned above by comparing any two types of transactions at a time with respect to the level of education. Here Equilibrium education denotes the level of education where the transaction cost of any two modes of the transaction will be equal to each other while comparing the two types of transaction mode. Beyond the equilibrium level of education, the transaction cost of one type of transaction mode will be lower than the other type. Then we can conclude that level of education has some influence on the selection of a particular payment mode.

3.2.1 Comparison between cash transaction of A type and B type in respect of level of education

If we want to find out equilibrium level of education beyond where the transaction cost of either cash transaction of A-type or cash transaction of B type becomes cheaper than other, we can't get any such equilibrium level of education the argument is that transaction cost at the shop floor, where education matters, the cost is the same for cash transaction of A type and B type. In the shop floor, the handling costs and time loss are the same for cash transaction of A type and B type. It's the travelling cost to the bank and the interest cost that are different. So here education level will not make any difference. So, depending on the level of all other parameters either the cash transaction of A-type or B-type will remain higher than the other one with respect to every level of education.

3.2.2. Comparison between Cash transaction of A type and debit card transaction with respect to education

To find out the existence of equilibrium level of education (given the level of income) beyond where transaction cost of cash transaction of A-type will be higher than the total transaction cost of debit card transaction each time we can consider following equation:

$TC_{Ra} \leq TC_D$ (considering education level greater than E_{D1} otherwise no intersections will be there figure 1)

$$\Rightarrow (\tau_R - e_R E)Y + \varnothing Y + i.Y + TP_R$$

$$\leq (\tau_D - e_{D2} E)Y + \left\{ Y.i - c\left[\frac{t+i}{i}\left(1 - \left(1 + \frac{i}{t} \right)^{(t-1)} \right) - (t-1) \right] \right\} + f_A$$

From the above equation we can get the equilibrium level of education beyond where transaction cost of debit card becomes less costly. That threshold level of education is

$$\Rightarrow E \leq \frac{(\tau_D - \tau_R)Y + (f_A - TP_R) - \varnothing Y - I}{(e_{D2} - e_R)Y} \; (= \widehat{E_{Ra}})$$

Where $I = c\left[\frac{t+i}{i}\left(1 - \left(1 + \frac{i}{t} \right)^{(t-1)} \right) - (t-1) \right]$ ***or I can be represented as Y.D***

Here $\bar{\bar{E}}_{Ra}$ is positive from considering the assumptions.

i.e. the education require to make the debit card transaction cheaper than the cash transaction of A type is directly depend on the initial time loss difference $(\tau_D - \tau_R)$ at zero level of education Such that if initial time loss to transact with debit card at zero level of education is much higher given the other parameters then much higher education will be required to make the transaction cost of debit card lower than the transaction cost of cash. and also depends on the difference between annual fees and the transportation cost of withdrawing cash from bank and inversely depend on the difference between education coefficients.

PPROPOSITION 2: Beyond the education level $\bar{\bar{E}}_{Ra}$ buyer will choose debit card transaction instead of cash transaction of 'A' type given income.

Figure 1 is the diagrammatic representation of the cost functions and equilibrium level of education between cash transaction of A-type and debit card transaction, where $\overline{TC_{Ra}}$ and $\overline{TC_D}$ represent a constant transaction cost with minimum time loss and handling costin case of cash transaction of A-type and debit card transaction respectively. Point E represents the equilibrium point where both the transaction cost is equal to each other, it could be any where between the education level E_{D1} and E_{D2}. In the diagram we represent equilibrium level of education by E_{Ea}.

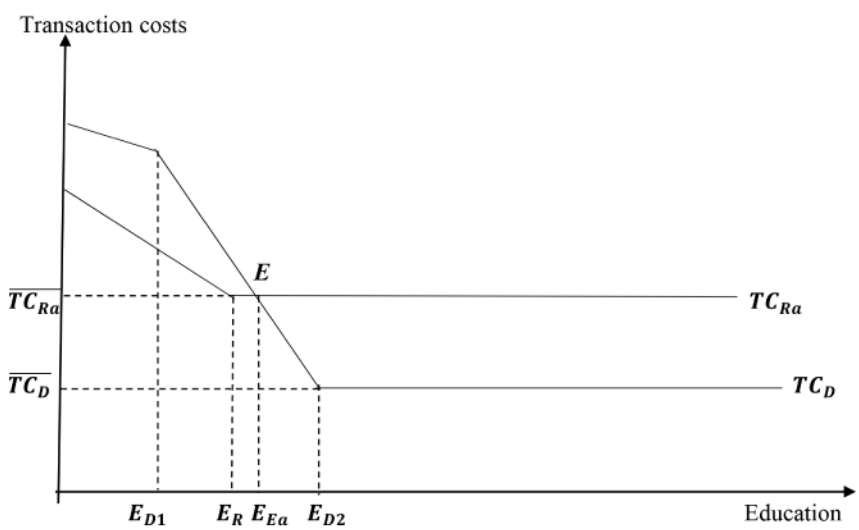

Figure 1: Diagrammatic Representation of Equilibrium Level of Education Between Cash Transaction of A-type and Debit Card Transaction

3.2.3. Comparison between Cash transaction of 'B' Type and debit card transaction with respect to education

Similarly debit card transaction will be costlier than the cash transaction of B type for the level of education where:

$$TC_{Rb} \leq TC_D$$

$$\text{Or, } (\tau_R - e_R E)Y + \varnothing Y + \left\{ Y.i - c\left[\frac{t+i}{i}\left(1 - \left(1 + \frac{i}{t} \right)^{(t-1)} \right) - (t-1) \right] \right\} + TP_R.t$$

$$\leq (\tau_D - e_{D2} E)Y + \left\{ Y.i - c\left[\frac{t+i}{i}\left(1 - \left(1 + \frac{i}{t} \right)^{(t-1)} \right) - (t-1) \right] \right\} + f_A$$

$$E \leq \frac{(\tau_D - e_{D2} E)Y + (f_A - TP_R.t - \varnothing Y)}{(e_{D2} - e_R)Y} \; (= \widehat{E_{Ra}})$$

For all the education level lesser than $\widehat{E_{Ra}}$debit card transaction cost will be much higher than the cash transaction of B type. So, for any education level lesser than $\widehat{E_{Ra}}$ buyer will choose cash transaction. But when education level is higher than $\widehat{E_{Ra}}$ then buyer will choose debit card each time to pay for his expenses.

$\widehat{E_{Ra}}$ is also a function of time loss at zero level of education, annual fees, cost of withdrawing money and education coefficients.This is an increasing function of time loss and handling cost differences at zero level of education and annual fees. But inversely related to the transportation cost of withdrawing money from bank, inconvenient cost of carrying cash and the difference between education coefficient.

PROPOSITION 3: Beyond the education level $\widehat{E_{Ra}}$ buyer will choose debit card transaction instead of cash transaction of 'B' type given income.

Figure 2 is the diagrammatic representation of the cost functions and equilibrium level of education where between Cash transaction of B-type and debit card transaction, where $\overline{TC_{Ra}}$ and $\overline{TC_D}$ represent a constant transaction cost with minimum time loss and handling cost in case of cash transaction of B-type and debit card transaction respectively. Point E represent the equilibrium point where both the transaction cost is equal to each other, it

could be anywhere between the education level and . In the diagram we represent equilibrium level of education by .

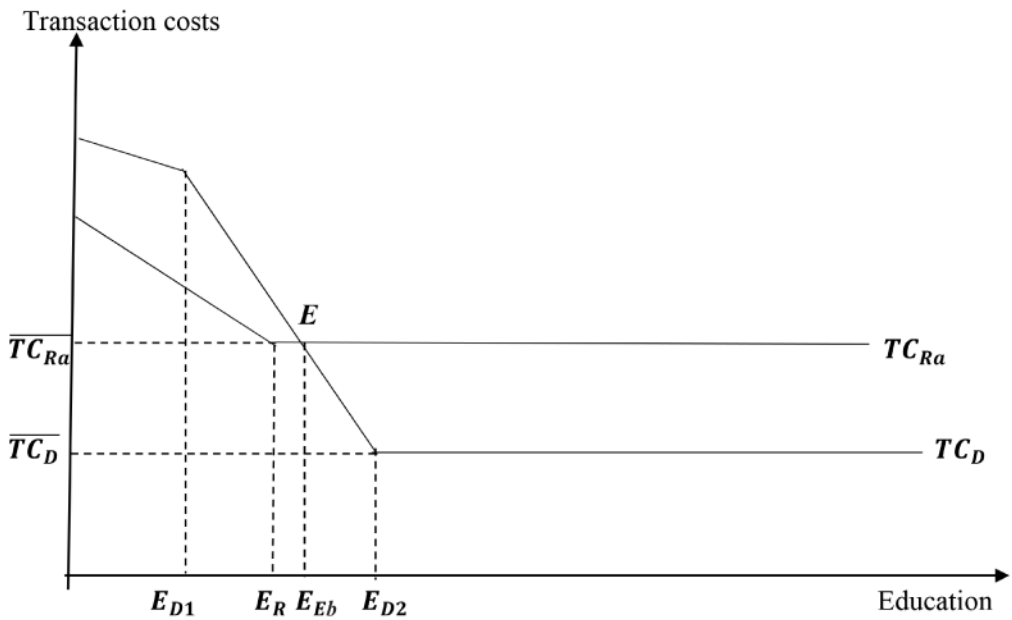

Figure 2: Diagrammatic Representation of Equilibrium Level of Education Between Cash Transaction of B-type and Debit Card Transaction

3.3. Equilibrium Income:

In this section we establish the existence of an equilibrium level of income between the three types of transactions mentioned above by comparing any two types of transactions at a time in respect of the level of income of the buyer. Here Equilibrium income denotes the level of education where the transaction cost of any two modes of the transaction will be equal while comparing the two types of transaction mode in respect of the level of income at a time. Beyond the equilibrium level of income, the transaction cost of one type of transaction mode will be lower than the other type. Then we can conclude that level of income has some influence behind the selection of a particular payment mode.

3.3.1. Comparison between Cash Transaction of A type and B type with respect of Income Level

Now we want to find out whether there exists any equilibrium level of income or not beyond where cash transaction of B type will be cheaper than the cash transaction of A type. i.e. the level of income where,

$$TC_{Rb} \leq TC_{Ra}$$

$$\Rightarrow (\tau_R - e_R E)Y + \varnothing Y + Y.i - c\left[\frac{t+i}{i}\left(1-\left(1+\frac{i}{t}\right)^{(t-1)}\right)-(t-1)\right] + TP_R.t$$

$$\leq (\tau_R - e_R E)Y + \varnothing Y + Y.i + TP_R$$

Or, $\geq \dfrac{TP_R(t-1)}{D} (= \widehat{Y_{Rba}})$ **Where** $D = \dfrac{1}{t}\left[\dfrac{t+i}{i}\left(1-\left(1+\dfrac{i}{t}\right)^{(t-1)}\right)-(t-1)\right]$

i.e. income level greater than $\widehat{Y_{Rba}}$ cash transaction of B type will be much cheaper than the cash transaction of A type. (given all other parameters). $\widehat{Y_{Rba}}$ is a decreasing function of interest gain from each unit of money each time (*D*).

PROPOSITION 4: Beyond the income level $\widehat{Y_{Rba}}$ buyer will choose cash transaction of 'B' type instead of cash transaction of 'A' type given income.

3.3.2. Comparison between Cash Transaction of 'A' Type and Debit Card Transaction with respect of Income Level

Now we want to check the existence of any equilibrium level of income beyond where debit card transaction becomes cheaper than the cash transaction of A typeconsidering level of education lesser than E_{D1} level. That is the level of income where;

$$TC_{Ra} \leq TC_D \text{ (given education level lesser than } E_{D1})$$

Or, $(\tau_R - e_R E)Y + \varnothing Y + Y.i + TP_R \leq (\tau_D - e_{D1} E)Y + \left\{Y.i - c\left[\dfrac{t+i}{i}\left(1-\left(1+\dfrac{i}{t}\right)^{(t-1)}\right)-(t-1)\right]\right\} + f_A$

(By putting the values of the cost functions)

$$or,\ Y \leq \frac{f_A - TP_R}{(\tau_R - e_R E) - (\tau_D - e_{D1} E) + \phi + D} \left(= \widehat{Y_{ad}}|_{at\ E<E_{D1}} < 0\right)$$

Where, $D = \dfrac{1}{t}\left[\left(\dfrac{t+i}{i}\right)\left(1-\left(1+\dfrac{i}{t}\right)^{(t-1)}\right)-(t-1)\right]$, From the above equation we can interpret that given education level lesser than E_{D1}, as the handling cost of debit card transaction $(\tau_D - e_{D1} E)$ will be higher than the handling cost of cash transaction

$(\tau_R - e_R E)$. Then $\widehat{Y_{ad}}$ will be negative (considering all the mentioned assumptions) implying for any level of **Y** greater than a negative value of $\widehat{Y_{ad}}$ the transaction cost of debit card transaction will be much costlier for the buyer compare to the transaction cost of cash transaction of A type. So, for any positive income level buyer will then choose cash transaction only, to pay for his expenses.

Now we want to check the existence of any equilibrium level of income beyond where debit card transaction becomes cheaper than the cash transaction of A type considering level of education is higher than E_{D1} but lesser than E_{D2} level. That is the level of income where;

$$\mathbf{TC_{Ra}} \leq \mathbf{TC_D} \text{ (given education level higher than } E_{D1} \text{ but lesser than } E_{D2} \text{ level)}$$

$$\textbf{Or, } (\tau_R - e_R E)Y + \varnothing Y + Y.i + TP_R \leq (\tau_D - e_{D2} E)Y + \left\{ Y.i - c\left[\frac{t+i}{i}\left(1 - \left(1 + \frac{i}{t} \right)^{(t-1)} \right) - (t-1) \right] \right\} + f_A$$

(By putting the values of the cost functions)

$$\textit{or, } Y \leq \frac{f_A - TP_R}{(\tau_R - e_R E) - (\tau_D - e_{D2} E) + \phi + D} \; (\widehat{Y_{ad}}|_{at\ E_{D1} < E < E_{D2}})$$

$\widehat{Y_{ad}}|_{at\ E_{D1} < E < E_{D2}}$could be positive or negative depending on the exact level of education lies between E_{D1} and E_{D2}, at a particular level of education more than E_{D1} but lesser than E_{D2} level if the handling cost of debit card transaction $(\tau_D - e_{D2} E)$ will be lesser than the handling cost of cash transaction $(\tau_D - e_R E)$. Then $\widehat{Y_{ad}}|_{at\ E_{D1} < E < E_{D2}}$ will be positive otherwise negative (considering all the assumptions and parameters fixed). and that will be considered as threshold level of income beyond which transaction cost of debit card transaction will be much cheaper than the transaction cost of cash transaction of A-type.

Now we want to check the existence of any equilibrium level of income beyond where debit card transaction becomes cheaper than the cash transaction of A type considering level of education is higher than or equal to E_{D2} level. That is the level of income where;

$$\mathbf{TC_{Ra}} \leq \mathbf{TC_D} \text{ (given education level higher than or equal to } E_{D2} \text{ level)}$$

$$\textbf{Or, } \overline{\tau_R} Y + \varnothing Y + Y.i + TP_R \leq \overline{\tau_R} Y + \left\{ Y.i - c\left[\frac{t+i}{i}\left(1 - \left(1 + \frac{i}{t} \right)^{(t-1)} \right) - (t-1) \right] \right\} + f_A$$

(By putting the values of the cost functions)

$$\textit{or, } Y \leq \frac{f_A - TP_R}{\overline{\tau_R} - \overline{\tau_R} + \phi + D} \left(\widehat{Y_{ad}}|_{at\ E>E_{D2}}\right) > 0).$$

So given the education level higher than equal to $\mathbf{E_{D2}}$ level, $\widehat{Y_{ad}}|_{at\ E>E_{D2}}$more than or equal to $\mathbf{E_{D2}}$ the handling cost of debit card transaction $\left(\tau_D - e_{D2}E\right) = \overline{\tau_D}$ will be lesser than the handling cost of cash transaction $\left(\tau_R - e_R E\right) = \overline{\tau_R}$. Then $\widehat{Y_{ad}}|_{at\ E>E_{D2}}$ will be positive implying the existence of a positive threshold level of income beyond which debit card transaction will be cheaper than the cash transaction of A type so buyer will then choose cashless transaction mode to pay for his expenses.

If level of education is zero then the value of $\widehat{Y_{ad}}$ will be negative (as the denominator of $\widehat{Y_{ad}}$ ratio will be negative as per the assumption 13 i.e, $\{\tau_R + TP_R + \varnothing + D\} < \tau_D$

$\widehat{Y_{ad}}$ at zero education $= \dfrac{f_A - TP_R}{(\tau_R - \tau_D) + \phi + D} < 0$.

So, for any income greater than a negative value of $\widehat{Y_{ad}}$ means for any positive value of Y (income) cash transaction of A type will be cheaper than debit card transaction cost. In other words, for any positive level of income if buyer has zero level of education will always pay in cash to make payments for his expenses.

So, we can conclude that conditional upon a particular level of education, people with higher level of income (beyond a threshold level) will choose debit card transaction.

Now, the **threshold level of education** is a decreasing function of 'D', inconvenient cost of carrying cash, difference between education coefficient, the difference between handling cost at zero level of education $\left(\text{i.e.}\left(\tau_R - \tau_D\right)\right)$ and transportation cost of with drawing money from bank. But increasing function of annual fees charged by bank for availing debit card.

PROPOSITION 5: Beyond the income level $\widehat{Y_{ad}}$ buyer will choose debit card transaction instead of cash transaction of 'A' type conditioning a particular level of education.

PROPOSITION 6: When education is zero or lesser than a particular level, buyer will always choose cash transaction of 'A' type over debit card transaction irrespective of any level of income.

3.3.3 Comparison between Cash Transaction of Case 2 and Debit Card Transaction with Respect of level of Income:

To find out that whether there any threshold level of income exists or not from where individual buyer will prefer cashless transaction each time over the cash transaction of B type we have to consider followings;

$$TC_{Rb} \leq TC_D$$

$$\Rightarrow (\tau_R - e_R E)Y + \varnothing Y + Y.i - c\left[\frac{t+i}{i}\left(1-\left(1+\frac{i}{t}\right)^{(t-1)}\right)-(t-1)\right] + TP_R t \leq (\tau_D - e_{D2}E)Y +$$

$$\left\{Y.i - c\left[\frac{t+i}{i}\left(1-\left(1+\frac{i}{t}\right)^{(t-1)}\right)-(t-1)\right]\right\} + f_A \qquad \textbf{where, } t = Y/c$$

$$or,\ y \leq \frac{(f_A).c}{(\tau_D - e_{D2}E).c - (\tau_D - e_{D2}E).c + TP_R + \varnothing c} \ (= \widehat{Y_{bd}})$$

From the above equation, we can interpret that income greater than $\widehat{Y_{bd}}$ the transaction cost of debit card each time will be cheaper than the transaction cost of cash by withdrawing money from the bank each time, conditioning education level beyond the explanation is same as the case of previous comparison. Any education level lower than a particular level (lie between E_{D1} and E_{D2}) where $(\tau_R - e_R E) < (\tau_D - e_{D2}E)$ then the value of $\widehat{Y_{bd}}$ will be negative and thenfor any positive income level buyer will choose cash transaction of 'B' type to pay for his expenses (as then $\widehat{Y_{bd}} \leq 0$)

So, people with a lower level of income will choose cash transaction of B-type and the people with a higher level of income will choose cashless transaction conditioning a certain level of education exist otherwise not.

Now at zero level of education the denominator of $\widehat{Y_{bd}}$ ratio will be negative as the denominator of function will be negative then (considering assumption 13). So, the threshold level $\widehat{Y_{bd}}$ will be negative, and as income can't be negative then for any positive level of income cash transaction (of 'B' type) will always cheaper than the transaction cost of debit card and buyer will then always choose cash transaction over cashless mode.

PROPOSITION 7: Beyond the income level $\widehat{Y_{bd}}$ buyer will choose debit card transaction instead of cash transaction of 'B' type conditioning a particular level of education exists.

PROPOSITION 8: When education is zero or lesser than a particular level buyer will always choose cash transaction of 'B' type over debit card transaction irrespective of any level of income.

4. Results and Policy Prescription

From the above analysis, we establish a strong influence of education and income on the selection of payment mode between cash and cashless transaction. The conclusive results are as follows:

Considering comparison between cash transaction of both type and cashless transaction (debit card transaction) a threshold level of education exists beyond which buyer will prefer to use cashless mode of payment (using debit cards) to pay for his expenses at a given level of income.

In the case of variable 'income', the existence of any threshold level of income beyond which cashless transaction will be preferred over cash transaction is dependent on the education level. Conditioning a particular level of education then only beyond an income level buyer prefer to pay his expenses using cashless mode. On the other way, irrespective of any level of income buyers will always choose cash transactions if the education is zero or lesser than a particular level.

So, Education has much stronger influence behind the selection of payment mode than the level of income. To increase the amount as well as the volume of the cashless transaction govt. should emphasise more on increasing the level of education than on increase in the level of income.

5. Conclusions:

A comparative theoretical study between thetwotypes of cash transaction and one type of cashless transactionestablishes a few results. The level of education has positive influence on the selection of payment mode.If the buyer has higher level of education beyond a particular levelthen he will choose cashless transaction over cash transaction to make payment for his expenses each time. In other words, buyer with high level of education will be more likely to use cashless transaction because beyond a particular level of education

transaction cost of debit card will be much lesserthan the transaction cost of cash transaction at a given level of income.

The level of income has also a strong influence on the selection of payment mode. If the income level of the buyer is higher than a particular level, then the transaction cost of a debit card transaction will be lower than the transaction cost of a cash transaction, this will be true only when the buyer has a certain level of education otherwise, the proposition will not true. That is, the buyer is likely to choose the cashless mode of payment to meet his expenses when the buyer has a higher level of income beyond a particular amount, conditioning that the buyer already holds a certain level of education.

If the buyer has zero education or lesser than a particular level then irrespective of any level of income the buyer will always choose cash transaction to pay for his expenses.

The transaction domains of the different payment mode are as follows;

If the buyer has higher level of income he will choose cashless transaction, but with a very high level of income but zero level of education he will always choose cash transaction. So, education level is dominating over the level of income in the case of the selecting cashless mode of payment.

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Poverty Analysis of the Districts in West Bengal in 2015-16: A Fuzzy Multidimensional Approach

Krishnendu Das*, Prankrishna Pal**

Abstract

Poverty is a Multidimensional phenomenon, and it is necessary to incorporate proper dimensions with precision. Sabina Alkire has done remarkable work in the field of the Multidimensional Poverty Index. The proposed methodology for Multidimensional Poverty Index by Alike is very useful in the aggregate sense but it lacks the individual representation and precision. It is very difficult to judge whether a person is deprived in any of the indicators or the sub-indicators so precisely. So, nature deprivation is intrinsically Fuzzy. Many other scholars have described that the information provided by any person regarding his/her deprivation is a fuzzy ranking. We tried to extend the existing methodology by Alikre to incorporate specific representations of different deprivation among different individuals (rural/urban). We used Fuzzy logic to this extended Multidimensional Poverty analysis for the representation of the individuals. As poverty is multidimensional it requires different specific indicators as well as sub-indicators with proper division of weights. We calculated the Fuzzy Deprivation Membership value for the specific sub-indicators and applied the weights predefined by Alkire. We used mainly NFHS-4 (household) unit-level data for our calculation. We applied our extended methodology in the districts of West Bengal for the calculation of the Multidimensional Poverty Index. We tried to analyze the existing situations in the different districts of West Bengal and the factors responsible for the persistence of multidimensional poverty.

JEL Code : C43, I32, O15, R11

Keywords: Multidimensional Poverty, Deprivation, West Bengal, Fuzzy Set Theory, Logistic Principal Component Analysis

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Introduction

Poverty has been present for many years in many countries. Still, this problem exists in many countries in the world. As Social Science develops our understanding of poverty also evolves. According to Prof. Sen (1992), the mainstream approach to identifying poverty specifies a cut-off 'Poverty-Line', defined as the level of income below which people are diagnosed as poor. The measurement of poverty can be seen as consisting of two distinct though interrelated exercises, viz; (1) identification of the poor, and (2) aggregation of the statistics regarding the identified poor to derive an overall index of poverty.

As per the traditional approach to poverty measurement, partitioning the population into the simple dichotomy of 'the poor' versus the 'nonpoor' is an oversimplification. According to Cheli and Lemmi (1995), poverty is not a simple attribute that characterizes an individual in terms of its presence or absence; the relative hardship or well-being of a person is a matter of degree, secondly, it is insufficient to define poverty in a single dimension, merely in terms of net monetary income; deprivation is multidimensional.

As poverty alleviation remains an important policy issue in many countries, there must be some measure of poverty for precise identification of the poor. For this Economists have been trying to construct a poverty index, which can incorporate every possible aspect of poverty. There are a lot of poverty indices readily available but the multidimensional poverty index is the most prominent and useful.

In the field of Multidimensional Poverty measurement,Alkire& Foster (2011) have made their remarkable contribution. The idea was mainly generated from Prof. Sen's (1999) pioneering works. According to him "poverty is not just a lack of money; it is not having the capability to realize one's full potential as a human being".

New ways & techniques are evolving by centering the concept of Multidimensional Poverty. Out of them, Fuzzy logic is one of the appropriate for measuring multidimensional poverty.

As India is a developing country, it has a long history of poverty elimination. With this, the study of the measurement of poverty also comes into play. In the pre-independence era, Dadabhai Naoroji started to study living conditions in 1901. In later periods the National Planning Committee (1938) also came into existence to examine the minimum standard of living in India. In 1944 the Bombay plan has been adopted with a poverty line of rupees 75 per capita per year. In the post-independence era, the measurement associated with poverty centered around the poverty line concept. In 1962, a Working

group committee had been formed and recommended the per capita monthly expenditure on food as per the Nutrition Advisory group of the Indian Council of Medical Research (ICMR) in 1958. A Task Force was formed on "Projections of Minimum Needs and Effective Consumption Demand" headed by Dr. Y. K. Alagh (1979), this task force submitted its report in 1979, and based on this report the first time in India, the official poverty counts began for the first time. The Lakadawal Expert committee was constituted by the planning commission of India and it submitted its report in 1993 It did not alter the poverty line defined by the Alagh committee, though it reviewed the poverty line and disaggregated it into many subparts like the Consumer Price Index of Industrial workers (CPI-W) in the urban region and Consumer Price Index of Agricultural Labors (CPI-AL) in rural areas.In 2009, the Tendulkar Expert Group reviewed the existing methodology for the measurement of poverty and suggested some modifications. In 2014, due to extreme criticism of the Tendulkar Committee approach, Rangarajan Committee came into action. Though most of these committees and groups have suggested alteration and modification of the poverty line concept.

West Bengal's poverty is also very much similar to India's structure. Though some regional factors are there but not much study of poverty in a multidimensional approach has been done. Also, the incorporation of the vagueness of poverty has not been done properly for West Bengal as well as India.

Objectives

We want to examine the multidimensional poverty in different districts of West Bengal during 2015-16, by incorporating the vagueness in the calculation to get a better picture. Specifically,

1. To analyze the fuzzy Multidimensional poverty in districts of West Bengal in 2015-16.
2. To examine the district-wise contribution in multidimensional poverty in West Bengal in 2015-16.

Data & Methodology

For the present study, we used National Family Health Survey unit level data and reports of 2015-16 from IIPS Mumbai.

For the calculation, we mainly used the Alkire-Foster methodology with the fuzzy set theory proposed by Degum &Costa, Costa & Angelis.According to the methodology proposed by Costa and Angelis (2008), the focus was on the identification and aggregation of the poor(Zadeh, 1965)(Dagum & Costa, 2004).

$$A = (a_1, a_2, a_3, ..., a_i, ..., a_n),$$

where n is the cardinal number of the crisp set A. Here A is a representative sample of the population.The m-order vector of attributes

$$X = (X_1, X_2, X_3, ..., X_j, ..., X_m).$$

It contains attributes of various dimensions of poverty. The degree of the membership to the set A of the i^{th} household represented by the poverty ratio of the i^{th} household. A contains any household (a_i) must have some degree of membership according to the attributes vector or in other words if any household does not possess at least any of the attributes of X. The membership function to the fuzzy set A defined as

$$\mu_{A}\left(X_j(a_i)\right) = x_{ij}, 0 \le x_{ij} \le 1 .$$

In particular, $x_{ij} = 1$ if and only if the i^{th} the household doesn't possess the j^{th} attribute; $x_{ij} = 0$ if and only if the i^{th} household possesses the j^{th} attribute; $0 < x_{ij} < 1$ if and only if the i^{th} household possesses the j^{th} attribute with some intensity, which belongs to the open interval (0,1).The poverty ratio or the degree of membership of the i^{th} household to the fuzzy set A can be defined as the weighted average of x_{ij}

$$\mu_A(a_i) = \sum_{j=1}^{m} x_{ij} W_j \Big/ \sum_{j=1}^{m} W_j .$$

Here , attached weight to the j^{th} attribute. $\mu_A(a_i)$ measures the degree of poverty (relative deprivation) of the i^{th} household. The weight W_j captures the intensity of the vulnerability of X_j. Its nature is an inverse type.

Cerioli& Zani (1990) suggested a form for W_j

$$W_j = log\left[n \Big/ \sum_{i=1}^{n} x_{ij} n_i \right] \ge 0$$

The weight measure suggested by Cerioli & Zani was not at its best since Alkire-Foster used equal weights for all the determinants of Multidimensional poverty as suggested by Amartya Sen. Sen's intuition was quite logical as the major dimensions of poverty are equally necessary for any human being. The Alkire-Foster idea for equal weights is mainly due to Sen's capability approach.

Table 01: Dimension wise indicators of Multidimensional poverty

Standard of Living		
Assets	*Rural*	Agricultural land
		Animal drawn cart
		Irrigated land
		Livestock
		Thresher
		Tractor
	Urban	TV
		Refrigerator
		Bike
		Car
		Water Pump
		Telephone/Mobile
	Rural-Urban	Radio
		Cycle
		Sewing Machine
		Watch
		Fan
		Chair
		Cot/Bed
		Own this House
Housing	Floor Material	
	Wall Material	
	Roof Material	
Drinking-Water	Source	
	Time	
Electricity	Whether having or not	
Sanitation	Toilet Facility	
	Shared Toilet	
Cooking (fuel & place)	Type of fuel	
	No Separate kitchen	
Education		
School Attendance	Member Attended school	
	Educational level current year	
Years of Schooling	Highest educational level	
	Highest years of schooling	
Health		
Child Mortality	Age at death (≤ 5)	
Nutrition	Child	
	Women	
	Men	

For this present study, we used unequal weights for different aspects of poverty measurement. To do this we had to use Principal Component Analysis, so the weights of the determinants (attributes) were calculated from the data according to their capacity to explain the variation. But the major problem to use traditional Principal Component Analysis is that we have variables in binary format. The traditional Principal Component Analysis may not be applicable for binary or categorical variables. To solve this problem, we have considered Logistic Principal Component Analysis.

Logistic Principal Component Analysis is a multivariate generalization of the so-called Bernoulli distribution. The Bernoulli distribution for univariate binary random variable:

$$P(x|p) = p^x(1-p)^{1-x},$$

where $x \in \{0,1\}$ with p (probability of success) as the mean. We can write this distribution in terms of the log-odds (the parameter θ):

$$\theta = log\left(\frac{p}{1-p}\right).$$

so, the logistic function:

$$\sigma(\theta) = \left[1 + e^{-\theta}\right].$$

Now the Bernoulli distribution function become (using the parameter θ)

$$P(x \mid \theta) = \sigma(\theta)^x \sigma(-\theta)^{1-x}.$$

The above expressionis considered as the Bernoulli distribution function expressed as a member of the exponential family. A generalization of the above equation gives us the Logistic Principal Component Analysis model(Schein, 2003)(Landgraf, 2016).

Assuming there is a d-dimensional binary data with n observations, so the matrix notation would be $n \times d$ for the matrix X. If x_{ij} is an element with Bernoulli probability p_{ij}, then the parameter θ_{ij} is the logit of the probability as :

$$\theta_{ij} = log\left(\frac{p_{i_j}}{1-p_{ij}}\right).$$

There exists three major kinds of logistic principal component analysis, which are Exponential Family PCA, Logistic PCA & Convex Logistic PCA.

Collins suggested exponential family PCA mainly for binary variables. The assumption made by Collins was the logit of the probability matrix presumed as a matrix factorization

$$logit(P) = k_{n}\mu^{T} + AB^{T}$$

Here 'A'&'B' (B^{T} is the transpose of B) are the lower rank, 'k'&'μ' are vectors of dimension 'd' of main effects (Collins, 2001)(Landgraf, 2016)

Landgraf extended Pearson's Principal Component Analysis. Pearson's idea was to find a rank 'k' projection using the mean squared error of the data that may be so close to the original data. In notation, it minimizes

$$\frac{1}{n}\sum_{1}^{n}\|(x_i - \mu) - UU^{T}(x_i - \mu)\|^2$$

Over μ and $n \times d$ orthonormal matrix 'U'., The Logistic PCA extended PCA for binary data, using the projection of the natural parameters from the Bernoulli saturated model along this minimizes the Bernoulli deviance. According to Landgraf letting the d dimensional vector of natural parameters from the Bernoulli saturated model that is $\bar{\theta}_i$ estimated by

$$\bar{\theta}_i = \mu - UU^{T}(\bar{\theta}_i = \mu)$$

Where μ and U are solved for minimizing the Bernoulli deviance

$$D(X \mid \hat{\Theta}) = \sum_{i=1}^{n}\sum_{j=1}^{d} -2x_{ij}\hat{\theta}_{ij} + 2\log\left(1 + \exp(\hat{\theta}_{ij})\right)$$

The logistic PCA model has three important benefits over the exponential family PCA, which are the number of parameters does not increase with the number of observations, The principal component scores are can be interpreted easily as linear functions of the data & lastly only the matrix multiplication is needed while using new data for PCA (Landgraf, 2016)(Landgraf & Lee, 2020).

The Convex Logistic PCA is a very much similar form of Logistic PCA. Here in the Convex Logistic PCA minimization is done over the convex hull of rank k projection matrices rather than minimization overrank'k' projection matrices. Convex Logistic PCA can be solved more quickly and reliably (Landgraf, 2016).

Hence, we use Convex Logistic PCA for the construction of the weight vector (col. matrix) to calculate the Multidimensional poverty index.

Here n_i, the weight attached to the i^{th} sample observation. So, we have the fuzzy set for the population:

$$\bar{A} = \{(a_{i,}\mu_A(a_i)) \mid a_i \in A\}.$$

In the present study, we divided the m-order vector attributes X into three main dimensions as suggested by Alkire and Foster (2011) for a multidimensional approach, which are Health, Education, and Standard of Living. (Table 01).

To calculate the Multidimensional Headcount ratio (MHCR), defined by

$$MHCR=|A_\alpha|/n.$$

Now we need to use the concept of the α-cut fuzzy set for poverty cut off:

$$\bar{A}_\alpha = \{(a_{i,}\mu_A(a_i)) \mid a_i \in A\},$$

where

$$\mu_{A,\alpha} = \{a_{i,} \in A \mid \mu_A(\alpha_i) \geq \alpha\}.$$

We take $\alpha = 0.3$, as there are three core dimensions of poverty, if any household is deprived in at least one dimension, will be considered as poor. Hence the number of α_i's in the α-cut fuzzy set mentioned above, i.e., $|A_\alpha|$, here A_α is a crisp set.

Multidimensional Average intensity (MAI):

$$MAI = \left[\sum_{i=1}^{n}\mu_A(A_1)\right] /|A_\alpha|.$$

Here is the membership value or deprivation score of the i^{th} household. To calculate the Multidimensional Poverty Index, we simply multiply the MHCR & MAI, i.e. MPI = MHCR × MAI, here MPI denotes the Fuzzy Multidimensional Poverty Index.

For the share of MHCR & MAI in MPI for different districts, we used the following formula

$$Share\_MHCR_i = \frac{\ln(1-MHCR_i)}{\ln(1-MPI_i)} \times 100\%$$

$$Share\_MAI_i = \frac{\ln(1-MAI_i)}{\ln(1-MPI_i)} \times 100\%$$

These are the share of MHCR of the ith district & MAI of the ith district in MPI of the ith district.

To compare the dispersion among the districts for different estimates of poverty we used the Coefficient of Variation (C.V.) and the formulas for this are

$$CV\_MHCR = \frac{SD_{MHCR}}{MHCR} \times 100\%,$$

$$CV\_MAI = \frac{SD_{MAI}}{MAI} \times 100\%,$$

$$CV\_MPI = \frac{SD_{MPI}}{MPI} \times 100\%,$$

To see the contribution of different districts for different estimates of poverty we used the relative contribution of MHCR, MAI & MPI for the entire West Bengal with combined, rural & urban regions. The formulas are

$$\alpha_i^{MHCR} = \frac{\gamma_i \times MHCR_i}{MHCR_{WB}} \times 100\%,$$

$$\alpha_i^{MAI} = \frac{\gamma_i \times MAI_i}{MAI_{WB}} \times 100\%,$$

$$\alpha_i^{MPI} = \frac{\gamma_i \times MPI_i}{MPI_{WB}} \times 100\%,$$

where γ_i be the share of population for the ith district of West Bengal.

For analyzing the unit leveldata we used R-programming packages and excel.

Estimates

Estimates are divided into four subsections, which are combined region, rural region, urban region& rural-urban comparative.

***Combined Region* :**

For the combined (rural & urban) region, West Bengal's MHCR was 0.78398 which means approximately 78% of households were multidimensionally poor. The district Puruliya (92%) was at the top of MHCR, and Darjeeling (58%) was at the bottom regarding MHCR. There were seven districts below West Bengal's MHCR in 2015-16, these are Nadia, North-24 PGNS, Kolkata, Hugli, Haora, Darjeeling & Burdwan. There were twelve districts above West Bengal's MHCR in 2015-16, these are Bankura, Birbhum,

Dakshin Dinajpur, Jalpaiguri, Kochbihar, Maldah, Murshidabad, Paschim Medinipur, Purba Medinipur, South-24 PGNS & Uttar Dinajpur. (Table 02).

West Bengal's MAI was 0.46057, which means an average poor household was experiencing roughly 46% intense multidimensional poverty during 2015-16. Puruliya (52%) & Kolkata (39%) were having the highest and lowest MAI among all districts of West Bengal. There were 12 districts below the West Bengal's MAI estimate, which are Uttar Dinajpur, Purba Medinipur, Nadia, N-24 PGNS, Murshidabad, Kolkata, Koch Bihar, Jalpaiguri, Hugli, Haora, Darjeeling & Dakshin Dinajpur. The estimates also show there were seven districts above the West Bengal's MAI in 2015-16 & these are Bankura, Birbhum, Dakshin Dinajpur, Darjeeling, Maldah, South-24 PGNS & Paschim Medinipur. (Table 02).

West Bengal's MPI was 0.36108, which means around 36% of the total households were having above 46% intense Multidimensional poverty in 2015-16. The districts having the highest and lowest MPI were Puruliya (48%) & Darjeeling (24%) respectively. There were seven districts below the West Bengal's estimate & these are Burdwan, Darjeeling, Haora, Hugli, Kolkata, North-24 PGNS & Nadia in 2015-16. According to the estimates, there were twelve districts above West Bengal's & these are Bankura, Birbhum, Dakshin Dinajpur, Jalpaiguri, Maldah, Murshidabad, South-24 PGNS, Puruliya, Uttar Dinajpur, Uttar Dinajpur, Purba Medinipur & Paschim Medinipur. (Table 02).

The coefficient of variation for MHCR was 12.41%, MAI was 6.72% & was 16.96%, this shows that the multidimensional headcount ratio (MHCR) has higher dispersion than MAI. For the the dispersion rate is higher than the rest. Wide variations are observed among the districts. (Table 02).

For the combined region, for the entire West Bengal, the contribution of MHCR in was 71.29% and the contribution of MAI in was 28.17%. During 2015-16, the districtSouth-24 PGNS had the highest contribution in MHCR (77.80%) & lowest contribution in MAI (22.02%) and whereas the district Darjeeling had the lowest contribution in MHCR (61.55%) & highest contribution in MAI (38.45%) for MPI. (Table 02).

Dakshin Dinajpur (3.63%) had the lowest contribution and Puruliya (8.25%) had the highest contribution in MHCR. Dakshin Dinajpur (3.23%) had the lowest contribution and Puruliya (8.01%) had the highest contribution in MAI among the districts of West Bengal. Kolkata (3.26%) has the lowest and Puruliya (9.45%) has the highest contribution in (Table 05).

Table 02: Multidimensional Poverty in West Bengal in 2015-16

Districts	MHCR	Share_MHCR	MAI	Share_MAI	MPI
Bankura	0.79324	69.04%	0.50684	30.96%	0.40205
Birbhum	0.83121	72.74%	0.48669	27.26%	0.40454
Burdwan	0.68195	63.93%	0.47602	36.07%	0.32462
Dakshin Dinajpur	0.85383	76.51%	0.44596	23.49%	0.38077
Darjeeling	0.58027	61.55%	0.41861	38.45%	0.24291
Haora	0.72896	68.74%	0.44767	31.26%	0.32633
Hugli	0.67532	64.98%	0.45460	35.02%	0.30699
Jalpaiguri	0.81440	73.87%	0.44876	26.13%	0.36546
Koch Bihar	0.85095	77.32%	0.42791	22.68%	0.36413
Kolkata	0.64439	66.99%	0.39921	33.01%	0.25725
Maldah	0.85818	75.99%	0.46045	24.01%	0.39515
Murshidabad	0.82095	74.29%	0.44860	25.71%	0.36828
North-24 PGNS	0.63579	64.09%	0.43212	35.91%	0.27474
Nadia	0.73729	69.90%	0.43767	30.10%	0.32268
Paschim Medinipur	0.80791	72.30%	0.46855	27.70%	0.37855
Purba Medinipur	0.84598	76.56%	0.43593	23.44%	0.36879
Puruliya	0.92458	77.51%	0.52755	22.49%	0.48776
South-24 PGNS	0.90044	77.80%	0.48222	22.20%	0.43421
Uttar Dinajpur	0.81613	73.45%	0.45787	26.55%	0.37368
West Bengal	0.78398	71.29%	0.46057	28.71%	0.36108
CV (%)	12.41%	-	6.72%	-	16.96%

Source: Author's calculation from NFHS-2015-16, unit-level data.

Rural Region

For rural, West Bengal's MHCR was 0.85986which means approximately 86% of households were multidimensionally poor. The district South-24 PGNS (96%) was at the top of MHCR, and Darjeeling (68%) was at the bottom regarding MHCR. There were nine districts below the West Bengal's MHCR in 2015-16, these are Paschim Medinipur, Nadia, North-24 PGNS, Murshidabad, Hugli, Haora, Darjeeling, Bankura& Burdwan (Table 03).

West Bengal's MAI was 0.46637, which means an average poor household was experiencing roughly 46% intense multidimensional poverty in 2015-16. Puruliya (52%) & Koch Bihar (42%) were having the highest and lowest MAI among all districts of West Bengal. There were 11 districts below the West Bengal's MAI estimate, which are Uttar Dinajpur, South-24 PGNS, Purba Medinipur, Nadia, N-24 PGNS, Murshidabad, Koch Bihar, Jalpaiguri, Hugli, Haora, Darjeeling & Dakshin Dinajpur (Table 03).

West Bengal's MPI was 0.40101, which means around 40% of the total households were having equal or above 46% intense Multidimensional poverty in 2015-16. The districts having the highest and lowest were Puruliya (50%) & Darjeeling (29%) respectively. There were ten districts below the West Bengal's estimate & these are Burdwan, Dakshin Dinajpur, Darjeeling, Haora, Hugli, Murshidabad, North-24 PGNS, Paschim Medinipur, Purba Medinipur& Nadia in 2015-16 (Table 03).

The coefficient of variation for MHCR was 7.37%, MAI was 6.06% & was 11.08%, which means the multidimensional headcount ratio has higher dispersion than MAI. For the the dispersion rate is higher than therest (Table 03).

For the rural region, for the entire West Bengal, the contribution of MHCR in MPI was 75.78% and the contribution of MAI in was 24.22%. In 2015-16, the district South-24 PGNS had the highest contribution in MHCR (83.19%) & lowest contribution in MAI (16.812%) and whereas the district Darjeeling had the lowest contribution in MHCR (66.93%) & highest contribution in MAI (33.07%) (Table 03).

Burdwan (3.16%) had the lowest contribution and Purba Medinipur (8.99%) had the highest contribution in MHCR. Murshidabad (3.13%) had the lowest contribution and Nadia (8.09%) had the highest contribution in MAI among the districts of West Bengal. Darjeeling (2.94%) has the lowest and Purba Medinipur (10.21%) has the highest contribution (Table 05).

Table 03: Multidimensional Poverty in Rural West Bengal in 2015-16

Districts	MHCR	Share_MHCR	MAI	Share_MAI	MPI
Bankura	0.80721	69.58%	0.51303	30.42%	0.41413
Birbhum	0.87737	75.54%	0.49320	24.46%	0.43272
Burdwan	0.81526	75.52%	0.47265	27.48%	0.38533
Dakshin Dinajpur	0.88685	78.53%	0.44893	21.47%	0.39814
Darjeeling	0.67901	66.93%	0.42957	33.07%	0.29168
Haora	0.81761	73.99%	0.45027	26.01%	0.36815
Hugli	0.78719	71.53%	0.45981	28.47%	0.36196
Jalpaiguri	0.90978	79.83%	0.45537	20.17%	0.41429
Koch Bihar	0.88449	79.44%	0.42801	20.56%	0.37857
Kolkata	NA	-	NA	-	NA
Maldah	0.88175	77.43%	0.46328	22.57%	0.40850
Murshidabad	0.84659	75.84%	0.44967	24.16%	0.38069
North-24 PGNS	0.83853	76.15%	0.43512	23.85%	0.36486
Nadia	0.82957	75.49%	0.43695	24.51%	0.36248
Paschim Medinipur	0.81747	72.94%	0.46799	27.06%	0.38256
Purba Medinipur	0.86964	77.91%	0.43889	22.09%	0.38167
Puruliya	0.95065	79.95%	0.52982	20.05%	0.50368
South-24 PGNS	0.96163	83.19%	0.48258	16.81%	0.46406
Uttar Dinajpur	0.88312	77.76%	0.45884	22.24%	0.40522
West Bengal	0.85986	75.78%	0.46637	24.22%	0.40101
CV (%)	7.37%	-	6.06%	-	11.08%

Source: Author's calculation from NFHS-2015-16, unit-level data.

Urban Region

For urban, West Bengal's MHCR was 0.58394which means approximately 58% of households were multidimensionally poor. The district Puruliya (77%) was at the top of MHCR, and North-24 PGNS (39%) was at the bottom regarding MHCR. There were nine districts below West Bengal's MHCR in 2015-16, these are Nadia, North-24 PGNS, Kolkata, Hugli, Haora, Darjeeling & Burdwan (Table 04).

West Bengal's MAI was 0.43807, which means an average poor household was experiencing roughly 43% intense multidimensional poverty during 2015-16. Puruliya (51%) &Darjeeling (39%) were having the highest and lowest MAI among all districts of West Bengal. There were 12 districts below the West Bengal's MAI estimate, which are Uttar Dinajpur, Purba Medinipur, Nadia, N-24 PGNS, Murshidabad, Kolkata, Koch Bihar, Jalpaiguri, Hugli, Haora, Darjeeling & Dakshin Dinajpur (Table 04).

West Bengal's MPI was 0.25581, which means around 25% of the total households were having above 46% intense Multidimensional poverty in 2015-16. The districts having the highest and lowest were Puruliya (39%) &North-24 PGNS (16%) respectively. There were seven districts below the West Bengal's estimate & these are Burdwan, Darjeeling, Haora, Hugli, Kolkata, North-24 PGNS & Nadia in 2015-16 (Table 04).

The coefficient of variation for MHCR was 19.24%, MAI was 7.10% &MPI was 23.88%, which means the multidimensional headcount ratio has higher dispersion than MAI. For the the dispersion rate is higher than the rest (Table 04).

For the urban region, for the entire West Bengal, the contribution of MHCR in MPI was 60.34% and the contribution of MAI in was 39.06%. During 2015-16, the district Kolkata had the highest contribution in MHCR (66.99%) & lowest contribution in MAI (33.01%) and whereas the district Uttar Dinajpur had the lowest contribution in MHCR (47.14%) & highest contribution in MAI (52.86%) (Table 04).

Koch Bihar (1.19%) had the lowest contribution and Kolkata (18.17%) had the highest contribution in MHCR. Koch Bihar (1.36%) had the lowest contribution and Kolkata (15.01%) had the highest contribution in MAI among the districts of West Bengal. Koch Bihar (1.16%) has the lowest and Kolkata (16.56%) has the highest contribution (Table 05).

Table 04: Multidimensional Poverty in Urban West Bengal in 2015-16

Districts	MHCR	Share_MHCR	MAI	Share_MAI	MPI
Bankura	0.63017	65.03%	0.41429	34.97%	0.26107
Birbhum	0.57182	60.10%	0.43051	39.90%	0.24614
Burdwan	0.57531	56.71%	0.47984	43.29%	0.27606
Dakshin Dinajpur	0.63127	64.84%	0.41783	35.16%	0.26376
Darjeeling	0.45513	54.48%	0.39790	45.52%	0.18109
Haora	0.64233	63.63%	0.44443	36.37%	0.28547
Hugli	0.52913	56.17%	0.44446	43.83%	0.23518
Jalpaiguri	0.47555	55.51%	0.40381	44.49%	0.19203
Koch Bihar	0.50000	55.52%	0.42611	44.48%	0.21306
Kolkata	0.64439	66.99%	0.39921	33.01%	0.25725
Maldah	0.69805	67.64%	0.43609	32.36%	0.30442
Murshidabad	0.72585	68.80%	0.44396	31.20%	0.32225
North-24 PGNS	0.39263	47.44%	0.42442	52.56%	0.16664
Nadia	0.50929	55.07%	0.44055	44.93%	0.22436
Paschim Medinipur	0.72158	66.53%	0.47443	33.47%	0.34234
Purba Medinipur	0.64798	66.95%	0.40273	33.05%	0.26096
Puruliya	0.77513	67.56%	0.51154	32.44%	0.39651
South-24 PGNS	0.72365	66.24%	0.48084	33.76%	0.34796
Uttar Dinajpur	0.40845	47.14%	0.44497	52.86%	0.18175
West Bengal	0.58394	60.34%	0.43807	39.66%	0.25581
CV (%)	19.24%	-	7.10%	-	23.88%

Source: Author's calculation from NFHS-2015-16, unit level data.

Rural-Urban Comparative Analysis

The rural-urban differential is the respective ratio of different poverty estimates. Which consists of MHCR, MAI & MPI. Now for Rural/Urban for MHCR shows whether the ratio is greater than one (>1) or less than one (<1). The West Bengal's Rural/Urban ratio for MHCR was 1.47, so it was greater than one. This shows the multidimensional headcount ratio for West Bengal in 2015-16 having a larger impact on rural West Bengal than its urban counterpart. All the districts have higher values greater than one (>1). This signifies in the rural region, the multidimensional headcount ratio's impact was higher than in urban regions in 2015-16.

For MAI, in 2015-16, West Bengal's Rural/Urban ratio was 1.06, greater than one (>1). For multidimensional average intensity, the impact was larger in the rural region than urban region. Only two districts, Koch Bihar & South-24 PGNS were had Rural/Urban ratio equal to 1. This shows these two only districts were having an almost equal impact on MAI. Whereas Burdwan, Nadia & Paschim Medinipur were having Rural/Urban ratio of less than 1 (0.99) this indicates the impact of MAI for urban were larger than rural in 2015-16.

Lastly, for , West Bengal's Rural/Urban ratio was 1.57 (>1). The impact of was larger in the rural region than urban region of West Bengal in 2015-16. All the districts have higher values greater than one (>1). This signifies in the rural regions, the multidimensional headcount ratio's impact was higher than in urban regions in 2015-16.

Table 05: District-wise share of Multidimensional Poverty in West Bengal in 2015-16

Districts	MHCR				MAI				MPI			
	All	Rural	Urban	Rural/Urban	All	Rural	Urban	Rural/Urban	All	Rural	Urban	Rural/Urban
Bankura	5.67%	6.62%	1.72%	1.28	6.17%	7.76%	1.51%	1.24	6.24%	7.28%	1.63%	1.59
Birbhum	5.47%	6.10%	2.75%	1.53	5.45%	6.33%	2.76%	1.15	5.78%	6.45%	2.70%	1.76
Burdwan	4.78%	3.16%	10.82%	1.42	5.68%	3.38%	12.03%	0.99	4.94%	3.20%	11.86%	1.40
Dakshin Dinajpur	3.63%	5.29%	2.17%	1.40	3.23%	4.94%	1.91%	1.07	3.51%	5.10%	2.07%	1.51
Darjeeling	3.92%	3.20%	6.56%	1.49	4.82%	3.73%	7.65%	1.08	3.57%	2.94%	5.96%	1.61
Haora	4.85%	3.35%	10.45%	1.27	5.07%	3.40%	9.64%	1.01	4.72%	3.23%	10.60%	1.29
Hugli	4.04%	3.32%	6.63%	1.49	4.63%	3.58%	7.42%	1.03	3.98%	3.27%	6.73%	1.54
Jalpaiguri	4.89%	5.31%	3.03%	1.91	4.59%	4.90%	3.43%	1.13	4.77%	5.19%	2.80%	2.16
Koch Bihar	4.82%	5.69%	1.19%	1.77	4.13%	5.08%	1.36%	1.00	4.48%	5.23%	1.16%	1.78
Kolkata	3.76%	NA	18.17%	NA	3.96%	NA	15.01%	NA	3.26%	NA	16.56%	NA
Maldah	5.66%	6.17%	2.85%	1.26	5.17%	6.04%	2.38%	1.06	5.66%	5.95%	2.84%	1.34
Murshidabad	6.10%	3.27%	5.53%	1.17	5.67%	3.13%	4.51%	1.01	5.94%	3.05%	5.61%	1.18
North-24 PGNS	3.65%	4.53%	4.95%	2.14	4.22%	4.40%	7.13%	1.03	3.42%	4.24%	4.80%	2.19
Nadia	4.54%	7.66%	4.37%	1.63	4.59%	8.09%	5.04%	0.99	4.31%	7.69%	4.39%	1.62
Paschim Medinipur	6.76%	7.11%	2.91%	1.13	6.67%	6.61%	2.55%	0.99	6.87%	6.69%	3.15%	1.12
Purba Medinipur	6.21%	8.99%	2.46%	1.34	5.45%	9.24%	2.03%	1.09	5.88%	10.21%	2.26%	1.46
Puruliya	8.25%	6.08%	4.96%	1.23	8.01%	5.63%	4.37%	1.04	9.45%	6.30%	5.80%	1.27
South-24 PGNS	6.16%	7.83%	6.15%	1.33	5.61%	7.50%	5.45%	1.00	6.45%	7.70%	6.75%	1.33
Uttar Dinajpur	6.76%	6.62%	2.31%	2.16	6.46%	7.76%	3.35%	1.03	6.72%	7.28%	2.35%	2.23
West Bengal	100%	100%	100%	1.47	100%	100%	100%	1.06	100%	100%	100%	1.57

Source: Author's calculation from NFHS-2015-16, unit level data

Concluding Remarks

In West Bengal, the share of Multidimensional Headcount ratio was much higher and had most of the variation. But the Multidimensional Average intensity was quite low and did not have much variation. This indicates that there were more multidimensionally poor households but their respective intensity was low or more precisely sluggish. Puruliya, South-24 PGNS, were few districts having a very high rate of MHCR and there were few districts like Darjeeling, Burdwan, Kolkata, etc., having quite low MHCR though the MAI were pretty much close to others. It can be interpreted that may be the number of poor households has been reduced may be due to the government's welfare schemes and policies but their respective intensity has not been reduced drastically like the headcount. We can also see that rural poverty is quite high and contribution to rural poverty estimates by different districts were pretty much eye-opening. But in the case of urban regions, the poverty was alarming. It empirically shown that in urban areas the grip of poverty must be low and mild. But in West Bengal, we see the variations and share of contributions were so fragmented among districts. In rural districts, the government should try to provide various aids and subsidies to generate employment, whereas in urban regions government should focus on urban planning and development.

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Towards Financial Inclusiveness – A Study of India over the period 2001-2019

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Abstract

Government of India started taking steps from the early twentieth century to promote several financial inclusion programmes,and now has extended the financial services to all groups of people in the nation. The present study attempts to measure financial inclusion for the period 2001-2019, in overall and segregating states/union territories in India. The study uses the dimensions like availability of, access to and usage of financial services to assess financial inclusion via the banking sector. The year-wise scores of financial inclusion are calculated by the method, 'Max-Min procedure to convert indicators into indices'. The result shows a fluctuating trend of financial inclusion in India over the entire study period. Financial inclusion is also reviewed following the CRISIL's (Credit Rating Information Services of India Limited) criteria of measurement and the RBI's (Reserve Bank of India) recently developed index to assess financial inclusion. Finally, the required improvements in the banking services to run the financial inclusion mission successfully, and thereby, the states to be much focused upon are analyzed in the study.

JEL Code : G2, E6, O2, I3, C65

Keywords: Financial Inclusion, Financial Exclusion, Inclusive Growth, Banking Service Indicator.

1. Introduction:

Financial inclusion is a practice to deliver appropriate financial products and services to the privileged as well as under privileged sections of the society in rural and urban areas at a reasonable cost and in clear terms by the mainstream institutional players of a nation.The vulnerable section of the society includes agricultural and small scale industrial labourers, people engaged in unorganised sector, unemployed persons, women, children, old people, physically challenged people, etc. In assessing financial inclusion; the role of banks and micro finance institutions, several insurance and pension schemes may be judged. However, the present study mainly focuses on the banking activities of India to

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assess financial inclusion. The Global Findex database (2017) shows that about 69 percent of adults worldwide opened accounts for transaction between 2014 and 2017, which is up from 62 percent in 2014 and 51 percent in 2011. In high-income countries, where 94 percent of adults have accounts; this estimate for developing economies is only 63 percent. Therefore, weighing up of the availability and accessibility of bank accounts becomes important dimensions to assess financial inclusion.Maity (2020) also reveals that the performance of banking sector is one of the strongest arms to assess financial inclusion in India.

On the contrary, financially excluded people are those who have no or low access to banking and financial services. They are generally the people of rural areas, mostly traditionalists and negligible ones. They have less access to health care facilities, education as well due to their vulnerable economic conditions.Therefore, financial exclusion is assessed in the following two ways :

a) Lack of access to financial services due to illiteracy; low income; nil or low saving; unemployment; psychological or disability issues; geographical remoteness; technological issues; personal and social factors like cultural norms, gender, age, legal identity etc; poor functioning of formal financial institutions or less financial resources base of the customers.

b) Financial exclusion due to the nature of informal financial services such as, high risk to save the required amount, high cost of credit, absence of insurance and pension services, etc.

Although account ownership is growing, but the Global Findex database (2017) shows that there is a wide variation in account ownership among individual economies. In developed economies, while 72 percent of men have accounts; this estimate for women is 65 percent. The gender gap of 7 percentage points was also present in 2014 and 2011. In developing economies, this gender gap has remained unchanged at 9 percentage points. Further, in developed countries, 74 percent adults have been found having an account from the richest 60 percent of households within economies, while this estimate for the poorest 40 percent is only 61 percent.This global gap of 13 percentage points is also true for the developing economies since 2014. Even the account ownership has been found lower among the young adults with having less education, and those who are out of the labour force. Therefore, a huge disparity lies towards achieving the goal of financial inclusion in any economy; the elimination or overcome of which may ensure sustainable development. On these backdrops, the present study tries to capture the performance of the states and union territories to achieve financial inclusion in India

and the discrepancies in achievement; which might be due to the socio-economic-cultural differences of people and geographical location of the states in a vast country like India.

Background of the Study

In view of the fact that financial inclusion aims to provide affordable financial services to the deprived people of the society for financial security and reducing the dependence on funds like charity which are not sustainable, so it helps in inclusive growth. In the study of Chibba (2009), beyond to the conventional approaches, financial inclusion was considered as an instrument for lessening poverty and to promote inclusive growth. Primarily, financial inclusion helps broadening the financial system through savings of the rural population. Supply of credit creates the path of financial inclusion in the society. Access to financial services opens the doors to economically poor families allowing them to smooth out consumption and investment for their futures as well as to invest in education and health. Further, access to credit enables businesses to expand, creates jobs and reduces poverty and inequality. Therefore, it raises demand for credit further and the process continues which helps inclusive growth.

Although there is a vast literature on financial inclusion in India, but literature stressing on the role of banking sector to augment financial inclusion is limited.In the study of Shah and Dubhashi (2015), it was reflected that among all the people excluded from access to financial services, one third was in India. They reviewed various studies on how financial inclusion might promote inclusive growth and examined the initiatives taken by the government and Reserve Bank of India (RBI) for strengthening financial inclusion in the country.Garg and Agarwal (2014) had considered the aspects of financial exclusion and inclusion during 2010-2013, for the development of the society and Indian economy, taking into account of the activities of banks. They concluded that even though enough efforts were made by all the stakeholders like banks, government and other financial institutions, but the initiatives were not yielded the expected results. Rohilla (2017) revealed the global position of India in the context of growth and financial inclusion based on banking activities and the findings showed that India's global position was not impressive compared to the other countries. In the study of Iqbal and Sami (2017), the authors examined the impact of financial inclusion on the growth of Indian economy from 2007-08 to 2013-14, analysing secondary data, by using a multiple regression model. The results showed a positive and significant impact of the number of bank

branch and Credit deposit ratio on GDP of the country, whereas an insignificant impact had been found for the ATMs growth on Indian GDP. The study of Singh and Naik (2017), was based on a survey of 148 farmers and 50 non-farmers from six villages at Gubbi in Karnataka, during 2013 and early 2014. They examined the impact of measures by the RBI and National bank for Agriculture and Rural Development (NABARD) in opening of accounts, availing of loans from formal institutions, easing of transactions, and searching the factors hindering financial inclusion in rural areas. They found that the money lenders were an important source of finance. Lack of awareness of government initiatives, distance from the banks, and dominance of money lenders were the main obstacles for the banking system to extend credit. Moreover, financial illiteracy, failure of Business Correspondence model due to high attrition rate, and technological issues were cited as the barriers for the expansion of bank accounts.Alam and Saha (2020) had also focused on the issues related to financial inclusion and inclusive growth for the Indian economy during the period 2010-2018, and later on, they extended their work segregating developed and underdeveloped regions in India (2021).

In line with all these research works done, the present study attempts to assess the extent of financial inclusion in India through the banking activities, with segregating states and union territories to attain inclusive growth, over the period 2001-2019, considering 2001 as the base year. Previously, Sahu (2013) examined financial inclusion following the approach by UNDP for the states in India, over the banking activities, and found that no states in India belonged to the group of high financial inclusion. Chandigarh and Delhi were in the cohort of medium financial inclusion group and others states showed low. The study used the data of RBI for 2011 and 2012 only. In the present study, state-wise consideration to show the discrepancies in achieving financial inclusion and almost two decadal analyses over the three crucial dimensions of banking activities – availability, access and usage, to assess financial inclusion are completely new in literature which might be a useful contribution to the existing research works.

Initiatives for Financial Inclusion in India

The term 'Financial Inclusion' was coined in April 2005, in India, by Y. Venugopal Reddy, the then Governor, RBI. *Mangalam* in Punducherry was the first Indian village where financial inclusion was initiated. The basic initiatives and policy measures by RBI and Government of India (GoI) for financial inclusion are opening up of bank branches in rural areas through rural infrastructure development; simplification of savings

bank account opening form; simplification of *Know Your Customer* (KYC) norms; introduction of Kisan Credit Cards (KCC) and General Credit Cards (GCC); providing the benefit of No-frill accounts which in the later phase transformed into Basic Savings Bank Deposit Accounts (BSBDA);creating Self Help Group (SHG) – Bank linkage programmes;utilization of *Business Correspondents* for providing financial and banking services to the common people; creating funds for financial inclusion like *Financial Inclusion Fund* and *Financial Inclusion Technology Fund* (Rangarajan Committee, 2008); introducing financial literacy programmes; extending help in overcoming language barrier; promoting National Rural Financial Inclusion Plan (NRFIP), Aadhar Card (Unique Identification Number) for the Indian Nationals, Swabhiman, Pradhan Mantri Jan Dhan Yojana (PMJDY), the National Strategy for Financial Inclusion (NSFI), etc.

Objectives of the Study

On account of several initiatives taken by the Indian government to achieve financial inclusiveness, the present study mainly analyzes the achievement at national and sub-national levels. Hence the main objectives of the study are-

1. Assessment of financial inclusion for the entire Indian economy, over the time period 2001-2019, and considering the three crucial dimensions of banking services - availability, access and usage.
2. Assessment of financial inclusion segregating states and union territories of India to detect the disparity in achieving financial inclusion.
3. Classification of the states/union territories of India in terms of achieving financial inclusiveness following the criteria developed by CRISIL (Credit Rating Information Services of India Limited), and comparison of the present study with CRISIL's reports.
4. Comparative analysis of the present study with the study by RBI, 2021, regarding the performance of states and union territories in achieving financial inclusion.

In the next section, methodology used in the study is discussed. Section 3 deals with data analysis and findings. Finally, conclusions of the study are presented in Section 4.

2. Methodology

Our study considers the three crucial dimensions of banking services - availability, access and usage to assess financial inclusion. In this context, the number of bank branches in per hundred thousand of population is considered to assess the availability of financial

services. The numbers of deposit and credit accounts per hundred thousand of population jointly have been considered to assess the access to financial services. Further, the credit-deposit ratio as a proportion to India's Gross Domestic Product (GDP) per hundred thousand of population is considered to evaluate the usage of financial services.

In the study, secondary data have been collected for the whole economy as well as segregating the states/union territories over the time period 2001-2019.

On the way to score financial inclusion in India in terms of the three dimensions of banking services, three separate indices have been formed with respect to each dimension considering the data of 2001-2019, and with the help of the method of 'Max-Min procedure to convert indicators into indices'. The basic formula for converting indicator value (V) into an index score (I) is given by,

$$I = \frac{(V - \text{Min.Value})}{\text{Max.Value} - \text{Min.Value})}$$

In the formula, $Min.Value$ is the minimum admissible value and $Max.Value$ is the maximum admissible value. It is a relative index with a scale of 0 to 1, and the score of 1 indicates the ideal state. This approach of measuring financial inclusion is similar to the approach used by the United Nations Development Programme for computation of the development indices like Human Development Index, Gender Development Index, Human Poverty Index, and is also used by Sarma (2012), Rahman (2012) in assessment of financial inclusion. The study gives equal weightage to each dimension since there is no evidence in existing literature that which dimension dominates over another. Consequently, geometric mean of the scores of the three indices for each year has been calculated to get the overall score of financial inclusion for a particular year. In this way the scores of financial inclusion in India have been calculated for the time period 2001-2019. Scores have been calculated year-wise for the states/union territories and the whole economy during the assessment period. Higher the index score, higher is the rate of financial inclusion; and vice versa.

Different mathematical tools are now being used to form financial inclusion index worldwide. In India, on June 25, 2013, CRISIL launched an index to measure the status of financial inclusion across 666 districts in India, named INCLUSIX. Initially, three parameters were included in this index as one metric to study the financial inclusion via the banking activities, which were bank branch penetration, deposit penetration and

credit penetration. Later on, the data on life insurance were incorporated. This index is a relative index with a scale of 0 to 100. In the process of assessment, CRISIL set a norm to define the level of financial inclusion in any region. In our study, following CRISIL's criterion, financial inclusion in India has also been analyzed segregating the states/union territories.

Later on, the RBI,in consultation with government and other regulatory bodies in India, constructed a financial inclusion index (in 2021) as a comprehensive measure incorporating banking, investments, insurance, postal and pension sector.The annual score of this index for the period ending March 2021 was 53.9, as against 43.4 for the period ending March 2017. This index also ranges between 0 and 100, and considers three parameters - access (35%), usage (45%), and quality (20%), comprising of 97 indicators. Although the inclusion of quality parameter reflected by financial literacy, consumer protection, and inequalities and deficiencies in services, makes this index unique; but the 'base year' is absent in this index.The index only reflects cumulative efforts of all stakeholders over the year towards financial inclusion.Although our study considers financial inclusion with only focusing on banking activities, but the performance of the states and union territories in achieving financial inclusion has been compared with the study of RBI, as a sort of validity of the present study result. It is expected that the quality aspect in RBI measurement, like financial literacy, awareness, have the power to boost up banking activities, investments in insurance and pension schemes, etc.; which help the financial inclusion to take place.

3. Analysis and Findings

In the recent days, financial inclusion is assumed to have public policy relevance. Many developed countries and international organizations like the United Kingdom, United Nations, World Bank have set up task force or committees to understand financial inclusion and to extend its reach. India is also no far behind. Hence a year-wise assessment to the extent of financial inclusion is evaluated in the study as this mission aims at economic and societal development of a nation.

Assessment of financial inclusion for the entire economy

Following the method of score calculation stated in the methodology section, the scores of financial inclusion in India in terms of the overall banking services (considering all the three dimensions) during 2001-2019 are calculated and presented in Table 1.

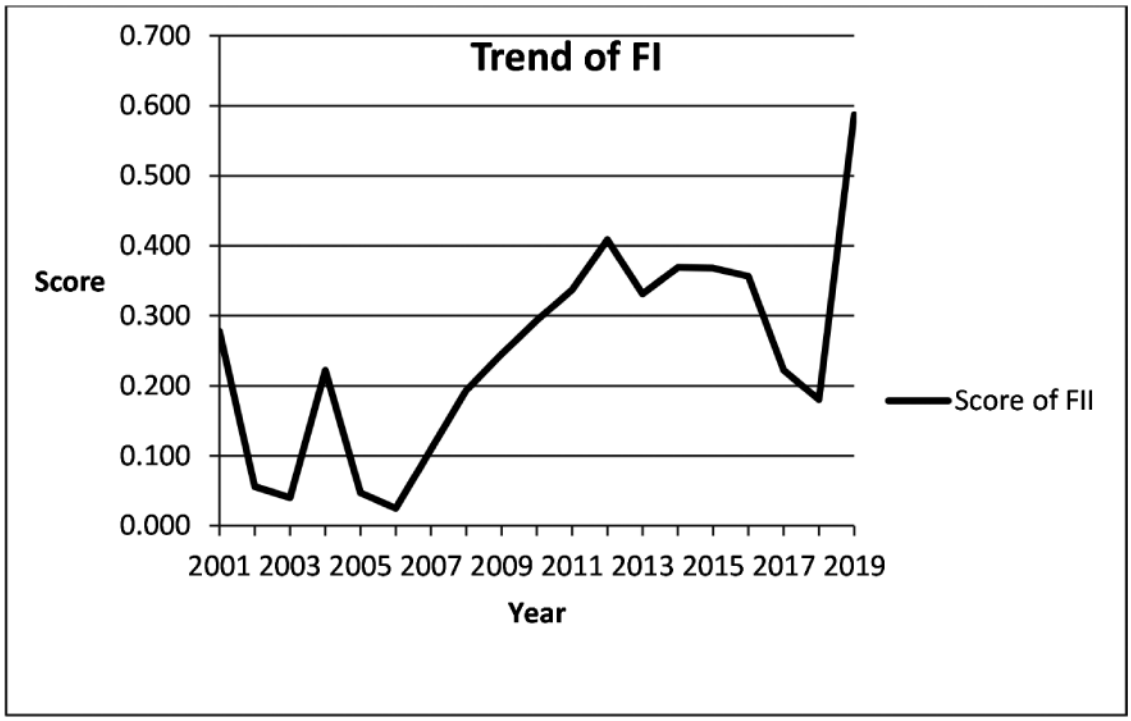
Table: 1. Scores of financial inclusion in terms of banking services in India

Year	Scores of financial inclusion
2001	0.278
2002	0.056
2003	0.040
2004	0.222
2005	0.047
2006	0.025
2007	0.109
2008	0.193
2009	0.245
2010	0.293
2011	0.337
2012	0.409
2013	0.331
2014	0.369
2015	0.368
2016	0.356
2017	0.222
2018	0.180
2019	0.587

Source : Prepared by authors

From Table 1, the trend of financial inclusion in India over the assessment period is determined and presented in Figure 1.

Figure: 1. Trend of financial inclusion in India



Source: Done by authors

The figure shows a fluctuating trend of financial inclusion in India during 2001-2019. Though the scores of financial inclusion were quite fluctuating in the initial phase, but from 2007 wards and until 2012, a steady increasing trend has been perceived. It might be due to the effect of official launch of financial inclusion programme (in 2005) in India, and thereby, the several initiatives taken by the government. After 2012, a more or less decreasing trend has been found for several years.A notable fall in 2017 might be a consequence of Demonetization policy (in 2016) of the government which continued up to 2018. Then again a hike in financial inclusion is perceived.

Table 2 shows the rates of change of the dimensions of banking services in India during the assessment period. This highlights the performance of the financial institutions in delivering the financial services and people's interest in adapting the said services.

Table: 2. Rates of change (in percentage) of the dimensions of banking services in India during 2001-2019

Time horizon	Rates of Change		
	Availability	Access	Usage
2001-2002	-1.078	1.653	-0.943
2002-2003	-1.323	0.238	-6.190
2003-2004	-0.730	1.950	-8.629
2004-2005	0.384	2.321	3.333
2005-2006	-0.344	3.335	0.538
2006-2007	1.926	5.999	-5.882
2007-2008	4.644	10.634	-4.545
2008-2009	3.822	10.602	-9.524
2009-2010	4.866	9.012	-7.895
2010-2011	4.530	7.619	-3.571
2011-2012	8.017	9.654	-0.741
2012-2013	7.036	12.038	-40.298
2013-2014	9.326	14.931	-6.250
2014-2015	6.566	14.614	-9.333
2015-2016	2.137	12.819	-5.882
2016-2017	2.787	9.275	-12.500
2017-2018	0.081	4.301	-1.786
2018-2019	1.333	3.447	-1.818

Source: Calculated by authors

After the official launch of financial inclusion mission; Government of India took initiatives on infrastructural development and extension of the banking services in remote areas. Hence from Table 2, it is evident that during 2011-2014, financial services were better available to the citizens. Inclination of people to access financial services was found very high during 2013-2015. It might be to reap the benefits of BSBDA accounts (2010), Swabhiman (2011), PMJDY (2014), etc.But thereafter, it started falling due to the fall in interest in banking operations as an effect of the demonetization policy. A deep down in usage of financial services has been perceived during 2012-2013.

Assessment of Financial Inclusion Segregating States/Union Territories

Effective financial inclusion helps the disadvantaged group of people through providing suitable financial products and services whenever they are in need. In addition to the economic analysis of financial inclusion at national level, a state-level analysis is also done in the study to show the discrepancy within a nation in promoting and adapting the financial services. From the year-wise scores of financial inclusion of the states/union territories in India, average scores are calculated for the two decades separately, in favour of the three dimensions of banking services and in overall, which are presented in Tables 3 and 4 respectively. While considering decadal averages of the three dimensions for each state/union territory, arithmetic mean is used as usual. However, decadal average for each state/union territory in overall is calculated taking the geometric mean of the three dimensions as discussed in the methodology section.

Table: 3. Average scores of financial inclusion in terms of banking services in the states/ union territories in India during 2001-2010

Sl. No.	States/Union Territories	Financial Inclusion			
		Availability	Access	Usage	Overall
1	Andhra Pradesh	0.090	0.155	0.894	0.232
2	Arunachal Pradesh	0.048	0.093	0.643	0.142
3	Assam	0.065	0.048	0.473	0.114
4	Bihar	0.060	0.048	0.659	0.124
5	Chhattisgarh	0.055	0.041	0.661	0.114
6	Goa	0.077	0.128	0.725	0.193
7	Gujarat	0.063	0.084	0.778	0.160
8	Haryana	0.066	0.055	0.829	0.144

9	Himachal Pradesh	0.069	0.057	0.789	0.146
10	Jammu and Kashmir	0.042	0.056	0.828	0.125
11	Jharkhand	0.065	0.045	0.737	0.129
12	Karnataka	0.061	0.081	0.847	0.161
13	Kerala	0.095	0.087	0.856	0.192
14	Madhya Pradesh	0.089	0.042	0.759	0.142
15	Maharashtra	0.066	0.114	0.602	0.165
16	Manipur	0.060	0.048	0.665	0.124
17	Meghalaya	0.019	0.038	0.383	0.065
18	Mizoram	0.056	0.073	0.727	0.144
19	Nagaland	0.058	0.086	0.539	0.139
20	Odisha	0.060	0.061	0.756	0.140
21	Punjab	0.059	0.050	0.820	0.135
22	Rajasthan	0.062	0.052	0.853	0.140
23	Sikkim	0.112	0.108	0.701	0.204
24	Tamil Nadu	0.066	0.102	0.794	0.175
25	Tripura	0.042	0.050	0.830	0.120
26	Uttar Pradesh	0.071	0.053	0.907	0.150
27	West Bengal	0.056	0.042	0.847	0.126
28	Andaman and Nicobar Islands	0.121	0.103	0.582	0.193
29	Chandigarh	0.229	0.251	0.720	0.346
30	Dadra and Nagar Haveli	0.156	0.113	0.521	0.210
31	Daman and Diu	0.114	0.085	0.546	0.174
32	Delhi	0.161	0.134	0.722	0.250
33	Lakshadweep	0.134	0.169	0.369	0.203
34	Pondicherry	0.134	0.143	0.830	0.252
	All India	0.057	0.064	0.803	0.143

Source: Prepared by authors

The average score of financial inclusion at all India level had remained high for the dimension – usage in the first decade and followed by the dimensions – access to and availability of financial services.

Table: 4. Average scores of financial inclusion in terms of banking services in the states/union territories in India during 2011-2019

Sl. No.	States/Union Territories	Financial Inclusion			
		Availability	Access	Usage	Overall
1	Andhra Pradesh	0.414	0.638	0.241	0.399
2	Arunachal Pradesh	0.708	0.646	0.119	0.380
3	Assam	0.684	0.592	0.049	0.271
4	Bihar	0.682	0.53	0.114	0.345
5	Chhattisgarh	0.694	0.579	0.119	0.363
6	Goa	0.766	0.756	0.139	0.432
7	Gujarat	0.728	0.649	0.152	0.416
8	Haryana	0.754	0.632	0.252	0.494
9	Himachal Pradesh	0.728	0.665	0.156	0.423
10	Jammu and Kashmir	0.709	0.632	0.082	0.332
11	Jharkhand	0.757	0.602	0.149	0.408
12	Karnataka	0.738	0.646	0.132	0.398
13	Kerala	0.780	0.613	0.216	0.469
14	Madhya Pradesh	0.718	0.616	0.109	0.364
15	Maharashtra	0.767	0.679	0.092	0.363
16	Manipur	0.533	0.597	0.067	0.277
17	Meghalaya	0.367	0.496	0.032	0.180
18	Mizoram	0.645	0.629	0.117	0.362
19	Nagaland	0.745	0.669	0.155	0.426
20	Odisha	0.724	0.630	0.117	0.376
21	Punjab	0.757	0.642	0.301	0.527
22	Rajasthan	0.707	0.596	0.227	0.457
23	Sikkim	0.734	0.672	0.244	0.494
24	Tamil Nadu	0.714	0.688	0.167	0.435
25	Tripura	0.682	0.598	0.137	0.382
26	Uttar Pradesh	0.754	0.663	0.199	0.463

(Contd...)

27	West Bengal	0.717	0.606	0.191	0.436
1	Andaman and Nicobar Islands	0.719	0.750	0.075	0.343
2	Chandigarh	0.551	0.668	0.139	0.371
3	Dadra and Nagar Haveli	0.879	0.665	0.037	0.279
4	Daman and Diu	0.765	0.669	0.061	0.315
5	Delhi	0.871	0.698	0.205	0.499
6	Lakshadweep	0.837	0.787	0.042	0.302
7	Pondicherry	0.837	0.735	0.270	0.550
	All India	0.742	0.645	0.165	0.429

Source: Prepared by authors

The average scores of financial inclusion at all India level have remained high for the dimensions – availability of,and then access to financial services. The other dimension - usage shows a less satisfactory outcome in contributing financial inclusion. From the Tables 2 and 3, the top five and bottom five states/union territories in achieving financial inclusiveness for the two decades separately have been detected and are listed in Table 5.

Table: 5. Performances of the states/union territories in India in financial inclusion in terms of banking services for the two decades

Time horizon	States/Union Territories	
	Top 5	**Bottom 5**
D1	Chandigarh	Meghalaya
	Pondicherry	Assam
	Delhi	Chhattisgarh
	Andhra Pradesh	Tripura
	Dadra and Nagar Haveli	Bihar, Manipur
D2	Pondicherry	Meghalaya
	Punjab	Assam
	Delhi	Manipur
	Haryana, Sikkim	Dadra and Nagar Haveli
	Kerala	Lakshadweep

Source: Prepared by asuthors

Note: D1 – during 2001- 2010, D2 – during 2011-2019

Table 5 shows that Pondicherry and Delhi are the steady good performers in achieving financial inclusion.However, the states like Meghalaya, Assam and Manipur need much attention as the performance of those states have remained low consistently.

Likewise, average scores of financial inclusion over the entire assessment period for the three dimensions of banking services separately and in overall have been calculated. Table 6 has been prepared from that consideration which shows the top five and bottom five states/union territories in each category.

Table : 6. Performances of the states/union territories in India in terms of the dimensions of banking services during 2001–2019

Dimensions of Banking Services	2001-2019	
	Top 5	**Bottom 5**
Overall	Pondicherry	Meghalaya
	Delhi	Assam
	Kerala	Manipur
	Uttar Pradesh	Bihar
	Goa	Chhattisgarh
Availability	Lakshadweep	Meghalaya
	Dadra and Nagar Haveli	Andhra Pradesh
	Delhi	Manipur
	Pondicherry	Mizoram
	Daman and Diu	Tripura
Access	Lakshadweep	Meghalaya
	Chandigarh	Bihar
	Goa	Chhattisgarh
	Pondicherry	Assam
	Andaman and Nicobar Islands	Manipur
Usage	Andhra Pradesh	Lakshadweep
	Punjab	Meghalaya
	Uttar Pradesh	Assam
	Pondicherry	Dadra and Nagar Haveli
	Rajasthan	Daman and Diu

Source: Prepared by authors

Table 6 depicts that Pondicherry is the best performer in achieving financial inclusivenessin each dimension, and thereby, in overall during the study period. Meghalaya is the state where much attention is needed for improvement in every dimension, and thereby, in overall.

Assessment of Financial Inclusion following CRISIL'S Criteria

CRISIL's estimate of financial inclusion highlights that if the score of financial inclusion (in per cent) is greater than 55, then it shows high rate of financial inclusion. The scores in between 40.1-55.0 show above-average rate of financial inclusion, the scores in between 25.0-40.0 show below-average rate of financial inclusion, and the scores less than 25 show low rate of financial inclusion. According to CRISIL's measurement, the scores of financial inclusion in India were 35.4, 37.6 and 40.1 in 2009, 2010 and 2011 respectively. While measuring financial inclusion, CRISIL took into account of bank branch penetration, deposit penetration and credit penetration. The top scoring states were Kerala, Andhra Pradesh, Tamil Nadu, Goa, Delhi, Himachal Pradesh, Pondicherry, Chandigarh and Lakshadweep. The bottom scoring states were Bihar, Assam, West Bengal, Manipur, Nagaland, Chhattisgarh, Dadra & Nagar Haveli, Daman & Diu, and Andaman & Nicobar Islands (Report of CRISIL, 2013). Further, CRISIL's Report of 2018 shows that the scores of financial inclusion in India were 42.8, 50.1 and 58.0 in 2012, 2013 and 2016 respectively. In this report, additionally, insurance penetration was considered. The top performing states were Kerala, Goa, Pondicherry, Chandigarh, Karnataka, Andhra Pradesh and Delhi. The states like Bihar, Uttar Pradesh, Assam, Manipur, Nagaland, Meghalaya scored low.

In our study, Table 7 classifies the states/union territories in India in terms of the extent of achievement of financial inclusion following CRISIL's measurement criteria. However, the study considers the dimension of banking servicesas discussed,for the entire study period, in overall and with segregating the two decades, while analyzing financial inclusion.

Table: 7. Classifications of the states/union territories in India for financial inclusion in terms of banking services during 2001–2019 according to CRISIL's criteria

Sl. No.	States/Union Territories	Availability			Access			Usage			Overall		
		D1	D2	2D	D1	D2	2D	D1	D2	2D	D1	D2	2D
1	**Andhra Pradesh**	**L**	**AA**	**L**	**L**	**H**	**BA**	**H**	**L**	**H**	**L**	**BA**	**BA**
2	Arunachal Pradesh	L	H	BA	L	H	BA	H	L	BA	L	BA	BA
3	Assam	L	H	BA	L	H	BA	AA	L	BA	L	BA	BA
4	Bihar	L	H	BA	L	H	BA	H	L	AA	L	BA	BA
5	Chhattisgarh	L	H	BA	L	H	BA	H	L	AA	L	BA	BA
6	Goa	L	H	AA	L	H	AA	H	L	AA	L	AA	AA
7	Gujarat	L	H	BA	L	H	BA	H	L	AA	L	AA	BA
8	**Haryana**	**L**	**H**	**BA**	**L**	**H**	**BA**	**H**	**L**	**H**	**L**	**AA**	**AA**
9	**Himachal Pradesh**	**L**	**H**	**BA**	**L**	**H**	**BA**	**H**	**L**	**AA**	**L**	**AA**	**AA**
10	Jammu and Kashmir	L	H	BA	L	H	BA	H	L	AA	L	BA	BA
11	Jharkhand	L	H	BA	L	H	BA	H	L	AA	L	AA	BA
12	**Karnataka**	**L**	**H**	**BA**	**L**	**H**	**BA**	**H**	**L**	**AA**	**L**	**BA**	**AA**
13	**Kerala**	**L**	**H**	**AA**	**L**	**H**	**BA**	**H**	**L**	**H**	**L**	**AA**	**AA**
14	Madhya Pradesh	L	H	BA	L	H	BA	H	L	AA	L	BA	BA
15	**Maharashtra**	**L**	**H**	**AA**	**L**	**H**	**BA**	**H**	**L**	**BA**	**L**	**BA**	**BA**
16	Manipur	L	AA	BA	L	H	BA	H	L	BA	L	BA	BA
17	Meghalaya	L	BA	L	L	AA	BA	BA	L	L	L	L	L
18	Mizoram	L	H	BA	L	H	BA	H	L	AA	L	BA	BA
19	Nagaland	L	H	BA	L	H	BA	AA	L	BA	L	BA	BA
20	Odisha	L	H	BA	L	H	BA	H	L	AA	L	BA	BA
21	**Punjab**	**L**	**H**	**BA**	**L**	**H**	**BA**	**H**	**BA**	**H**	**L**	**AA**	**AA**
22	Rajasthan	L	H	BA	L	H	BA	H	L	H	L	AA	BA
23	**Sikkim**	**L**	**H**	**AA**	**L**	**H**	**BA**	**H**	**L**	**AA**	**L**	**AA**	**AA**
24	**Tamil Nadu**	**L**	**H**	**BA**	**L**	**H**	**BA**	**H**	**L**	**AA**	**L**	**AA**	**AA**
25	Tripura	L	H	BA	L	H	BA	H	L	AA	L	BA	BA
26	Uttar Pradesh	L	H	BA	L	H	BA	H	L	H	L	AA	AA
27	West Bengal	L	H	BA	L	H	BA	H	L	AA	L	AA	BA
1	Andaman and Nicobar Islands	L	H	AA	L	H	AA	H	L	BA	L	BA	BA
2	Chandigarh	L	H	BA	L	H	AA	H	L	AA	BA	BA	AA
3	Dadra and Nagar Haveli	L	H	AA	L	H	BA	AA	L	BA	L	BA	BA
4	Daman and Diu	L	H	BA	L	H	BA	H	L	BA	L	BA	BA
5	Delhi	L	H	AA	L	H	AA	H	L	AA	L	AA	AA
6	Lakshadweep	L	H	AA	L	H	AA	BA	L	BA	L	BA	BA
7	Pondicherry	L	H	BA	L	H	AA	H	BA	H	BA	H	AA
	All India	L	H	BA	L	H	BA	H	L	AA	L	AA	AA

Source: Prepared by authors

Notes :

1. D1 – during 2001- 2010, D2 – during 2011-2019, 2D – during 2001-2019 2. H: High, AA: Above Average, BA: Below Average, L: Low

While comparing our study with CRISIL's reports of financial inclusion in India during the period 2009 to 2016; it reveals that though CRISIL's study shows an increasing trend of financial inclusion but our study reflects the increasing trend only up to 2012. Then a dip down has been perceived and after that again an increasing trend has been found. At all India level, the average scores of financial inclusion during the entire study period are below the average level for the dimensions like availability of and access to financial services, but the scoresare above average for the dimension of usage. Therefore, restructuring of the policies of banking sector like infrastructural development or making the products easily accessible to the commons are the urgent needs. Mittal & Shukla (2014) have discussed the coverage of banking services in India region-wise considering secondary data of 2005 and data of financial inclusion developed by CRISIL for the banking sector for the period 2009-2011. The study concludes that though the Indian financial system has grown rapidly in the last three decades, however, creating an appropriate credit delivery system and monitoring the productive use of that credit are necessary to reach the poor in remote areas under the mission of financial inclusion.

Assessment of Financial Inclusion with Comparison to the Study of RBI, 2021

According to the RBI report of 2021, Kerala, Maharashtra, and Karnataka have achieved high financial inclusion (score of financial inclusion is greater than 0.5), while Tamil Nadu, Punjab, Andhra Pradesh, Himachal Pradesh, Sikkim, and Haryana have been identified as having medium financial inclusion (score of financial inclusion is in between 0.3 and 0.5).In our study, the average score of financial inclusion interms of banking services,in almost over the two decades, lies between 0.21 (Meghalaya) and 0.48 (Pondicherry), and the India average is 0.40. Further, Goa, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Punjab, Sikkim, Tamil Nadu, Uttar Pradesh, Chandigarh, Delhi, and Pondicherry have the scores of financial inclusion above the India average, which almost matches with the RBI study except for Andhra Pradesh and Maharashtra. Perhaps, as our study only stresses on banking activities and the financial inclusion index of RBI stresses on the other parameters as well, so Andhra Pradesh and Maharashtra might have done exceptionally well in terms of other indicators. But according to the CRISIL's criteria for measuring financial inclusion, the performance of Andhra Pradesh and Maharashtra are poor as well. The RBI study was made on 2021, as an annual

estimate of financial inclusion;however, the path (2001-2019) of performance of the states and union territories actually makes sureof the outcome, which our study actually examines.

4. Conclusions

The study comes to the conclusions that all the dimensions - availability, accessibility and proper usage of financial services are equally important for realizing financial inclusiveness through banking services in a nation. Though many government and non-government agencies work for financial inclusion in India,but lack of literacy in remote areas may be an obstacle to achieve this. Sudden changes in government policies, and thereby, the certain shocks on citizens also affect financial inclusion. So government policies should be directed for modernization and stabilisation of the financial system, and to make the disadvantaged group financially educated.

The study covers the vast time period 2001-2019 to assess financial inclusion in India through banking activities, which is new in literature at national and sub-national levels. However,limitations of the study are rooted in the scope of incorporation of the other banking service indicators like ATM service, pension scheme, mutual funds, insurance, etc. to assess financial inclusion. Evaluation of financial inclusion even more enhancing the time period and considering all such banking services might help to assessthe mission to a greater extent.Variation in account ownership, gender and age discrimination, regional imbalances are also important aspects to judge the achievement of financial inclusiveness. Saha and Alam (2021) have examined financial inclusion segregating the developed and underdeveloped regions in India over the time period 1990-2018 in this regard. The present study shows state-wise discrepancies in attainment.A part, the future scopes also lie in analyzing the other distributional aspects; considerations of which may enhance the quality of the study.

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Spending Diversification in Urban India: An Inter-State Analysis

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Abstract:

Economic reforms in 1991 have improved the economic condition in India, explored the new job opportunities and increased the degree of urbanization that influenced the lifestyle of urban consumers. As a result, consumers' taste and preference have significantly transformed and hence diversified the expenditure pattern. In this paper, our basic objective is to analyse the changing monthly per capita consumption expenditure pattern and the degree of diversification of the spending in urban India and its constituent states during the period of 1983 – 2011/12. Based on the five different rounds of NSSO data the expenditure of the commodity basket has differentiated in terms of food and non-food baskets. Here, we have used the Theil entropy measure to show the extent of diversification of food and non-food basket in India and its constituent states during the period under study. Our estimates reveal that with the development of the economy the expenditure share on food basket has declined compared to non-food one in urban India and its constituent states. Initially, the degree of diversification is quite higher in non-food basket compared to food one but over time the consumption expenditure has highly diversified on food basket than non-food one in all the constituent states in urban areas in India during 1983 – 2011/12. States like Kerala, Maharashtra, Madhya Pradesh, Andhra Pradesh, Haryana, Gujarat, etc. have higher spending diversification both in food and non-food baskets during this period.

JEL Code – D12, C02, R2

Key words: Consumption Expenditure, Spending Diversification Index.

Introduction:

The economic reforms in 1991 have generated a large-scale structural transformation of economies shifting from the primarily agrarian towards more industrial and service-oriented activities. Due to the opening up of the economy, the livelihood pattern of the

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consumers in urban areas has changed in regard to the composition of food and non-food baskets. But with a large and diversified consumption basket, higher income inequality and regional diversity, the consumption behaviour of the household became more complex. So, to understand the consumption pattern across the entire range of consumption categories of households, the monthly per capita consumption expenditure has emerged as the more reliable measure. Nowadays, the continuing progression of social, economic and technological transformations has highly influenced the composition of the household consumption baskets. As a result, the consumption pattern may shift from food to non-food items as well as cereal to non-cereal products. An expansion in consumption of high-value products such as egg-fish-meat, dairy products, fruits and veggies, etc. in the non-cereal aspects has resulted in primary changes in the demand for a food basket. Here we are to examine the spending diversification in the consumption baskets of food and non-food in urban India and its constituent states during the period of 1983 – 2011/12.

Literatures on spending diversification on commodities are very few both at national and international levels. Based on NSSO data of 1983/94 and 2011/12, Joshi, Parappurathu and Kumar (2016) have investigated the dynamics of food consumption and nutritional amount of the household in India both in case of food and non-food baskets. They have used Simpson index to show the degree of diversification among the various income levels. To decompose the household's consumption expenditure inequalities Mishra and Parikh (1992) have used Entropy Indices (Theil index and Atkinson's index). Based on the NSSO data (1977/78 to 1983) on consumption expenditure in urban India and its 17major states, they observed that the between states and indirectly the within states disparity had been one of the major factors for inequality in India. Similarly, depending on the primary survey data Vellaichamy et al. (2008) tried to examine the nutritional statues and food consumption pattern in India. So, based on random sample of last 24 hours diet of 240 persons (including men, women and children) specifically collected from Dhar and Datia districts of Madhya Pradesh, they examine the food consumption pattern and diet diversification over time. The number based Individual Diet Diversity Score (IDDS) and Body Mass Index (BMI) had used to analyse the diversity and food nutritional statues by Nasurudeen et al. (2006). They tried to examine the consumption of food cereals and calorie intake amount in India and the inter-state variability and inequality in food and energy intake during the period of 1972/73 to 1999/2000. Using Gini coefficient, they shown that inequality in consumption of calorie, protein and fat continuously declined between the states as well as across the income classes.

Using the NSSO data Sen (2009) in his study had shown the changing pattern of consumption expenditure in rural India during 1993-2004 based on Theil and Simpson's index. He had examined the changing nature of consumption baskets across different income groups in rural India. However, Ying and Brown (1989) examined the households demand for variety of goods as this variation of the daily consumption baskets had continuously increased in the recent years. So, with the help of Herfindahl and Simpson indices they tried to investigate the relationship between the household's composition of diet and the budget share to study the consumer's demand for diversity and expanded the research work by using Theil and Finke indices. The results have shown that the demand for the diversified food diet had a positive relation to the total food expenditure and numbers of members in the households in different age and sex groups.

Though the consumption spending diversification is the main focus of these above studies but it would be confined for a particular state or region. The state-wise as well as region specific analysis especially, for the urban area for the baskets specific diversification have not included. Therefore, a study on changing spending diversification in urban India and its constitute states is quite significance. Since consumption diversity appears very slowly, such analysis should be based on long time period.

Objectives of the Study:

In this paper, we are to examine the compositional change in the monthly per capita consumption expenditure between the food and non-food baskets in urban India and its constituent states during the period of 1983 - 2011/12. Here the food basket contains 13 items: Cereals, Gram, Cereal substitute, Pulses & Pulse products, Milk & Milk products, Edible oil, Fish-Egg & Meat, Vegetables, Fruits & Nuts, Sugar, Salt, Spices, Beverages, etc. and the non-food basket includes 15 items: Pan, tobacco and intoxicant, Fuel and Light, Clothing & Bedding, Footwear, Education, Medical (institutional), Medical (non-institutional) Entertainment, Toilet articles, Conveyance, Rent, Taxes & cesses, Durable goods and misc. consumers goods & services etc. For this study we have used the NSSO (National Sample Survey Organisation) consumption expenditure data on five different rounds such as 38th, 50th, 56th, 60th and 68th which has covered the period of 1983 - 2011/12 (almost 30 years). These data are at the current price. These data are deflated to compensate for the effect of price change by using the deflator (using the 'Splicing method') such as Consumer price index (CPI), (i.e., CPI of the industrial worker (CPI-IW) for the urban area) in the base year of 2011-12.

Methodology:

Let us consider a commodity basket consists of i number of commodities, i = 1,2,3……n, and $x = (x_1, x_2, x_3 \ldots\ldots x_n)$ be the expenditure vector of consumption corresponding to these i commodities (in terms of rupees).

Consider another variable E, $E = \sum_{i=1}^{n} x_i$: E is the total spending of all commodities and the spending share of i-th commodity: $p_i = x_i / E$, such as $0 \leq p_i \leq 1$ and $\sum_{i=1}^{n} p_i = 1$.

Therefore, Theil (1967) entropy measure is:

$$T = \sum_{i=1}^{n} \ln(1/p_i) p_i \quad \ldots\ldots\ldots\ldots\ldots (1).$$

As the upper bound of the index depends on n, i.e., the number of items consumed. So, to normalise it we now divide T by ln n, the maximum value. Therefore, the Spending Diversification Index (SDI) is given by

$$SDI = \frac{T}{\ln n} = \sum_{i=1}^{n} \frac{\ln(1/p_i) p_i}{\ln n} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2).$$

Now SDI lies between 0 to 1. So, as the value of SDI more tends towards 1 indicated that consumption basket consists of various items and expenditure is highly diversified. This is the case of complete diversification because all the commodities are equally important to the consumers now. On the other hand, SDI = 0, it means that only one item of the commodity basket shares the total expenditure and no other commodities are consumed at all. Here the consumers are totally biased for one commodity. This is the case of full concentration meaning that there is no option of spending diversification.

Estimates:

I. Indices of Spending Diversification of Food and Non-food Baskets in Urban India: A State-wise Analysis

Let us now examine the indices of spending diversification on food and non-food baskets in urban India and its constituent states during 1983 - 2011/12. Our estimates (Table 1) reveal that at the all-India level the SDI of food basket has increased from 0.790 in 1983 to 0.821 in 1993-94 and then declined to 0.780 in 2000-01. Thereafter it has risen to 0.824 in 2004-05 and 0.827 in 2011-12. In the case of the non-food basket, the SDI has also increased from 0.384 in 1983 to 0.458 in 1993-94 and to 0.932 in 2000-01. Thereafter it has slightly decreased to 0.884 in 2004-05 and increased slightly to 0.897 in 2011-12.

This variation has also been seen among the constituent states in India during the period of under study. In 1983 the SDI is highest in Maharashtra (0.826) followed by Sikkim, Gujarat, Himachal Pradesh, Kerala, Punjab, etc. and it is lowest in Bihar (0.700) in the case of the food basket. In the case of the non-food baskets, it is highest in Himachal Pradesh (0.411) followed by Sikkim, Orissa, Bihar, Punjab, Madhya Pradesh and lowest in Tamil Nadu (0.320). In 1993-94 the highest diversification of food basket has observed again in Maharashtra (0.842) followed by Madhya Pradesh, Kerala, Karnataka, Tamil Nadu, Jammu & Kashmir, Gujarat, etc. Similarly, in the case of the non-food basket, it is highest again in Himachal Pradesh (0.534) followed by Arunachal Pradesh, Madhya Pradesh, Assam, Rajasthan, Punjab and it is lowest in Bihar (0.325). From 2000-01 and onwards, the index of spending diversification has gradually increased both in food and non-food baskets in the constituent states. In this period the SDI of food, as well as non-food baskets, is highest in Maharashtra (0.832 in food & 0.945 in non-food). But it is lowest in Haryana (0.753) in food and in Jammu & Kashmir (0.887) in non-food one. During 2004/05 – 2011/12 with the injection of a new variety of commodities both in food and non-food baskets, the index has risen continuously. Consumers have preferred more non-food basket than food one. The SDI is highest in Kerala (0.837 in 2004-05 and 0.858 in 2011-12) in the food basket. But in case of non-food basket, it is highest in Haryana (0.882) in 2004-05 and in Andhra Pradesh (0.894) in 2011-12. Interestingly, we note that the SDI of both food and non-food baskets has increased significantly in all the constituent states during the period under study in the urban area. But the non-food basket has been more diversified than the food one in all the states.

- **Food vs. Non-food**

We have already examined separately the spending diversification indices of food and non-food baskets in urban India and its constituent states during 1983 - 2011/12. Let us now examine a comparative analysis of the indices of two baskets in urban India during the period of under study. To compare the level of diversification between food and non-food baskets in urban Indian states, we have estimated the ratio between the spending diversification index of food and non-food basket (F/NF). If the ratio is greater (less) than unity, this indicates that the food basket has been diversified more (less) than the non-food one. If the ratio is equal to unity, the food basket and non-food baskets are equally diversified. Our estimates (Table 1) reveal that irrespective of the states, the ratio has greater than unity indicating that the food basket has been diversified more than the non-food one during the period of 1983 – 1993/94. But the diversity of food basket has gradually declined. In 2000-01, the ratio has less than unity in all the states.

This shows the enrichment of the non-food basket than the food one. However, in 2004-05, excepting Sikkim (1.015) all the other states have shown the higher diversification of non-food basket than that of food one. But in 2011-12 the diversity as well as the consumer's expenditure level has increased both in food and non-food baskets though the consumers have more spending on non-food than food basket in all the states. This is due to the fact that both food and non-food baskets are highly diversified and compared to the food basket, the non-food basket is diversified more.

Thus, we observe that over the time period, globalisation tremendously has affected the urban consumers in India. The modernisation, technological innovation and e-commercialisation have given the opportunity to consume a bunch of new products which are added in the non-food basket. Moreover, our analysis reveals that the states like Kerala, Maharashtra, Madhya Pradesh, Andhra Pradesh, Haryana, Gujarat etc. have the higher diversification of non-food basket as well as an increasing diversification of food basket during 2004/05 – 2011/12.

II. Indices of Overall Spending Diversification (Food and Non-Food items together) in Urban Indian States

Let us now examine the overall spending diversification in urban India and its constituent states during 1983-2011/12. Here we have considered the total consumption basket consisting of thirteen food and fifteen non-food commodities. That is, we are to examine the SDI of the overall (food and non-food) consumption basket in urban India and it constitute states during the period under study.

Our estimates (Table 2) reveal that at the all-India level the SDI has varied over time. It has decreased from 0.737 in 1983 to 0.725 in 1993-94 and then increased to 0.898 in 2000-01. Thereafter it has decreased marginally to 0.890 in 2004-05 and again risen slightly to 0.897 in 2011-12. Thus, the trend of SDI has been fluctuating during the period under study. At the state level analysis, we observe that the SDI is highest in Sikkim (0.755) followed by Rajasthan, Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, West Bengal, Uttar Pradesh etc. and it is lowest in Tripura (0.693) in 1983. In 1993-94, the index has gradually increased in all the states. The SDI is highest in Arunachal Pradesh (0.759). Interestingly, Sikkim, the highest diversified state in 1983, has shown in lowest SDI (0.643) in 1993-94. However, from 2000-01 and onwards, Maharashtra has continuously achieved the highest position, though during this period the indices have continuously declined from 0.923 in 2000-01 to 0.895 in 2004-05 and to 0.884 in 2011-12. On the other hand, the SDI is lowest in Bihar (0.867) in 2000-01 and Sikkim (0.882 in 2004-05 and 0.845 in 2011-12). Interestingly, we note that though

Bihar and Sikkim have marked as the lowest diversified states during the period but their indices have significantly higher indicating the increasing trend of consumption spending diversification in urban area. The other states namely, Kerala, Uttar Pradesh, Andhra Pradesh, Madhya Pradesh, Himachal Pradesh, Tamil Nadu, Karnataka, Gujarat, Jharkhand etc have shown the constant progression with the higher indices of SDI during the period under study.

Thus, we observe that with the changing consumers' tastes and preferences, the per capita spending diversification in the overall consumption basket has been fluctuating over time in urban India and its constituent states during the period 1983- 2011/12. The states like Maharashtra, Kerala, Gujarat, Karnataka, Andhra Pradesh, Himachal Pradesh, Jharkhand etc. have shown the higher indices in urban area during 1983 – 2011/12.

III. State-classification on the basis of Overall Spending Diversification in Urban India

Throughout the paper we have examined the changing consumption spending diversification with respect to food, non-food and overall commodity baskets during the period of 1983-2011/12. We now construct a 2 × 2 classification of states on the basis of overall and food (or non-food) basket diversification at the all-India level in urban area in five different time periods. Here we have created four different cells (I, II, III and IV) based on two segments: (a) whether the value of the overall SDI of the state is higher or lower than that of the all-India level and (b) whether the states' SDI of food (or non-food) basket is higher or lower than the all-India SDI level. Our estimates are shown in Table 3.

Our estimates reveal that in 1983 seven states namely, Gujarat, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Punjab, Rajasthan and Sikkim have fallen in cell I (high, high). All the other states in case of food have fallen in cell IV (low, low) but in case of non-food these states are in cell II (low, high). In 1993-94 five states namely Arunachal Pradesh, Kerala, Madhya Pradesh, Tamil Nadu and Uttar Pradesh are now in cell I in case of non-food and in cell III in case of food basket. In 2000-01 six states namely Himachal Pradesh, Karnataka, Kerala, Maharashtra, Madhya Pradesh and Tamil Nadu have fallen in cell I in case of food and in cell III in case of non-food baskets. In 2004-05 only 2 states namely Kerala and Maharashtra have the higher SDI both in food and non-food and overall basket compared to the all-India level. In 2011-12, the situation is just opposite in food and non-food baskets as all the states in case of food have fallen in cell II and in case of non-food these are in cell IV.

IV. Indices of Spending Diversification on Food and Non-Food Baskets: A Regional Analysis

The idea of consumption spending diversification may be extended if the analysis would be done with respect to the region. We have 22 major states divided into six regions according to the geographical position: (i) **Northern region-** consists of five states namely Himachal Pradesh, Haryana, Jammu & Kashmir, Punjab and Uttar Pradesh. (ii) **Southern region**- groups of four states- Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. (iii) **Western region-** consists of Gujarat, Rajasthan and Maharashtra. (iv) **Eastern region** has four states - Bihar, Jharkhand, Orissa and West Bengal. (v) **Central region** contains two states Chhattisgarh and Madhya Pradesh. (vi) **Northeast region** has four states Assam, Arunachal Pradesh, Sikkim and Tripura. Table 4 has shown the region-wise indices of spending diversification in five different time periods in urban India.

During 1983 – 2011/12, a wide disparity has observed among the regions both in food and non-food baskets. In 1983, the SDI is highest in Western region (0.808) followed by Northern, Southern, Central, Northeast regions and it is lowest in Eastern (0.727) region in case of food basket. Whereas in case of non-food basket, it is highest in Northern region (0.536) followed by Eastern, Western Southern, Central region and it is lowest in Northeast region (0.487). However, in 1993-94 the highest SDI has been achieved by Southern region (0.824) in food basket and by Northern region (0.513) in case of non-food basket. Moreover, Western region (0.820) has achieved the highest position in case of food but the lowest (0.449) one in case of non-food basket. From 2000-01 & onwards the idea would be totally changed as the spending diversification has increased both in food and non-food baskets irrespective of regions. Interestingly, we note that in 2000-01 the SDI is highest in Southern region both in food (0.820) and non-food (0.934) baskets. In this period the lowest SDI has been achieved by Northeast region (0.775) in case food and by Eastern region (0.775) in case of non-food baskets. During 2004/05-2011/12 in case of food basket the highest SDI has been marked by Southern region and the lowest one by Northeast region. But in case of non-food basket, the diversification is highest in Northern region in 2004-05 and Central region in 2011-12 but the lowest one constantly in Eastern region.

Thus, we observe that the spending diversification both in food and non-food baskets has increased irrespective of the region during the period of 1983- 2011/12. Here also we note that Southern region and Northern region are the highest diversified regions in case of food and non-food baskets respectively during the period under study.

Conclusions:

Over the years the spending on food and non-food baskets has diversified irrespective of regional boundary in India during the period under study. Almost all the states have shown the higher consumption spending diversification in food, non-food and overall commodity baskets. But the diversification of non-food basket is slightly higher than that of food one in urban India and its constituent states during the period under study. The states-classification matrix has shown that the states like Kerala, Maharashtra, Madhya Pradesh, Andhra Pradesh, Haryana, Gujarat etc. have the higher spending diversification and this diversification actually exists both in food and non-food commodity baskets. On the other hand, the states like Bihar, Arunachal Pradesh, Uttar Pradesh, Punjab, Orissa etc. have the lower spending diversification. Thus, we observe that the expenditure pattern and the degree of diversification of the consumption basket in urban India have been changing during the period 1983 - 2011/12.

This shows the improvement in the socio-economic welfare of the economy. The consumers are now not only aware about the products but also updated about the price, quality and the other options available to them. The results indicate an increasing demand for livestock, horticultural products and various non-food commodities. Even for the poorer states (in term of lower MPCE) it is also significant.

From the perspective of a developing country, a prominent consumption spending diversification has to be considered as a broader strategical aspect of sustainable development. It might be some extent of the positive effects of various programme and policies taken by the government under the scheme of Sustainable Development Goals (NITI Aayog Report, 2014)

In future these types of changes should be guided by appropriate reform policy, technological backing, institution and policies to accelerate and sustain this diversification process in the right way and with the improve consumption pattern and nutritional security for all.

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Table 1: Indices of Spending Diversification of Food and Non-Food Baskets in Urban Indian States during 1983—2011/12

Year	1983			1993-94			2000-01			2004-05			2011-12		
States	Food	Non-food	F/ NF	Food	Non-food	F/ NF	Food	Non-food	F/ NF	Food	Non-food	F/NF	Food	Non-food	F/NF
Andhra Pradesh	0.777	0.377	2.061	0.801	0.446	1.796	0.799	0.923	0.866	0.807	0.884	0.913	0.833	0.894	0.932
Arunachal Pradesh	—-	—-	—-	0.805	0.519	1.551	—-	—-	—-	0.794	0.879	0.903	0.809	0.894	0.905
Assam	0.707	0.402	1.759	0.714	0.394	1.812	0.780	0.897	0.870	0.801	0.869	0.922	0.816	0.891	0.916
Bihar	0.700	0.399	1.754	0.735	0.325	2.262	0.778	0.887	0.877	0.787	0.838	0.939	0.808	0.876	0.922
Chhattisgarh	—-	—-	—-	—-	—-	—-	0.079	0.924	0.085	0.811	0.882	0.920	0.836	0.890	0.939
Gujarat	0.805	0.374	2.152	0.813	0.443	1.835	0.799	0.920	0.868	0.808	0.867	0.932	0.808	0.887	0.911
Haryana	0.780	0.374	2.086	0.773	0.445	1.737	0.753	0.900	0.837	0.769	0.892	0.862	0.756	0.865	0.874
Himachal Pradesh	0.798	0.422	1.891	0.806	0.534	1.509	0.799	0.937	0.853	0.811	0.897	0.904	0.812	0.888	0.914
Jammu and Kashmir	0.756	0.394	1.919	0.816	0.466	1.751	0.786	0.887	0.886	0.796	0.882	0.902	0.809	0.872	0.928
Jharkhand	—-	—-	—-	—-	—-	—-	0.780	0.909	0.858	0.817	0.870	0.939	0.826	0.870	0.949
Kerala	0.795	0.381	2.087	0.819	0.381	2.150	0.820	0.933	0.879	0.817	0.834	0.980	0.833	0.887	0.939
Madhya Pradesh	0.780	0.396	1.970	0.826	0.501	1.649	0.816	0.921	0.886	0.839	0.877	0.957	0.835	0.857	0.974
Karnataka	0.776	0.381	2.037	0.816	0.489	1.669	0.807	0.933	0.865	0.817	0.874	0.935	0.818	0.884	0.925
Maharashtra	0.826	0.362	2.282	0.842	0.434	1.940	0.832	0.945	0.880	0.842	0.883	0.954	0.831	0.889	0.935
Orissa	0.692	0.411	1.684	0.781	0.480	1.627	0.787	0.909	0.866	0.789	0.806	0.979	0.805	0.883	0.912
Punjab	0.797	0.398	2.003	0.808	0.459	1.760	0.793	0.911	0.870	0.782	0.853	0.917	0.774	0.875	0.885
Rajasthan	0.772	0.425	1.816	0.780	0.469	1.663	0.772	0.922	0.837	0.777	0.863	0.900	0.772	0.880	0.877
Sikkim	0.821	0.418	1.964	0.800	0.375	2.133	—-	—-	—-	0.810	0.798	1.015	0.779	0.804	0.969
Tamil Nadu	0.754	0.320	2.356	0.815	0.493	1.653	0.821	0.928	0.885	0.828	0.845	0.980	0.835	0.869	0.961
Tripura	0.732	0.355	2.062	0.765	0.443	1.727	0.766	0.912	0.840	0.761	0.882	0.863	0.779	0.838	0.930
Uttar Pradesh	0.766	0.391	1.959	0.808	0.475	1.701	0.806	0.916	0.880	0.813	0.871	0.933	0.815	0.895	0.911
West Bengal	0.759	0.374	2.029	0.791	0.466	1.697	0.793	0.906	0.875	0.809	0.870	0.930	0.807	0.874	0.923
All India	0.790	0.384	2.057	0.821	0.458	1.793	0.780	0.932	0.837	0.824	0.884	0.932	0.827	0.897	0.922

Source: Various rounds of NSSO data.Govt. Of India.

Note: F/NF is the ratio of Food / Non-food spending diversity.

Table 2: Indices of Overall Spending Diversification (Food and Non-Food baskets) in Urban Indian States during 1983 - 2011-12

Year / States	1983	1993-94	2000-01	2004-05	2011-12
Andhra Pradesh	0.722	0.707	0.898	0.881	0.893
Arunachal Pradesh	—	0.759	—	0.87	0.887
Assam	0.705	0.692	0.868	0.871	0.888
Bihar	0.695	0.687	0.867	0.851	0.878
Chhattisgarh	—	—	0.894	0.882	0.894
Gujarat	0.738	0.72	0.895	0.875	0.884
Haryana	0.723	0.698	0.869	0.874	0.855
Himachal Pradesh	0.747	0.718	0.901	0.889	0.883
Jammu & Kashmir	0.723	0.725	0.871	0.874	0.877
Jharkhand	—	—	0.874	0.878	0.881
Karnataka	0.734	0.711	0.909	0.862	0.883
Kerala	0.739	0.743	0.905	0.891	0.873
Madya Pradesh	0.728	0.729	0.907	0.881	0.884
Maharashtra	0.744	0.721	0.923	0.895	0.894
Orissa	0.696	0.716	0.883	0.861	0.88
Punjab	0.738	0.713	0.89	0.858	0.867
Rajasthan	0.74	0.711	0.884	0.862	0.869
Sikkim	0.755	0.682	—	0.842	0.845
Tamil Nadu	0.71	0.729	0.907	0.871	0.882
Tripura	0.693	0.698	0.869	0.863	0.85
Uttar Pradesh	0.729	0.728	0.897	0.885	0.891
West Bengal	0.719	0.716	0.885	0.877	0.878
All India	**0.737**	**0.725**	**0.898**	**0.89**	**0.897**

Source: As in Table 1.

Table 3. 2×2 State-classification on the basis of Overall Spending Diversification in Urban India during 1983 – 2011/12

1983	Food Group SDI (All India : 0.790)		Non-Food Group SDI (All India : 0.384)	
Overall SDI (All India : 0.705)	High	Low	High	Low
High	I -	II : Gujarat, Himachal Pradesh, Kerala, Maharashtra, Punjab, Rajasthan, Sikkim	I: Gujarat, Himachal Pradesh, Kerala, Maharashtra, Punjab, Rajasthan, Sikkim	II. ...
Low	III ...	IV. AndhraPradesh,Assam, Bihar, Haryana, Jammu & Kashmir, Karnataka, Madhya Pradesh, Orissa, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal	III. : Andhra Pradesh, Assam, Bihar, Haryana, Jammu & Kashmir, Karnataka, Madhya Pradesh, Orissa, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal	V. ...

1993-94	Food Group SDI (All India : 0.821)		Non-Food Group SDI (All India : 0.458)	
Overall SDI (All India: 0.734)	High	Low	High	Low
High	I -	II: Arunachal Pradesh, Kerala, Madhya Pradesh, Tamil Nadu, Uttar Pradesh	I: Arunachal Pradesh, Kerala, Madhya Pradesh, Tamil Nadu, Uttar Pradesh	II. ...
Low	III ...	IV: Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Maharashtra, Orissa, Punjab, Rajasthan, Sikkim, Tripura, West Bengal	III: Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Maharashtra, Orissa, Punjab, Rajasthan, Sikkim, Tripura, West Bengal	IV. ...

2000-01	Food Group SDI (All India : 0.780)		Non-Food Group SDI (All India : 0.932)	
Overall SDI (All India: 0.776)	**High**	**Low**	**High**	**Low**
High	I. Himachal Pradesh, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Tamil Nadu	II. ...	I.	II.Himachal Kerala, Maharashtra, Madhya Pradesh, Tamil Nadu
Low	III. Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Jammu & Kashmir, Jharkhand, Orissa, Punjab, Rajasthan, Tripura, Uttar Pradesh, West Bengal	IV. Arunachal Pradesh, Sikkim	III.	IV.Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana,Jammu & Kashmir, Jharkhand, Orissa, Punjab, Rajasthan, Sikkim, Tripura, Uttar Pradesh, West Bengal

2004-05	Food Group SDI (All India : 0.824)		Non-Food Group SDI (All India : 0.884)	
Overall SDI (All India: 0.861)	High	Low	High	Low
High	I. Kerala, Maharashtra	II.	I. Kerala, Maharashtra	II. .....
Low	II. Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal	IV.	III. HimachalPradesh, Uttar Pradesh	IV.Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Jammu & Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, West Bengal

2011-12	Food Group SDI (All India : 0.836)		Non-Food Group SDI (All India : 0.897)	
Overall SDI (All India: 0.886)	High	Low	High	Low
High	I.	II.	I.	II. .....
Low	III. Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Assam, Bihar Pradesh, Haryana, Jammu &Kashmir, Jharkhand, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Punjab, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh,West Bengal	IV.	III.	IV. Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Himachal Pradesh, Haryana, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Punjab, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal

Source: As in Tables.

Table - 4 : Indices of Spending Diversification on Food and Non-Food Baskets in Urban Region of India during 1983 to 2011-12

Year	1983		1993-94		2000-01		2004-05		2011-12	
Region	Food	Non-food	Food	Non-food	Food	Non-food	Food	Non-food	Food	Non-food
Northern	0.793	0.536	0.809	0.513	0.798	0.905	0.806	0.896	0.802	0.890
Southern	0.783	0.513	0.824	0.474	0.820	0.912	0.830	0.881	0.841	0.888
Western	0.808	0.518	0.820	0.449	0.811	0.908	0.818	0.881	0.814	0.895
Eastern	0.727	0.526	0.778	0.464	0.792	0.901	0.813	0.869	0.825	0.884
Central	0.779	0.510	0.821	0.489	0.808	0.910	0.822	0.880	0.840	0.897
Northeast	0.767	0.457	0.782	0.479	0.775	0.904	0.800	0.882	0.808	0.894

Source: Various rounds of NSSO data, Govt. of India

Diversification of Urban India During 1991-2011: An Inter-State Analysis

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Abstract

With economic reforms it is expected that urbanization rate is increasing day by day. Urban places are socially and economically very important. Due to some special amenities or some concentrated natural resources in some places, the urbanization rate has varied among the constituent states in India. As well as, the urban centers are not very well diversified among all the districts of different states. In India, there exists a dramatic variation in urbanization across the states. The Census of India has classified urban areas into six categories on the basis of their population. This study estimates the diversification among the percentage distribution of number of cities and the percentage distribution of population among states in India during 1991-2011. Also, this study examines the class-size diversification of cities and population in India and its constituent states during 1991-2011. Social development in medium & small towns and socio-economic amenities in rural areas can only reduce the population pressure in mega cities by increasing the urban area.

JEL Codes: C01, R23

Key words : Urban Population, Diversification Index, Class-Sizes

Introduction:

Economic reforms, Globalization and liberalization in 1990's boost massive inflow of capital from outside the country to India specially the urban areas. Sometimes those industries which are located in rural areas, by receiving foreign capital they are becoming strong and in a few years those areas are becoming urbanized. So, after economic reforms it is expected that the urbanization of India should increase. That increase may be due to natural growth or migration or reclassification of urban areas due to new independent towns or due to boundary change.

In India, towns and cities can be defined on the basis of:

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1. All places with a municipality corporation, cantonment board or notified town area committee, etc.

2. All other places which satisfied the following criteria:

I. A minimum population of 5000;

II. At least 75 per cent of the male main working population engaged in non-agricultural pursuits and

III. A density of population of at least 400 person per sq. km.

The number of cities in India and its constituent states has increased during 1991-2011. On the basis of number of populations, the number of cities may be classified into different size-classes. The Census of India has classified towns into six categories on the basis of their population:

1) Class I towns: More than 1,00,000 population.

2) Class II towns: 50,000 to 99,999 population.

3) Class III towns: 20,000 to 49,999 population.

4) Class IV towns: 10,000 to 19,999 population.

5) Class V towns: 5000 to 9,999 population.

6) Class VI towns: Less than 5000 population.

"City is a relatively permanent and large settlement having a population of diverse skills and characteristics, lacking self-sufficiency in the production of food, usually depending on manufacturing and commerce to satisfy the wants to its inhabitants and providing goods and services for the benefit of areas lying outside it." (Siddhartha & Mukherjee, 2019).

Urban places are interlinked. There exists a wide variation of urban places among the constituent states in respect of number of towns as well as urban population according to different size-classes in India during 1991-2011. Due to some special amenities or some concentrated natural resources in some places, the urbanization rate is obviously different among the states. In India, there exists a dramatic variation in urbanization across the states.

Literature Review:

There exists a vast literature in urbanization at both national and international levels

over a period of time. According to Majumdar & Chatterjee (2021), urban growth is more rapid for developing countries than the developed countries. Urbanization is an index of long-term process of transformation from traditional rural economies to modern industrial one (Datta, 2006). Though India ranks the second about urban population but it has very low level of urbanisation. The patterns of urbanisation are very diverse among the states. Delhi, Goa & Mizoram have recorded the significant level of urbanisation (Singh & Singh, 2017). In India urbanisation has increased faster than expected during 2001-2011(Bhagat, 2011). Kundu (2003) has observed that from 1990 there was a significant departure from previous decade and urbanisation had been concentrated in developed regions and larger cities. It was observed that two-third of urban population lived in the Class I cities (Chatterjee, 2012). From 1970, the dominance of million plus cities are continuously increasing very slowly since the last two decades. The relatively newer metropolitan cities like Pune, Surat, Patna, Kanpur etc. are growing very fastly compared to older metros like Mumbai, Kolkata and Chennai and Hyderabad and Bangalore. Higher growth and larger concentration of urban population in metropolitan area and its peripheries is an important feature of India's urbanization in the post-globalisation period. The area of class I cities had increased as well as new class I cities had emerged (Bhagat, 2005). Higher growth and larger concentration of urban population in metropolitan area and its peripheries is an important feature of India's urbanization in the post-globalisation period. The area of class I cities had increased, as well as new class I cities had emerged (Bhagat, 2005). Some studies have shown that million-plus cities are uniformly distributed except in the hilly area (Chandchan& Shankar, 2012). Important implication of globalisation in India that inter-city has been increasing. Slower growth rate of traditional mega cities is at the core of regional development process (Saitluanga, 2013). The distribution among the class-size cities were highest in 2001 during the time frame of 1951-2001(Das,2012). Kumari (2015) has examined that class I cities have grown at a higher rate than the small cities.During 1961-2001, the percentages of variance in the distribution of cities are lower than 95 percent at the all-India level. In Bangladesh, spatial inequalities in urban development amongst cities and municipalities have existed during 1990-2019, i.e. urban expansion is unsustainable in nature (Bajracharya& Sultana, 2020). India is characterized by high inequality within the urban areas, though urban poverty is reducing (Imai & Malaeb, 2018). Thus, we observe that India's urbanization has increased rapidly but there is no uniformity among the growth rate in different size-class cities India during post-independence. Here all studies have focused only on India's urbanisation.

Here we would like to analyze the class-size diversification of number towns/cities as well as urban population in India and its constituent states during 1991-2011.

Objectives of the Study:

The main objectives of this paper are:

1. To examine the rate of urbanization in India and its constituent states during 1991-2011.
2. To examine the state-wise percentage distribution of number of cities in different Class-size cities in India during this period.
3. To examine the state-wisepercentage distribution of urban population in different Class-size cities in India during this period.
4. To examine/quantify the class-size diversification of number of cities/ urban population among the Size-classes in India and its constituent states during 1991-2011.

Methodology:

To examine the objectives we have used the following methodologies: -

i) The urbanization rate of any economy like India is the ratio between the urban population and the total population of the economy. Urbanisation rate (UR) is defined as the ratio between urban population(UP) and Total Population(TP), i.e,

$$UR=UP/TP \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1),$$

ii) Diversification Index: $DI=T/\log n = \Sigma [pi \log (1/pi)] / \log n$ where, $pi=c_i/\Sigma c_i$, $i=1,2.....n$.
T : Theil Entropy.

pi = The value of the observation/Summation of all the values.

$0 \leq DI \leq I$. DI is zero, when distribution is completely concentrated and unity when the distribution is completely diversified.

Estimates:

1: Rate of Urbanization in India During 1991-2011: An Inter-State Analysis

In this section we are to examine the urbanisation rate in India and its constituent states during 1991-2011. Our estimates (Table 1) reveal that irrespective of sex the urbanisation rate has varied in India and its constituent states during the period under study. At the

all-India level, it has increased from 25.43% in 1991 to 27.82% in 2001 and to 31.14% in 2011. It has increased in all the states excepting Bihar during 1991-2011. In 1991, irrespective of sex among the bigger states Maharashtra has shown the highest position in terms of urbanisation rate, whose position has lost by Tamil Nadu both in 2001 and 2011. Among the smaller states, Goa has taken the highest position for the three census years. Six bigger states namely Gujarat, Karnataka, Kerala, Maharashtra, Punjab, Tamil Nadu, West Bengal and two smaller states namely Goa & Mizoram have shown the higher urbanization rate than the national level for the three census years irrespective of sex. All the union territories have shown the higher urbanization rate than the national level during 2001 - 2011. During 1991-2011, three major states (namely Haryana, Kerala and Tamil Nadu) and three smaller states (namely Goa, Nagaland and Sikkim) have shown an increase in rank. Among them, Kerala has shown the highest increase in rank with an increase in urbanisation rate from 26% to 48%. Tripura is the only state which has shown the equality in ranking of urbanisation during 1991-2011. Interestingly, we note that the smaller states and the union territories have recorded a significant urbanisation level with Delhi topping the list having 93% urban population. The union territories have taken the first five ranking in urbanisation rate in the three decades except in 2001and Goa has taken the fourth position. Among the bigger states, Assam and Bihar have respectively achieved the lowest urbanisation rate in 1991and in 2011. Among all the states and union territories, Dadra & Nagar Haveli is the least urbanised union territory in 1991, but Himachal Pradesh has occupied the same position with only 10% level of urbanisation in the last two decades.

Sex-wise analysis reveals that during 1991-2011, only few states have shown the higher female urbanization rate than the male one. The rate of male urbanization rate as well as the total urbanization rate has increased but the female rate has decreased during 1991-2001 in the states of Gujarat and Himachal Pradesh. During 1991-2001, Nagaland is the only state where the total urbanization rate has increased only due to increase in female rate. During 2001-2011, Himachal Pradesh has shown an increase in total urbanization rate but its male urbanization rate has shown a slightly decreasing rate. In 1991, the female urbanization rate is greater than the male one in the states of Haryana, Manipur, Mizoram, Tripura, Chandigarh, Daman & Diu, Delhi and Pondicherry. In 2001, no bigger states have shown the higher female urbanization rate than the male one whereas in 2011, Kerala and Tamil Nadu have the higher female urbanization rate than the male

one.

Thus, we observe that the rate of urbanization has shown a rising tendency in the constituent states and union territories in India during 1991-2011. Among the states the variation in urbanization rate for female has decreased more than the male one during this period. In 2011 the variation in urbanization rate among the states is more or less same for both male and female.

2. Distribution of Number of Cities in Different Class-sizes in India during 1991-2011: An Inter-State Analysis

We are to examine the distribution to cities/towns among the size-classes in India and its constituent states during 1991-2011. Our estimates reveal that during 1991-2011, the number of towns in India and its constituent states has shown an increasing rate due to rapid industrialization and rural-urban migration. During this time period, at the all-India level class I cities have shown an increase in numbers from 300 to 463,class II cities from 345 to 470, class III cities from 947 to 1366,class IV cities from 1167 to1667 and class V cities from 740 to 1739. But class-VI cities have shown a slight decrease in number from 197 in 1991 to 194 in 2001 and then an increase to 420 in 2011.

Our estimates (Tables 2-4) reveal that at the all-India level among all the size-class cities class IV has obtained the highest position in the years of 1991and 2001. In 2011, Class IV has failed to achieve that position and lost its position to Class V. However, it has achieved the lowest position among all the city sizes during 1991-2011.

The shares of number of city-sizes are very much diversified among the states in India during 1991-2011. Among the size-classes class III has achieved the highest position in the states of (i) Andhra Pradesh, Bihar, Karnataka, Kerala, Maharashtra, and West Bengal in 1991, (ii) Bihar, Gujarat, Karnataka, Kerala, Maharashtra, and Rajasthanin 2001. The same position for Class III has achieved by all the aforesaid states in 2011 as well, only Uttar Pradesh has entered into that list. Class IV has obtained the highest position in the states of Gujarat, Madhya Pradesh, Haryana, Odisha, Punjab, Rajasthan, Tamil Nadu and Uttar Pradeshin1991. In 2001, the highest position was achieved by Class IV in the states like 1991 except Gujarat. On the other hand, only for the states like Gujarat, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh, Class IV city-size has achieved the highest Positionin 2011. In 1991, only Assam is the state for which

Class V has achieved the highest position. In 2001, West Bengal has entered into that list. For the states like Assam, West Bengal and Odisha, Class V city-size has achieved the highest position. For almost all the major states Class VI city-size is lowest except Karnataka in 1991. In that period the share of ClassVI city is zero in the states of Assam and Kerala, as there are no Class VI cities. In 2001, Class VI city-size has achieved the highest position for almost all the states except Assam and West Bengal. In 2011, Class VI city-size has achieved the highest position in almost all the states except Assam, Odisha and West Bengal.

The share of number of towns in class I is highest in (i) Andhra Pradesh followed by West Bengal and Haryana among all the major states in 1991, (ii) Andhra Pradesh followed by Haryana and Bihar in 2001 and (iii) Kerala followed by Bihar and Haryana in 2011. Similarly, the share of number of town in class II is highest in (i) Tamil followed by Andhra Pradesh and Bihar in 1991, (ii) Andhra Pradesh followed by Gujarat and Kerala in 2001 and (iii) Andhra Pradesh followed by Bihar and Karnatakain 2011. Also, in class III Andhra Pradesh got this position followed by Kerala and Bihar in 1991, Bihar followed by Rajasthan and Maharashtra in 2001, and Bihar followed by Rajasthan and Kerala in 2011. In class IV, (i) Odisha had achieved the highest share followed by Madhya Pradesh and Rajasthan in 1991 (ii) Tamil Nadu followed by Madhya Pradesh and Odisha in 2001 and (iii) Tamil Nadu followed by Madhya Pradesh and West Bengal in 2011. The share of numbers of towns in class V is highest for Assam followed by Madhya Pradesh and Uttar Pradesh in 1991, (ii) West Bengal followed by Assam and Tamil Nadu in 2001and (iii) West Bengal followed by Assam and Odisha in 2011. Class VI city-size is highest in Karnataka in 1991, West Bengal in 2001 and Assam in 2011.

Let us now examine the trend of size-class cities among the constituent states in India during 1991-2011. Our estimates reveal that there exists a wide variation of the trend of size-class cities among the constituent states in India during the period under study. Almost all the states excepting Tamil Nadu and West Bengal has shown a declining trend of the share of number of towns in class I during 1991-2001. Though no state has shown any decrease in absolute number in class I but the decrease in percentage shares indifferent statesisdue to huge increase in absolute numbers of any one or two size-classes. The share of number of towns in class II has increased in the states of Andhra

Pradesh, Assam, Gujarat, Maharashtra, Odisha, Rajasthan and Uttar Pradesh. But a decreasing trend is observed in the states of Andhra Pradesh, Assam, Kerala, Tamil Nadu and West Bengal during 1991-2001. Almost all the states have shown a decreasing trend in the class V excepting Andhra Pradesh, Kerala, Punjab, Tamil Nadu and West Bengal during this period. Also, Andhra Pradesh, Bihar, Haryana, Karnataka, Maharashtra, Punjab, Rajasthan and West Bengal have shown a declining trend in the percentage distribution of class VI. Interestingly, we note that Andhra Pradesh has shown a significant decrease in percentage distribution of class III city-size due to an increase in the percentage distribution of class I and class II city-sizes during this period. Bihar has also shown an increase in class III due to decrease in Class IV and Class V. Tamil Nadu has shown a decrease in percentage share of class I due to huge increase in the absolute numbers of Class IV and Class V. Similarly, the percentage share of class I in WestBengal has also shown a decreasing trend due to the increase in absolute number of class V city-sizes. Rajasthan has shown a huge decrease in percentage share of class IV city-size due to absolute fall in class IV city-size and increase in class III city-size.

During 2001-11, most of the states have shown a decrease in the percentage share of number of towns in class I cities in almost all the states excepting Bihar, Kerala, Madhya Pradesh, Rajasthan and Uttar Pradesh. But like first phase, there will be no decrease in the absolute numbers of class I cities. West Bengal has shown a remarkable decrease in percentage share of number of towns in class I city-size due to large increase in the absolute numbers of class V city-size. The percentage of number of towns in class II cities has shown a decreasing trend for the states excepting Bihar, Haryana, Karnataka and Uttar Pradesh. For class III cities the share of number of towns has shown a reduction in almost all the states except Bihar, Haryana, Madhya Pradesh and Uttar Pradesh during this period. Like class III, the percentage of number of towns in class IV cities has also shown a decrease in the rate in almost all the states except Andhra Pradesh, Gujarat and West Bengal. The percentage of number of towns in class V cities has shown an increase in the rate except Madhya Pradesh, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal during 2001-11. Odisha has shown a huge increase in percentage distribution in class V cities due to huge increase in absolute value of class V cities and decrease in percentage share of class VI cities. The percentage of numbers of town in class VI cities has shown an increase in almost all the states except Gujarat and Kerala.

3. Distribution of Urban Population in Different Class-size Cities in India During 1991-2011: An Inter-State Analysis

We are to examine the percentage distribution of urban population in different size-class cities in India and its constituent states during the period of 1991-2011. Our estimates (Tables 5-7) reveal that at the all-India level the percentage distribution of urban population is highest in Class I cities followed by class III cities during the period of 1991-2011. On the other hand, class VI cities have achieved the lowest position among the size-class cities during this period. The share of urban population in class I cities has increased from 70% in 1991 to 77% in 2011 at the cost of the declining shares of urban population in classes II, III, IV and VI. Thus, we observe that the distribution of urban population among the size-class cities in India is not uniform during the period under study.

Wide variations of the percentage distribution of urban population in different class-size cities are observed among the constituent states in India during the period under study. Among the size -classes Class I has achieved the highest position in all the constituent states during 1991-2011. Class III has achieved the second highest position in the states of (i) Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Maharashtra, Orissa, Rajasthan, Uttar Pradesh and West Bengal in 1991, (ii) Assam, Bihar, Karnataka, Kerala, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and West Bengal in 2001 and (iii) Assam, Bihar Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal in 2011. Class II city-size is the second highest in the states of (i) Gujarat, Haryana, Madhya Pradesh, Punjab, Tamil Nadu in 1991, (ii) Andhra Pradesh, Gujarat and Punjab in 2001 and (iii) Andhra Pradesh, Karnataka and Punjab in 2011.

We also observe that in case of class I cities West Bengal has achieved the highest position among the all states followed by Maharashtra and Andhra Pradesh in 1991, Maharashtra and Gujarat in 2001. Kerala has achieved the highest position followed by Maharashtra and Gujarat in 2011. Among the states, Assam has achieved the lowest position during 1991-2011. In case of class II cities, the highest percentage distribution of urban population is observed in (i) Punjab followed by Bihar and Tamil Nadu in 1991, (ii) Orissa followed by Punjab and Assam in 2001 and (iii) Punjab followed by Orissa and Andhra Pradesh in 2001. The lowest percentage distribution of urban population has achieved in Maharashtra in 1991, West Bengal in 2001 and Kerala in 2011.In class

III cities among all the states Assam has achieved the highest percentage share followed by Rajasthan & Bihar whereas West Bengal had taken the lowest position followed by Maharashtra & Gujarat in 1991. Percentage population lived in Bihar has highest followed by Rajasthan & Assam whereas percentage population has lowest in West Bengal in 2001. Among the major states, Bihar has achieved the highest rate of urban population percentage rate followed by Rajasthan and Orissa whereas Kerala has the lowest rate of population percentage in 2011.

Among the major states, the percentage share of urban population lived in class IV cities is highest in Orissa followed by Madhya Pradesh and Assam in 1991. The lowest position has taken by West Bengal. In 2001, Tamil Nadu has obtained the highest position followed by Assam and Orissa in 2001. In 2011, Assam has achieved the highest position followed by Tamil Nadu and Madhya Pradesh. Andhra Pradesh and Kerala have the lowest position in 2001 and 2011 respectively. Also, the percentage share of urban population lived in class V cities is highest in Assam followed by Madhya Pradesh and Uttar Pradesh in 1991, followed by Tamil Nadu and Madhya Pradesh in 2001 and followed by Orissa and West Bengal in 2011. The highest percentage of population lived in class VI cities is in Karnataka in 1991, Assam both in 2001 and 2011.

Let us now examine the pattern of urban population among the states in India according to the size-class during the period of 1991-2011. Among the size-classes, class I has increased the population percentage in the constituent states excepting Tamil Nadu during 1991-2001, Andhra Pradesh, Assam, Haryana, Maharashtra, Orissa and West Bengal during 2001-2011. But class II has shown a decrease in population percentage in the constituent states excepting Bihar, Gujarat, Haryana, Madhya Pradesh, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal during 1991-2001. Similarly, Class III city-size has shown a decrease in population percentage in most of the states excepting Bihar, Madhya Pradesh, Tamil Nadu and Uttar Pradesh during 1991-2001, Haryana, Madhya Pradesh, Maharashtra and Punjab during 2001-2011. Class IV has also shown a decrease in population percentage like Class II and Class III in almost all states excepting Tamil Nadu and West Bengal during 1991-2001, Andhra Pradesh, Assam, Gujarat, Karnataka, Maharashtra and West Bengal during 2001-2011. A declining trend is observed in most of the states excepting Andhra Pradesh, Kerala, Punjab, Tamil Nadu and West Bengal in class V. In class VI the percentage of urban population has also decreased in the constituent

states excepting Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Punjab and Uttar Pradesh during the period under study.

4. Diversification Indices of Number of Towns and Urban Population among the Size-classes in India During 1991-2011: An Inter-State Analysis

In the earlier sections we have examined the percentage distributions of urban population and number of towns among the size-classes in India and its constituent states during 1991-2011. Wide variations of this distribution among the size-classes in a particular state as well as among the states are exist during the period under study. These variations are not uniform among the states. So we have to examine the nature of variation and quantify this variation among the states in respect of size-class distribution of urban population and number of towns by means of Diversification Index (DI) by using the Theil Entropy measure. Our estimates are shown in Table 8.

Our estimates reveal that at the all-India level the DI for the number of towns among the size-classes has decreased from 0.902 in 1991 to 0.899 in 2001 and then increased to 0.905 in 2011 while the DI for the urban population among the size-class cities has decreased from 0.597 in 1991 to 0.559 in 2001 and to 0.526 in 2011. Thus, we observe that the number of towns among the size-classes have highly diversified but this diversification of population has not diversified. Interestingly, we note that the diversification of the number of towns among the size-classes are more compared to that of the population during the period under study.

There exists a wide inter-state variation of the DI for the number of towns and the number of urban populations among the size-classes during 1991-2011. In 1991 DI of numbers of towns is highest in West Bengal followed by Maharashtra and Kerala and lowest in Uttar Pradesh. In 2001, it is highest in Gujarat followed by West Bengal and Punjab and lowest in Bihar. In 2011 it is also highest in Gujarat followed by Punjab and Andhra Pradesh and lowestin West Bengal. Also, DI of urban population of towns is highest in Assam followed by Odisha during 1991-2011 and it is lowest in West Bengal during 1991-2001 and Kerala in 2011. Also, DI of number of towns has increased in the states of Andhra Pradesh, Assam, Gujarat, Kerala, Madhya Pradesh, Odisha, Rajasthan and Uttar Pradesh during 1991-2011, while DI of urban population has decreased in almost all the states during this period. Interestingly, we note that compared to the national level, the DI of number of towns is more only in four states namely Gujarat, Karnataka, Punjab and West Bengal in 1991, only in Gujarat in 2001 and only three states namely

Andhra Pradesh, Gujarat and Punjab in 2011. But the DI of population is more in almost all the states compared to the national level during 1991- 2001. In 2011 it is more only in four states namely Andhra Pradesh, Gujarat, Karnataka and Kerala compared to the national level.

Concluding Remarks

Urbanisationin India is increasing day by day means this is a situation where urban population in India is continuously showing greater increase than the increase in total population. Though the urban population is increasing but it is not increasing at a same rate for all the states. Even the urban centers are also not very well diversified among all the districts of different states. The Census of India has classified urban areas into six categories on the basis of their population.Urban population has a tendency to concentrate in the class I cities. So the number of class I cities are increasing or the area of class I cities are expanding i.e. 'sprawling'. That is why the diversification among the percentage of population for different class sizes are very high for almost all states. Though, the urban amenities of those class sizes are not very bad, but people want to live either in the class I cities or in the peripheral areas of class I cities. Governments of different states are trying to shift the offices from class I cities to the other places so that the new employment opportunities can be generated in those places and the population can be diversified into all over the urban areas.

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Table - 1 : Rate of Urbanization in Indian States during 1991-2011

India/States/Union Territories	1991			2001			2011		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
India	25.43	25.87	24.97	27.82	28.29	27.31	31.14	31.37	30.91
Bigger States									
Andhra Pradesh	26.89	27.08	26.70	27.30	27.49	27.12	33.36	33.45	33.27
Assam	11.10	11.61	10.54	12.90	13.33	12.44	14.10	14.18	14.01
Bihar	13.14	13.62	12.62	10.46	10.75	10.14	11.29	11.43	11.15
Gujarat	34.49	34.98	33.95	37.36	38.16	36.49	42.60	43.48	41.64
Haryana	24.63	24.58	24.68	28.92	29.14	28.67	34.88	34.98	34.76
Karnataka	30.92	31.40	30.42	33.99	34.39	33.57	38.67	38.87	38.46
Kerala	26.39	26.43	26.36	25.96	25.97	25.96	47.70	47.54	47.85
Madhya Pradesh	23.18	23.64	22.67	26.46	26.75	26.14	27.63	27.82	27.44
Maharashtra	38.69	39.90	37.40	42.43	43.54	41.22	45.22	45.85	44.55
Orissa	13.38	14.13	12.60	14.99	15.60	14.36	16.69	17.09	16.27
Punjab	29.55	29.77	29.30	33.92	34.41	33.36	37.48	37.88	37.04
Rajasthan	22.88	23.25	22.47	23.39	23.77	22.97	24.87	25.06	24.67
Tamil Nadu	34.15	34.39	33.91	44.04	44.17	43.91	48.40	48.31	48.48
Uttar Pradesh	19.84	20.04	19.62	20.78	21.02	20.52	22.27	22.48	22.04
West Bengal	27.48	28.35	26.53	27.97	28.58	27.32	31.87	31.97	31.77
Smaller States									
Arunachal Pradesh	12.80	13.77	11.66	20.75	21.60	19.81	22.94	23.52	22.31
Chhattisgarh				20.09	20.69	19.49	23.24	23.65	22.83
Goa	41.01	41.80	40.20	49.75	50.45	49.04	62.17	62.74	61.59
Jharkhand				22.24	23.09	21.35	24.04	24.53	23.54
Himachal Pradesh	8.69	9.37	7.99	9.80	10.75	8.82	10.03	10.67	9.37
Jammu & Kashmir				33.00	34.78	31.06	37.69	39.09	36.16
Manipur	27.52	27.28	27.78	26.58	26.17	27.01	29.21	28.62	29.81
Meghalaya	18.60	19.04	18.13	19.58	19.48	19.69	20.07	19.95	20.19
Mizoram	46.10	45.84	46.37	49.63	49.31	49.97	52.11	51.54	52.70
Nagaland	17.21	18.56	15.69	17.23	17.90	16.48	28.86	29.20	28.49
Sikkim	9.11	9.77	8.34	11.07	11.34	10.76	25.15	24.85	25.50
Tripura	15.29	15.19	15.41	17.06	16.96	17.16	26.17	25.99	26.35
Uttaranchal				25.67	27.31	23.96	30.23	31.51	28.91
Union Territories									
Andaman & Nicobar Island	26.71	27.46	25.79	32.64	33.17	31.98	37.70	37.75	37.65
Chandigarh	89.69	88.69	90.95	89.77	88.79	91.03	97.25	97.05	97.51
Dadra & Nagar Haveli	8.47	9.10	7.81	22.89	24.52	20.87	46.72	49.26	43.44
Daman & Diu	46.80	45.52	48.13	36.25	31.25	43.30	75.17	78.45	69.87
Delhi	89.93	89.82	90.06	93.18	93.14	93.23	97.50	97.48	97.53
Lakshadweep	56.31	56.68	55.90	44.41	44.78	44.13	78.07	78.13	78.00
Pondicherry	64.00	63.83	64.17	66.57	66.38	66.76	68.33	68.18	68.48
CV(%)	70.16	68.36	72.19	62.22	60.82	64.00	60.24	60.03	60.37

Source: Census of India

Table 2: Size-class Percentage Distribution of Number of Towns in India in 1991 : An Inter-State Analysis

States	I	II	III	IV	V	VI	Total
India	8.12	9.33	25.62	31.57	20.02	5.33	100
Andhra Pradesh	15.02	15.96	42.72	18.31	6.57	1.41	100
Assam	4.35	4.35	21.74	30.43	39.13	0	100
Bihar	8.06	13.27	37.44	25.12	13.74	2.37	100
Gujarat	9.33	12	22.22	32.89	19.56	4	100
Haryana	13.33	10	18.89	33.33	22.22	2.22	100
Karnataka	8.27	6.69	32.28	27.56	15.75	9.45	100
Kerala	12.84	8.26	42.20	31.19	5.50	0	100
Madhya Pradesh	5.31	6.70	15.94	40.88	30.02	1.15	100
Maharashtra	9.31	9.66	35.52	28.62	13.79	3.10	100
Odisha	5.88	8.40	21.85	42.86	18.49	2.52	100
Punjab	8.33	15	20.83	36.68	13.33	5.83	100
Rajasthan	6.51	9.30	33.20	40.47	10.23	0.47	100
Tamil Nadu	9.62	16.15	27.31	30.77	13.46	2.69	100
Uttar Pradesh	5.98	6.41	18.38	33.62	29.91	5.70	100
West Bengal	14.38	11.25	28.75	20.63	21.25	3.75	100

Source: Same as Table 1.

Table 3: Size-class Percentage Distribution of Number of Towns in India in 2001 : An Inter-State Analysis

States	I	II	III	IV	V	VI	Total
India	8.99	9.17	26.33	30.75	20.32	4.44	100
Andhra Pradesh	22.54	25.43	26.01	13.29	11.56	1.16	100
Assam	6.36	6.36	20	28.18	31.82	7.27	100
Bihar	15.32	12.90	52.12	16.13	2.42	1.11	100
Gujarat	14.81	14.81	32.28	23.28	7.94	6.88	100
Haryana	19.59	6.19	24.74	32.99	15.46	1.03	100
Karnataka	10.30	11.59	42.06	22.32	11.59	2.15	100
Kerala	14.29	14.29	35.71	26.53	9.18	0	100
Madhya Pradesh	7.07	7.05	24.18	38.32	21.74	1.63	100
Maharashtra	9.80	11.24	36.60	26.51	13.54	2.31	100
Odisha	6.06	10.61	25	35.61	18.18	4.54	100
Punjab	8.92	11.47	22.93	34.39	18.47	3.82	100
Rajasthan	9.26	12.04	41.67	27.31	7.87	1.85	100
Tamil Nadu	4.34	6.74	18.11	42.22	26.95	1.65	100
Uttar Pradesh	8.06	7.76	25.97	37.31	19.55	1.34	100
West Bengal	11.30	6.69	17.99	20.50	34.73	8.79	100

Source: Same as Table 1.

Table 4: Size-class Percentage Distribution of Number of Towns in India in 2011 : An Inter-State Analysis

States	I	II	III	IV	V	VI	Total
India	7.56	7.67	22.30	27.22	28.39	6.86	100
Andhra Pradesh	17.69	23.85	23.85	17.31	15.38	1.92	100
Assam	3.73	4.23	12.70	23.81	41.80	13.76	100
Bihar	16.76	14.45	41.62	8.67	15.61	2.89	100
Gujarat	10.79	10.43	26.62	28.06	17.63	6.47	100
Haryana	13.48	6.38	29.08	21.99	24.82	4.26	100
Karnataka	8.41	12.62	31.39	21.68	22.33	3.56	100
Kerala	16.40	4.76	34.40	22.22	22.02	0.20	100
Madhya Pradesh	7.73	6.79	24.82	37.47	20.84	2.34	100
Maharashtra	7.39	9.78	31.34	24.95	21.36	5.19	100
Odisha	4.17	6.94	17.59	22.22	35.65	13.43	100
Punjab	8.10	10.95	22.38	29.05	22.38	7.14	100
Rajasthan	10.79	9.35	35.97	26.62	14.03	3.24	100
Tamil Nadu	3.92	5.51	17.26	38.68	30.60	4.04	100
Uttar Pradesh	8.16	7.77	27.59	31.61	22.67	2.20	100
West Bengal	4.55	3.61	8.95	20.72	50.71	11.46	100

Source: Same as Table 1.

Table - 5: Size-class Percentage Distribution of Urban Population in India in 1991

	1991						
Class / States	**I**	**II**	**III**	**IV**	**V**	**VI**	**Total**
India	69.75	7.67	9.38	5.65	4.85	2.71	100
Andhra Pradesh	66.88	12.60	16.53	3.30	0.64	0.05	100
Assam	37.56	11.65	25.61	16.67	8.51	-	100
Bihar	52.62	17.58	20.80	7.03	1.79	0.18	100
Gujarat	66.43	12.73	10.52	7.69	2.42	0.21	100
Haryana	58.54	15.11	11.95	10.43	3.75	0.23	100
Karnataka	64.60	7.35	17.68	7.73	2.09	0.55	100
Kerala	66.34	7.22	19.08	6.78	0.58	-	100
Madhya Pradesh	50.39	13.94	12.82	16.15	6.58	0.13	100
Maharashtra	77.85	6.49	10.39	4.13	1.03	0.11	100
Orissa	44.43	14.65	19.73	16.97	3.94	0.28	100
Punjab	54.36	19.79	12.89	10.46	2.03	0.47	100
Rajasthan	50.10	13.67	21.31	13.08	1.82	0.02	100
Tamil Nadu	65.96	15.21	11.19	6.11	1.38	0.15	100
Uttar Pradesh	55.99	11.45	13.94	12.25	5.86	0.50	100
West Bengal	81.70	6.58	7.66	2.59	1.35	0.11	100

Source: Same as Table 1.

Table - 6 : Size-class Percentage Distribution of Urban Population in India in 2001

	2001						
Class / States	**I**	**II**	**III**	**IV**	**V**	**VI**	**Total**
India	69.75	7.67	9.38	5.65	4.85	2.71	100
Andhra Pradesh	66.88	12.60	16.53	3.30	0.64	0.05	100
Assam	37.56	11.65	25.61	16.67	8.51	-	100
Bihar	52.62	17.58	20.80	7.03	1.79	0.18	100
Gujarat	66.43	12.73	10.52	7.69	2.42	0.21	100
Haryana	58.54	15.11	11.95	10.43	3.75	0.23	100
Karnataka	64.60	7.35	17.68	7.73	2.09	0.55	100
Kerala	66.34	7.22	19.08	6.78	0.58	-	100
Madhya Pradesh	50.39	13.94	12.82	16.15	6.58	0.13	100
Maharashtra	77.85	6.49	10.39	4.13	1.03	0.11	100
Orissa	44.43	14.65	19.73	16.97	3.94	0.28	100
Punjab	54.36	19.79	12.89	10.46	2.03	0.47	100
Rajasthan	50.10	13.67	21.31	13.08	1.82	0.02	100
Tamil Nadu	65.96	15.21	11.19	6.11	1.38	0.15	100
Uttar Pradesh	55.99	11.45	13.94	12.25	5.86	0.50	100
West Bengal	81.70	6.58	7.66	2.59	1.35	0.11	100

Source: Same as Table 1.

Table -7 : Size-class Percentage Distribution of Urban Population in India in 2011

	2011						
Class / States	**I**	**II**	**III**	**IV**	**V**	**VI**	**Total**
India	77.04	4.91	6.55	4.55	4.91	2.01	100
Andhra Pradesh	74.96	14.39	6.92	2.37	0.97	0.07	100
Assam	42.67	11.29	16.48	14.53	12.63	2.40	100
Bihar	62.12	13.56	20.54	2.04	1.57	0.17	100
Gujarat	77.20	7.72	8.89	4.66	1.39	0.15	100
Haryana	71.53	6.60	13.55	5.20	2.86	0.27	100
Karnataka	76.47	11.65	4.62	4.74	2.31	0.20	100
Kerala	91.50	1.49	4.52	1.65	0.85		100
Madhya Pradesh	61.52	6.99	15.99	11.61	3.66	0.23	100
Maharashtra	78.27	6.69	9.81	9.50	1.51	0.20	100
Orissa	47.80	15.24	17.33	10.22	7.64	1.76	100
Punjab	59.34	16.24	12.95	8.65	2.20	0.63	100
Rajasthan	63.11	10.33	18.31	6.89	1.75	0.22	100
Tamil Nadu	60.70	8.85	11.55	12.80	5.69	0.41	100
Uttar Pradesh	65.27	9.56	14.24	7.86	2.91	0.15	100
West Bengal	74.52	4.84	5.86	6.09	7.59	1.11	100

Source: Same as Table 1.

Table 8: Diversification Indices of Number of Towns and Urban Population in India during 1991-2011

Class / States	I	II	III	IV	V	VI	Total
India	77.04	4.91	6.55	4.55	4.91	2.01	100
Andhra Pradesh	74.96	14.39	6.92	2.37	0.97	0.07	100
Assam	42.67	11.29	16.48	14.53	12.63	2.40	100
Bihar	62.12	13.56	20.54	2.04	1.57	0.17	100
Gujarat	77.20	7.72	8.89	4.66	1.39	0.15	100
Haryana	71.53	6.60	13.55	5.20	2.86	0.27	100
Karnataka	76.47	11.65	4.62	4.74	2.31	0.20	100
Kerala	91.50	1.49	4.52	1.65	0.85		100
Madhya Pradesh	61.52	6.99	15.99	11.61	3.66	0.23	100
Maharashtra	78.27	6.69	9.81	9.50	1.51	0.20	100
Orissa	47.80	15.24	17.33	10.22	7.64	1.76	100
Punjab	59.34	16.24	12.95	8.65	2.20	0.63	100
Rajasthan	63.11	10.33	18.31	6.89	1.75	0.22	100
Tamil Nadu	60.70	8.85	11.55	12.80	5.69	0.41	100
Uttar Pradesh	65.27	9.56	14.24	7.86	2.91	0.15	100
West Bengal	74.52	4.84	5.86	6.09	7.59	1.11	100

Source: Same as Table 1.

Livelihood Pattern of Forest Dwellers in Simlipal National Park

Shradha Agarwala* Prankrishna Pal**

Abstract

Forest is the source of existence on planet. Forest is a diverse natures I habitat with million of species depend on it for survival. It has its own potential to maintain ecological, biological and environmental balance. Dependence on forest marks from the coin we leather to the wood used by forest triage dwellers. It plays a multi-dimensional role, which can't be ignored. In this context our study is to explore the role of forest in making livelihood of the forest dwellers in Simlipal National Park, Odisha. SNP is rich with indentured flower and face. It is 6th longest blusher rescuer. Based on the surveyed data we are to examine the socio-economic-demographic features like caste, dwelling pattern, household size, occupational structure, income and educational level, the monthly expenditure pattern and inequality on food and non-food items of the respondents of the study region of Simlipal National Park.

JEL Code : Q20, Q23, Q56

Key Words : Livelihood Pattern, Inequality, Educational Level.

I. Introduction:

Forest is the source of existence on planet. It has its own potential to maintain ecological, biological and environmental balance. The population 240 million of across the world depend on forest to meet their livelihood needs. As per Census of India (2011) about 26 percent of villages are located in proximity to forests. The socio-economic and cultural lives of people inhabiting in these villages are highly influenced by forests. As a result, they depend on forest for their means and ends. Over time the manifold increase in population increases pressure on forest leading to excessive forest extraction (ISFR, 2019). Thus, the anthropogenic activities leave a footmark on forest and natural life which imbalance the whole equilibrium. Forest, being a free rider good, undergoes mass exploitation. The forest dwellers utilize natural resources as per their requirement rather than conservation (Umesh Bau&Nautiyal, 2015).

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II. Review of Literature:

Literature on the livelihood pattern of forest dwellers are not few at the international/ national/ regional level. Forest is the means of the livelihood for majority of the population living in the forest area through subsistence use of products, food, fodder and medicinal plants; cash income generated through sale of forest products and contributing indirect ecological benefits for agricultural productivity(Rasmussen and et al. 2017). Ganapathy (1998) in his paper entitled "Collection and marketing of non-timber forest products – A Study in KollegalTaluk of Karnataka." has shown that Non Timber Forest Products (NTFPs) has generated the maximum employment 42.96 percent for tribal households followed by the 22.06 in firm employment, 12.72 percent in allied employment, 11.86 percent of wage employment and 10.40 percent of other sources of employment. Thus, NTFPs is the main income generator for the tribal households. It has contributed about 34.09 percent of the total income of the households. Similarly, Ghosal (2011) has conducted his study by examining the role of NTFPs in dry deciduous forest of Bankura, Purulia and West Midnapore in West Bengal. His finding states that the value added forest product has improved the socio-economic status of the forest dwellers. The share of forest income being significant in total income concludes that high forest dependency can be explained by income generated by forestry (Basu, 2020).

Community forest income is important for poor households, the untouchable caste and illiterate people, i.e. the marginalized and underprivileged groups of the society. It has strong equalizing effect on local income distribution (Chhetri and Yoshimoto, 2016).It has further reduced income inequality which was analysed by using Gini Coefficient in the study of Kassa and Yigezu (2015). A study finding states that poor spends less on non-food items in comparison to non-poor, where poor tries to fulfil the basic needs, whereas non-poor tries to meet the needs to maintain the standard of living (Kayode etal 2016).

III. Objectives of the Study:

The objectives of the studyare:

a) To examine the socio-economic- demographic features like caste, dwelling pattern, household size, occupational structure, income and educational level of the respondents of the study regionof SimlipalNational Park.

b) To examine the monthly expenditure pattern and inequality on food and non-food items of the forest dwellers in the study area.

IV. Methodology

i) Study Area Description:

We have purposively selected SimlipalNational Park in our study area because it has national-cum global significance with total area is 845.7 km^2. Simlipal National Park was formally designated a tiger reserve in 1956 and under Project Tiger in the year of 1973.The Government of Odisha declared Simlipal as a wildlife sanctuary in 1979 with an area of 2,200 Km^2. In 1980 it was declared as a National Park with total area of 303 Km^2. Later on, in 1986 the area of the national park was increased to 845.70 Km^2. In 2009, UNESCO added Simlipal as a biosphere reserve in Indiawith an area of more than 2750 $km^2$of the ChotanagpurPlateau. There are 10,000 people living in 61 villages in the forest. That is why Simlipal is yet to be declared a full-fledged park, despite its having the status of one of the eighteen biospheres of India. The entire Similipal forest area falls under the scheduled V^{th} district of the state, known as Mayurbhanj district. Simlipal Biosphere Reserve (SBR) comprises of three zones: core zone, buffer zone and transitional zone. There are 6 villages inside the Critical Tiger Habitat (Core), out of those 4 villages are the revenue villages and 2 villages are the settlement villages. About 65 villages are situated in the buffer zone of Simlipal Biosphere Reserve.The Park has some beautiful waterfalls like Joranda and Barehipani. The park holds the highest tiger population in the state of Odisha.

ii) Data Collection:

Our focus of the research isbasically on the primary data collected through direct personal interview. No doubtsecondary data is being collected to acquire the overall information of the study area. A well-designed questionaire schedule was prepared to collect primary data after having Focus Group Discussions (FGD) in the villages. Inorder to collect data the interview schedule was administered directly in person. The demographic and socio-economicvariables of the households like age, sex, religion, caste, monthly income, monthly expenditure on food and non-food items, literacy level, dwelling type, tiolet facility, occupational structure, asset and land holding etcwas gathered as per the requirement of the study.

Proportionate sampling method is used to collect the demographic and socio-economicvariables of the households from the six blocks namely Bisoi,Thakurmunda, Jashipur, Bangriposi, Khunta and Shamakhuntaof the Simlipal National Park. 33 percent of the population from each block are interviewed for the purpose of our study. The villages were selected purposively based on the accessibility and objective of our study.

Around 262 households from 10 villages had been interviewed residing in core-buffer mix, buffer and transitional zone. While choosing households systematic random sampling method has been used where the sample has the population characteristics and is based on the objectives of the study.

Table: 1. Sample Size

Blocks	**Zone**	**Households surveyed (in per cent)**	**Households surveyed**
Bisoi	Buffer	33	44
Thakurmunda		33	41
Jashipur	Core- Buffer Mix	33	42
Bangriposi		33	35
Khunta	Transitional	33	55
Shamakhunta		33	45
	Total		**262**

Source: Primary data

V:Socio- Economic Status of the Surveyed Households

a) Percentage Distribution of Households according to their Caste

There are varied communities prevailing in our society. The population is generally distributed under the castes namely Schedule Caste (SC), Schedule Tribe (ST), Other Backward Caste (OBC) and General Caste (GC).In our study we have considered six blocks- Bisoi, Bangriposi, Jashipur, Khunta, Samakhunta and Thakurmunda which are situated in the core-buffer mix, buffer and transitional zones of Simlipal Biosphere Reserve. In our study area the surveyed households belongs to three castes, i.e SC, ST and OBC. Thus we here examine the caste wise distribution of the inhabitants of our study area.

Among the caste the dominance of ST caste is quite evident in all the blocks as shown in Table 2. The surveyed population of Bangriposi block has ST caste people only. Followed by it Bisoi block has 97.73 of ST population, which is the highest and Jashipur (88.10) has lowest percentage of ST population. In Bisoi block where the proportion of ST caste is highest the SC caste population is lowest, i.e 2.27 percent. With respect to

Jashipur block it has highest number of SC caste population i.e, 11.90 percent.

In case of OBC population the percentage distribution of only two blocks is seen, where Thakurmunda has 6.67 percent of the population and Khuntahas only 3.64 percent of OBC people, which is the lowest value.

Now coming to aggregate value, where major population of around 95.42 percent households belong to ST community followed by 2.67 and 1.91 percent from SC and OBC community.

Table: 2. Percentage of Caste Distribution Household wise

Blocks	**No of HH**	**Scheduled Caste**	**Scheduled Tribe**	**OBC**	**Total**
Bisoi	44	2.27	97.73	0	100.00
Bangiriposi	41	0	100	0	100.00
Jashipur	42	11.90	88.10	0	100.00
Khunta	55	0	96.36	3.64	100.00
Shamakhunta	35	2.86	97.14	0	100.00
Thakurmunda	45	0	93.33	6.67	100.00
Total	**262**	**7 (2.67)**	**250 (95.42)**	**5 (1.91)**	**100.00**

Source: Primary Survey

b) Household Size

Household size is defined as number of persons staying together at a housing unit. It is the basic demographic unit among other socio-economic factors. To have a clear idea about the household we have computed the descriptive of the household size of our surveyed blocks. As per the average household size table given below it's evident that average household size varies from minimum value of 4.23 of Bisoi block to maximum value of 6.31 of Thakurmunda block.

The average total comprisingof all the six blocks is 4.88. Among the blocks Bangriposi and Thakurmunda block household size is above the average total, whereas other four blocks have the value below the average total.

Table : 3.Average Household Size

Blocks	No of HH	Average HH size
Bangiriposi	41	5
Bisoi	44	4.23
Jashipur	42	4.54
Khunta	55	4.6
Shamakhunta	35	4.51
Thakurmunda	45	6.31
Total	**262**	**4.88**

Source: Primary Survey

c) Dwelling Pattern

The dwelling pattern of the inhabitants reflects their pattern of living, which can be very well depicted by their house structure. Traditional building materials like mud, bamboo, thatch and grasses are prevalent in rural areas, which are used mostly to construct kuchha house. Pucca house is concrete cemented house which is usually provided by government. It runs under two schemes as Indira Awas Yojana (IAY) by central government and Biju PakkaGhar Yojana (BPGY) by state government. It reflects their standard of living.Thus the housing structure of the sampled households is being taken in to consideration.

It is evident from the table 4 that major proportion of the surveyed population of around 56 percent lives in kuchha house followed by semi pucca house of around 36.02 percent. It ranges as 80.49 percent of surveyed population of Bangriposi block stays in kuchha house which is too high in comparison with the aggregate value ofkuchha dwelling.Followed by it 76.47 and 64.44 percent of surveyed population of Shamakhunta and Thakurmunda blocks resides in kuchha house. In contrast only 40.48 and 29.55 percent of surveyed population of Jashipur and Bisoi blocks stays at kuchha house.

Estimates (Table 4) shows that the largest proportion of around 63.64 percent of surveyed population of Bisoi block and the lowest proportion of 8.82 percent of Shamakhunta block stays in semi-pucca house. Followed by it 47.62 and 38.18 percent of surveyed population ofJashipur and Khunta block resides at semi-pucca structured house.

Coming to pucca house it is observed that the Thkurmunda block inhabitants do not

avail pucca house. In case of other blocks, the largest percentage distribution of 14.71 percent of surveyed population from Shamakunta block avails pucca house and the lowest proportion of only 4.88 percent of surveyed population of Bangriposi block avails pucca house. Followed by it 11.90 and 10.91 percent of Jashipur and Khunta blocks avail pucca house.

Table: 4. Percentage Distribution of Housing Type

Blocks	Kuchha	Semi Pucca	Pucca	Total
Bangiriposi	80.49	14.63	4.88	100.00
Bisoi	29.55	63.64	6.82	100.00
Jashipur	40.48	47.62	11.90	100.00
Khunta	50.91	38.18	10.91	100.00
Shamakhunta	76.47	8.82	14.71	34*
Thakurmunda	64.44	35.56	0	100.00
Total	**146(55.94%)**	**94(36.02)**	**21(8.05)**	

Source: Primary Survey Only one household No house*

d) Percentage Distribution of Respondents according to their Educational Level

Education enhances the understanding level enriching people with skills and their ability to deal with every circumstance. It enriches them in decision-making and leadership roles in their life.We here examine the educational level of the respondents block wise. Our surveyed data reveals that the education varies within the households and differs across the blocks. It can be well depicted with the distribution of education among various classes. Thus in our study we have classified the education level as i) Illiterate ii) Primary (I-V) iii) Medium (V-VIII) iv) Higher (IX-X) and v) Intermediate & Graduation.

Educational level of the respondents of our surveyed population of the study area reveals that the highest proportion of the respondents from all the blocks are illiterate. Coming across blocks the highest percentage of illiterate respondents is in Bisoi(77.27) and the lowest percentage of illiterate respondents is 50.91 in Khunta block. Followed by it 71.11 and 65.71 percent of Thakurmunda and Shamakhunta blocks are found illiterate.

Under primary educational level the highest percentage distribution of 22.86 is observed

from Shamakhunta block and the lowest percentage under this category, i.e 2.44 is from Bangriposi block. Further 21.82 percent and 20 percent distribution of Khunta and Thakurmunda block respondent are under primary education level.

11.43 percentage distribution of Shamakhunta respondents are under medium education class, which is the highest value in this range and the lowest value of 4.55 percentage distribution of respondents are under medium educational class. Followed by it 10.91 and 9.52 percentage distribution of Khunta and Jashipurrespondents are under this category.

In case of high school educational class, the highest percentage distribution, i.e 17.07 percent is from Bangriposi block and the lowest percent distribution, i.e 4.55 percent is from Bisoi block. Not a single respondent from Shamakhunta and Thakurmunda block belongs to high school educational class.

Now coming to intermediate and graduation educational class it is observed that the highest percentage distribution of 12.20 is from Bangriposi block and the lowest percentage distribution of 2.22 is from Thakurmunda block. It is to be seen that not a single respondent of Shamakhunta block comes under this category.

Table: 5. Percentage Distribution of Respondents by Education

Blocks	Bangiriposi	Bisoi	Jashipur	Khunta	Shamakhunta	Thakurmunda
Illiterate	60.98	77.27	59.52	50.91	65.71	71.11
Primary	2.44	4.55	11.90	21.82	22.86	20.00
Medium	7.32	4.55	9.52	10.91	11.43	6.67
High School	17.07	4.55	9.52	10.91	0	0
Intermediate & Graduation	12.20	9.09	9.52	5.45	0	2.22
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: Primary Survey

e) Percentage Distribution of Households by Occupation

The forest dwellers residing in and around SimlipalNational Park are engrossed with different types of occupation throughout the year due to lack of livelihood opportunities. It is prominent that agriculture is the prime source of livelihood other than forestry. In this context the block-wise livelihood options adopted by the respondents of the respective block is evident from the given table 6.

The people of the study area depend on agriculture for livelihood purpose, but it hardly earns them any income for most of the surveyed population. People who have agricultural land generally work on their piece of land and they keep theproduced paddy for self-consumption, which saves them from deprivation. Our estimates shows that almost all the block residents rely on agriculture, which is exceptional for Shamakhunta block as the inhabitant doesn't possess agricultural land, which makes their life quite miserable especially during slack season. Among all the blocks 96.36 percent of Khunta block residents rely on agriculture whereas only 20 percent of Shamakhunta block depends on agriculture for livelihood.

Followed by agriculture, being forest inhabitants, they consider it their sole right to collect forest products to earn their livelihood. 100 percent of surveyed population of Thakurmunda block depends on NTFPs for livelihood measures, whereas in contrast only 16.67 percent of the surveyed population of the Jashipur block depends on NTFPs for mode of earning. The pathway to reach the block is hilly and the restriction imposed by the forest department during entry and exit of forest gate add complexities for the forest inhabitants of the Jashipur block to collect and sale the forest products in the nearby town. It's being revealed from the interview that forest dwellers left with no other alternatives to earn livelihood indulge them to extract forest resources, which results in forest deforestation.

Along with that they work as agricultural labour during Rabi and Kharif seasons and rest they work as labour under MGNREGA. All the forest dwellers of the surveyed blocks are engaged as agricultural labour with pay of Rs 100/- per day, whereas the payment of the worker varies block wise under MGNREGA. The labour per day is same for male and female in some blocks, differing in some blocks. The labourer ofJashipur and Shamakuntablock both male and female gets equal pay of Rs 200/- per day, whereas Bangriposiand Thakurmundablock both male and female gets equal amount of Rs 200/ - per dayand Rs 170/- per day and Rs 250/- per day respectively. The labour per day rate varies among male and female in Bisoi block, where a male worker gets Rs 180/- per day and the female worker gets Rs 150/- per day. 95.55 percent of surveyed population of Thakurmunda block are engaged as labourer whereas 76.19 percent of Jashipur blocks people are engaged as labourer. This engagement as a whole relies on the work opportunities availed by them.

Further the surveyed population of the respective blocks are engaged with livestock rearing, which shows that 38.64 percent of surveyed population of Bisoi block are engrossed with livestock rearing practices, whereas only 14.28 percent of Jashipur block are engaged

in livestock rearing.

Near about in all the surveyed blocks it came forefront that the village female residentsare appointed to cook under Mid Day Meal (MDM) Programme, appointed as ASHA worker and to work in AWC (Anganwadi Centre), whereas the male members are selected as Green Brigade (*Sabuja Vahini*) by Forest Department.

The over age and widow get monthly pension under Old Age and Widow Scheme which adds some purchasing power to the hands of the poor.

Table 6. Percentage of Dwellers by Occupational Structure

Blocks	Bangiriposi	Bisoi	Jashipur	Khunta	Shamakhunta	Thakurmunda
Agriculture	75.61	90.91	80.95	96.36	20	95.55
NTFPs	87.80	72.73	16.67	67.27	91.43	100
Labour	95.12	95.45	76.19	70.91	88.57	95.55
Business	1	0	4	5	2	0
Social Security	26.83	7	7	15	40	6
Green Brigade	—	—	5	1	1	—
MDM	1	—	1	1	1	2
Animal Husbandry	19.51	38.64	14.28	20	20	31.11
Fishing	—	—	—	—	1	2
Carpenter	2	0	1	1	—	—

Source: Primary Survey

f) Basic Amenities of forest fringe Dwellers

The socio-economic condition of the forest dwellers can be further represented through thebasic amenities availed by dwellers in the study area. We are here concerned with the access to thefundamental needs of the inhabitants of the study area. Coming across the literatures, where the traditional list of immediate basic human needs includes food, shelter and clothing, but with the advent of modernization, the list has been updated. The emphasis is given to clean drinking water, sanitation and electricity facilities, level of education etc. Thus we are concerned here with the access and availability of the basic amenities in the study area.

Table 7. Basic Amenities Availed by Forest Dwellers (%)

Blocks	Toilet	Electricity	Drinking Water	Fossil Fuel
Bangiriposi	12.5	10	100	97.5
Bisoi	88.63	18.18	34.09	100
Jashipur	7.14	78.57	59.52	100
Khunta	92.59	87.03	94.44	98.14
Shamakhunta	57.14	60	37.14	100
Thakurmunda	31.11	0	51.11	100

Source: Primary Survey

Table 7 reflects the percentage of population who avail the sanitation facility at their home front. Only 7.14 percent of surveyed household of Jashipur block possess toilet, whereas 92.59 percent of surveyed households of Khunta block possess toilet facilities, which is highest among all the blocks.Usually, the toilet is provided by the government, as lack of sanitation facilities and poor hygiene is the prime cause of disease.

The above table reveals that the reliance on firewood for fuel can't be ignored. It's evident that all the inhabitants rely on firewood for their domestic purpose. Dependence on fossil fuel results in forest extraction, which states that all the surveyed households of the respective blocks like Bisoi, Jashipur,Shamakhunta and Thakurmunda depend as a whole on fossil fuel.As it has been observed from the personal interview that even if the forest dwellers have LPG cylinders either in fear of being burnt, they avoid it or they don't have enough money to refill it. Further 97.50 and 98.14 percent of surveyed households of Bangriposi and Khunta block relies on it for daily purpose. The highest quantity of fuelwood is removed by Maharastra followed by Odisha (ISFR, 2019). Use of fossil fuel is hazardous to the health.

Now coming across the access to clean drinking water. The forest dwellers are generally deprived of the proper piped/channelized drinking water inside their premises. No doubt public tube wells are accessible to some households, whereas some collect water from spring water or nearby pond.The above table shows that all the surveyed population of Bangriposiblock have access to water through wells and public tube wells. 94.44 percent of Khunta block have access to water either through wells or public tube wells, whereas only 34.09 percent of surveyed households of Bisoi block have access to clean drinking

water. In some blocks even if wells are there, either are dried or the distance of tube wells to their yard is quite lengthy. Moreover, some have to rely on the spring water for all the basic needs which is even risky during the rainy season due to slippery nature of rocks. Addition to its lack of channelized water results in water borne disease in the study area.

Estimates show that the whole surveyed population of Thakurmunda block is deprived of electricity. 87.03 percent of surveyed population of Khunta block have electricity facility, followed by 78.57 percent of Jashipur block have electricity via provision of solar light. They face huge problem during rainy season as solar panels require sunlight to electrify the equipment. Only 10 percent of Bangriposi block have access to electricity.

g) Percentage Distribution of Household's Monthly Expenditure

Income and expenditure are correlated, where expenditure of a household depends on the income of that particular household. As income varies individually, expenditure also varies individually forming a unit as a household. As per our surveyed household expenditure data we have classified the data into various expenditure classes. The expenditure classes are i) Rs. (0 -1000), ii) Rs. (1000-2000), iii) Rs. (3000-4000), iv) Rs. (4000-5000) and v) Rs 5000 & above.

The monthly expenditure distribution table given below reflects that in the forest fringe areas the monthly expenses range below (Rs.1000) to (Rs.5000) and above. Among all the blocks 12.20 percent of the surveyed population of Jashipur block spends less than (Rs.1000) monthlyfollowed by 9.30 percent of the surveyed population of Bisoi block monthly expenses lies within (Rs.1000). In contrast, only 1.82 percent of the surveyed population of Khunta block spend less than (Rs.1000).

Among the highest expenditure class, it is observed that 11.43 and 11.1 percent of the surveyed population of Shamakhunta and Thakurmunda block monthly expenditure is (above Rs.5000), which is followed by 9.76 percent of surveyed population of Jashipur block. Only 1.82 percent of Khunta block of surveyed population is coming under the highest income class.

It is to be noticed that among all the income classes the maximum surveyed population of the study area spends (Rs.1000- 2000) as a monthly expenditure. It follows as (37.21, 36.59, 36.36, 35.56, and 31.43) percent of Bisoi, Jashipur, Khunta, Thakurmunda and Shamakhunta blocks respectively monthly expenditure lies within (Rs.1000-2000).

Following that expenditure class further, the largest proportion of the surveyed population

is to be found in expenditure class of (Rs.2000-3000). Among all the blocks 40 and 38.46 percent of surveyed population of Thakurmunda and Bangriposi blocks respectively monthly expenditures ranges from (Rs.2000-3000).

Similarly in expenditure class of (Rs.3000-4000) the maximum expenditure of 21.95 percent households is incurred by Jashipur block followed by 20 percent of Khunta block. The lowest expenditure in this range is incurred by 6.67 percent of surveyed population of Thakurmunda block.

Table: 8. Percentage Distribution of Households Monthly Expenditure (in Rupees)

Blocks	0-1000	1000-2000	2000-3000	3000-4000	4000-5000	5000 &Above	Total
Bisoi	9.30	37.21	32.56	13.95	2.33	4.66	100.00
Bangriposi	5.13	28.21	38.46	12.82	7.69	7.68	100.00
Jashipur	12.20	36.59	9.76	21.95	9.76	9.76	100.00
Khunta	1.82	36.36	29.09	20	7.27	1.82	100.00
Shamakhunta	5.71	31.43	25.71	11.43	14.29	11.43	100.00
Thakurmunda	2.22	35.56	40	6.67	4.44	11.1	100.00

Source: Field Survey

Table 9 is a picture of pattern of expenditure on food and other items of the surveyed households represented blockwise. The poor spends the highest proportion of their income on food and the lowest percentage on entertainment which is evident from the table given below. The maximum share of expenditure that a poor household can afford is for food, which resembles for all the respective blocks. As per 68th WSS round, the Monthly per capita enpendeture for rural odisha on food share was 52 percent and non-food class 48 percent. (Mahapatra & Patro 2016) The table below clarifies that followed by food, four blocks, i.e., Bangriposi, Jashipur, Khunta and Thakurmunda spends the highest proportion of their income on education. Expenditure on education reflects the expenses done for something productive, which will result in increase in their awareness and enhance income generation opportunities. Whereas the rest two blocks, i.eBisoi and Shamkunta spends huge proportion of income on addiction after food expenditure.

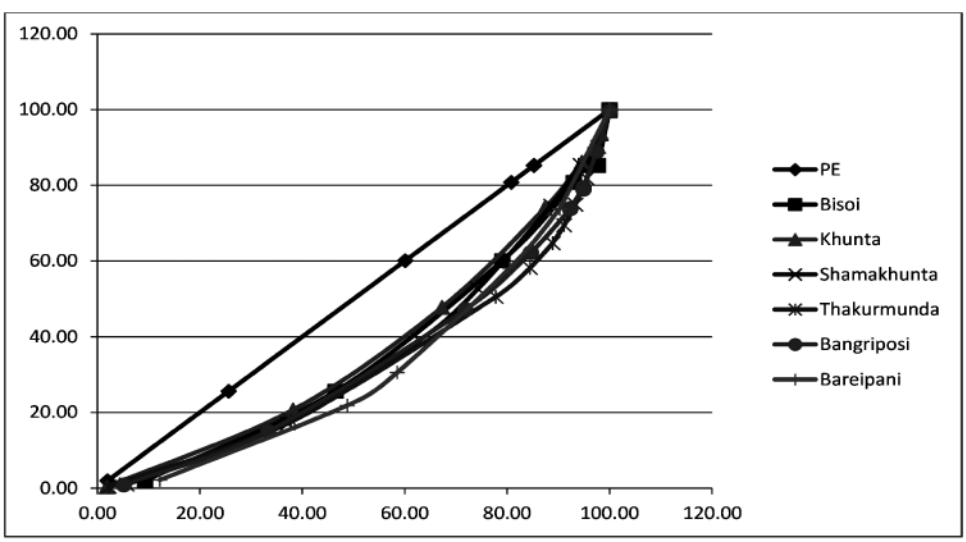
The surveyed blocks being deprived of proper channelized water and tube well generally suffers from water bornedisease. They have to collect water from contaminated ponds or streams which is prevalent in Thakurmunda, where the inhabitants spends 20.30 percent of their income on health. On the other hand,Bisoi block inhabitants spend only 0.49 percent on medical as the block inhabitants have well or tube wells in the village.

Table 9 Percentage Distribution of Expenditureon Food and non-food items

Blocks	Food	Health	Education	Transport/Entertainment	Addiction	Total
Bisoi	69.98	0.49	11.34	0.54	17.66	100.00
Bangriposi	53.77	2.72	28.73	2.78	12	100.00
Jashipur	52.38	3.51	27.85	5.10	11.16	100.00
Khunta	54.68	12.83	17.42	7.81	7.26	100.00
Shamakhunta	59.66	5.51	7.89	4.56	22.38	100.00
Thakurmunda	55.92	20.30	17.03	1.40	5.35	100.00

Source: Primary Survey

h) Gini Index of Expenditure Inequality: In our study, we have collected data on monthly income and expenditure of each family member of the respective households. Expenditure is basically the function of income, which varies across blocks. Our objective of this paper is to measure the expenditure inequality across households comprising varied blocks. Income or expenditure inequality can be measured with the use of Gini Coefficient. It varies between 0 and 1, where 0 corresponds to perfect equality and 1 corresponds to perfect inequality. Hence, the expenditure inequality values of Gini Coefficient among the surveyed blocks are as follows: i) 0.30 for Bisoi, ii) 0.34 for Bangriposi iii) 0.37 for Bareipani iv) 0.26 for Khunta v) 0.32 for Shamakhunta and vi) 0.36 for Thakurmunda. Thus the lowest expenditure inequality is observed among Khunta block inhabitants followed by Bisoi block.



i) Percentage Distribution of Asset Distribution Respondentwise:

Table 10 shows the distribution of assets holding structure of the forest dwellers of the surveyed population. Possession of agricultural land and domestic animals are considered as assets for the people residing in the surveyed area, which is very well depicted from the table given below. It shows that 91.11 percent of surveyed household of Thakurmunda block possess agricultural land, which is the highest among all the blocks, whereas only 20 percent of Shamakhunta block possess agricultural land, which is the lowest figure. Possession of agricultural land holding is a crucial asset holding, which protects the forest dwellers from deprivation.

Now coming across livestock, this is either considered as source of earning or self-consumption. Near about all the blocks possess domestic animals where 95.45 percent of surveyed households of Bisoi block have domestic animals whereas the lowest holding of around 68.57 percent is with Shamakhunta block. Typically the people of Shamakhunta block practised livestoch rearing. But the domestic animals infected by certain virus resalted in extensive loss to the households.

Table - 10 : Percentage Share of Asset Dwellers

Blocks	Agricultural Land	Domestic Animals
Bisoi	90.91	95.45
Bangriposi	90.24	95.12
Jashipur	85.71	92.86
Khunta	65.45	76.37
Shamakhunta	20	68.57
Thakurmunda	91.11	95.55

Source: Primary Survey

V. Conclusions

The forest dwellers lives in a deplorable conductors as revealed from the overall social-economic condition of the forest dwellers. The dominance of 51 population is prominent among the surveyed population of the study area, especially in Bangriposi block with 100 percent of St population. The living stanched of the population on he justified with their dwelling type, their access to fundamental needs, income level and the basic amenities avoided by them. Shamakunta block avails pucca house. Irrespective of blocks the

educational level of the surveyed household population is very poor. As seen from the occupation of the forest dwellers is agriculture but it hardly gesscraks any income. Due to lach of livelihood opporturites, they need to diversity their livelihoods for sustenance (Agriculture & Saha, 2021). Agriculture is the main occupation in all the blocks. Bangriposi and Jashipur blocks have poor basic amenities in respect of toilet facility. Irrespective of blocks the expenditure inequality prevails at a low level. To improve the livelihood pattern of the forest dwellers of Simlipark National Park the Govt. should take different programmes and implement these programmes properly. Along with that there is need to activate NG05 In each respective blocks, who can train them to use the forest resources sustainable. In order to release forest extraction.

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Department of Economics

The Department of Economics at Rabindra Bharati University was established in November 1972 and the Silver Jubilee of its activities was celebrated during 1997-98 through a series of Foundation Lectures. Special lectures, Seminars and Re-union of past and present students and teachers.

Economics courses both at the Postgraduate and Honours levels have a well-planned and balanced approach to the teaching of this dynamic social science discipline. In the Post Graduate level semester system has been introduced in 2010. Semester syllabus for M.A. in Economics has been framed in 2010 and further revised in 2013. Courses in each subject area are detailed in separate Modules with references to specific reading materials. Specialization at the postgraduate level includes (1) Econometrics and Statistics (2) Rural Economics and (2) Economics of Money and Finance and International Trade. Each of the area of Specialization contain Project Work emphasizing on theoretical as well as empirical analysis. Field Survey, Building up of theoretical model, Statistical analysis of result obtained by running computerized statistical software in respective area of research and finally, Preparation of the project in the Post Graduate Level encourage the research aptitude of the students. From April 2007, the department has already started M.Phil course. From 2010 the semester system has been introduced and curriculum have been revised and updated in the light of present need of the day. Asper the new regulation of UGC a six month Ph.D. Course work has also been initiated from 2010 in this department successful completion of which give the opportunity to the students to be registered in the Ph.D. programme under this university.

Class-room teaching is regularly supplemented by Extension Lectures and Special Lectures by noted teachers and scholars from others universities/Institutes, occational seminars on contemporary issues in the subject area.

The Department has published quite a few books and monographs over the years. The NAAC Peer Team in report made special mention of the research activities in this Department.

The Department takes pride in the fact that increasingly large number of its students have been qualifying in the NET/SLET examinations each year.

The Department has organized its 1st Refesher Course (UGC) in Economics on "Development Economics and India since 1991" during February, 2004.

In April, 2006, the department organized a national on IPR Awarness sponsored by the Ministry of Human Resource Department, Govt. of India.

In March. 2009, the department organized a seminar on "Globalization : Conceptual and Empirical Issues."

In March. 2010, the department organized a seminar on "Empirical Issues on Indian Economy".

In March. 2011 and 2012, the department organized annual seminar on "Contemporary Issues in Development Economics."

In March.2013, the department organized Seminar on "Development Paradiagm of the East and North-East States in India during the post-reform period : problems and prospects."

In February 2014, the department organized a workshop on Contemporary issues on Macroeconomics.

In February 2015, the department organized a workshop on advanced issues on Microeconomics.

In March 2015 the department organized a seminar on "Contemporary Issues in Development Econom fos"

In March 2016 the department organized a seminar on "Contemporary Issues in Development Economics"

In February 2016 the department organized threeday workshop in "Frontiers in Applied Econometrics".

In March 2017 the department organized a Research Scoholars' workshop.

In January 2018 the department organized International workshop on 'Behavioural Economics.'

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