Rabindra Bharati University Journal of Economics

(A Peer-Reviewed Journal)

VOLUMES - XIII & XIV
2019–2020
ISSN 0975-802X

DEPARTMENT OF ECONOMICS
RABINDRA BHARATI UNIVERSITY

Rabindra Bharati University Journal of Economics

(A Peer-Reviewed Journal)

VOLUMES - XIII & XIV
2019–2020
ISSN 0975-802X

DEPARTMENT OF ECONOMICS
RABINDRA BHARATI UNIVERSITY
56A, Barrackpore Trank Road, Kolkata-700 050

Rabindra Bharati University Journal of Economics
(A Peer-Reviewed Journal)
Volumes - XIII & XIV
December, 2020
ISSN 0975-802X

© Rabindra Bharati University 2020

Published by
Registrar, Rabindra Bharati University
For
Department of Economics

Printed By
Mahamaya Press & Binding
23, Madan Mitra Lane, Kolkata-700073
Phone : 9830532858

Price : Rs. 270/-

Editorial Board

Prof. Prankrishna Pal	–	Editor
Prof. Swati Ghosh	–	Member
Dr. Debolina Saha	–	Member
Prof. Siddhartha Mitra (Jadavpur University)	–	Member
Prof. Rajarshi Majumder (University of Burdwan)	–	Member

Faculty Members
Department of Economics

Dr. Prankrishna Pal	–	Professor
Dr. Swati Ghosh	–	Professor
Dr. Bindi Shaw (Head)	–	Associate Professor
Dr. Debolina Saha	–	Assistant Professor
Smt. Sushma Subba	–	Assistant Professor
Dr. Srobonti Chattopadhyay	–	Assistant Professor
Ms. Sulekha Hembram	–	Assistant Professor

Rabindra Bharati University
Journal of Economics
Volumes : XIII & XIV

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.

Due to Covid-19 situation and prolonged lockdown our University was closed for 20 months (middle of March, 2020 to middle of November, 2021). So we merge two volumes : XIII & XIV, 2019–2020. This volume contains 8 (eight) research articles.

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.

All rights are reserved. Reproduction of any matter from this journal or storing in a retrieval system or transmitted in any form or by any means is not permitted without the approval of the publisher of this journal.

At the end, I would like to extend my whole-hearted thanks to the members of the Editorial Board and especially to *Mahamaya Press & Binding* for bringing out the present volume despite of many constraints.

December 2020

Prankrishna Pal
Editor

Contents

Value Added per Employee and Factor Content of India's Foreign Trade: A Study in Input-Output Framework

Tushar Das

Abstract

While determining the factor content of a country's foreign trade, human capital component requires to be properly accounted for. This requires that while calculating labour requirement, one should separate out the skilled labour component (ie, differentiation between skilled and unskilled) from the total labour requirements and be clubbed with the physical capital requirement while calculating capital intensity. If we assume that wage value is highly correlated with labour skills, value added per employee may be taken to reflect inputs of human as well as physical capital. When value added per employee method is used to calculate capital intensity one may expect that along with physical capital 'human capital' component is automatically captured in the estimation process. Besides, the usual reliance on more infrequent and sometimes unreliable statistics of stocks of physical capital not of good quality as a measure of capital intensity may be avoided by using this alternative notion of factor intensity. This paper tries to improve the robustness of the results related to the above by using domestic Input-Output matrix for projection on the one hand and using 'Value Added per Employee' as a measure of relative capital intensity on the other. Using the Input Output matrices for the years 1989-90, 1993-94, 1998-99, 2003-04, 2006-07, 2007-08 and 2013-14 the results obtained suggest that India exports labour intensive goods and imports capital intensive goods and like the pre reform period, Hecksher-Ohlin theorem holds good for India in post reform periods also. As far as sectoral study is concerned, we observe that, Hecksher-Ohlin theorem survives comfortably for manufacture in India in 1989-90 (pre-liberalization) and 2013-14 (post-liberalisation) when it is looked from the view point of direct factor content of trade. On the other hand, evaluating from the view point of direct and indirect factor content of trade. trade pattern of agriculture, and community services support Hecksher-Ohlin theorem both in the pre and post liberalization. The other sectors like trade and hotels, transport, finance and insurance do not support the Hecksher-Ohlin theorem neither from direct factor content nor from direct and indirect factor content of trade point of view.

JEL Classification-F14

Key Words: Factors of Production, Value Added per Employee, Domestic Input-Output Matrix. Direct and Direct and Induced Factor Content of Trade

Formerly of Netaji Subhas Open University, Kolkata

I Introduction :

Varying factor endowments in different countries, as Hecksher-Ohlin Theorem asserts, is the most important single factor in determining comparative cost differences leading to international trade. This coupled with the fact of different commodities using different factor proportions will lead to a pattern of trade where 'each country tends to export commodities which use relatively large amounts of abundant factors'.

Based on certain assumptions, the Hecksher-Ohlin theorem has been put to empirical verification by quite a few researchers including Leontief himself in various countries in fifties, sixties and also a few in recent decades. So far, the most controversial of such attempts is that of Leontief himself who aimed to analyze the structural basis of American Foreign Trade (1956). Leontief put to test with the help of Input – Output model commonly held notion that U.S possesses a comparative advantage in the production of commodities which require large quantities of capital and relatively small amount of labour for their manufacture as suggested by Hecksher-Ohlin Model. It is well known that the Input-output method has the unique advantage of enabling us determining not only the direct but also the indirect input requirements (induced by some exogenous demand)

The factual finding of Leontief caused a great deal of puzzle as it implied some notion contrary to general expectation that the U.S exports goods which require relatively more labour than those required by her competitive import replacements. The later studies of Leontief related to the pattern of trade between the Rest of the World and Japan, U.S, West Germany and Canada also did not support the theorem (1953, 1956).

But the studies by Totemoto and Ichumura (1959) related to Japan, Stolper, Roskamp (1961) related to East Germany and Bharadwaj (1962), Sengupta(1989), Pal (1981,1988) related to India supported the theorem. These observations, certainly, stimulated some more studies incorporating some new approaches towards measuring capital intensity in determining the precise factor content of a country's trade.

Leontief's results apparently contradicting with that of Hecksher-Ohlin theorem induced quite a few researchers to examine the above conflict from various angles.

Leontief himself suggested that though there is some scope of substitutability of capital for labour in America, the productivity of American labour is still higher than that of other countries due to the fact that American labour is possibly endowed with richer human capital. Leontief observed (1956) and later Bharadwaj & Bhagabati (1968) subscribed to the same observation

that U.S seemed labour abundant because the U.S labour was on the average three times as efficient as foreign labour and so Hecksher-Ohlin theorem seems valid for U.S also .

In the noted exercise of Bharadwaj and Bhagwati (1968), we see a very stimulating attempt to split capital intensity of various Indian industries into physical and human capital components and the apparent contradiction between the Hecksher-Ohlin Theorem and Leontief's original empirical studies can be resolved if these results are adjusted by accommodating human capital in the capital intensity calculation and the Hecksher-Ohlin Theorem seems to survive comfortably. The first exercise of Bharadwaj (1962) on factor content of Indian trade was carried out on unadjusted data (human capital was not taken into consideration) The actual pattern of Indian trade observed in this study seemed to support the Hecksher-Ohlin theorem. The second exercise of Bharadwaj jointly with Bhagawati was carried out with an intention to test the validity of Hecksher-Ohlin Theorem in the context of Indian economy incorporating revised notion of capital (adjusted for human capital) It was suggested that the skilled labour be separated from unskilled labour and the differential wage rates are to be treated as returns to human capital. Their results despite the adjustment for human capital did support the Hecksher-Ohlin theorem.

The analytically interesting explanation for this contradictions perhaps is the one that runs in terms of the concept of Factor Intensity Reversal introduced by Minhas (1963) (and suitably linked with Hecksher-Ohlin theorem). Minhas in his outstanding exercise(1963) tried to show that the strong factor intensity assumption implicit in the Hecksher-Ohlin theorem does not hold if factor intensities are reversible empirically within the observable price range. The CES production function fitted by him to international data showed elasticities of substitution both significantly different from unity and zero and also from one another. This implies that factor intensity reversals took place within observable price ratios. However, serious doubts have been raised on the validity of these observations on both statistical and analytical grounds.

In this connection it should be mentioned that the earlier works for India , by and large, are based on the Input-Output tables prepared by the planning commission. Unfortunately Planning Commission's tables are mostly derived from projection from previous tables (not based on actual survey) In the empirical work of Bharadwaj and Bhagawati (1968), in the absence of any availability of imported input matrix, factor requirements have been calculated on the basis of total input matrix only (Domestic + Import). So, to this extent, imported inputs are proxied by domestic inputs. Hence, factor requirement calculation is to some extent erroneous because calculation of domestic factor requirement needs to be based on domestic input-output matrix only. It needs to be noted that no exercise published till date relating to testify the validity of Hechsher-Ohlin theorem seems to have been based on domestic matrix.

Now, in this paper, an attempt has been made to understand and study the trade pattern of India in relation to its factor endowment in pre and post reform periods. The study covers six period points of Indian economy namely 1989-90, 1993-94, 1998-99 and 2003-04, 2006-07, 2007-08 and 2013-14.

So, the purpose of this paper is four fold.

First, to utilize the domestic input output matrices for India for the years 1989-90, 1993-94, 1998-99 and 2003-04 (except for 2006-07, 2007-08 and 213-14) made available by CSO for getting a more correct projection of domestic output requirement and hence the capital and labour requirement for a certain export and import vector as a component of final demand. So by the above we may expect some improvement in the quality of projection of the consequences of liberalisation of import compared to projection obtained in the exercises done by others.

Second, as the data base of our study incorporates information related to more recent periods it has been possible to capture the impact of liberalization in the truer sense as it is expected that as more and more time passes consequences of relaxation of controls will be manifested in greater and greater degrees. In this respect, results of our study possibly appear more robust.

Third, 'Value Added Per Employee' as a measure of capital intensity proposed by Lary (1968) is used here to calculate the factor content of Indian Trade. The concept of 'Value Added Per Employee' as a measure of capital intensity has some unique advantages which would be discussed later on.

Fourth, to carry out the comparison of indirect factor content implicit in the composite export and that in the composite import replacements in somewhat unconventional fashion. The total factor content of Indian export in a hypothetical pre trade situation would be compared with the total factor content of the same bill of goods in the actual post trade situation. The indirect factor content of an average unit of export in the actual post trade situation will have to accommodate for intermediate imported inputs. Here the hypothetical pre trade situation is considered as proxy for a situation of import substitution and the post trade situation is generally considered as a situation of import leakage. Then the comparison of factor content of an average unit of export in the pre trade and the post trade situation can be taken as equivalent to the comparison of factor content of export and import replacements.

Now, the paper has been organized as follows:

In Section-I after highlighting the purpose of the paper, section -II discusses the case for using 'Value Added per Employee' as a measure of factor intensity, originally proposed by Lary (1968). In Section-III the unconventional method of assessing the factor content of trade which is somewhat similar to that used by Mogilany and Simpson (1968) in analyzing the pattern of factor content in trade is reviewed. Section-IV contains a discussion on the data base of the present exercise for analyzing the factor content of actual Indian trade pattern for the years 1989-90, 1993-94, 1998-99, 2003-04, 2006-07, 2007-08 an 2013-14. The significant findings are presented in section-V. Section-VI deals with the limitation of the study along with the concluding remarks.

II Rationale of Taking 'Value Added Per Employee' as a Measure of Relative Capital Intensity

According to 'Value Added per Employee' as a measure of relative capital intensity, industries with a high value added per employee are regarded as relatively capital intensive and industries with a low value added per employee are regarded as relatively labour intensive. While this measure of capital intensity has its own limitations, Lary's tests on US data suggest that value added per employee is a reasonably good measure of relative capital intensity.

If we assume that wage value is highly correlated with labour skills, value added per employee may be taken to reflect inputs of human as well as physical capital. The usual reliance on more infrequent and sometimes unreliable statistics of stocks of physical capital not of good quality as a measure of capital intensity may be avoided by using this alternative notion of factor intensity. It is worthy of mention that Lary has tested the validity of this approach by breaking down the value added per employee into its wage component and the rest and significant correlations have been found across industries between the first component and measures of skill and between the second and stocks of physical capital. Value added per employee being a flow concept rather than a stock figure, it fits better with the notion of factor inputs into production. Apart from this, the problems associated with the conventional measurement of physical capital are due to the fact that the available data on capital assets include equipment and buildings acquired at various times in the past and evaluated at different price levels, varying depreciation practices and changing tax laws.

III The Methodological Framework

Leontief open static input-output model appears undoubtedly the most useful basic tool for analyzing the factor content of Indian trade. Total output from each industry equals total inter-industrial demand plus the final demand. So, we have the balance relations as follows:

$X_i = \sum_{j=i}^{m} X_{ij} + D_i$ …….(1), where X_i = Output of the i^{th} sector (in value terms), D_i = Final Demand in the i^{th} sector (in value terms) and X_{ij} = input flow from i^{th} sector to j^{th} sector.

Assuming a production function with fixed coefficients , we can write

$X_{ij} = a_{ij}.X_j$ ……..(2) where $a_{ij} = X_{ij}/X_j$

By substituting (2) in (1) , gross output or sales of sector i can be expressed as :

$X_i = \sum_{j=i}^{m} a_{ij}.X_j + D_i$ ……(3).

Therefore, $X = AX + D$ where $X= (X_i)$, $A = (a_{ij})$ and $D = (D_i)$, D= C+E-M where D= Total Final Demand, C= Private Final Consumption Expenditures (PFCE) + Govt. Final Consumption Expenditure (GFCE) + Gross Fixed Capital Formation (GFCF) + Change in Stocks (CIS), E=Exports and M=Imports.

Or, $D = X – AX = IX – AX = (I – A)X$

Or, $X = (I – A)^{-1}D$……..(4).

In the equation (4) if D is prescribed from outside, the required gross output levels X's get determined. For our present purpose it is not the entire Final Demand(D) but the export and import part of the final demand that are relevant.

Case 1. D= C+E-M

$X=(I-A)^{-1}C + (I-A)^{-1}E - (I-A)^{-1}M$, where $A=(a_{ij})$, the Input coefficient matrix or technical coefficient matrix of Leontief system. Now, from this equation, it follows-

$X_E =(I-A)^{-1}E$ …….(5) (Direct and induced gross output requirement (domestic plus import) for E) and

$X_M= (I-A)^{-1}M$……..(5a) (Direct and induced gross output requirement to meet the import replacement vector M)

$X_C = (I-A)^{-1} C$……..(5b) (Direct and induced gross output requirement (domestic plus import) for C)

Case 2. Now, if $X_{ij}(m)$ = Imported input of the i^{th} sector to the j^{th} sector and if $X_{ij}(t)$ = total supply of input of the i^{th} sector to the j^{th} sector, then we can estimate $X_{ij}(d)$ which indicates domestically produced input of the i^{th} sector to the j^{th} sector and is given by

$X_{ij}(d) = X_{ij}(t) - X_{ij}(m)$.

$A = Ad + Am$

So, $X = (Ad + Am) X + C+E-M$

$= AdX + AmX + C + E – M = AdX + C + E – M_I$, $M_I = M - AmX$ (import used as Final Demand) so that $X= (I-Ad)^{-1} C + (I-Ad)^{-1} E - (I-Ad)^{-1} M_I$.

We write : $X_{ED} = (I-Ad)^{-1} E$ ……...(6) (Gross output requirement (domestic) for E and

$X_{MI} == (I-Ad)^{-1} M_I$ ……..(7). $X_C = (I-Ad)^{-1} C$ …..(7a)

Clearly , X_M in eq^n (5a) and X_{MI} in eq^n (7) are not same . But, in our exercise, we have used eq^n (5a) to determine gross output requirement (direct plus induced) to meet the total import replacement vector M which includes inter-industrial as well as final demand use.

We, now, discuss the methodology related to the determination of factor content of export.

Using the criterion of 'Value Added Per Employee', as proposed by Lary(1968) and as already referred to, direct factor content of an average unit of export (E) in the economy is given by

$V^e = V.e$…….(8) where e is a column vector of sectoral export proportions representing an average unit of export and V is a row vector of sectoral value added per employee. V^e is then simply a weighted mean of value added per employee, the weights being the sectoral export proportions. Similarly, the direct factor content of an average unit of competitive imports (M) is given by

$V^m = V.m$ ……(9) where m is a vector of competitive import proportions.

Here, we can consider two possible situations.

Situation-1 : $V^e > V^m$

The above situation may be characterized as a situation when an average unit of a country's export is relatively more factor (capital)intensive than an average unit of import replacements.

Situation-2 : $V^e < V^m$

This situation can be interpreted as a situation where an average unit of a country's export is relatively less factor (capital) intensive than an average unit of import replacements.

Now the procedure for calculation of total factor content is as follows:

Considering 'A' as the current Technical Matrix (combining the domestic and the imported input) in case of no trade and consequent absence of any intermediate imports, it may be taken to approximate to the domestic 'pre-trade' technical matrix as it is assumed that domestic inputs are substitutes for imported inputs. So vector $\mathbf{X_E = (I-A)^{-1}E}$ indicates the direct and indirect output requirement induced by a unitary increase in export in sector **i**. Hence total (factor)capital content of an average unit of exports as suggested by Lary can be calculated by pre- multiplying the normalized $X_E = (I-A)^{-1} E$ by the vector of value added per employee as follows:

$$\mathbf{T_k = V\bar{X}_E} \quad \text{.....(10)}$$

Where $\mathbf{T_k}$ = Total capital content of an average unit of exports

V = Row **vector** of value added per employee

$\mathbf{\bar{X}_E}$ = Normalised $\mathbf{X_E}$ (The elements of this vector $\mathbf{\bar{X}_E}$ is obtained by dividing corresponding element of $\mathbf{X_E}$ by the sum of the elements of the vector $\mathbf{X_E}$**).**

Similarly, from eq^n (6) $\mathbf{^X_{ED} = (I-A_d)^{-1} E}$ which is the vector of sectoral outputs to satisfy an average unit of exports in the situation when opening up of trade allows import leakage in the intermediate inputs.

So, $\mathbf{T_k^* = V\bar{X}_{ED}}$ .....(11) will indicate total factor (capital) content of an average unit of export when opening up of trade allows import leakage in the intermediate inputs. Here, $\mathbf{\bar{X}_{ED}}$ = Vector of normalized $^X_{ED}$.

Now, we are in a position to compare the relative factor (capital) intensity of exports vis-à-vis factor intensity of imports substituted for the intermediate inputs and in this context we make the crucial assumption that the country concerned is relatively labour abundant and capital scarce .

We may have the two possible situations as follows :

Situation 1:

If it happens that $\mathbf{T_k > T_k^*}$, then it would mean that an average unit of the concerned country's export is relatively less capital intensive. In this case, the country concerned imports capital intensive goods and skilled labour from Rest of the World and exports labour intensive goods and the Hecksher-Ohlin proposition holds good.

Situation 2:

But if the result shows that $\mathbf{T_{k<} T_k^*}$, it will mean that an average unit of the concerned country's export is relatively more capital intensive .In this case, the country concerned imports labour intensive goods and exports capital intensive goods and the Hecksher-Ohlin proposition seems not valid.

IV Data Base of the Empirical Study

For our empirical study of relative factor content of Indian trade (capital and labour requirements of exports and import replacements), Input-Output tables (Total inter-industry Transaction matrix) prepared and circulated by CSO for the years 1989-90, 1993-94, 1998-99, 2003-04, 2006-07 and 2007-08 provide major part of the information required for our purpose. We have also used the input-output table of 2013-14 prepared by Singh and Saluja and published by NCAER, New Delhi. The import matrices for the said years except 2006-07, 2007-08 and 2013-14 are also prepared by CSO but these are not circulated by them. We have collected the import matrices(not published or circulated) from C.S.O 's desk informally. The import matrices for the years 2006-07, 2007-08 and 2013-14 are projected from other import matrices. For the import matrices of 2006-07, 2007-08 and 2013-14, we have adopted an appropriate projection methodology mentioned in the appendix. The import matrices for the year 2006-07 and 2007-08 have been projected from the import matrix of 2003-04 and the import matrix for the year 2013-14 has been projected from the projected import matrix of 2007-08. The matrices (Transaction and Import) as obtained from CSO for the years 1989-90, 1993-94 and 1998-99 are of order 115*115 where as the Transaction and Import matrix for the year 2003-04, 2006-07, 2007-08 and 2013-14 are of order 130*130. All the matrices (115*115 and 130*130) are aggregated into 6*6 matrices by clubbing the similar sectors.

The employment data for the different sectors have been taken from the Economic Survey, various years published by Govt. of India and National Accounts Statistics of India-(1950-

51 to 2002-03), Linked series with 1993-94 as the base year , published by EPW Research Foundation respectively as well as from NSS Employment and Unemployment Surveys, various rounds.

V Results of the Study

On the assumption that 'Value Added per Employee' may be taken as a reasonably reliable index of relative capital intensity, estimates of the factor content of Indian exports and imports replacements are obtained as shown in Table-1.

Table-1: Direct Factor Content of Indian Exports and Imports Replacements

	Value Added per Employee (In Rs. Lakh)						
	1989-90	1993-94	1998-99	2003-04	2006-07	2007-08	2013-14
Export (V^e)	0.6809	0.1880	0.3083	2.1230	2.1430	1.9510	4.8500
Import Replacements (V^m)	1.3260	0.6428	1.5221	7.0501	6.5432	4.0865	5.0868

Source : Author's Own Calculation Based on the Equations-8 and 9

It is observed from table-1 that in the pre reform as well as post reform periods, $V^e < V^m$. That is the value added per employee for exports are less than the value added per employee for import replacements. So, on the basis of the results shown in table-1, we may conclude that an average unit of Indian exports is relatively less capital intensive than a unit of import replacement. Not only for the pre-liberalization period, 1989-90, the result is confirmed by repetition of the exercise of the calculation for the post liberalization years -1993-94, 1998-99, 2003-04, 2006-07, 2007-08 and 2013-14 also.

The results of 2003-04, 2006-07, 2007-08 and 2013-14 in respect of value added per employee seem little bit large as compared to those of previous years like 1989-90, 1993-94 and 1998-99. So, one may question the sensibility of the above results. But we feel that the observations of value added per employee themselves do not seem to suggest any direct implication. Rather, we should be more concerned with the comparative values of value added per employee for export and import replacements to obtain any conclusion relevant for testing Hecksher-Ohlin theorem. Though we have taken value added per employee as our guideline for determining relative capital intensity, we should note that the increase in the absolute value added per employee may result from various other factor like technological changes etc. So, too high value of value added per employee in those may be partly result of significantly improved technology and so on.

Now, we incorporate the implication of induced factor requirement in the calculation of factor intensity through Value Added per Employee.

Table-2: Direct and Indirect Factor content of an average unit of Export (Rs. Lakhs)

	1989-90	1993-94	1998-99	2003-04	2006-07	2007-08	2013-14
Without import leakege ($\mathbf{T_k}$)	0.7955	0.3095	0.5892	0.7259	0.7843	0.6953	7.1935
With import leakege ($\mathbf{T_k}$*)	0.7869	0.3012	0.5727	0.6435	0.6523	0.5892	6.6709

Source : Author's Own Calculation Based on the Equations -10 and 11

Table-2 shows that estimated values of T_k and T_k* for the year 1989-90 are 0.7955 and 0.7869 respectively. The corresponding values for the years 1993-94, 1998-99 ,2003-04, 2006-07 ,2007-08 and 2013-14 are 0.3095 and .3012 , .5892 and .5727, .7259 and .6435, .7843 and .6523, .6953 and .5892, 7.1935 and 6.6709 respectively. The results for the years suggest that opportunity of trade reduces the domestic capital intensity of an average unit of exports. This is in agreement with the hypothesis that India imports capital intensive inputs from the rest of the world and exports relatively labour intensive commodities. When estimation of factor inputs based on direct plus induced input requirement is considered, an average unit of exports is found less capital intensive than what is suggested by a measure based on direct factor inputs only.

Whatever is true for the whole economy, may not equally be true for the sectoral level. So, we have undertaken a sectoral level micro study to understand the factor content of different sectors and for this purpose, we consider the year 2013-14 for which the latest I-O table is available.

Table-3 shows the estimated values of 'Direct' capital content of an average unit of export (Rs. Lakhs) at sectoral level. It is observed from table-3 that $V^e < V^m$. holds good only for 'manufacture'. For this sector, the value added per employee for exports are less than the value added per employee for import replacements. For the other sectors like agriculture, Trade and hotels, transport, Finance and insurance and community service, the value added per employee for exports are more than the value added per employee for import replacements. Based on the results presented in table-3, it is our conclusion that an average unit of Indian exports is relatively less capital intensive than a unit of import replacement for the sector 'manufacture' whereas Agriculture, Trade and Hotels, Transport, Finance and Insurance and Community Services are more capital intensive as compared to import replacements.

Table-3: Direct Factor Content of Indian Exports and Imports Replacements at Sectoral Level (Rs.Lakh)

	Agriculture		Manufacture		Trade & Hotels		Transport		Finance & Insurance		Comm. service	
	1989-90	2013-14	1989-90	2013-14	1989-90	2013-14	1989-90	2013-14	1989-90	2013-14	1989-90	2013-14
Export(V^e)	0.0004	0.4621	0.0126	0.704	0.0061	0.1635	0.0216	0.2155	0.0071	1.0659	0.0026	1.787
Import Replacements(V^m)	0.0004	0.3399	0.0139	0.8464	0.0044	0.0100	0.0000	0.2143	0.0050	0.8225	0.0033	0.8303

Source : Author's Own Calculation Based on the Equations -10 and 11

Table-4 highlights the estimated values of 'Direct and Indirect' capital content of an average unit of export (Rs. Lakhs) at sectoral level. It is observed from the table that ($\mathbf{T_k}$) > ($\mathbf{T_k}$*) is achieved for the sectors like agriculture and community services. The results for these sectors suggest that opportunity of trade reduces the domestic capital intensity of an average unit of exports. But for the other sectors like manufacture, trade and hotels, transport and finance and insurance, it is interesting to note that opportunity of trade increases the domestic capital intensity of an average unit of exports.

Table-4: Direct and Indirect Factor Content of an Average unit of Export (Rs. Lakh) at Sectoral Level

	Agriculture		Manufacture		Trade & Hotels		Transport		Finance & Insurance		Comm. service	
	1989-90	2013-14	1989-90	2013-14	1989-90	2013-14	1989-90	2013-14	1989-90	2013-14	1989-90	2013-14
Without import leakage($\mathbf{T_k}$)	0.0031	0.7342	0.0524	1.2954	0.0274	0.2200	0.0387	0.2768	0.0288	1.2267	0.0078	1.7647
With import leakage($\mathbf{T_k}$*)	0.0029	0.6762	0.0455	1.4826	0.0266	0.2406	0.0419	0.3523	0.0346	1.3773	0.0084	1.4303

Source : Author's Own Calculation Based on the Equations -10 and 11

VI Conclusions

India is a labour abundant and capital scarce country and our results, using the concept of 'value added per employee' show that India exports relatively more labour intensive commodities and imports capital intensive commodities, both in the pre liberalization and post liberalization periods. So, Hecksher Ohlin theorem holds for the Indian economy both in the pre reform and post reform periods.

As far as sectoral study is concerned, we observe that, Hecksher-Ohlin theorem survives comfortably for manufacture in India in 2013-14 when it is looked from the view point of direct factor content of trade. On the other hand, trade pattern of agriculture and community

services support Hecksher-Ohlin theorem when evaluated from the view point of direct and indirect factor content of trade. The other sectors like trade and hotels, transport, finance and insurance do not support the Hecksher-Ohlin theorem neither from direct factor content nor from direct and indirect factor content of trade point of view.

Three important points need be noted here.

One is that the orthodox measure of total factor intensity developed by Leontief assumes that all intermediate inputs are domestically produced. No distinction has been made between the imported input and the domestic inputs as regards the direct factor requirement calculation for the inputs. As a result, the applicability of the total factor intensity so computed is required to be dependent on the validity of the implicit assumption that in respect of direct factor intensity imported intermediate inputs are equivalent to domestic inputs. This assumption seems, to some extent, unrealistic.

Another point is that the labour has been used here in its unadjusted form. Human capital component requires to be properly accounted for. This requires that while calculating labour requirement, we should separate out the skilled labour component (ie differentiation between skilled and unskilled) from the total labour requirements and be clubbed with the physical capital requirement while calculating capital intensity. In this connection, it should be mentioned that when value added per employee method is used to calculate capital intensity one may expect that along with physical capital 'human capital' component is automatically captured in the estimation process.

The third point is that we should be careful to note that in the calculation of total factor requirement when we consider the post trade situation by incorporating the possibility of imported inputs our procedure of calculation does not take into consideration import in final demands. So when we talk of import replacement we restrict the meaning of 'import' to import in intermediate inputs only. Further our method of analysis does not have any room for considering the factor content in non competitive imports. Though for US it may be true that large changes in domestic factor prices would not lead to goods classified as non competitive imports being substituted by domestic production , it is doubtful whether the same borderline in the classification of non competitive and competing imports can be applicable for India.

References :

Arrow, K, Chenery, H, Minhas, B, and Solow, R (1961): "Capital Labour Substitution and Economic Efficiency" Review of Economics and Statistics, August, Vol-43, Pp-225-250

Bharadwaj , R(1962) : Structural Basis of India's Foreign Trade, University of Bombay.

Bharadwaj, R and J. Bagwati (1968) : "Human Capital and the Pattern of Foreign Trade : The Indian Case, Economic Analysis in Input-Output Framework", Arthavijnan, Vol-2, Gokhale Institute of Politics and Economies, Pune, India.

Cliffton and Maxsen (1984) : "An Empirical Investigation of the Hecksher –Ohlin Theorem, Canadian Journal of Economics", Vol - XVII, No-1, PP-442–46.

Ghosh, A (1960) : Experiments with Input-Output Models, Cambridge University Press.

Jones R.W (1956) :"Factor Proportions and The Hecksher-Ohlin Model", Review of Economic Studies. Vol. 24 Pp-1956–57.

Leontief W.W (1956) : "Factor Proportions and The Structure of American Trade : Further Theoretical and Empirical Analysis", Review of Economics and Statistics, Vol-38,Pp-386-407

Lary, H.B(1968) : Imports of Manufactures from Less Developed Countries NBER, New York.

Leontief W(1955) : Studies in the Structure of the American Economy, Oxford University Press, New York.

Minhas B.S (1962) : "The Hemohypallagic Production Function, Factor Intensity Reversals and the Hecksher Ohlin Theorem", Journal of Political Economy.

Pal,D.P(1981): "Structural Interdependence in India's Economy : An Intertemporal Analyis", Ph.D Dissertation, University of Kalyani.

Pal,D.P(1988): "Structural Interdependence and Development" : Himalaya Publishing House, Bombay

Rasmussen, P and Norregaard (1957) **:** Studies in International Relations Amsterdam, North Holland Publishing Company .

Sengupta, A.K (1989)- "Some Further Evidences on the Factor Content of Indian Trade", Artha Vijnana, Sept, Vol-31, N3, P-257-267.

Stopler W.F and Karl W, Ros Kamp.(1961) : "Input output Table for East Germany with Application to Foreign Trade", Bulletin of Oxford University Institute of Statistics ,Vol-23.

Tatemoto M, and S. Ichimura (1959) : "Factor Proportions and Foreign Trade: The Case of Japan", Review of Economics and Statistics, Vol-41, Pp-442-446

Appendix :

A) Import Matrix Projection Technique (In case of non- availability of Import Matrix) :

As indicated in the paper, the import matrices for the years 1989-90, 1993-94, 1998-99 and 2003-04 have been collected (not published or circulated) from C.S.O 's desk informally. For the other years - 2006-07, 2007-08 and 2013-14, the import matrices are projected from other available import matrices following an appropriate methodology to be discussed here. The import matrices for the year 2006-07 and 2007-08 have been projected from the import matrix of 2003-04 and the import matrix for the year 2013-14 has been projected from the projected import matrix of 2007-08.

Let, the import matrix of the year T_1 is available but we do not have the import matrix of a subsequent year T_2. We assume that total intermediate import for T_1 is distributed among the sectors of year T_2 in such a way that the pattern of distribution of sectoral import for year T_2 originated from a sector and destined to different sector assumed unchanged as in T_1 .

Let IMi^{T1} and TMi^{T1} be the sectoral intermediate import and sectoral total import(includes final demand import) for the year T_1. For T_2, we have sectoral total import ie, TMi^{T2}. First, we like to find out sectoral intermediate import for T_2 ie, IMi^{T2} . In order to do this, we find the ratio of sectoral intermediate import to sectoral total import for T_1 ie, $m_i = IMi^{T1} / TMi^{T1}$. Then, $TMi^{T2} * m_i$ simply provide us the sectoral intermediate import, ie, IMi^{T2} for the year T_2. Now we inflate the total intermediate import of T_1 and the rate of overall inflation is given by $I = \sum IMi^{T2} / \sum IMi^{T1}$.

We calculate the share of intermediate import for each sector in total intermediate import for T_1 and T_2 which is given by $pi = IMi^{T1} / \sum I\,Mi^{T1}$ and $qi = IMi^{T2} / \sum IMi^{T2}$

We now estimate an adjustment factor for each sector i which is given by, $ri = qi/pi * I$

Finally, the sectoral adjustment factor is multiplied by respective row of import matrix of T_1 to get the import matrix of T_2 . In other words, We get,

$M_{11} * r_1 \quad M_{12} * r_1 \ldots\ldots\ldots\ldots\ldots\ldots M_{1n} * r_1$

$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$

$M_{m1} * r_n \quad M_{m2} * r_n \ldots\ldots\ldots\ldots\ldots\ldots M_{mn}.r_n$

This is our projected import matrix for the year T_2 (projected from the import matrix of the year T_1).

B) Aggregated Domestic and Import Matrices :

Table-A1 : Aggregated **Domestic** Commodity by Industry Matrix-1989-90 (Value in Lakhs)

	1	2	3	4	5	6	IIUSE	C	E	M	TFUSE	Total
1 Agriculture	2845606	2371912	286040	67907	0	37869	5609334	10080153	2802923	1983858	10899218	16508552
2 Manufacture	312416	50171754	318219	2617482	258250.999	1599768	55277889	8447637	46906240	101397121	-46043244	9234645
3 Domestic Trade & Hotels	544491	3590236	851708	378261	115460	101092	5581248	2349240	7708884	0	10058124	15639372
4 Transport Services	48851	146900	402938	35929	7211	55817	697646	1201032	9989612	4974000	6216644	6914290
5 Finance, Insurance	117180	793926	284688	145086	98757	14162	1453798	210533	606038	419200	397372	1851170
6 Community Service	108026	2901129	486598	1676047	188795	4579190	9939785	2284251	27812640	15188301	14908590	24848375
GVA	12691652	11195287	10341043	2457030	1666001	1638696						
Total Value of Output	16508552	9234645	15639372	6914290	1851170	24848375						

Note : C= Private Final Consumption Expenditures(PFCE)+ Govt. Final Consumption Expenditure(GFCE)+ Gross Fixed Capital Formation(GFCF)+Change in Stocks(CIS), E=Exports and M=Imports

Table-A2 : Aggregated Commodity by Industry **Import** Matrix-1989-90 (Value in Lakhs)

	1	2	3	4	5	6	IIUSE	C	E	M	TFUSE	Total
1 Agriculture	98818	528183	61593	6701	0	1055	696350	1287508	0	0	1287508	1983858
2 Manufacture	1272404	66254670	806026	4036655	334428	1989955	74694138	26702983	0	0	26702983	101397121
3 Domestic Trade & Hotels	0	0	0	0	0	0	0	0	0	0	0	0
4 Transport	211864	1339576	341340	221650	58244	93422	2266096	2707904	0	0	2707904	4974000
5 Finance, Insurance	7594	179878	49780	23996	38736	14285	314269	104931	0	0	104931	419200
6 Community services	112798	2902240	497179	1746971	188795	4604246	10052229	5136072	0	0	5136072	15188301

Note : C= Private Final Consumption Expenditures(PFCE)+ Govt. Final Consumption Expenditure(GFCE)+ Gross Fixed Capital Formation(GFCF)+Change in Stocks(CIS), E=Exports and M=Imports

Table-A3 : Aggregated **Domestic** Commodity by Industry Matrix-2003-04 (Value in Lakhs)

	1	2	3	4	5	6	IIUSE	C	E	M	TFUSE	Total
1 Agriculture	15110508	13669646	2843686	518526	0	79389	32221754	43184788	1843952	945992	44082748	76304502
2 Manufacture	6236383	82667297	6575681	13369583	1023301	2022581	111894826	104780507	24703991	42750708	86733790	198628616
3 Domestic Trade & Hotels	3392093	19696162	5382943	4727475	1048730	1105704	35353107	47144775	11302062	62927	58383910	93737017
4 Transport	1744032	11906437	2437155	1916013	441144	542176	18986957	19959564	2923122	318968	22563719	41550676

5 Finance, Insurance	440062	8839233	3148129	844698	2051503	257529	15581154	5170768	329900	488900	5011768	20592922
6 Community service	4519	1019696	633772	408980	5679	158435.583	2231082	22065368	0	671705	21393663	23624745
GVA	54622853	65093264	83476673	16193900	16198500	19356611						
Value of Output	76304502	198628616	93737017	41550676	20592922	23624745						

Note : C= Private Final Consumption Expenditures(PFCE)+ Govt. Final Consumption Expenditure(GFCE)+ Gross Fixed Capital Formation(GFCF)+Change in Stocks(CIS), E=Exports and M=Imports

Table-A4 : Aggregated Commodity by Industry **Import** Matrix-2003-04 (Value in Lakhs)

	1	2	3	4	5	6	IIUSE	C	E	M	TFUSE	Total
1 Agriculture	47121	251861	29370	3195	0	503	332051	613941	0	0	613941	945992
2 Manufacture	550254	27554525	348524	1745577	144624	860551	31204055	11546653	0	0	11546653	42750708
3 Domestic Trade & Hotels	66	137	1172	6108	2260	5046	14789	48138	0	0	48138	62927
4 Transport	13586	85903	21889	14214	3735	5991	145318	173650	0	0	173650	318968
5 Finance, Insurance	8856	209786	58057	27986	45177	16660	366522	122378	0	0	122378	488900
6 Community services	4988	128352	21988	77260	8350	203623.583	444562	227144	0	0	227144	671705

Note : C= Private Final Consumption Expenditures'(PFCE)+ Govt. Final Consumption Expenditure(GFCE)+ Gross Fixed Capital Formation(GFCF)+Change in Stocks(CIS), E=Exports and M=Imports

Table-A5 : Aggregated **Domestic** Commodity by Industry Matrix-2013-14 (Value in Lakhs)

	1	2	3	4	5	6	IIUSE	C	E	M	TFUSE	Total
1 Agriculture	19717275	45460687	5561540	67349870	4697166	7141296	149927834	82907468	14707626	227718856	-130103762	19824072
2 Manufacture	21237821	549970279	20432349	10999181	10494906	54850971	667985507	601587363	145602411	160145901	587043873	1255029380
3 Domestic Trade & Hotels	7031818	22341006	15561333	65650068	127806730	65332275	303723230	387698988	1192895200	745996360	834597828	1138321058
4 Transport	183532576	558344528	258333676	5580092	1853385	13152752	1020797009	4697166	96344170	1047586920	-946545584	74251425
5 Fin, Insurance	124525308	1531732520	231502139	5877360	3799460	11069781	1908506568	0	53604260	1917792507	-1864188247	44318321
6 Community Service	236172	38850518	1939100	6270589	2487443	20812666	70596488	129275183	70688249	0	199963432	270559920
GVA	185515739	341050341	124905975	70465555	61596849	264052461						
Total Output	19824072	1255029380	1138321058	74251425	44318321	270559920						

Note : C= Private Final Consumption Expenditures'(PFCE)+ Govt. Final Consumption Expenditure(GFCE)+ Gross Fixed Capital Formation(GFCF)+Change in Stocks(CIS), E=Exports and M=Imports

Table-A6 : Aggregated Commodity by Industry Import Matrix-2013-14 (Value in Lakhs)

	1	2	3	4	5	6	IIUSE	C	E	M	TFUSE	Total
1 Agriculture	1983163	52826454	13152752	67962369	4697166	9634417	150256321	77462535	0	0	77462535	227718856
2 Manufacture	4603595	35105765	11069781	50779141	0	5360426	106918708	53227193	0	0	53227193	160145901
3 Domestic Trade & Hotels	236172	49547650	20812666	70596488	129275183	70688249	341156408	404839952	0	0	404839952	745996360
4 Transport	185515739	598018720	264052461	0	0	0	1047586920	0	0	0	0	1047586920
5 Fin, Insurance	129128903	1550945384	237718220	0	0	0	1917792507	0	0	0	0	1917792507
6 Community Service	0	0	0	0	0	0	0	0	0	0	0	0

Note : C= Private Final Consumption Expenditures'(PFCE)+ Govt. Final Consumption Expenditure(GFCE)+ Gross Fixed Capital Formation(GFCF)+Change in Stocks(CIS), E=Exports and M=Imports

COVID 19 and Socio-economic Resilience: An Inter-Country Econometric Study in Search of Vulnerability

Sugata Sen[1] Soumitra Kundu[2] Soumya Sengupta[3]

Abstract

Aim: *COVID 19 pandemic has exposed the vulnerability of the human societies in the absence of pharmaceutical interventions. It is found that this vulnerability depends upon various socio-economic factors. The varying levels of these factors in different countries have made the economies differently resilient in preventing the menace. So this work wants to estimate the vulnerability status and levels of resilience of different economies in the face of pandemic. Finding the socio-economic reasons behind the variation in resilience is also within the aim of this paper.*

Methods: *Here the growth rate of fatality has been used as an estimate of vulnerability while the efficacy of the community measures has been accepted as the level of resilience. To that respect this work has extensively used time series and cross section econometric tools. Level of vulnerability is assessed through measuring the daily average growth rate of incidence of fatality due to COVID 19. To judge the effectiveness of different social interventions multiple endogenous structural breaks in the country-wise growth rates of COVID 19 induced fatality rates have been determined. The estimated country-wise sub-period growth rates are regressed over corresponding institutional and socio-economic variables.*

Result: *Wide variation in country level growth in fatality rates has been observed. The efficacy of the stringency measures to control the growth of fatality also varied widely among different countries. Observed that the variations in vulnerability and resilience appeared due to variations in the country-wise socio-economic and institutional factors.*

Conclusions: *It is observed that affluence and modernization of human societies cannot minimize the vulnerability of human societies to unforeseen disasters. But possibly greater public spending on human resources, reduction in social inequality and more sustainable development policies can improve the resilience of the societies.*

JEL Code: C220, C310, H120, I150, I180, O500

Keywords: Biological infections, Vulnerability; Community interventions; Structural Break; Resilience, Socio-economic status.

---

1. Associate Professor of Economics, Panskura Banamali College (Autonomous), West Bengal
2. Associate Professor of Economics, Narasinha Dutt College,Howrah, West Bengal
3. Faculty, Post-graduate Department of Computer Science, Panskura Banamali College (Autonomous), West Bengal

Introduction

COVID 19 pandemic has exposed the vulnerability of the human societies in the absence of pharmaceutical interventions. Following the history human beings are again trying to take shelter to community initiatives. Incidentally the effectiveness of these initiatives depends upon various socio-economic factors. Naturally the varying levels of these factors in different countries have made the economies differently resilient in preventing the menace. This work wants to estimate the vulnerability and resilience of the economies to face the biological disaster posed by COVID 19 infections on the basis of socio-economic factors.

The idea to isolate a disease is at least as old as the existence of Hebrew Bible. But history says that the first government directed successful non-pharmaceutical quarantine practice originated in fourteenth century Venice during the emergence of Black Death. History is full of examples of epidemics communicated through the mixing of human beings and subsequent social containment measures. The current COVID 19 pandemic and its social intervention measures are the continuation of the previous ones (Poos, 2020). Learning from the history the Centre for Disease Control and Prevention of the United States has developed a comprehensive guideline to face infections in the absence of pharmaceutical interventions. The set of community measures described under this guideline has been termed more specifically as non-pharmaceutical interventions (NPI). Through a simulated model on influenza spread they have become able to show scientifically that NPI can be an effective step to mitigate the spread of pandemic (Glass, Glass, Beyeler, & Min, 2006).

The success of NPI largely depends upon the response of the governance, composition of the society, socio-economic factors and the vulnerability of the human beings to biological infections. So UNDP has mentioned that the COVID 19 pandemic is not a global health emergency but a human development crisis. They have concluded that higher the state of development, higher the level of preparedness to face the pandemic (UNDP, 2020).This preparedness of the countries has differently been studied through HAQI (Healthcare Access and Quality Index). It is found that greater the access to quality health care greater is the recovery rate from the viral infections (Lai, Wang, Wang, Hsueh, Ko, & Hsueh, 2020). Apart from quality health care it is the nutritional status of the society which directly influences the risk of getting infected. It is observed that susceptibility to COVID 19 infection has a robust relationship with nutritional status of the population. Improvement in nutrition status strongly improves the resilience against the COVID 19 infection (Mehta, 2020). Social science research has found that apart from the human capital social capital also plays a bigger role to mitigate the risk of viral infections. It is observed that greater stock of social capital develops better management of preventive

healthcare initiatives (Koh & Cadigan, 2008) (Chuang, Huang, Tseng, Yen, & Yang, 2015) (Parks, 2020) (Wakiaga, 2020). Contemporary epidemiological studies on COVID 19 research has also found that the variation in sex ratio has played a crucial role in the spread of infection. But breaking the usual rule of marginalization, this time the females are less affected (Conti & younes, 2020). Another important factor which has left a distinct mark in the rate of infection and fatality is the extent of urbanization. Reyes et. al (Reyes, Ahn, Thurber, & Burke, 2012) have found that the urban population worldwide is increasing at a disproportionate rate and this increase is associated with many health hazards. They have shown that level of urbanization also played a crucial role during the Spanish Flu pandemic (1918-1919) and during that period the infection induced fatality within the urban areas were much higher than their other counterparts. But they observed that among the urban population the poor experienced the higher infection and fatality in comparison to the richer. Neiderud (Neiderud, 2015) also found that the urban areas worldwide were becoming hot spots for the spreads of infectious diseases over time. He has asserted that modern surface communications with concentration of huge population within a limited area have made the urban areas breeding grounds for viral infections. His study concluded that that the increase in viral infections in urban areas has positive correlation with the extension of urban activities. Lee et. al have shown that due to the development of modern urban lifestyles the emerging infectious diseases are either originating in the urban areas or quickly emerging as lethal outcomes. The advent of urbanization with rampant encroachment into the natural ecosystem has increased the risk of zoonotic infections like SARs and COVID 19 in the urban areas. They have also showed that apart from the expansion of urban life the growing inequalities within the modern urban cities is a potential reason behind the viral outbreaks (Lee, Ho, Kai, Aguilera, Heymann, & Wilder-Smith, 2020). Desai has also found that unprecedented disease outbreaks can easily begin at urban areas. The urban dwellers irrespective of developed as well as developing countries carry the greater risk to be infected from highly contagious infections. He has suggested to maintain region wise optimum population density so that the infectious health hazards can be minimised permanently (Desai, 2020).

Apart from the extent of urbanization population size is believed to be an important determinant of pathogenic transmission. Zhang et. al. have observed that the intensity of infectious diseases declines with the reduction in population size (Zhang, Liu, Tang, Zhang, Yuan, & Shen, 2020). Almost same conclusion has been reached by Neto and Melo. Their study has shown that infection has strong and significant positive correlation with population size (Neto & Melo, 2020). But the study of Powell and Faulkner has implied that it is not the size of population but the initial contact size and the susceptibility of the population which are important for the

spread of pathogens. At the same time the study has concluded that the size of susceptible population depends upon the size of population though this relationship may not be linear and can vary between countries. So the absolute number of infected may be higher in the populous countries in comparison to the less populous counterparts and the populous countries can take much time to reach the herd immunity. Naturally infection can stay much longer in populous countries due to their population size even after maintaining the same infection rate as their less populous counterparts (Powell & Faulkner, 2020). As an alternative to the studies on importance of population size on the spread of infection a volume of literatures have tried to show the importance of population density on the spread of deadly infection. These studies have tried to show that it is not population size but the population density which has greater influence on contagious infections. In the support of this conclusion Kadi and Khenfaoui have found significant positive relationship between the spread of infection and the population density (population per square kilometer) at Algeria (Kadi & Khelfaoui, 2020). Bhadra, Mukherjee and Sarkar have found positive significant correlation between population density and infection spread with fatality in Indian perspective (Bhadra, Mukherjee, & Sarkar, 2020). Coskun, Yildirim and Gunduz have also shown that in Turkey the density of population played an important role in the spread of the infection. They have found that the risk of infection increases with the increase in wind flow in the presence of greater density of population. Wind speed acts as a catalyst to strengthen the positive influence of population density in the spread of infection (Coþkun, Yýldýrým, & Gündüz, 2020). On the contrary to this positive influence of population density on infection spread Hamidi et. al. have not found any significant influence of population density on the infection spread. Moreover, they have found that the fatality rate is inversely related with population density. So they have concluded that in large populous areas instead of population density the social commuting connections have greater influence on the infection spread (Hamidi, Sabouri, & Ewing, 2020). Going a step further the study of Carozzi, Provenzano and Roth have found no influence of population density on COVID 19 induced infection and mortality. They have concluded that denser location can have early outbreaks due to greater connectedness. So it is not human density but the human connectedness which should be studied in greater details to assess the factors behind the infection spread as well as mortality (Carozzi, Provenzano, & Roth, 2020). The importance of connectedness in the spread of infectious diseases has also been mentioned by World Economic Forum. According to them, globalization and affluence induced mobility are important reasons behind the quick spread of COVID 19 infections worldwide (World Economic Forum, 2020). The positive influence of connectedness has also been observed by So et.al. They have found that greater the connectedness among the regions greater the risk of infection spread (So, Tiwari, Chu, Tsang, & Chan, 2020). But the studies on influence of connectedness on the infection

spread are not a newly developed perspective. The influence of connectedness on the spread of infection started to draw importance with the development of trade networks worldwide. These studies on human connectedness and spread of infections have found that the risk of pathogenic infections have increased with the advent of globalization. The study of Kimball has argued that the process of globalization has increased the risk of deadly infections through the greater movement of goods and services worldwide. Much before the current pandemic she cautioned the world that economic globalization can directly contribute to serious acute respiratory diseases (SARs) (Kimball, 2006) (Price-Smith, 2008). Like Kimball the study of Neiderud (Neiderud, 2015) has also mentioned the potential influence of trade networks in spreading SARs like corona virus infections much before the current pandemic.

But the economic factor which is assumed to be the most influential reason behind the spread of infection can be termed as incidence of poverty. It is observed that due to low nutritional status along with lower access to quality curative and preventive health care the poor are more prone to the contagious biological infections. (Ahmed, Ahmed, Pissarides, & Stiglitz, 2020). Due to poverty the under-resourced members of the society cannot afford to follow the containment measures by staying in isolation at home. They cannot afford to maintain isolation away from their economic activities for a long time. They are highly constrained to follow the non-pharmaceutical measures as recommended by World Health Organisation. At the same time due to wealth constrained choices the poor generally reside in atmospheres and locations which are not conducive to easily combat the challenges posed by the current pandemic. So the interpersonal interaction, mobility and danger of contacting the pathogen is much higher among the poor (Brown, Ravallion, & Walle, 2020). Apart from all these factors the poor also carry greater incidences of co-morbidities within them. It is reflected by the greater infection and co-morbidity induced fatality within the under-resourced communities (Finch & Finch, 2020). Interestingly, though the poor have the greater probability to be infected, on contrary, it is observed that abundance may not ensure greater resilience. It is found from different inter-regional studies that relationship between per capita GDP and incidence of infection is positive (Tauberg, 2020). Social scientists have intensely tried to find answer to this inconsistency. One popular justification to this apparent contradiction, which is generally offered, is that the poor people are more habituated to stay with lesser hygienic condition and lesser medical care and naturally can develop a better immunity. So the poor are more resilient against any infective disease. But this resilience may be weaker than their vulnerability, which has delivered greater COVID 19 induced death among the poor. May be due to the existence of this incongruity about the infection within the poor the statistical study of Roy has found that case fatality rate is independent of the availability of resources (Roy, 2020).

On the other hand it is also observed that the human vulnerability to any biological disaster like COVID 19 pandemic depends upon a complex networked system where the above discussed socio-economic factors play a crucial role. It is found that this vulnerability depends largely upon the above-stated socio-economic factors (Galea, Aherna, & Karpati, 2005). Before this study Bates et. al. have also found that socio-economic factors strongly influence the vulnerability of human beings to some biological infections (Bates, et al., 2004). So in the absence of pharmaceutical interventions it is undoubtedly the effectiveness of these factors which can make some nations more competent and some not. So the different trajectories of COVID 19 infection and fatalities as followed by different countries (World Health Organisation, 2020) may be a reflection of this varied vulnerability of different countries induced by varied levels of socio-economic factors.

As the final words of the preceding discussion it can be said that with the growth and development of human societies the vulnerability of human beings to deadly infections has increased many folds in the absence of proper pharmaceutical interventions. Human beings are left with no other alternative but to stay with the age old practices of non-pharmaceutical community interventions. The success of these interventions or the resilience of the societies depends upon a set of socio-economic factors. So this work wants to study the following:

- To estimate the growth in fatality rates of different countries from COVID 19 infection as a proxy of country level vulnerability to unforeseen biological disasters.
- To estimate the structural breaks in country-wise growth rates in fatality due to COVID 19 infection to consider the country-wise levels of resilience.
- To estimate the influence of different national level institutional as well as socio-economic variables on the country-wise fatality rates due to COVID 19 infection.
- To find the socio-economic reasons behind the variation in inter-country fatality rates due to COVID 19 in the absence of pharmaceutical interventions.

Methodology

This work is based on secondary data (Appendix –I). Standard mathematical procedures have been followed to find the per million inter-country rates of fatality. The proxy of country-wise vulnerability or Country-wise daily growth rates of fatality due to COVID 19 are estimated for 176 countries which had experienced positive growth in death during the broad reference period from 3rd February 2020 or from the date of first confirmed report of death due to COVID 19 (whichever is later) in the country under consideration to 23rd June 2020. Due to dynamic behavior of per day incidence of fatality from COVID 19 the growth rate of fatality has been used as the proxy instead of other figures on fatality. As number of persons

died with COVID 19 virus in a country is expected to grow exponentially in the initial days, this work has employed an exponential growth model where the reported daily confirmed case of total number of deaths from corona infection in a country, expressed in natural logarithm, as dependent variable and time in days as independent variable have been taken. Here the used simple exponential growth model is

$$y_t = \mu + \beta t + \varepsilon_t \ldots.(1)$$

Where y_t is the time series being tested, t is a time trend variable (counted in number of days) and ε_t is an error term. Here y_t= Natural logarithm of the number of deaths from COVID 19 infection in the country under consideration on the day t.

To find the level of resilience of the individual countries the present work intends to identify structural breaks in the growth of deaths from covid infections. The structural change in growth rate of deaths from covid infection induced by a policy may be estimated by directly measuring change in growth rate of deaths from covid infection from the date of adoption of that policy by employing statistical tools like exponential growth model and kinked exponential growth model. However, some researchers (Banerjee, Lumsdaine, & Stock, 1992) (Christiano, 1992) (Zivot & Andrews, 1992) have emphasised that the break point should be selected as the outcome of an endogenous procedure involving formal testing techniques instead of measuring break points of growth rate exogenously, as the later process of conventional exogenous determination of structural break would give rise to statistical problems like data mining and resulted into erroneous conclusions. For avoiding these problems, endogenous selection of break date(s) has been adopted in the present work.

Here the Bai and Perron (Bai & Perron, 1998) (Bai & Perron, 2002) methodology to the time series data to simultaneously estimate multiple break points endogenously is used. The exponential growth model containing m+1 growth regimes and m break dates ($T_1, T_2, \ldots, T_m$) can be written as follows:

$$\left.\begin{array}{ll} y_1 = \mu_1 + \beta_1 t + \varepsilon_t, & t = 1, \ldots\ldots\ldots\ldots, T_1 \\ y_2 = \mu_2 + \beta_2 t + \varepsilon_t, & t = T_1 + 1, \ldots\ldots, T_2, \\ . & \\ y_t = \mu_{m+1} + \beta_{m+1} t + \varepsilon_t, & t = T_m + 1, \ldots., T. \end{array}\right\} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Here $T_0 = 0$ and $T_{m+1} = T$. The number of break points m and the break dates (T_1, T_2, …., T_m) are treated as endogenous and estimated from the data. Here the break dates are estimated as global minimisers of the sum of squared residuals from an OLS regression using a dynamic programming algorithm as described in the following paragraph.

Given the number of breaks m, for each partition (T_1, T_2, …., T_m), denoted by $\{T_p\}$, the associated least square estimates $\beta_p = (\mu, \beta)_p$ are obtained as by minimising the sum of squared residuals

$$\sum\sum\left(Y_t - \mu_j + \beta_j t\right)^2$$

Due to working with trending regressors, the Bayesian Information Criteria (BIC) is used for determination of optimum numbers of structural breaks, as suggested by Wang (Wang, 2006). In our estimation, a trimming of 15 percent of total observations is selected, implying a maximum of five breaks or six growth regimes in our sample ranging from 3rd February, 2020 or date of first reported mortality from corona infection in the country under consideration to 23rd June 2020. Starting from the zero to maximum, the optimum number of breaks selected (m) is that for which BIC is minimum. After choosing the optimum number of break(s), the growth rates across different periods are estimated for selected countries by kinked exponential growth model allowing for both shift in intercept and change in slope coefficient at the point of break. The "strucchange" package developed by Zeileis et. al. (Zeileis, Leisch, Hornik, & Kleiber, 2002) (Zeileis, Kleiber, Kramer, & Hoenik, 2003) is employed for this purpose and computations are done with the R software.

For identifying the causes for cross-country differences in the growth of death, growth rate of death due to corona infection in countries is regressed on a set of structural and institutional variables using the multiple regression framework, employing the ordinary least squares method, as follows:

$$y = \beta_0 + \beta_1 . x_i + \beta_2 . x_2 + \ldots + + \beta_k . x_k + u,$$

where y is the dependent variable and x_1 , x_2 , …, , x_k are explanatory variables and u is random error term.Level of significance of the explanatory variables is judged through standard statistical methods.

Findings

The daily growth rates (percent per day) of reported confirmed deaths due to COVID 19 infection in the 176 countries during the period from the date of first reported confirmed death due to COVID 19 up to 23rd June 2020 are estimated. It is observed that highest number of fatalities (119761, which alone accounted for more than 25% of total deaths) was reported in the United States of America, followed by Brazil and United Kingdom. Daily growth rate of fatality is also very high (8.61% per day) in the United States. Brazil, Mexico, France, India, Canada and Peru also observed very high daily growth rate of fatality (around 8.29% to 9.6%). Daily growth rate in mortality for the world as a whole was 5.36% per day during this period and 51 countries have experienced growth rate in mortality higher than that of the world as a whole. Daily growth rates of reported confirmed deaths due to COVID 19 infection in 30 most affected countries (in terms of death) of the world during the period are presented in Table 1. These 30 countries account for more than 95% of the total number of deaths from confirmed COVID 19 infection in the World as on 23rd June 2020.

Table 1

Daily growth rate (percent per day) during the period from the date of first report of confirmed death from COVID 19 infection to 23rd June 2020

Country	Number of deaths as on 23rd June 2020	Date of first report of confirmed death from COVID 19 infection	Number of infected persons on the date of first report of confirmed death from COVID 19 infection	Daily growth rate (% per day) during the period from the date of first report of confirmed death from COVID 19 infection to 23rd June 2020
United States of America	119761	03.03.2020	2	8.61
Brazil	50617	19.03.2020	1	8.59
The United Kingdom	42647	07.03.2020	1	7.61
Italy	34657	23.02.2020	2	5.46
Spain	29858	05.03.2020	1	5.47
France	29591	16.02.2020	1	8.83
Mexico	21825	20.03.2020	1	9.60
India	14011	13.03.2020	1	8.74

Contd...

Table 1 (Contd...)

Iran	9742	20.02.2020	2	4.77
Belgium	9696	16.03.2020	5	5.10
Germany	8895	10.03.2020	2	6.15
Canada	8430	11.03.2020	1	8.29
Russian Federation	8359	26.03.2020	2	7.94
Peru	8045	20.03.2020	2	8.30
Netherlands	6090	07.03.2020	1	5.70
Sweden	5122	16.03.2020	3	5.84
Turkey	4974	19.03.2020	2	4.96
China	4646	03.02.2020	361	1.01
Chile	4502	21.03.2020	1	7.73
Ecuador	4223	16.03.2020	2	6.77
Pakistan	3695	20.03.2020	2	6.95
Indonesia	2500	11.03.2020	1	5.51
Egypt	2278	09.03.2020	1	6.41
Colombia	2237	23.03.2020	2	6.42
South Africa	1991	28.03.2020	1	7.43
Ireland	1717	12.03.2020	1	6.61
Switzerland	1680	06.03.2020	1	5.10
Portugal	1534	18.03.2020	1	4.29
Romania	1523	23.03.2020	2	4.42
Bangladesh	1502	20.03.2020	1	7.10
WORLD (All Countries)	469587	03.02.2020	362	5.36

Source: WHO and the calculation of the authors.

This work intends to estimate the extent of vulnerability of human beings to COVID 19 pandemic. Here this vulnerability is expressed through the growth rate of mortality from COVID 19 infection in the country under consideration. The resilience of the countries are expressed through the ability to lower the rate of mortality and the growth rate of mortality from COVID 19 infection in the country under consideration. So, structural break(s) in the growth rate of deaths from COVID 19 infection in the 30 most affected countries (Table1) are searched. The estimated break dates in the 30 most affected countries (up to 23rd June 2020) are presented in Table 2 and the daily growth rate in the associated sub-periods in those countries are reported in Table 3.

Table 2

Estimated break dates in the daily growth rate in number of total fatality from COVID 19 infection in the 30 most affected countries of the world

Country	Number of deaths from corona infection as on 23-06-2020	First Break	Second Break	Third Break	Fourth Break	Fifth
United States of America	119761	20.03.2020 (+)**	05.04.2020 (-)**	21.04.2020 (-)**	15.05.2020 (-)**	
Brazil	50617	02.04.2020 (-)**	17.04.2020 (-)**	20.05.2020 (-)**		
The United Kingdom	42647	23.03.2020 (-)**	09.04.2020 (-)**	04.05.2020 (-)**		
Italy	34657	12.03.2020 (-)**	30.03.2020 (-)**	25.04.2020 (-)**		
Spain	29858	21.03.2020 (-)**	06.04.2020 (-)**	02.05.2020 (-)**		
France	29591	06.03.2020 (+)**	25.03.2020 (-)**	13.04.2020 (-)**	02.05.2020 (-)	
Mexico	21825	08.04.2020 (-)**	26.04.2020 (-)**	24.05.2020 (-)**		
India	14011	14.04.2020 (-)**	09.05.2020 (-)**			
Iran (Islamic Republic of)	9742	09.03.2020 (-)**	27.03.2020 (-)**	17.04.2020 (-)**		
Belgium	9696	31.03.2020 (-)**	15.04.2020 (-)**	03.05.2020 (-)**		
Germany	8895	28.03.2020 (-)**	12.04.2020 (-)**	02.05.2020 (-)**		
Canada	8430	27.03.2020 (-)**	15.04.2020 (-)**	09.05.2020 (-)**		
Russian Federation	8359	08.04.2020 (-)**	21.04.2020 (-)**	04.05.2020 (-)**	02.06.2020 (-)**	
Peru	8045	08.04.2020 (-)**	02.05.2020 (-)**	24.05.2020 (-)**		
Netherlands	6090	23.03.2020 (-)**	08.04.2020 (-)**	01.05.2020 (-)**		

Contd...

Table 2 (Contd...)

Sweden	5122	31.03.2020 (-)**	15.04.2020 (-)**	05.05.2020 (-)**		
Turkey	4974	04.04.2020 (-)**	26.04.2020 (-)**			
China	4646	24.02.2020 (-)**	16.03.2020 (-)**	17.04.2020 (-)**		
Chile	4502	06.04.2020 (-)**	26.04.2020 (-)**	12.05.2020 (+)**	09.06.2020 (-)**	
Ecuador	4223	02.04.2020 (-)**	16.05.2020 (-)**			
Pakistan	3695	03.04.2020 (-)**	23.04.2020 (-)**	08.05.2020 (-)**		
Indonesia	2500	26.03.2020 (-)**	18.04.2020 (-)**			
Egypt	2278	28.03.2020 (-)**	18.04.2020 (-)**			
Colombia	2237	13.04.2020 (-)**	27.04.2020 (-)**			
South Africa	1991	10.04.2020 (-)**	23.04.2020 (-)**			
Ireland	1717	27.03.2020 (+)	11.04.2020 (-)**	01.05.2020 (-)**		
Switzerland	1680	22.03.2020 (-)**	07.04.2020 (-)**	30.04.2020 (-)**		
Portugal	1534	01.04.2020 (-)**	23.04.2020 (-)**			
Romania	1523	05.04.2020 (-)**	18.04.2020 (-)**	12.05.2020 (-)**		
Bangladesh	1502	03.04.2020 (-)**	20.04.2020 (-)**			
World	469587	24.02.2020 (-)**	16.03.2020 (+)**	07.04.2020 (-)**	28.04.2020 (-)**	19.05.2020 (-)**

‘ + ’ sign in the parenthesis indicates an increase in growth rate of infection while ‘ – ‘ sign in the parenthesis indicates a decline in growth rate of infection ‘**’, ‘*’ and ‘#’ implies corresponding null hypothesis of statistically insignificant growth rate is rejected at 1%, 5% and 10% level of significance.

Source: WHO and the calculation of the authors.

Table 3

Daily growth rate (percent per day) in number of total fatality due to COVID 19 in the 30 most affected countries of the world on different periods

COUNTRY	First Period	Second Period	Third Period	Fourth Period	Fifth Period	Sixth Period	Whole Period
United States of America	20.66	27.99	11.88	3.66	0.96		8.61
From	03.03.2020	20.03.2020	05.04.2020	21.04.2020	15.05.2020		
To	19.03.2020	04.04.2020	20.04.2020	14.05.2020	23.06.2020		
Brazil	42.67	16.55	7.42	3.23			8.59
From	19.03.2020	02.04.2020	17.04.2020	20.05.2020			
To	01.04.2020	16.04.2020	19.05.2020	23.06.2020			
The United Kingdom	46.82	23.18	5.68	0.79			7.61
From	07.03.2020	23.03.2020	09.04.2020	04.05.2020			
To	22.03.2020	08.04.2020	03.05.2020	23.06.2020			
Italy	39.31	16.81	3.51	0.45			5.46
From	23.02.2020	12.03.2020	30.03.2020	25.04.2020			
To	11.03.2020	29.03.2020	24.04.2020	23.06.2020			
Spain	55.58	17.89	2.77	0.15			5.47
From	05.03.2020	21.03.2020	06.04.2020	02.05.2020			
To	20.03.2020	05.04.2020	01.05.2020	23.06.2020			
France	7.63	32.62	12.68	1.96	0.33		8.83
From	16.02.2020	06.03.2020	25.03.2020	13.04.2020	02.05.2020		
To	05.03.2020	24.03.2020	12.04.2020	01.05.2020	23.06.2020		
Mexico	30.90	13.87	6.56	3.97			9.60
From	20.03.2020	08.04.2020	26.04.2020	24.05.2020			
To	07.04.2020	25.04.2020	23.05.2020	23.06.2020			
India	20.00	7.27	4.42				8.74
From	13.03.2020	14.04.2020	09.05.2020				
To	13.04.2020	08.05.2020	23.06.2020				
Iran (Islamic Republic of)	30.58	16.58	4.08	0.94			4.77
From	20.02.2020	09.03.2020	27.03.2020	17.04.2020			
To	08.03.2020	26.03.2020	16.04.2020	23.06.2020			

Contd...

Table 3 (Contd...)

Belgium	38.88	16.03	3.86	0.38			5.10
From	16.03.2020	31.03.2020	15.04.2020	03.05.2020			
To	30.03.2020	14.04.2020	02.05.2020	23.06.2020			
Germany	34.78	17.00	4.99	0.54			6.15
From	10.03.2020	28.03.2020	12.04.2020	02.05.2020			
To	27.03.2020	11.04.2020	01.05.2020	23.06.2020			
Canada	32.91	19.62	7.45	1.39			8.29
From	11.03.2020	27.03.2020	15.04.2020	09.05.2020			
To	26.03.2020	14.04.2020	08.05.2020	23.06.2020			
Russian Federation	33.65	17.92	10.15	4.62	2.49		7.94
From	26.03.2020	08.04.2020	21.04.2020	04.05.2020	02.06.2020		
To	07.04.2020	20.04.2020	03.05.2020	01.06.2020	23.06.2020		
Peru	25.86	10.67	5.47	3.03			8.30
From	20.03.2020	08.04.2020	02.05.2020	24.05.2020			
To	07.04.2020	01.05.2020	23.05.2020	23.06.2020			
Netherlands	41.33	18.81	3.98	0.39			5.70
From	07.03.2020	23.03.2020	08.04.2020	01.05.2020			
To	22.03.2020	07.04.2020	30.04.2020	23.06.2020			
Sweden	34.41	16.30	5.40	1.20			5.84
From	16.03.2020	31.03.2020	15.04.2020	05.05.2020			
To	30.03.2020	14.04.2020	04.05.2020	23.06.2020			
Turkey	31.86	9.34	0.92				4.96
From	19.03.2020	04.04.2020	26.04.2020				
To	03.04.2020	25.04.2020	23.06.2020				
China	10.34	1.17	0.14	0.04			1.01
From	03.02.2020	24.02.2020	16.03.2020	17.04.2020			
To	23.02.2020	15.03.2020	16.04.2020	23.06.2020			
Chile	27.82	9.59	3.88	6.32	5.99		7.73
From	21.03.2020	06.04.2020	26.04.2020	12.05.2020	09.06.2020		
To	05.04.2020	25.04.2020	11.05.2020	08.06.2020	23.06.2020		
Ecuador	29.83	7.34	1.65				6.77
From	16.03.2020	02.04.2020	16.05.2020				
To	01.04.2020	15.05.2020	23.06.2020				

Contd...

Table 3 (Contd...)

Pakistan	22.52	9.93	6.91	4.09			6.95
From	20.03.2020	03.04.2020	23.04.2020	08.05.2020			
To	02.04.2020	22.04.2020	07.05.2020	23.06.2020			
Indonesia	41.75	9.73	2.32				5.51
From	11.03.2020	26.03.2020	18.04.2020				
To	25.03.2020	17.04.2020	23.06.2020				
Egypt	23.18	10.52	3.37				6.41
From	09.03.2020	28.03.2020	18.04.2020				
To	27.03.2020	17.04.2020	23.06.2020				
Colombia	20.42	7.34	3.87				6.42
From	23.03.2020	13.04.2020	27.04.2020				
To	12.04.2020	26.04.2020	23.06.2020				
South Africa	23.34	11.14	5.94				7.43
From	28.03.2020	10.04.2020	23.04.2020				
To	09.04.2020	22.04.2020	23.06.2020				
Ireland	14.99	16.16	7.60	0.57			6.61
From	12.03.2020	27.03.2020	11.04.2020	01.05.2020			
To	26.03.2020	10.04.2020	30.04.2020	23.06.2020			
Switzerland	28.74	20.19	3.43	0.29			5.10
From	06.03.2020	22.03.2020	07.04.2020	30.04.2020			
To	21.03.2020	06.04.2020	29.04.2020	23.06.2020			
Portugal	44.21	7.98	1.02				4.29
From	18.03.2020	01.04.2020	23.04.2020				
To	31.03.2020	22.04.2020	23.06.2020				
Romania	35.33	9.65	4.00	0.97			4.42
From	23.03.2020	05.04.2020	18.04.2020	12.05.2020			
To	04.04.2020	17.04.2020	11.05.2020	23.06.2020			
Bangladesh	13.46	18.41	4.52				7.10
From	20.03.2020	03.04.2020	20.04.2020				
To	02.04.2020	19.04.2020	23.06.2020				
World (All Countries)	10.35	3.45	12.07	5.32	2.18	1.14	5.36
From	03.02.2020	24.02.2020	16.03.2020	07.04.2020	28.04.2020	19.05.2020	
To	23.02.2020	15.03.2020	06.04.2020	27.04.2020	18.05.2020	23.06.2020	

Source: WHO and the calculation of the authors.

From Table 2 and Table 3 it appears that the daily growth rate of mortality from COVID 19 infection went up to around 56% per day in Spain and around 40% per day in countries like United Kingdom, Italy, Brazil, Netherlands, Portugal and Indonesia. Belgium, Romania, Germany, France, Russian Federation, Sweden and Turkey also suffered a mortality rate of over 30% per day in March 2020. However, the government initiated community measures have succeeded in reducing the daily rates of mortality significantly in all the 30 countries, as is evidenced by statistically significant drops in daily growth rate of mortality in all of these countries, reported in Table 2. However, it may also be observed that the effectiveness of the community measures varies across countries (Table 3). While 14 of 30 countries managed to reduce the daily growth rate of mortality to less than 1% per day by May 2020, the daily growth rate of mortality remains at around 6% per day even in June 2020 in Chile and South Africa. Daily growth rate of mortality remains at over 4% per day in populous countries of Indian sub continent like India, Bangladesh and Pakistan in May and June 2020, while some other developing countries like Mexico, Brazil, Columbia, Peru and Egypt experienced a daily growth rate over 3% per day even in June 2020. Chile, in fact, experienced a significant increase in growth rate of mortality from early May.

In order to estimate the influence of the institutional factors on the variations in mortality rates, the reported country-wise total number of deaths from COVID 19 infection per million (as on 23rd June 2020) and country-wise daily growth rate of mortality from COVID 19 infection are regressed on a set of institutional variables using the method of ordinary least square. These regressions are carried over with data from187 countries (positive growth in fatality had been reported in 176 countries and only one death was reported in 11 other countries in the period under consideration). Here country wise per capita income (per capita GDP in USD at PPP), urbanization ratio (urban population as a percentage of total population), Trade Openness Index (total value of foreign trade as a proportion of Gross National Product on the year), poverty (as proportion of population under poverty) and population density (population per square kilometer of area) and population (for the regressions where 'growth rate of mortality' are considered as dependent variables - in operations II, III & IV) have been selected as structural variables which may potentially affect the extent of COVID 19 infection in the country under consideration, while an index of health infrastructure of the country (HAQI) is taken as measure of health infrastructure and gender ratio (ratio of male to female population) is taken as a measure of demographic characteristics of the society. Apart from these regressions, the 'maximum daily growth rate of mortality' observed in the 30 most affected countries (Table 3) and the daily growth rate in death rate from COVID 19 infection in the most recent sub-period (Table 3)in those countries are also taken as dependent variable.

All of these four exercises or operations are performed taking natural logarithm of the dependent as well as explanatory variables, so that the regression coefficients may be considered as a measure of relative responsiveness or elasticities, indicating percentage change in dependent variable of interest from a given change in the explanatory variable of interest. Results from these exercises are reported in Table 4.

Table 4

Evidence from cross-section regression of natural logarithm of death from COVID 19 per million population and natural logarithm of growth rate of mortality from COVID 19 infection on natural logarithm of a set of institutional variables

Explanatory variables	Dependent variable: Death from COVID 19infection per million population (as on 23.06.2020)	Dependent variable:daily growth rate of mortality from COVID 19 (up to 23.06.2020)	Dependent variable:maximum daily growth rate of mortality from COVID 19 in the 30 most affected countries	Dependent variable:daily growth rate of mortality from COVID 19 in the most recent sub-period in the 30 most affected countries
	Operation I	Operation II	Operation III	Operation IV
Constant	-23.435 (-7.57) **	-2.297 (-1.41)	0.296 (0.08)	-14.304 (-0.74)
Per capita GDP (Purchasing Power Parity)	1.002 (3.34) **	0.252 (2.11)*	0.006 (0.02)	-0.724 (-0.54)
Population density (person/square km)	0.007 (0.06)	-0.062 -(1.43)	0.046 (0.85)	-0.014 (-0.09)
Population		0.226 (4.35) **	-0.016 (-0.23)	0.493 (1.64)
Proportion of population under poverty	0.261 (1.46)	0.141 (1.82) #	0.160 (1.32)	0.239 (0.36)
Gender ratio	-0.519 (-1.46)	-0.102 (-0.80)	0.688 (0.44)	-1.763 (-0.42)
Trade Openness Index	-0.128 (-0.44)	0.189 (1.51)	-0.162 (-0.76)	0.947 (1.11)
Urban population (as % of total population.)	0.977 (2.13)*	-0.003 (-0.01)	0.337 (1.20)	-0.268 (-0.23)
HAQI	-0.048 (-0.04)	-0.663 (-1.56)	0.637 (0.50)	2.534 (0.47)

Contd...

Table 4 (Contd...)

–				
Adjusted R^2(R^2)	0.4325	0.2336	0.2553	-0.1311
DW	1.98	2.41	2.13	1.61
F Statistics	15.70 **	6.07 **	2.07 #	0.64
Number of observations	136	134	26	26

*('t' ratios are reported in parentheses. 't' ratios are calculated using White heteroscedasticity consistent standard error and covariences. '**', '*' and '#' implies corresponding null hypothesis is rejected at 1%, 5% and 10% level of significance.).All of the four operations are carried out taking natural logarithm of dependent and explanatory variables.

Source: Calculated by the authors.

From Operation I under Table 4 it appears that the death from COVID 19 infection per million of population is positively and significantly associated with per capita income and extent of urbanization. The mortality from COVID 19 infection is also found to bear a positive association with poverty and population density, although the regression coefficients are not statistically significant for these variables. On the other hand, death per million of population is found to be negatively associated with gender ratio, HAQI and Trade Openness Index; although the regression coefficients for these variables are not statistically significant.

The daily growth rate of mortality across countries is found positively and significantly associated with population, per capita income and poverty. The 'Trade Openness Index' also bears a positive but insignificant association with the daily growth rate of mortality across countries. The daily growth rate of mortality across countries bears a negative but statistically insignificant association with 'gender ratio' and HAQI (Operation II).

The present work also regressed the maximum daily growth rate of mortality observed in the thirty most affected countries and daily growth rate of mortality observed in the most recent sub-period in those countries in the above-mentioned set of explanatory variables, reported in the Operation III and Operation IV, respectively. From Operation III a positive relation is observed between 'maximum growth rate' in mortality and per capita income, population density, poverty, sex-ratio, urbanisation and HAQI, although none of the regression coefficients are statistically significant. The coefficients of Trade Openness Index and population, on the other hand, are negative and statistically insignificant in that regression.

The Operation IV, which regress the logarithm of 'daily growth rate in mortality' in most recent sub-period on the logarithm of the given set of structural variables, yields very low value of adjusted R^2 and F statistics, implying that the cross-country variations in the given set of

institutional and structural variables explained a very little proportion of observed variations in daily growth rate of mortality in the most recent sub-period (up to 23rd June 2020) in the thirty most affected countries. All individual regression coefficients of Operation IV are also statistically insignificant, with very low t ratios, again indicating low explanatory power of the regression IV and pointing out that there may be other determinants resulting into varying levels of success across countries in reducing the growth rate of mortality. However, all the other three regression exercises (operations I, II & III) yield statistically significant F statistics, Durbin – Watson statistics within normal range along with moderate values of adjusted R^2 (ranging between 0.43 and 0.23).

To sum up, from the Table 4, we have found evidences of a significantly positive relationship between Country-wise incidence and growth of mortality and per capita income of the country under consideration, which may be caused by changes in life style induced from higher income and affluences. The more urbanized countries are also prone to greater fatality per million. 'Population level' and the 'level of poverty' along with 'per capita income' of the country under consideration also showed strong positive association with growth of mortality. On the other hand, there are some, relatively weak (as the associated coefficients are not statistically significant) evidences of negative association between growth of mortality from COVID 19 and structural variables like HAQI, which have pointed out to the fact that development of health infrastructure may be helpful in controlling the mortality from COVID 19.

Conclusions

The world has suffered around 470,000 deaths of humans from COVID 19 infection till 23rd of June 2020. Majority of these deaths occurred in the United States of America, western European countries like the United Kingdom, Italy, Spain, France etc., the Latin American countries like Brazil, Mexico, Peru, Chile etc. and in Indian sub-continent, as the COVID 19virus spread all over the world from the initial epicenter of the pandemic in China. As no medicines or vaccines of COVID 19 virus is available till date, affected countries opted for non-pharmaceutical community interventions. The present work intends to identify the efficacy of these interventions by testing for endogenous structural breaks, if any, in the daily growth rate of mortality from COVID 19 infection in the 30 most affected countries. It is found that all of these countries experienced statistically significant drops in the growth rate of mortality during the period under consideration, indicating that non-pharmaceutical community initiatives were successful in reducing the daily growth rate of mortality. However, the fact remains that in spite of the drop, the daily growth rate in mortality remains positive in all of these countries even in the most recent sub-periods. It is also noteworthy that the effectiveness of the stringency

measures or the resilience level varies across countries, while 14 of the 30 most affected countries succeed in dropping the daily growth rate of mortality from COVID 19 infection to less than 1% per day in the last endogenously determined sub-period in May – June 2020, the daily growth rate of death from COVID 19 infection remains above 3% per day in 10 of these 30 countries during the last endogenous sub-period. Notably, all of these 10 countries are developing countries from Asia, Africa and South America (including Mexico). Using the cross-country regression results for identifying the institutional characteristics influencing the incidence and daily growth rate of mortality from COVID 19 infection, evidences of a positive relationship has been found between Country-wise incidences of fatality and variables like per capita income and level of urbanization. Evidences of positive relationship have also been found between country-wise growth of mortality and per capita income, level of population and incidence of poverty of the country under consideration, probably caused by changes in life style induced from higher income as well as the inequality of income distribution depicted by incidence of poverty. Higher daily growth rate in mortality from COVID 19 infection is also positively associated with population, as growth rate in mortality from COVID is higher in large, populous countries like U.S.A, Brazil, United Kingdom, India etc. On the other hand, there exist some evidences of negative influences of development of health infrastructure on incidence and growth of mortality across countries. So finally it can be said that affluence and modernization of human societies cannot minimize the vulnerability of human societies to unforeseen disasters. But possibly greater public spending on human resources, reduction in social inequality and more sustainable developmental strategies can improve the resilience of the societies.

Appendix – I

Particulars	Source /URL
Fatalities	WHO; https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/
Per Capita GDP (PPP)	The World Bank; URL : https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD
Population	The World Bank; URL: https://data.worldbank.org/indicator/SP.POP.TOTL
Population Density	The World Bank; URL: https://data.worldbank.org/indicator/EN.POP.DNST
Percentage of population below lower poverty	The World Bank; URL : https://data.worldbank.org/topic/poverty

Gender ratio	Central Intelligence Agency; URL : https://www.cia.gov/library/publications/the-world-factbook/fields/351.html
Trade Openness Index	The World Bank; URL : https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS
Urban Population	The World Bank; URL : https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS
HAQI	Oxford Martin school; URL:https://ourworldindata.org/grapher/healthcare-access-and-quality-index?tab=table&time=2015..

All data were collected on June 22, 2020

[All authors contributed to the study conception, material preparation, data collection and analysis. All authors read and approved the final manuscript.]

Conflicts of interest / Competing interests:

- The authors have no relevant financial and non-financial interests to disclose.
- The authors have no conflicts of interest to declare that are relevant to the content of this article.
- All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.
- The authors have no financial or proprietary interests in any materials discussed in this article.

Funding:

- This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical Approval:

- This is a national level socio-economic data based statistical study without the participation of any human or animal biological material. So no ethical approval is required.

Informed Consent:

- This study is not based on identifiable personal data. So the question of informed consent does not arise.

Reference list

Ahmed, F., Ahmed, N., Pissarides, C., & Stiglitz, J. (2020, APR 02). *Why inequality could spread COVID-19.* Retrieved SEPT 21, 2020, from THE LANCET Public Health: https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667(20)30085-2/fulltext#articleInformation.

Bai, J., & Perron, P. (1998). Estimating and Testing Linear Models with Multiple Structural Changes. *Econometrica, 66* (1), 47-78.

Bai, J., & Perron, P. (2002, October). Computation and analysis of multiple structural change models. *Journal of Applied Econometrics*.

Banerjee, A., Lumsdaine, R. L., & Stock, J. H. (1992). Recursive and Sequential Tests of the Unit-Root and Trend-Break Hypotheses: Theory and International Evidence. *Journal of Business & Economic Statistics, 10* (3).

Bates, D. I., Caroline Fenton, Gruber, J., Lalloo, D., Lara, A. M., Squire, S. B., et al. (2004). Vulnerability to malaria, tuberculosis, and HIV/AIDS infection and disease. Part 1: determinants operating at individual and household level. *THE LANCET Infectious Diseases* , 267-277.

Bhadra, A., Mukherjee, A., & Sarkar, K. (2020, AUG 24). *Impact of population density on Covid 19 infected and mortality rate in India.* Retrieved SEPT 22, 2020, from medRxiv: https://www.medrxiv.org/content/10.1101/2020.08.21.20179416v1.article-info.

Brown, C., Ravallion, M., & Walle, D. v. (2020, JUN 27). *The world's poor cannot protect themselves well from the novel coronavirus.* Retrieved SEPT 21, 2020, from VOXEU CEPR: https://voxeu.org/article/world-s-poor-cannot-protect-themselves-well-novel-coronavirus.

Carozzi, F., Provenzano, S., & Roth, S. (2020, JUL). Discussion Paper Series. *Urban Density and COVID-19* . Bonn, Germany: IZA Institute of Labour Economics.

Christiano, L. J. (1992). Searching for a Break in GNP . *Journal of Business & Economic Statistics*, 237-250.

Chuang, Y.-C., Huang, Y.-L., Tseng, K.-C., Yen, C.-H., & Yang, L.-h. (2015). Social Capital and Health-Protective Behavior Intentions in an Influenza Pandemic. *PloS one*.

Conti, P., & younes, A. (2020, APR). *Coronavirus COV-19/SARS-CoV-2 affects women less than men: clinical response to viral infection.* Retrieved MAY 18, 2020, from NCBI: https://www.ncbi.nlm.nih.gov/pubmed/32253888.

Coþkun, H., Yýldýrým, N., & Gündüz, S. (2020). The spread of COVID-19 virus through population density and wind in Turkey cities. *Science of The Total Environment*.

Desai, D. (2020, MAY 04). *Urban densities and the Covid-19 pandemic: Upending the sustainability myth of global megacities*. Retrieved MAY 18, 2020, from Observer Research Foundation: https://www.orfonline.org/research/urban-densities-and-the-covid-19-pandemic-upending-the-sustainability-myth-of-global-megacities-65606/.

Finch, W. H., & Finch, M. E. (2020). Poverty and Covid-19: Rates of Incidence and Deaths in the United States During the First 10 Weeks of the Pandemic. *frontiers in Sociology*.

Galea, S., Aherna, J., & Karpati, A. (2005). A model of underlying socioeconomic vulnerability in human populations: evidence from variability in population health and implications for public health. *Social Science & Medicine* , 2417-2430.

Glass, R. J., Glass, L. M., Beyeler, W. E., & Min, H. J. (2006). Targeted Social Distancing Designs for Pandemic Influenza. *Emerging Infectious Diseases*, 1671-1681.

Hamidi, S., Sabouri, S., & Ewing, R. (2020). Does Density Aggravate the COVID-19 Pandemic? *Journal of the American Planning Association*.

Kadi, N., & Khelfaoui, M. (2020). Population density, a factor in the spread of COVID-19 in Algeria: statistic study. *Bulletin of the National Research Centre*.

Kimball, A. M. (2006). *Risky Trade: Infectious Disease in the Era of Global Trade.* Aldershot: Ashgate Press.

Koh, H. K., & Cadigan, R. O. (2008). Disaster Preparedness and Social Capital. *Social Capital and Health*, 273-285.

Lai, C.-C., Wang, C.-Y., Wang, Y.-H., Hsueh, S.-C., Ko, W.-C., & Hsueh, P.-R. (2020). Global epidemiology of coronavirus disease 2019 (COVID-19): disease incidence, daily cumulative index, mortality, and their association with country healthcare resources and economic status. *International Journal of Antimicrobial Agents*.

Lee, V. J., Ho, M., Kai, C. W., Aguilera, X., Heymann, D., & Wilder-Smith, A. (2020). Epidemic preparedness in urban settings: new challenges and opportunities. *THE LANCET Infectious Diseases*, 527-529.

Mehta, S. (2020). Nutritional status and COVID-19: an opportunity for lasting change? *Clinical Medicine Journal, 20* (3), 270-273.

Neiderud, C.-J. (2015). How urbanization affects the epidemiology of emerging infectious diseases. *Infection Ecology & Epidemiology*.

Neto, R. A., & Melo, G. C. (2020, JAN 01). *Correlation between weather, population size and COVID-19 pandemic: a study of Brazilian capitals / Correlação entre clima, tamanho da população e pandemia da COVID-19: um estudo das capitais brasileiras.* Retrieved SEPT 22, 2020, from World Health Organisation: https://search.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/en/covidwho-678384.

Parks, V. (2020, APR 16). *eGROVE*. Retrieved MAY 18, 2020, from The University of Mississippi: https://egrove.olemiss.edu/population_brief/2/.

Poos, L. R. (2020, MAR 16). *Lessons from past pandemics: Disinformation, scapegoating, and social distancing*. Retrieved MAY 18, 2020, from BROOKINGS: https://www.brookings.edu/blog/techtank/2020/03/16/lessons-from-past-pandemics-disinformation-scapegoating-and-social-distancing/.

Powell, J., & Faulkner, C. (2020, APR 04). *Population Size Does Not Explain the High Number of Covid-19 Cases in the United States*. Retrieved SEPT 22, 2020, from The Cairo Review of Global Affairs: https://www.thecairoreview.com/covid-19-global-crisis/population-size-does-not-explain-the-high-number-of-covid-19-cases-in-the-united-states/.

Price-Smith, A. (2008). Review on "Risky Trade: Infectious Disease in the Era of Global Trade". *Emerging Infectious Diseases*, 1678-1679.

Reyes, R., Ahn, R., Thurber, K., & Burke, T. F. (2012). Urbanization and Infectious Diseases: General Principles, Historical Perspectives, and Contemporary Challenges. In F. I., *Emerging Infectious Diseases of the 21st Century* (pp. 123-146). New York: Springer.

Roy, S. (2020). Low-income countries are more immune to COVID-19: A misconception. *Indian Journal of Medical Sciences*, 5-7.

So, M. K., Tiwari, A., Chu, A. M., Tsang, J. T., & Chan, J. N. (2020). Visualizing COVID-19 pandemic risk through network connectedness. *International Journal of Infectious Diseases*, 558-561.

Tauberg, M. (2020, JUL 19). *Comparing Coronavirus Economic and Health Impacts Across Nations: A Simple Multivariate Analysis of the Covid Pandemic.* Retrieved SEPT 21, 2020, from towards data science: https://towardsdatascience.com/comparing-coronavirus-economic-and-health-impacts-across-nations-ef8e4ea52741.

UNDP. (2020). *COVID-19 AND HUMAN DEVELOPMENT: Exploring global preparedness and vulnerability.* Newyork: UNDP.

Wakiaga, J. (2020, MAY 01). *COVID-19: Leveraging on social capital to 'Flatten the Curve' in Eritrea.* Retrieved MAY 18, 2020, from UNDP Africa: https://www.africa.undp.org/content/rba/en/home/blog/2020/covid-19—leveraging-on-social-capital-to-flatten-the-curve-in-e.html.

Wang, Z. (2006). The joint determination of the number and the type of structural changes. *Economics Letters, 93* (2), 222-227.

World Economic Forum. (2020, MAR 04). *Coronavirus isn't an outlier, it's part of our interconnected viral age.* Retrieved SEPT 22, 2020, from World Economic Forum: https://www.weforum.org/agenda/2020/03/coronavirus-global-epidemics-health-pandemic-covid-19/.

World Health Organisation. (2020, MAY 18). *WHO Coronavirus Disease (COVID_19) Dashboard.* Retrieved MAY 18, 2020, from World Health Organisation: https://covid19.who.int/.

Zeileis, A., Kleiber, C., Kramer, W., & Hoenik, K. (2003). Testing and dating of structural changes in practice. *Computational Statistics & Data Analysis , 44* (1), 109-123.

Zeileis, A., Leisch, F., Hornik, K., & Kleiber, C. (2002). Strucchange: an R package for testing for structural change in linear regression models. *Journal of Statistical Software , 7* (2), 1-38.

Zhang, X., Liu, H., Tang, H., Zhang, M., Yuan, X., & Shen, X. (2020, APR 22). *The Effect of Population Size for Pathogen Transmission on Prediction of COVID-19 Pandemic Spread.* Retrieved SEPT 22, 2020, from Cornell University: https://arxiv.org/abs/2004.10527.

Zivot, E., & Andrews, D. W. (1992). Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis. *Journal of Business & Economic Statistics , 10* (3), 251-270.

Labour Force Participation and Occupational Segregation by Gender in India

Panchanan Das[1] **Madhurima Saha**[2]

Abstract

This study analyses the employment distribution of the working age women by occupations across their activities in usual principal status in the periodic labour force survey for 2017-18 by taking into account household specific factors and workers' personal characteristics. There are some social customs which may have some influence in making decision on labour market participation, particularly by the women. In analysing the pattern of employment distribution we hypothesise that social status in terms of ethnicity, in many cases, determines the type of activity performed by a person, given other factors remain the same. The effects of personal and household specific factors on predicted probability of labour force participation have been estimated by using logit link function.The study infers that the decline of female participation in labour force at higher rate appears in India largely because of social factors like marital status and ethnic differences among the people. However, education plays a significant role in predicting employment in different occupation.

Keywords: Occupational segregation, gender, logit model, India

JEL Classification: J31, J24, J71

1. Introduction

The status of female employment in India has been the subject of research interest during the post-reform period. It is observed that women participation in the labour market declined gradually over different survey rounds on employment and unemployment conducted by the National Sample Survey Office (NSSO). The Economic Survey 2017-18 also points out that the proportion of working women has reduced over time. NSSO 68th round report no. 554(68/10/1) tells us that the population in the age group 15-59 years, which is considered to be economically active, comprised about 60 per cent of males and 61 per cent of females in rural areas and about 66 per cent each of males and females in urban areas. For females,

1. Professor of Economics, University of Calcutta, 56A, B.T. Road, Kolkata-700050
2. Research Scholar, Department of Economics, University of Calcutta

LFPR was about 25 per cent in rural areas and about 16 per cent in urban areas. The studies are showing that female labour force participation is declining over the years. Despite the availability of jobs, in many cases women face various constraints in participating in the labour market by the social, religious and cultural factors.According to the feminisation U hypothesis, in the development process, female labour force participation first declines and then rises. The hypothesised mechanisms for the decline are rising incompatibility of work and family duties as the workplace moves away from agriculture and the home, income effect of husband's earnings, and stigma against females working outside of home (in other new sectors). The rising portion then comes with receding stigma, high potential earnings of females as their education improves further, as well as decline in fertility, and better options to combine work and family duties.

Conventionally, supply side analysis of the labour market uses differences in human capital accumulation between men and women as the major explanatory factor for gender differences in job choices and wages.But, gender gap in educational attainment has been reducing over time and today, in many cases, the education gap has reversed in favour of women. Thus, occupational differences by gender cannot be explained fully by the differences in human capital variables like education and experience between men and women.

In India, as an economy transforms from an agricultural economy to an industrial economy, a decline in participation of female labour force is observed. There are extensive studies that have looked at the issue of female employment in India .Most of the studies have shown the declining female labour force participation over the years. Verick (2017) mentioned that increased enrolment in secondary school is a factor behind the decline in LFPR, though it hasn't been the main driver since the fall is also evident among prime-age women. At the same time, educational attainment is a key determinant of labour market outcomes – this is reflected in both the differences in female LFPR across education categories and the types of jobs women can access. According to him while Indian women have withdrawn from traditional roles in agriculture, there have been insufficient job opportunities for women in fast-growing sectors, which has been the case in other Asian countries, including Bangladesh. Dasgupta and Verick (2016), focused on four key drivers of the decline of the female labour force participation: firstly, increased enrolment in secondary schooling; secondly, rising household incomes, which pulled women out of the drudgery of agricultural labour; thirdly, mismeasurement of women's participation in the labour force; and finally, the lack of employment opportunities for women in the non-farm sector. Sarkar et.al (2017) using individual level panel data for 2005 and 2012 from the India Human Development Survey (IHDS) showed that women are not only participating less in the labour force, but also dropping out at an alarming rate. They investigated

the determinants of women's entry into and exit from employment and found that an increase in income of other members of the household leads to lower entry and higher exit probabilities of women. Klasen and Pieters(2015)investigated that why female labour force participation (FLFP) in urban India stagnated despite rising education levels and rapid economic growth using individual level cross-section data spanning the period 1987 to 2011.Kyandar(2020) studied the effect of India's trade liberalisation on female labour force participation in the manufacturing sector using two rounds of the Indian Employment and Unemployment Survey to evaluate the effect of rising manufacturing imports over the time period 1987 - 2000 and revealed that import exposure is positively related to higher employment levels for women in the manufacturing sector, especially in export-oriented industries which employ a large number of female workers. Majumdar (2012)argued that there have been many proximate determinants at individuals, households and state level which affect as well as constraints for women regarding their decision related to work participation.

Most of the studies available in the early literature have attributed mainly the pattern of occupational segregation by gender by looking into the differences in human capital accumulation and examine the incidence of discrimination across occupations. In recent literature, gender differences in preference for job attributes has been suggested as a potential explanation for gender differences in occupational choice. Recent studies have used gender differences in cognitive skills in analysing the differences in occupations and wages between men and women (Bertrand, 2011). It is observed that women have a comparative advantage in cognitive relative to manual skills, and these facts are likely to explain why women are absorbed more in cognitive intensive jobs (Welch, 2000). Deshpande et.al (2015) tried to explore the gender wage gaps among Regular Wage/Salaried workers in India using the nationally representative data from the Employment-Unemployment Surveys in 1999-2000 and 2009-10. They revealed that over the decade, while the wage earning characteristics of women improved relative to men , the discriminatory component of the gender wage gap also increased. It was noted that in 2009-10, if women were 'paid like men' they would have earned more than men on account on their characteristics. Das and Kotikula (2019) discussed the factors that drive employment segregation and suggested some policy prescriptions those are highly dependent on local context, government policies are most likely to be effective if they strategically address the supply-side and demand-side constraints that are binding for a particular context.

In this study, we measure occupational segregation with unit level data from periodic labour force survey (2017-18) in India.In India women participation in labour market has been declining even during the high growth regime. Structural reforms towards more services sector growth and increase in tertiary education have failed to push women into the labour force, and

female participation rates in the labour market declined substantially.On the other hand, participation of women outside the labour market, particularly in domestic activities of different types increased over the survey rounds on employment and unemployment in India.It is reported in the NSSO No. 518(61/10/4)that 54 per cent of women in rural areas and 58 per cent in urban areas have constrained to participate in the labour market as there are 'no other member to carry out the domestic duties'. Social and/or religious constraints' was the reason reported by about 19 to 20 per cent of the women. Another 7 to 8 per cent of the women were required to spend most of their days on domestic duties as they could not afford hired help. SEconomic survey 2020 reported that 60 per cent of women in India in the productive age bracket of 15-59 years are engaged in full-time housework. Mukherjee and Mazumdar (2020) observed that men are more into remunerative and recognized work and women shoulder the burden of unpaid and often unrecognised forms of work which weakens their bargaining power within the family and even in the society.

Though the Indian economy is moving towards the path of development and the contribution of service sector is increasing to GDP as well as the participation of workers but still involvement of male workers are found to be higher than female workers in maximum service sector jobs. Very few jobs are there where participation of females are higher than males. According to PLFS data 2017-18in rural areas, about 55 per cent of the male workers and 73.2 per cent of the female workers were engaged in the agricultural sector. The proportions of male and female workers in rural areas engaged in 'construction' sector were 14.5 per cent and 5.3 per cent respectively. The proportions of male and female workers in rural areas engaged in 'manufacturing' sector were 7.7 per cent and 8.1 per cent respectively. In urban India, during 2017-18, among male workers, the industry sector, 'trade, hotel and restaurant' sector engaged about 24.5 per cent while 'manufacturing' and 'other services' sectors accounted for about 22.4 per cent and 21.5 per cent, respectively. Among female workers in the urban, 'other services' sector (other than 'trade, hotel & restaurant' and 'transport, storage & communications') shared the highest proportion of workers (44.4 per cent), followed by 'manufacturing' (25.2 per cent) and 'trade, hotel and restaurant' (13 per cent). According to Verick (2017) Indian women have withdrawn from traditional roles in agriculture but there have been insufficient job opportunities for women in fast-growing sectors. The author also mentioned that women are entering the labour force in larger numbers in some states, such as Tamil Nadu, where the garment industry has become a large employer of women workers.

This observed fact is contrasting to the experiences of structural reforms and opening of the economy of other countries.The fall in female labour participation rates is assumed to be reflected by the changes in occupational structure. The present study attempts to examine this

phenomenon by using labour force survey data in India.There are some demand side factors in the labour market that also determines the type of job of the worker. Demand for labour is generated form the producers' characteristics like workers' productivity, market conditions of the product produced by the firm and so on. But, because of lack of data, it is highly difficult to capture those factors in analyzing occupational pattern and ultimately the wage rate. As the data from periodic labour force survey cover only workers' characteristics, we focus on supply side of the labour market to analyse gender wage inequality.

This study analyses the changes in employment distribution of the working age women by their activities in usual principal status over two survey rounds on employment and unemployment in 2004-05 and 2011-12 and periodic labour force survey for 2017-18 by taking into account the household specific factors and personal characteristics. There are some social customs which may have some influence in making decision on labour market participation, particularly by the women. In analysing the pattern of employment distribution we hypothesise that social status in terms of ethnicity, in many cases, determines the type of activity performed by a person, given other factors remain the same.The basic hypothesis tested in this study is that the persons in vulnerable social group are not in gainful employment in terms of pay and job related other benefits. A Binary logit model is performed to analyse whether they would participate in the labour market or not and the possible factors that will affect their participation in the labour market using PLFS 2017-18 data.

The rest of the study is organised as follows.Section 2 describes the data used in this study. Econometric methodology used in empirical analysis is provided in short in section 3 with the discussion of some observed facts of labour force participation and worker population ratio in usual status of employment. A logit model of labour force participation is estimated and the results are analyzed in this section. Section 4 mainly analyses the distribution of employment activities across occupations and measures occupational segregation using a gender segregation index. Section 5 summarises and concludes.

2. The data

The primary source of information used in this study on economically active population at the household level is employment and unemployment survey (EUS) and recently available periodic labour force survey (PLFS) conducted by the National Sample Survey Office (NSSO). On the basis of the recommendation of the Task Force formed in 2017, the EUS was replaced by the PLFS. In schedule 10 of the survey round, activity status is classified into 13 groups consisting mainly different forms of self-employment, wage employment and other activities. Here persons who are either employed or unemployed during the reference period together

constitute the 'labour force' and persons who are neither 'working' nor 'seeking or available for work' for various reasons during the reference period are considered to be 'out of labour force'. The persons under this category are students, those engaged in domestic duties, rentiers, pensioners, recipients of remittances, those living on alms, infirm or disabled persons, too young or too old persons, prostitutes, etc.

Self-employed are those who operate their own farm or non-farm enterprises or are engaged independently in a profession or trade. The self-employed are further categorised into own-account workers, employers and unpaid workers in household enterprises. Wage employment is divided into regular wage employment and casual employment. Regular wage workers are those who work in other's farm or non-farm enterprises of household or non-household type and get salary or wages on a regular basis, not on the basis of daily or periodic renewal of work contract. This category not only includes persons getting time wage but also persons receiving piece wage or salary and paid apprentices, both full time and part time. On the other hand, a person working in other's farm or non-farm enterprises, both household and non-household type, and getting wage according to the terms of the daily or periodic work contract is a casual wage labour.

3. Labour Force Participation – Estimating Logit Model

3.1 Some observed facts

Female labour force participation[1] has been declining over the survey rounds on employment and unemployment, and also in periodic labour force survey in India both for men and women, but at a significantly higher rate for women (Tables 1 and 2). The rate of decline was faster for rural women than among urban women during the period between 2011-12 and 2017-18. The female labour force participation rate came down significantly for the young age (15-29 years) group as compared to the other age cohorts. Around one fifth of the urban female and one fourth of the rural female were in the labour market either as employed or unemployed in 2017-18, and the share was much less for young women. Dasgupta and Golder(2005) using NSS data for 1999-2000 found that supply of female labour from below poverty line households in rural areas is inversely related to wage rate and the number of earning members in the family which may create difficulties in attaining the objectives of the recent National Rural Employment Guarantee Scheme and . By following the similar types of declining trend, only around 13 and 14 percent of the young women were participated as worker in 2017-18 in urban and rural India respectively. The rise in enrolment rate in higher education,

[1] the share of working-age women who report either being employed, or being available for work

increasing household income and lack of job opportunities for women are cited in the literature as the probable explanatory factors for declining female labour force participation rate (Mehrotra and Sinha, 2017; Klasen and Pieters, 2013; Lahoti and Swaminathan, 2013). While the fall in women's workforce participation is explained partly by higher enrolment rates in higher education indicating that more young women are in higher education rather than working or looking for jobs, the data also points to a fall in working rates for older women.

Table 1 Labour force participation rate in usual status of employment

	15-29 years				15 years and above			
Survey	Rural		Urban		Rural		Urban	
period	male	female	male	female	male	female	Male	female
2004-05	77.2	42.8	68.3	21.7	85.9	49.4	79.2	24.4
2011-12	64.9	27.1	60.7	18.1	81.3	35.8	76.4	20.5
2017-18	58.9	15.9	58.5	17.5	76.4	24.6	74.5	20.4

Source: Statement 8, Annual Report: PLFS, 2017-18

Table 2 Worker population ratio in usual status of employment

	15-29 years				15 years and above			
Survey	Rural		Urban		Rural		Urban	
period	male	female	male	female	male	female	Male	female
2004-05	74.2	41	62.3	18.4	84.6	48.5	76.3	22.7
2011-12	61.6	25.8	55.8	15.7	80	35.2	74.1	19.5
2017-18	48.6	13.8	47.6	12.8	72	23.7	69.3	18.2

Source: Statement 11, Annual Report: PLFS, 2017-18

We have demonstrated in Tables 1 and 2 that labour market participation for women was very low and it has been declining. Now we are analyzing participation in labour market either as employed or unemployed in probabilistic sense by estimating logit model. We assume that, along with human capital of a person, household's economic condition, dependency ratio, marital status and social group of a person have influence on entry into the labour market. Estimates are done by using PLFS data in which year of formal education is available and it is used to measure education level of a person. By following the literature on human capital theory, person's age and its square value are used as possible explanatory variables. Vocational training is a dummy variable constructed based on whether a person has vocational training

or not. Household's economic condition is measured by per capita consumption expenditure of the household. The ratio of number of persons below 15 years and above 65 years to household size measures dependency ratio of the household. Marital status and social groups are incorporated in terms of dummy variables.

Table 3: Percentage distribution of social groups across gender in 2017-18

	ST		SC		OBC		Others	
	15-65	15-29	15-65	15-29	15-65	15-29	15-65	15-29
Male	51	51	52	54	51	52	51	52
Female	49	49	48	46	49	48	49	48

Source: Author's own calculation from Annual Report: PLFS, 2017-18

Table 3 depicts the distribution of social groups between working age males and females during the period 2017-18 which reports that higher percentage of working males and than working females for all the social groups. Relative to others social groups the percentage of SC caste male workers are higher for both the age cohorts but opposite can be seen in case of female workers.

Table 4: Percentage distribution of marital status across gender in 2017-18

	Never Married		Currently Married		Widowed		Divorced/Separated	
	15-65	15-29	15-65	15-29	15-65	15-29	15-65	15-29
Male	62	61	48	33	17	20	35	28
Female	38	39	52	67	83	80	65	72

Source: Author's own calculation from Annual Report: PLFS, 2017-18

From table 4 , we can observe the marital status of males and females for the age cohorts 15-65 and 15-29. It is observed that percentage of unmarried males belongs to both of these age cohorts are higher whereas maximum working age females are either widowed or divorced/ separated.

Table 5:-Percentage Distribution of working age and younger age people whether they are receiving vocational training or not

	Received formal training		Not received formal training		Self-learning		Learning on the job		Others		Did not receive any training	
	15-65	15-29	15-65	15-29	15-65	15-29	15-65	15-29	15-65	15-29	15-65	15-29
Male	55	54	70	73	68	67	83	83	54	49	49	51
Female	45	46	30	27	32	33	17	17	46	51	51	49

Source: Author's own calculation from Annual Report: PLFS, 2017-18

From the above table 5 , it is found that maximum working age male workers have received the training during their job whereas in case of working age female workers maximum have not received any kind of training and a very small percentage of females received training during their job from where we can infer the backwardness of female workers from participation in the labour market.

3.2 Logit estimation

We analyse the effects of personal and household specific factors on predicted probability of labour force participation by using logit link function to conceptualise gender differential in declining rates of labour market participation in India. We assume that, along with human capital of a person, household's economic condition, dependency ratio, marital status and social group of a person have influence on entry into the labour market. Estimates are done by using PLFS data in which year of formal education is available and it is used to measure education level of a person. By following the literature on human capital theory, person's age and its square value are used as possible explanatory variables for entry into labour market. Vocational training is a dummy variable constructed based on whether a person has vocational training or not. Household's economic condition is measured by per capita consumption expenditure of the household. The ratio of number of persons below 15 years and above 65 years to household size measures dependency ratio of the household. Marital status and social groups are incorporated in terms of dummy variables.

Suppose that

$$y_i^* = \acute{x}_i\beta + \varepsilon_i \qquad (1)$$

Here y_i^* is the net benefit to person i from participating in labour force which cannot be observed. But we can observe the outcome having the following decision rule:

$$y_i = \begin{matrix} 1 & \forall y_i^* > 0 \\ 0 & elsewhere \end{matrix}$$

We have constructed a binary response variable y_i which is equal to unity if a person is in labour market either as employed or as unemployed and is zero elsewhere. The vector $\hat{x}_i$ includes all explanatory variables as mentioned above, $\hat{a}$ is the corresponding coefficient vector, and ε_i is the random error.If the distribution of $\hat{a}$ is logistic we have the logit model.

Table 6 presents the estimated coefficients of the logit model along with the marginal effects for working age and young age males and females. Marginal effects of the explanatory variables is a useful way to describe the average effect of changes in explanatory variables on change in the probability of outcomes in logistic regression. We have constructed a binary response variable which is equal to unity if a person is in labour market either as employed or as unemployed and is zero elsewhere. Among the young age people higher is the level of education lower is the probability to enter into the labour market may be because they want to continue for further education keeping away themselves from the labour market. Higher the age of a person, on the other hand, induces more for entry in to labour market either for searching a job or in job, and the age effect is higher for men than for women. Diminishing effect of age on labour market participation is effective in our estimation.

Having vocational training of a person enhances the chance of performing labour market activities more for women than for men. If one extra working age male receive vocational training then then the probability of entering into the job market increases by 0.1 and if an extra working age female receive vocational training then the probability of participating increases by about 0.2 that means the responsiveness is higher for working age women. Economic condition of the household has very little effect on probability of entry into the labour market of a person. Similarly, the effect of dependency ratio is found to be insignificant even among the women. Married women have lower chance for entering into labour market, but marriage premium for it is positive for men. Since labour force participation rates differ substantially between male and female workers, this may be signalling that womenare likely to drop out of the labour force once they engage in marriage. The margins of the variable marriage for the younger age women is -0.05 and for the working age women is -0.11 which means if one additional women get married from the age cohort 15-29 then the probability of participating in the labour market decreases by 0.05 and if one additional women get married from the age cohort 15-65 then the probability decreases by 0.11. Differences among social groups in labour force participation are different between men and women. The probability for labour

force participation is higher for general castes, other backward castes and scheduled castes than that for scheduled tribes among working age as well as young age males. For females, on the other hand, the pattern of differences among social groups is just opposite.

Table 6 Logit estimation of labour force participation with marginal impacts

Explanatory variables	Age 15 to 65				Age 15 to 29			
	Margins (dy/dx)	Men	Margins (dy/dx)	Women	Margins (dy/dx)	Men	Margins (dy/dx)	Women
Intercept		-9.22***		-8.07***		-15.47***		-14.19***
Year of schooling	-0.02	-0.12***	-0.00009	-0.0007	-0.06	-0.25***	-0.002	-0.03***
Age	0.08	0.63***	0.06	0.42***	0.32	1.29***	0.06	0.95***
Age^2	-0.001	-0.01***	-0.0006	-0.01***	-0.005	-0.02***	-0.001	-0.02***
Vocational training	0.1	0.79***	0.15	1.10***	0.31	1.26***	0.11	1.48***
Household's economic health	-0.000001	-0.00001***	-0.000002	-0.00002***	-0.000004	-0.00002***	-0.0000009	-0.00001***
Dependency ratio	0.009	0.07	-0.001	-0.01	-0.0008	-0.003	0.009	0.13
Married	0.22	1.73***	-0.11	-0.80***	0.44	1.80***	-0.05	-0.64***
SC	0.02	0.13***	-0.04	-0.27***	0.05	0.22***	-0.04	-0.40***
OBC	0.02	0.17***	-0.07	-0.46***	0.07	0.29***	-0.04	-0.52***
General	0.02	0.17***	-0.1	-0.74***	0.07	0.31***	-0.05	-0.65***
Number of observation	72552	70200	30621	27873				
LR X^2 (10)	40537	7294.01	16685	2332.5				
Prob > X^2	0	0	0	0				
Pseudo R^2	0.465	0.104	0.397	0.121				

Source- Author's own calculation from PLFS 2017-18 dataset

4. Distribution of employment

The Report on periodic labour force survey clearly demonstrates that women participation is less than one third of men's participation in the Indian labour market. Self-employment has been the dominating part followed by employment in casual wage and regular wageboth for men and women workers in rural India (Table 7). Within self-employment, a major part of the women worked as unpaid family worker. As unpaid family workers contribute to economy's production without receiving any pay, they are in more vulnerable situations. In urban economy,

on the other hand, the major part of the workers are in regular wage employment and this part has been rising both among men and women workers, but at a higher rate for women over different survey rounds (Table 7). In casual wage employment, a major part of the women workers are absorbed in domestic work activities like maids and cooks, beauty and wellness service activities, and in call centres. In most cases their working conditions are alarming.

Table 7 Percentage distribution of workers in usual status

	Male			Female		
	Self-employed	Regular wage employees	Casual labour	Self-employed	Regular wage employees	Casual labour
Rural						
2004-05	58.1	9	32.9	63.7	3.7	32.6
2011-12	54.5	10	35.5	59.3	5.6	35.1
2017-18	57.8	14	28.2	57.7	10.5	31.8
Urban						
2004-05	44.8	40.6	14.6	47.7	35.6	16.7
2011-12	41.7	43.4	14.9	42.8	42.8	14.3
2017-18	39.2	45.7	15.1	34.7	52.1	13.1

Source: Statement 15, Annual Report: PLFS, 2017-18

The proportion of women workers in regular salaried employment who did not have any written job contract increased in 2017-18 as compared to the share in 2011-12 (Table 8). The situation of women employment of this type is more alarming in urban location than in rural areas. The PLFS Report demonstrates that, in 2017-18, more than half of regular salaried women workers did not have any social security benefits, and the incidence was more among rural women than among urban women. Incidence of informalisation of employment is very high in any indicator of informalisation (Table 8). The share of employment without any written job contract has been rising significantly over different survey rounds.

Table 8 Informal employment among workers in usual status

Survey period	No written job contract				Not eligible for paid leave				Not eligible for social security benefits			
	Rural		Urban		Rural		Urban		Rural		Urban	
	male	female	male	female	male	female	male	Female	male	female	male	female
2004-05	59.4	56.8	58.6	61.2	58.1	47.9	53.1	51.8	51.9	55.1	47	50.1
2011-12	65.4	61.9	64.4	65.9	51.7	48.1	49.5	49.1	56.8	63.4	53.5	56.2
2017-18	71.7	58.5	72.7	71.4	47.3	48.7	44.8	48	55.5	60.8	51.9	59.6

Source: Statements 19, 20 and 21, Annual Report: PLFS, 2017-18

In the rural economy, the workers, both of men and women, were absorbed mainly in agriculture and fishing, and in elementary occupations, and the shares were much higher for women than for men (Table 9). In the urban economy, on the other hand, the occupations are relatively scattered across the occupation groups, but still the major occupations were elementary occupations, particularly for women.

Table 9 Percentage distribution of workers in usual status by broad occupation

NCO 2004	Rural				Urban			
	Male		Female		male		female	
	2011-12	2017-18	2011-12	2017-18	2011-12	2017-18	2011-12	2017-18
Legislatures and executives	4.2	5.1	2	2.9	17	15.4	10.8	9.8
Professionals	1.9	2	1.1	1.8	8.1	8.4	11.6	13.1
Technicians	1.8	2	1.9	4	6	6.6	9.5	11.7
Clerks	1	1.2	0.3	0.4	4.9	4.1	5	4.8
Service workers	5.6	7	2.7	4.1	15.4	16.6	11.5	15.3
Skilled agricultural workers	38.8	40.5	47.9	47.1	4.1	3.8	6.4	4.9
Craft and related trades workers	11	10	10	6.6	19	18.8	19.9	16.7
Plant and machinery operators	4.1	5.6	0.6	0.5	10.8	11.1	2.7	1.9
Elementary occupations	31.4	26.5	33.3	32.6	14.5	15.2	22.5	21.9

Source: Statement 17, Annual Report: PLFS, 2017-18

Table 10 displays two- way distribution of men and women workers by occupation and status of activity in 2017-18. The distribution of employment by activity status are not similar in every occupation among men and women. Legislatures and executives are mostly own account workers both among men and women workers. Professionals and technicians, on the other hand, are mostly regular wage employees. The shares of women in regular wage employment in these occupations are significantly higher than men. The distribution of persons in clerical jobs is roughly similar for men and women, and they are mostly in regular wage employment. Service related work like selling are mostly own account and regular wage payment in nature, and the incidence of regular wage workers in this occupation is high among women workers. While the share of skilled agricultural workers among men is very high (more than 73 percent) in own account work, more than 68 percent of women workers in this occupation are unpaid family worker. The majority of the craft workers and trade related workers among women are own accounting type, but the distribution of men workers in this occupation in significantly different. While the dominating part of machine operators is regular wage workers, the most part of workers in elementary work are in casual wage employment in the private sector both for men and women.

Table 10 Employment distribution by activities across occupations

Activity status / Occupation type	own account worker	employer	unpaid family worker	regular wage worker in public sector	casual wage worker	casual wage worker in private sector
Men						
Legislatures and executives	64.29	9.48	6.58	19.11	0.15	0.39
Professionals	30.00	2.55	1.82	63.85	0.12	1.66
Technicians & associate professionals	15.32	1.02	0.69	81.34	0.05	1.57
Clerks	2.89	0.35	0.07	96.19	0.07	0.42
Service workers and shop and market sales workers	46.02	2.40	6.50	41.84	0.10	3.13
Skilled agricultural and fishery workers	73.74	2.60	20.05	1.03	0.06	2.52

Contd...

Table 10 (Contd...)

Craft and related trades workers	30.46	1.96	3.75	28.24	0.97	34.61
Plant and machinery operators and assemblers	34.10	0.56	1.45	54.00	0.36	9.52
Elementary occupations	14.55	0.39	2.14	15.43	2.30	65.19
Women						
Legislatures and executives	58.86	2.44	21.14	16.42	0.00	1.14
Professionals	12.19	0.29	2.46	84.56	0.10	0.39
Technicians & associate professionals	4.96	0.34	0.51	93.50	0.17	0.51
Clerks	3.34	0.28	0.00	96.38	0.00	0.00
Service workers and shop and market sales workers	29.70	0.89	13.32	51.33	0.08	4.68
Skilled agricultural and fishery workers	27.71	0.80	68.48	0.37	0.16	2.47
Craft and related trades workers	52.64	0.85	13.69	14.80	2.47	15.56
Plant and machinery operators and assemblers	29.13	2.36	11.02	41.73	2.36	13.39
Elementary occupations	4.05	0.08	4.57	19.06	5.76	66.47

Source: As for Table 6

4.1 Measuring occupational segregation

We measure Duncan and Duncan (1955) index to provide an objective measure of occupational structures of males and females:

$$D = \frac{\sum_{j=1}^{n} |M_j - F_j|}{2} \qquad (2)$$

Here, M_j is the employment share by males and F_j the share by females in occupation *j*.The index ranges between 0 and 1.If the distributions of men and women across occupations are identical, the index would be 0. If, on the other hand, all occupations are completely performed by either men or women, the index will be 1t means that 0 indicates perfect gender integration within the workforce and 1 indicates complete gender segregation within the workforce.

The segregation index may decline either because of changes in sex composition within occupations, or because of the shifts in the occupation mix of the economy away from predominantly male or predominantly female occupations. The sex composition within occupation change when either women enter the male-dominated occupations, or men enter the female-dominated occupations. We can decompose the change in segregation into a component that captures changes in sex composition, and a component that captures changes in the occupation mix.

Table 11 Gender segregation index across employment status by occupation

	Proportion of male	Proportion of female	Dissimilarity index
Legislatures and executives	0.87	0.13	0.16
Professionals	0.70	0.30	0.21
Technicians	0.65	0.35	0.12
Clerks	0.80	0.20	0.01
Service workers	0.84	0.16	0.18
Skilled workers in agriculture	0.74	0.26	0.48
Craft and related trades workers	0.86	0.14	0.34
Plant operators	0.97	0.03	0.18
Elementary occupations	0.75	0.25	0.10
All	0.79	0.21	0.22

Source: As for Table 6

From the table 11 it can be seen that almost in all the occupation types proportion of male workers are higher than the proportion of female workers. Under these categories of occupation, the proportion of male workers is highest in the plant operators occupation type and obviously it is lowest for female workers. If we look into the dissimilarity index by each occupation, it can be seen that it is highest for the occupation type group skilled agricultural workers whereas it is lowest for clerk group. This means that gender segregation is lowest in the clerical occupation type and this segregation is highest in the plant operators occupation types across all the occupations.None of the occupation dissimilarity index is approaching very nearer to 1and the overall index is also 0.22 which implies that none of the occupation type reflects high gender segregation during the period 2017-18.

5. Conclusions

We measure occupational segregation and examine its implications in analysing gender differences in occupation. Possible sources of gender differences in occupation are located by estimating the relationship between occupational characteristics and occupational choice in probabilistic sense. The effects of personal and household specific factors on predicted probability of labour force participation have been estimated by using logit link function. It is observed that additional year of schooling has negative effect on predicted probability of labour force participation indicating labour market distortion in the form of severe job scarcity or the predominance of some unobserved factors not related to labour productivity. Non-availability of quality jobs matching with level of education or suitable job conditions particularly for females induces young age people out of labour force. The study infers that the decline of female participation in labour force at higher rate appears in India largely because of social factors like marital status and ethnic differences among the people.

The distribution of workers by employment status is not similar in every occupation among men and women. In this study we calculate the shares of men and women, and the gender specific dissimilarity index by employment type by using Duncan and Duncan (1955) index in each of the 9 occupational groups. Dissimilarity in distribution of workers by employment types between male and female is relatively less in elementary occupations, technicians, and the high paid occupation like legislatures and executives.

Some policy measures can be suggested in this regard which are: inclusive growth and job creation which can benefit specially females, educational attainment beyond secondary schooling needs to be promoted, along with vocational education and training, which, in turn, increases occupational choices for women, support should be given to reduce the time burden associated with unpaid household work through the provision of child care and elderly care, as well as

sharing of care responsibilities at the household level and finally written job contracts, safety of the female workers at the workplace and different social security benefits(including maternity benefit and child care leave) should be properly implemented in the every sector to remove the occupational discrimination and enhance the female labour force participation in India.

References

Bertrand, Marianne. (2011). "New Perspectives on Gender." In *Handbook of Labor Economics,* Volume 4b, edited by Orley C. Ashenfelter and David Card, 1545-1592. Amsterdam: Elsevier, Ltd.

Dasgupta, S and S Verick (eds.) (2016). "Transformation of Women at Work in Asia: An Unfinished Development Agenda." ILO/SAGE, Geneva/New Delhi.

Dasgupta, Purnamita and Bishwanath Goldar (2005) ."Female Labour Supply in Rural India: An Econometric Analysis." Working Paper No. 265, Institute of Economic Growth, New Delhi.

Das S and Kotikula A (2019). "Gender-Based Employment Segregation: Understanding Causes AndPolicy Interventions." Jobs Working Ppaer, Issue No. 26, World Bank.

Duncan, O. and Duncan, B. (1955). "A methodological analysis of segregation indexes". *American Sociological Review*, 20(2): 210-217.

Deshpande A , Goel D and Khanna S(2015). "Bad Karma or Discrimination? Male-Female Wage Gaps among Salaried Workers in India." Discussion Paper No. 9485, IZA.

GOI, 2007, Participation of Women in Specified Activities along with domestic duties, Report No. 518(61/10/4), National Sample Survey Office National Statistical Organisation, Ministry of Statistics &Programme Implementation.

GOI, 2014, Participation of women in specified activities along with domestic duties, Report No. 559(68/10/3), National Sample Survey Office National Statistical Organisation, Ministry of Statistics &Programme Implementation.

GOI, 2014, . Employment-Unemployment Situation in India, Round 68th, Report No. 554(68/10/1), National Sample Survey Organisation, Ministry of Statistics and Programme Implementation.

Klasen, S and J Pieters (2013): "What Explains the Stagnation Of Female Labor Force Participation in Urban India?." Discussion Paper No 146, Courant Research Centre, "Poverty,

Equity and Growth in Developing and Transition Countries: Statistical Methods and Empirical Analysis," August.

Kyandar E (2020). "Trade Liberalisation and Female Employment in Manufacturing: Evidence from India". CSAE Working Paper WPS/2020-22.

Klasen, S., & Pieters, J. (2015). "What explains the stagnation of female labor force participation in urban India?." *The World Bank Economic Review*, 29(3), 449-478.

Lahoti, R and H Swaminathan (2013): "Economic Growth and Female Labour Force Participation in India," Working paper No 414, Indian Institute of Management, Bengaluru.

Mehrotra, S. and S. Sinha (2017), "Explaining Falling Female Employment during a High Growth Period." *Economic and Political Weekly*, 53(39): 54-62.

Mukherjee N and Majumdar R (2020): "Cascading effect of increasing female employment in urban India". SSI-Quarterly , Volume:39, Issue:2 , pp:245-265.

Majumder R , 2012. "Female labour supply in India: proximate determinants". MPRA Paper No. 43250.

Sher Verick (2017), The paradox of low female labour force participation, Retrieved from http://www.ilo.org/newdelhi/info/public/fs/WCMS_546764/lang—en/index.htm

Sarkar S, Sahoo S and Klasen S (2017) . "Employment Transitions of Women in India: A Panel Analysis." IZA Institute of labour economics, IZA DP No. 11086.

Welch, Finis. (2000). "Growth in Women's Relative Wages and in Inequality among Men: One Phenomenon or Two?" *American Economic Review*, 90(2): 444-449.

A Study on Passenger Service of Indian Suburban Railways

Debojyoti Lahiri[1] **Sudakshina Gupta[2]**

Abstract

Infrastructure, more precisely transportation, as a major component of infrastructure plays a very important role in economic development of a country. Indian Railways (IR), being one of the world's largest transport networks, plays a key role in the communication and infrastructure in Indian economy. On one hand, a huge number of Indian people depend on the railways for travelling and on the other hand, Indian Railways carries a large amount of goods within the territory for different purposes. The railways are the most preferred mode of transportation for the suburban areas where a large number of passengers need to be moved to and from the metropolitan cities within certain fixed time. This paper aims at studying the growth of railway's revenue that it earns from suburban railways and how the increasing number of passengers and extension of route in the suburban railways are consistent with this growth in revenue. The paper has two specific objectives as – to study the relation between the passenger earnings and growth of Indian Railways, measured in terms of passenger kilometres, in suburban railways and to study the relation between passenger earning and number of passengers in the suburban areas, for the period from 1974 to 2018. The study uses trend analysis and time series regression methods to observe the relationships in interest. The results show that, although number of passengers travelling in local trains is sufficiently higher than that travelling in long distance ones, or its non suburban counterpart, in suburban railways, the number of passengers does not have a positive impact on the earnings from passengers. Finally the paper concludes by recommending a suitable restructuring of the fare.

Keywords: Urban Transportation, Indian Suburban Railways, Passenger Earning, Passenger Kilometres, Number of Passengers.

JEL Classification : C42, H41, L91, L92, O18

1. SACT-I, Sovarani Memorial College, Howrah, Research Scholar, Department of Economics, University of Calcutta

2. Professor, Department of Economics, University of Calcutta

Introduction

Economic development of an economy depends heavily on infrastructure. Availability of adequate infrastructure helps the economy by increasing the productivity and reducing the cost of production and also by expanding its trade, both domestic and international. Infrastructure, in an economy, includes several social overheads like transport, communication, power facilities etc. Transportation is one of the major components of infrastructure. A well developed transport facilities helps an economy to expand its trade by widening the market for both agricultural and industrial products. Transport can be categorised into two groups: Passenger Transport and Goods Transport. Transport serves as input to other productive services in the economy. So, it can be thought as an intermediate good (Bonavia, 1988).

During the last few decades, Developing Countries are witnessing rapid urbanization. Urbanization is visible in different parts of India as well.

Rapid urbanization in the developing countries calls for rise in rural-urban migration and, therefore, a well connected transport system. Moreover, increase in urban population, increased economic activities of the urban people leads to increase in income, which, in turn, leads to an increase in demand for transport as well as the transport ownership. Such an increased demand causes greater allocation of resources to the transport sector (Jacobs et al.).

The urban public transport sector in developing countries, are broadly characterized by a high growth rate, diversity as both motorised, non motorized and traditional, informal modes of transport are seen in urban areas, and in many cases poor financial performance. The urban transport in India consists of roads, suburban railways and waterways. Indian railways is owned and operated by Government of India.

Railway

Indian Railways (IR) was introduced in the year 1853 under the private ownership during the British colonial rule. It stands out as being not only one of the world's largest transport networks but also controlled entirely by the state alone, although, in recent times, private investments are being encouraged by the Government of India in different sectors of Indian railways. The Indian Railways also claims to be the largest employer in Asia.

Indian Railway plays a key role in the communication and infrastructure. On one hand, a huge number of Indian people depend on the railways for travelling and on the other hand, Indian Railways carries a large amount of goods within the territory for different purposes. Railways are generally said to be suited for carrying long distance traffic, especially, in heavy and bulk

commodities such as coal, minerals etc. Electricity driven railways are a non polluting source of transport for bulk carriage.

Since its inception, the activities of Railway have been increased in several phases and also Indian railways have gone through several systems of management and administration. Railway routes have been expanded, the goods traffic has been increased, and railway's track gauges have been converted. The expansion of railways caused increase in economic activities as well. Moreover, the number of passenger travelling through railways has also increased overtime.

Railway is the biggest mode of transportation of India and one of the world's largest networks, covering 115000 km of track over a route of 65000 km and 7500 stations.

IR operates both long distance and suburban rail systems. It works on a multi-gauge network of broad, metre and narrow gauges. In many parts of the country it owns locomotive and coach production facilities. In our country the railway system is spread up to 28 states and 7 union territories. It also connects some of the neighbouring countries like Nepal, Bangladesh and Pakistan with India.

The entire Indian Railway is divided into 17 zones: Central Railway, East central Railway, East Coast Railway, Eastern Railway, North central railway, North Eastern railway, North Western railway, North East Frontier Railway, Northern railway, South Central railway, South East Central railway, South Eastern railway, South Western railway, Southern railway, West Central railway, Western railway, Metro Railway.

As regional specialization began to occur, trade expanded. Railways linked the local centers and thus integrated the market by reducing the cost of transportation.

Almost 70 percent of IR's revenues come from the freight operations. Freight traffic can be segmented into bulk and other cargo. The bulk commodities bring 94 percent of the freight revenue. Among the bulk commodities, Coal alone accounts for nearly half of the bulk traffic carried. Passenger business, in terms of train kilometres, causes nearly 60 percent of IR's total transport effort, but it constitutes less than 30 percent of the total revenues. Suburban services account for 57 percent of the originating passengers, while contribute to only 8 percent of the passenger revenue (Raghuram & Gangwar, 2008). Indian Railways are better suited for the suburban areas.

Motivation of the Study:

Since 1854, IR has been serving as one of the most important modes of transportation in India. From the decades of 1960s till the present times, number of passengers travelling by

railways has increased by almost 4000 millions (Ministry of Railways, government of India). Moreover, the railway routes have also expanded manifold. IR connects the entire India. Although, freight traffic is the key source of railway's income and the passenger traffic is subsidised in many ways, such a huge increase in the number of passengers might have some effect on its earnings. Moreover, day-to-day experience says that, the suburban railways are over crowed by the passengers and the volume of the crowd is increasing day by day. The data (Ministry of Railways, government of India) also corroborates the fact. This gives motivations to study how the suburban passengers contribute to the earnings of Indian railways.

Literature Review

There are a large number of literatures on different aspects of transport economics and railways and particularly on IR. Some points out the role of transport as a determining factor of economic growth some show how IR impacts the growth of Indian economy, while some others examine the growth of IR, its revenue etc. Few of the literatures studied are discussed below.

Jenks. Leland H (1944), based on Scumpeter's theory of innovation shows that railroad contributed directly to the generation of National Income in America, through the rendering of transportation services.

Ramanathan and Parikh (1999), using cointegration approach and scenario analysis, projected that, in India, the passenger traffic is likely to grow at a rate more than 8 per cent and freight traffic at more than 5 per cent per year during 1990-2021.

Canning (1999) estimated an aggregate production function of Cobb-Douglas type using a panel data set of 77 countries for the period 1960-1990. The production function incorporated labor, physical capital, and human capital and infrastructure variables. The study found that the elasticity of output with respect to physical capital is around 0.37. However no significant impact of transportation structure was found on growth. But the study also mentions that, since these types of infrastructure capital have already been included in his physical capital stock, they have positive impact on growth.

Canning and Pedroni (1999), in a study over the period 1950-1992 found that on an average, paved roads are provided to the extent of growth maximizing level but there are incidences of undersupply as well as oversupply in some countries.

Christoph Wolff (2001) proposed that Indian Railways must separate some areas, such as manufacturing and catering, from its core business of providing service for freight customers and passenger service. However, India has the world's most vertically integrated rail system.

M. Kulshrestha, B. Nag and M. Kulshrestha (2001), in a study, taking data for the period 1960-1995, found a high GDP elasticity of freight transport demand and a low price elasticity of freight transport demand. The study also concludes that, any short run disequilibrium in the system is likely to be corrected in the long run via adjustment of GDP and freight transport demand.

Seetanath Boopen(2006), in an empirical study of both cross sectional and panel data analyses the impact of transport capital on economic growth, taking data for sub Saharan African Countries and Small Island Developing States for the period of 1980-2000. The study concluded that transport capital plays an important role in the economic progress of these countries. Further, the for the SSA set, the productivity of transport capital was found to be greater compared to the overall capital.

R. Prakash Pradhan (2010), in a study on Indian Economy, over the period 1970-2007, tried to investigate the relationship between transport infrastructure, energy consumption and economic growth. Using Cointegration and Granger causality tests, the study finds unidirectional causalities from transport infrastructure to economic growth, economic growth to energy consumption and transport infrastructure to energy consumption in India.

Sudakshina Gupta (2010) in her study showed that expansion in railway route has benefited the Indian Railways and the economy in general. The study also concluded that Indian railways have fallen in a severe crisis after its centralization.

Hong .J, Zhaofang Chu and Qiang Wang (2011), developed a comprehensive index to measure both qualitative and quantitative features of transport infrastructure for Chinese economy. The study finds that transport infrastructure has an important role in economic growth. The impact of both land and water transport is strong while that of the air transport is relatively weak. The study also shows that uneven distribution of transport infrastructure acts as one of the factors behind regional economic disparities in China

Abhijit Banerjee, Esther Duflo and Nancy Quain (2012), taking data on Chinese economy over the period 1986-2006 estimated the impact of access to transportation on regional economic outcomes. The paper provided a simple theoretical model and empirical verification of the predictions. The results show that, proximity to transportation network has a positive causal effect on per capita GDP levels.

Chengri Ding (2012), with data on Chinese economy for the period 1996-2004 studied the relationship between transport costs and economic concentration and tried to investigate the point effect and the network effect of transport. The study finds that development of urban roads leads to rising GDP shares in the city for both manufacturing and service sectors and there is a point effect for both urban roads and major regional roads in GDP. Further, the paper concludes that different types of transports have different economic impacts.

R. Prakash Pradhan and Tapan P. Bagchi (2013), taking data on Indian economy over the period 1970-2010, studies the effect of transport infrastructure on economic growth. The paper used Vector Error Correction approach to study the same. Rail and Road Transport was considered here. The study finds a unidirectional causality from rail transport to economic growth, from rail transport to capital formation, bidirectional causality between road transport and economic growth as well as between road transport and capital formation.

Research gap

Indian Railways serves a huge number of daily passengers. People from rural and suburban areas travel by local trains for the purpose of going to their workplaces, educational institutions, hospitals and other places. Urban people also travel by such local trains daily for the same purposes. These local trains are operated by suburban railways of IR. Indian suburban railways play an important role in constituting the transport network of urban India and also in connecting the villages with the cities. But the literature studied so far suggests that there has not been much extensive study on the growth of Indian suburban Railways.

Objectives

This paper aims at studying the growth of railway's revenue that it earns from suburban railways and how the increasing number of passengers and extension of route in the suburban railways are consistent with this growth in revenue. In particular, this paper has two main objectives:

(i) To study the relation between the passenger earnings and growth of Indian Railways, measured in terms of passenger kilometres, in suburban railways.

(ii) To study the relation between passenger earning and number of passengers in the suburban areas.

Data and Methodology

Data have been collected from Ministry of Railways, Government of India and Directorate of Economics and Statistics, Government of India on different indicators for both Suburban and non suburban section of Indian Railways like number of passengers originated measured in million, Passenger Revenue earned measured in million rupees, distance travelled by passengers measured in kilometres for the period 1974 to 2018. Data on Wholesale Price Index (taking 2010 as the base year) have been collected from Ministry of Commerce and Industry, government of India for the same period. To eliminate the inflationary effects from the financial data, the data have been deflated using the WPI numbers.

At first, trend analyses have been done.

Next, regression has been run using methods of time series econometrics taking earnings from passengers as the dependent variable and number of passengers and passenger kilometres as the two dependent variables, all the variables being specific to the suburban railways.

Results and Analyses

Graphical Trend Analyses:

Figure 1 shows that within the reference time period, both the number of passengers and the earnings from passengers have increased in the suburban section of Indian Railways. Here the passenger earnings from suburban railways have been deflated using the WPI numbers. The figure shows that both the variables deflated passenger earnings from suburban railways and number of passengers travelling in suburban railways has an upward linear trend. In case of passenger earnings, the trend line is steeper but in many cases the actual values deviate much from the trend values while the trend line fitted for the variable number of passengers is comparatively flatter but the fluctuations of the actual values from the trend value is very little. This says that the earnings of railways from passengers change more rapidly compared to the change in the numbers of passengers in the suburban section.

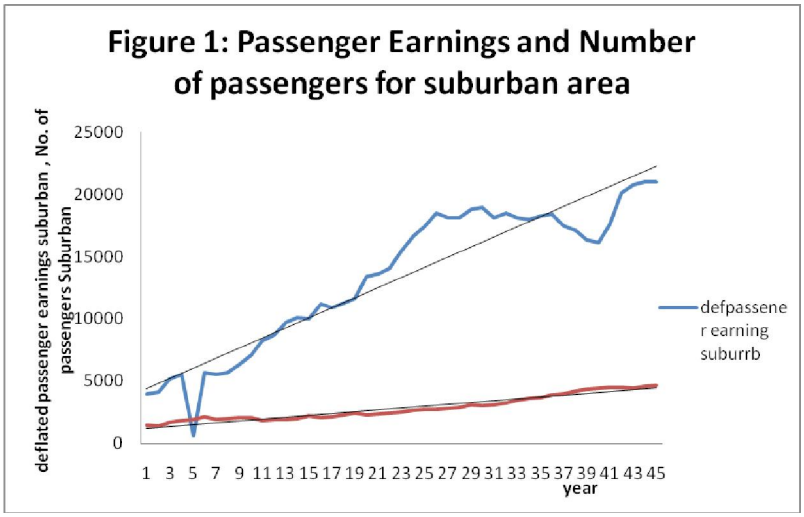
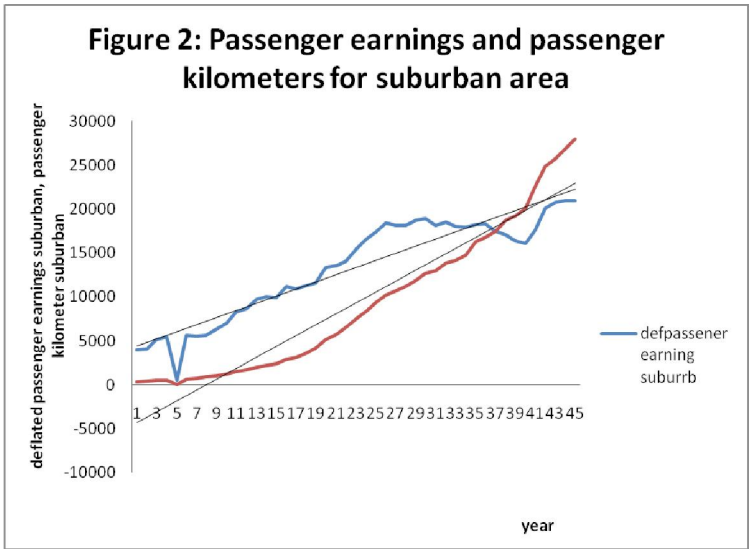
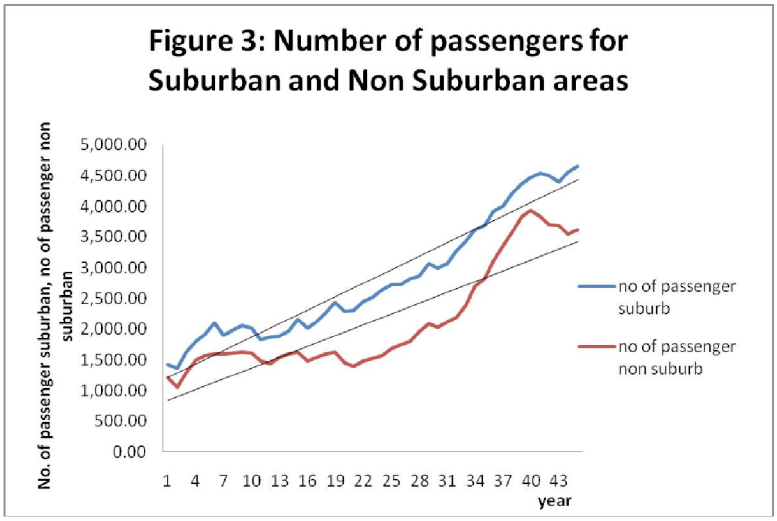
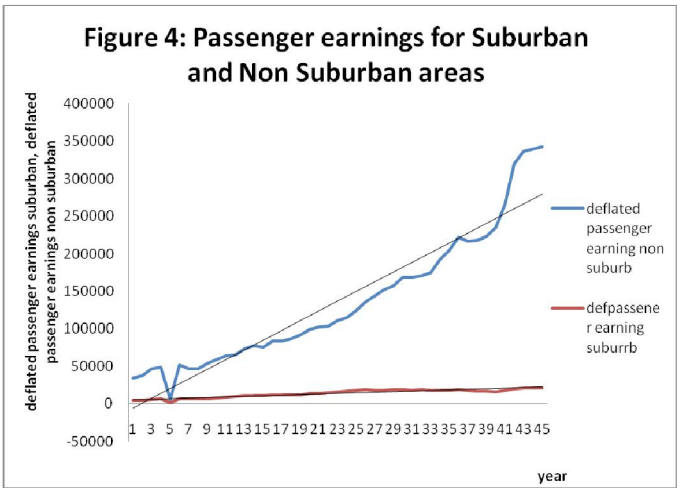


Figure 2 shows a somewhat similar relationship between passenger kilometres and earnings from passengers. Here also, deflated passenger earnings from suburban railways have been used. Here also, the trend lines show positive trend for both the variables but unlike the case of number of passengers, here the slopes of the two trend lines are not widely different.



Figures 3 and 4 show that number of passengers travelling by rail is more in suburban railways whereas the revenue earned from passengers is more in non suburban railways. Moreover, the number of passengers have been increased in both the suburban railways and its non suburban counterpart simultaneously and the trend lines show that the number of passengers have been increased in almost a similar way in both the sections of IR. Furthermore, as compared to non suburban case, the increase in earnings from passenger is very little in suburban railways.





The reason for this is that a single train in suburb category contains a huge number of passengers at a time and the number of trains per day in a particular route is also quite high. But the fare of such trains is quite low. But a single train in non suburb category carries limited number of passengers as it need reservation for most of the coaches and since such trains travel a longer distance, the number of trains per day in such routes is quite low. But the reservation charges and other charges make the fare of the trains of this category much higher. Furthermore, trains in this category have some higher class coaches such as A.C. coaches. The fare of such coaches is reasonably high as in general, the affluent people travel in these coaches. But, although the passengers travelling in suburbs are mostly middle class or lower middle class people, railways can have a little thought of restructuring the fares which may lead to a further increase in the earnings of railways.

Time Series Analysis

The following equation is considered to view the impact of the number of passengers and passenger kilometres on earnings from passengers of the suburban railways:

$Y_t = \alpha_0 + \alpha_1 X_{1t} + \alpha_2 X_{2t} + + €_t$ …(i)

Where, Y represents the earnings from passengers, X_1 represents the number of passengers, X_2 represents the passenger kilometres, α_0 represents the intercept term, α_1, α_2 represent the slope coefficients and € represents the error term.

Now, since the financial data such as passenger earnings involve some inflationary effect, to eliminate those effects, data have been deflated using Wholesale Price Index Numbers which have been constructed taking the year 2010 as the base period. As a result, equation (i) becomes-

$Y^*_t = \alpha_0 + \alpha_1 X_{1t} + \alpha_2 X_{2t} + €_t$ ……(i') and

Where, Y^* represents the deflated passenger earnings.

At the first step, time series data are needed to be checked whether they are stationary. If not, they are to be made stationary by taking the first difference. For this purpose, Dicky-Fuller test is applied here. The variable, Y^* , say, is taken and to check its stationarity, the following equation is used-

$Y^*_t = \rho Y^*_{t-1} + u_t$, where ρ is the autocorrelation function. This equation can be rewritten as-

$Y^*_t - Y^*_{t-1} = (\rho-1)Y^*_{t-1} + u_t$ and $(\rho-1)$ can be defined as δ.

Now, the Null Hypothesis for stationarity of Y^* is:

H_0: $\delta = 0$ ($\rho=1$).

And the alternative hypothesis is H_1: $\delta \neq 0$, that is, the null hypothesis is that the coefficient of Y^*_{t-1} is unity and the alternative one is its coefficient is not unity.

If the null hypothesis is rejected, then it can be concluded that the series is stationary.

In the data set, Dicky-Fuller test for all the variables suggest that the variables are not stationary in the levels as they are given.

At the next step, one may either check for cointegrating rank of the regression equation or take the values of the variables at their first differences. Here, the equation is cointegrated of rank 1(Table 1).

Table 1: Cointegrating Rank between the dependent variable Y and independent variables X_1 and X_2

Maximum Rank	Trace Statistic
0	37.8175
1	9.5579*
2	0.2571

So, Vector Error Correction model (VECM) is used to find out the relationship between the dependent variable and the independent variables.

The results show that, in the short run (Table 2) while the passenger kilometre has a positive and significant impact on the earnings from passengers, the number of passenger does not have any significant impact.

Table 2: Summary Output of Regression (Short Run) of Y on X_1 and X_2 (VECM model)

	X_1	X_2	Constant
Coefficient	0.799207	1.324217	155.2766
Standard Error	1.772545	0.5941383	327.2547
P Value	0.964	0.026	0.635

But in the long run (Table 3), the impact of the number of passengers is significant and negative while the impact of passenger kilometres turns out to be significantly positive.

Table 3: Summary Output of Regression (Long Run) of Y on X_1 and X_2 (VECM model)

	X_1	X_2	Constant
Coefficient	-24.27156	1.999048	-56280.92
Standard Error	7.101876	0.8331785	
P Value	0.001	0.016	

Next, the variables are taken at their first difference values and the Dicky-Fuller test says that they are stationary at the first difference levels. So equation (i') becomes,

$$y^*_t = \beta_0 + \beta_1 x_{1t} + \beta_2 x_{2t} + e_t \quad \text{....(i")}$$

Where, y*, x_1, x_2 represent the variables at their first difference values. Now, Vector Autoregressive (VAR) Model is used. Results show that (Table 4), in both lag 1 and lag 2, number of passengers is significantly negatively related with the earnings from passengers and the impact of passenger kilometres is significantly positive in lag 1 but insignificant in lag 2.

Table 4: Summary Output of Regression of Y on X_1 and X_2 (VAR model)

	X_1		X_2		Constant
	Ll	L2	L1	L2	
Coefficient	-3.250883	-3.361733	0.8094	-0.3496289	905.9676
Standard Error	1.937173	1.591416	0.4615087	0.4642503	367.5735
P Value	0.093	0.035	0.079	0.451	0.014

So, this analysis suggests that in the long run, the number of passengers have a negative impact on the earnings from passengers while the passenger kilometres have a positive impact on the same.

Conclusions

Results bring the conclusion that, although the railways act as a popular mode of transportation in suburban India for short distance daily travelling which mostly includes travelling to and from workplaces, schools, colleges etc., in the suburban railways, the number of passengers does not contribute positively to the passenger earnings of the railways, but the growth of the railways, which is measured in terms of passenger kilometres contributes positively to it. One of the reasons for this may be that, the fare is not proportionately higher for longer distance within the suburban railways. Moreover, although the number of passenger travelling in local trains is sufficiently higher than that travelling in long distance trains or its non suburban counterpart, railways earn less from the former than the latter. These conclusions drawn from the study leaves a scope for further research on the fare structure of Indian suburban railways.

References

Ahluwalia. Montek S. "Infrastructure development in India's reforms", "India's Economic Reforms and Development: Essays for Manmohan singh", Oxford university Press, 1998.

Banerjee A, Esther Duflo, N. Quain; "On the road: access to transportation infrastructure and economic growth" National Bureau of Economic research, working paper, March 2012.

Bonavia. MR., "The Economics of Transport", Nisbet and Cambridge University Press, 1988, p 117-173.

Boopen S, "Transport Infrastructure and Economic Growth : Evidence from Africa Using Dynamic Panel Estimates", The Empirical Economic Letters, 2006.

Canning, D, 'Infrastructure's contribution to aggregate output,' World Bank Policy Research Working Paper, No. 2246, Washington, D.C., 1999.

Canning. D, and P. Pedroni, "Infrastructure and Long Run Economic Growth", Consulting Assistance on Economic Reform II, Discussion Paper 57, 1999.

Ding Chengri, "Transport development, Regional concentration and Economic growth" Urban Studies, Vol 50, 2012.

Directorate of Economics and Statistics, government of India.

Directorate of Economics and Statistics, government of India.

Gokarn S., "The New Oxford Companion to Economics in India", ed Kaushik Basu, "Oxford University Press" Vol II, 2007.

Gupta S., "Indian Railways: A Few Aspects of Performance", Transport System Studies and Policy Analysis, ed S.Sriraman, Himalaya Publishing House, 2010.

Hirsch. W Z, "Urban Economic Analysis", Tata McGrew Hill, New Delhi, 1973, p 82.

Hong .J, Zhaofang Chu and Qiang Wang, "Transport Infrastructure and Regional Economic Growth: Evidence From China", Transportation, 2011.

Jacobs, G.D., D.A.C. Maunder and P.R. Fouracre, "Characteristics of Conventional Public Transport Services in Third.

Jenks. Leland, "Railroad as an economic force in American Development", Journal of Economic history, Vol IV, May 1944.

Kulshrestha. M, B. Nag and M. Kulshrestha, "A Multivariate Cointegrating Vector Autoregression Model of Freight Transport Demand: Evidence from Indian Railways", Transportation Research Part A: Policy and Practice, 35(1), January, 2001.

Ministry of Commerce and Industry, government of India.

Ministry of railways, government of India.

Nash. C A, "Economics of public transport", Longman, London, 1982, p 98-99.

Pradhan R. Prakash and Tapan P. Bagchi, "Effect of transportation infrastructure on economic growth in India: The VECM approach", Research in transportation economics, Vol 38, February 2013.

Pradhan R. Prakash, "Transport infrastructure, Energy consumption and economic growth" Journal of Sustainable Development, Vol 3, June 2010.

Raghuram G. and Rachna Gangwar(2008), "Indian Railways in the past twenty years: Issues, Performance and Challenges", Indian Institute of Management, Ahemadabad, working paper no. 2008-07-05.

Ramanathan, R., & Parikh, J.K., "Transport sector in India: An analysis in the context of sustainable development". Transport Policy, 6, 35-45, 1999.

Venkatraman. P "Rail road coordination", " Indian Railways Annual Report, April 1969", edited by K.L.Ahuja.

Wolff. C, "Getting India¹s railways on track", McKinsey Research Report, 2001.

Man, Nature and Adversity of Livelihood: A Study of the Deltaic Sundarbans of West Bengal

Atanu Sengupta[1] **Anirban Hazra**[2]

Abstract

India is a wonderful country protected by seas and waters and nurtured by green forests. The delta of SUNDARBANS is one of the beautiful parts of India abounds with trees and waters; a large painted canvas abounds with the colour green and blue. However, a look at the livelihood of the people of Sundarbans reveals a constant struggle with the harsh realities of Nature which remained as 'a dark under the lamp'. It is very much shocking to see how people of the delta survive facing the harsh realities of nature and the constant threat from wild animals (like- tiger, crocodile) and their constant struggle to make the unproductive land fruitful and conducive to their earnings. They live with the Nature and also by the Nature. A socio-economic survey by the students of Burdwan University in 2014 revealed this myriad phase of life. In this area there is a wide lacuna of basic facilities of life with a huge inequality. Agriculture is underdeveloped with mostly mono-crop. Some amount of pisciculture and shrimp cultivation is prevalent. There are some meagre non-farm activities with honey collection and fish catching as predominant activities. As a result, there is huge migration from this area. Lastly, we considered the measures happiness-happiness in respect to work, children, money, mental satisfaction etc. Here we saw they are more or less satisfied. This is mainly due to their less awareness about the outside world.

JEL Classifications: O1, Q1, Q3, I3

JEL Words: Economic Development, Nonreliable Resources and Conservation, Welfare, Wellbeing and Poverty.

1. Introduction

People generally eke out their living from nature. It is from the nature that man collects all the requirements that are necessary for the existence and the thriving of life. The man-nature relation is usually modeled through technology that relates resources with outcomes. For all

1. Professor, Department of Economics, University of Burdwan, Burdwan, West Bengal, India.
2. Researcher, Department of Economics, University of Burdwan, Burdwan, West Bengal, India.

other animals it is adjustment to nature that is the basis of their survival. For man adjustments go along with transformation. It is this dual aspect from human nature that is the basis of men's efflorescence within the ambit of nature. This becomes less and less evident in a modern society where man is surrounded by the artificial world that he has created out of nature. Their nature comes indirectly often veiled in the raw inputs and the basis of food products. Thus man becomes oblivions of the nature that is the basis of the existence. A modern urban dweller living in a multi storied flat forgets that what he gets is a derivation of the Mother Nature – the prime source of everything.

However, the picture radically changes when we move from the center to the periphery – from the artificial world to a world where nature is more out spoken. It is the terrain of underdevelopment, poverty and extreme nature dependence where the role of nature becomes more prominent. Our study area is one such field of canvas where this symbiosis between nature and man becomes very prominent. This is Sundarbans – the deltaic mouth of the Ganges – Brahmaputra River. It is an area where the river opens up into a multitude of tributaries before fall in into the Bay of Bengal. Along this complex network has grown up the thick Mangrove forests petered through islands with a wide range of Flora and Fauna. The executive beauty of the region with a dense Mangrove forests on both side of the river leaves its beholder enchanted. It was really a mesmerizing sight, a treat for the eyes.

These beauties are covered by lots of dangers – Snake, Crocodile, Tiger, the sudden storms and saline water. However, people live here in numerous villages trying to maintain their livelihood out of the harsh nature. It is the peoples struggle with the unhospitable nature to bring out a reasonable livelihood is a worth studying idea. In this small monograph we tried to fashion how people maintain their livelihood in such an unhospitable climate. Though the sectional breakup of this paper we are trying to tell their story in a way that was possible to capture by a city bread academician like us through the lens of modern economic techniques.

In this paper we have tried to understand the livelihood pattern in Sundarban where nature has deeply crippled avenues of productive earning. Furthermore, in the era of sustainable development, we cannot speak of large-scale projects that purport to undermine the fine fiber of ecological balance that is already in threat and in fragile condition. Some policy makers have even opined of rehabilitating the populace to a safer and better place leaving the delta in its pristinely position as was done in some of the natural parks of Africa (such as Serengeti). We think it would be too harsh to take such a decision. Rather it is possible to hope for a more promising way of sustainability such as the development of the cooperatives and agro-processing industries. This paper does not deal with these suggestions. Rather we paint a view of the livelihood activity of Sundarban as is captured by our survey.

This paper is divided into five major sections. Section 2 briefly discusses the sample design of the study. It also prepares the study with a short review of some of the existing literature. Also the basic direction of our analysis is made clear here. Section 3 gives the socioeconomic profile of the sampled household in Sundarbans. Section 4 discusses the pattern of livelihood opportunities that are available in this area. After these major two deliberations, we then move on to the subjective evaluation as captured by the Happiness Index. Section 5 concludes the study.

2. Contextualization – Literature Survey, Methodology and Survey Design

People from the early past lived in the confluence of river – even in the deltaic inhospitality. When we turned the grand book Mankind, Sumeria emerges as the cradle of human civilization. Sumeria was a very unhospitable place with marshy lands, submerged fields and pores of water. The rivers Tigris and Euphrates sometimes merged into a single river. The whole area was submerged. The place suffered from malaria, scorpions and myriads of insects. Lions attack the heads of domesticated animals. Numerous bores lived in the rigs and destroyed the crops. However, the people remain undaunted. They dug cannels to drain away the swamp and irrigate the fields. They made dikes to protect against flood. The land tillers invented a plough for cultivating the though loamy soil. Gradually the nature is controlled and people overcame the swamps and draughts. Civilization progressed as urban settlement grew up ushering in a new area in the human history.

In the modern times the people of Holland reclaimed land from the sea by the means of dikes and dams. It is these reclaimed lands that become the most fertile area for crop cultivation in Netherlands. The thriving dairy industry in the country was not the Natures Gift. People reclaimed it from nature.

The third example is from Venice – the city of canals. It is a city cited on a group of 117 small islands located in a marshy Venetian lagoon which stretches across the shore line between the mouths of the rivers Poe and Pave. The early history of Venice refers to a group of fishermen on the islands in the Mercy river. Gradually the area turned into a grand city. In the 16th century Venice became the epitome of the Renaissance in Europe. Grate painters, sculptors and thinkers gradually emanated from this city.

The history of all these three places clearly shows how people have succeeded in overcoming the gruesome aspects of nature. Compared with this, Sundarbans is far behind in terms of progress and development. The monograph wishes to document these facts and understand why the region is still lagging behind while the world around us is changing fast.

2.1. A Brief Profile of Sundarbans

The deltaic region of Ganges – Brahmaputra have forged to form the largest Tidal Halophytic Mangrove forest in the world. The area roughly covers 10,000 sq.km. of which 60% is in Bangladesh and remaining is in India. The indian Sundarbans is spread in 19 blocks and 16 police stations in North and South 24 Parganas districts of West Bengal (Table-1). The Sundarbans is a vast area with a large portion of it being covered by forest. However there remain a sizable inhabitant area and the population is roughly 45 lakhs according to 2011 census.

With the emergence of the British Empire in India, the area of the Sundarbans witnessed a vast change and the dense forest cover was cleared to make it fit for human settlements in order to increase the revenue collection. Also Gosaba (a block area of Sundarbans) was a part of the first rural development project in India which was started and managed by the Zamindars of that age. The survey was designed to get a snapshot view of the people of Sundarbans –on how they interact and face the vagaries of nature.However, the study has its background on past literature. We concentrate on a few important researches in this area.

According to Haqueand Blowfield (1997) coastal fishing communities, by their very nature, are more exposed to severe weather hazard than most agriculture areas. They found that shrimp enclosure owners have the most education and that fishers have the least. In general, the lowest level of literacy for a shrimp owner is equivalent to highest level that fishers have reached of fishers, the women have a much higher level of illiteracy and semi-literacy (47%) than male fishers (7%) on the others hand, none of the shrimp enclosure owners is illiterate or semi-literate.

According to Arabinda N Choudhury et al. (2008) even after 60 years of independent Sundarbans remains isolated, remote backward region of the state, the cumulative effect of all social political factors, Viz. extreme population growth, low income level, lack of industries and employment opportunities, lack of electricity and organized transport, Rain-dependent monocarp agriculture, raising of the river bed by manmade embankments, frequent cyclonic insult and inflow of tidal waves, make the people of Sundarbans totally dependent on natural resources of mangrove. Well as of nature the increasing population pressure not only pushed back forest frontier but also competing for the resources with the wild animals. And the invariable result is the violent human animal conflict leading to loss of life on both sides.

According to Department of Sundarbans Affairs, one of the characteristic statements used to describe the people of Sundarbans is that 85% of people depend on agriculture. The proportion

of the population without work in 1991 was 70% was only 3% in part time or marginal employment and 27% in main employment categories of main employment 10% are employed in agriculture as cultivation and another 10% as labourers. To obtain employment, local people migrate to access employment opportunities within the Sundarbans or in Kolkata.

The mangroves in Cochin and Sundarbans (West Bengal and Bangladesh) are different in many respects. First of all, the mangrove in Cochin is highly degraded, fragmented and situated in the urban and semi urban localities around Cochin City whereas Sundarbans is a large having significant portion of intact forests with limited access to, and used by human beings. On the other hand, a major part of Sundarbans in both West Bengal and Bangladesh is declared as protected areas and managed by the forest departments of the respective govt. and received global attention and resources for the conservation. Thus, the study carried out in these two contrasting quotations provides insides on the contribution of Mangroves in diverse context.

According to the survey carried out by two officers of the SBI's planning dept. the forest region of Sundarbans with a total population of 20 lakhs is the most backward and poorest part of West Bengal. Sundarbans is also home to countless people who migrate from different countries or even places within the country. "The whole area looks as if it is always in the grip of famine".

2.2. Survey Methodology

We conducted our survey[1] in the villages of Sundarbans in South 24 Parganas. First of all, we have to find the reason behind our choice of those particular villages in Sundarbans. In this survey we have tried to examine the socio-economic condition of the people in those villages. Due to the backward nature of those villages the examination was often tough and stannous. The economic conditions in those villages are very poor. One of the most important features is that the quantity of poor is maximum. The total geographical area of Indian Sundarbans is 9630 sq.km. It includes mangrove forest area is about 2180 sq.km. Populated area of about 5363 sq.km. The population of Sundarbans is heterogeneous. The process of uncontrolled population growth reduced per capita cultivated land. This has created a range of ecological and socio-economic problems in this region, lending to crisis in the livelihood of the poor and marginalized people. The Indian Sundarbans has a rich history of local people and new migrants pushing into a harsh environment access to land and natural resources. The

1. The present data is collected under the socio economy survey of Sundarbans done by the post graduate economics students of Burdwan University.

main occupation in these villagers is farming and fishery. 85% of the people depends on agriculture. The proportion of the population without work in 1991 was 70% with a 3% in a part time and 27% in main employment categories. Among the agriculture workers high percentage is landless agricultural labor accounting to about 50% substantives the level of poverty in this region. During the agricultural lean season people resort to fishing and collective prawn seeds even risking their lives from man eating tigers and crocodiles. During April-May some people also entered reserved forest for collecting honey. Next to agriculture fishery provide a distinct source of employment and income for the people. On the other hand, some people migrate to access employment within Sundarbans or in Kolkata. Gender difference in work force participation is high. The person of this region lives in physically vulnerable circumstances. Another striking feature in this region of this area is cyclone prone, monsoonal and low lying with many settlements located along sides the waterways and coastline. We also find sanitary consciousness of poor people. The people in these villages suffered from lack of proper toilets, roads etc. Another reason for backwardness of these villages is the lack of modern facilities and information.

Table 1: Block Profile of Sundarbans:

District	Sub-Division	Police Stations	Blocks / Panchayat Samiti
24-Parganas (South)	Kakdwip	Sagar, Namkhana, Kakdwip, Patharpratima	Sagar, Namkhana, Kakdwip, Patharpratima
	Diamond Harbour	Mathurapur, Roydighi	Mathurapur-I, Mathurapur-II
	Baruipur	Kultali, Joynagar	Kultali, Joynagar-I, Joynagar-II
	Canning	Canning, Basanti, Gosaba	Canning-I, Canning-II, Basanti, Gosaba
24-Parganas (North)	Bashirhat	Hingalganj, Hasnabad, Sandeshkhali, Haroa, Minakhan	Hingalganj, Hasnabad, Sandeshkhali-I, Sandeshkhali-II, Haroa, Minakhan

Source: Department of Sundarban Affairs, Govt. of West Bengal

Every economic survey intended to question and analyses multiphase structure of the society must have in its approach a rigorous statistical analysis which unravels the realities of the area under study.

As we know we have a range of sampling methods from simple random sampling to systematic stratified sampling. We employed multistage stratified purposive sampling without and selected household in a village at the guidance we were providing with. Our survey was a questionnaire-based survey which polled the informants directly about their socio-economic condition. We

have all about 57 questions and additional questions on agriculturist families. Some houses give us good response to our queries and some of them provide us uncertain responses. We now compare the statistics gathered by us of Sundarbans with other places in the following table.

From the table below data we have constructed the overall picture of Sundarbans and our study areas. By using the census report of 2001 and from internet side development of Sundarbans affair the above table is constructed. For our study, we have chosen Gosaba block in North 24 Parganas. Gosaba has the history of first implemented programs of rural development by the initiative of private players. We have selected three villages of this block, namely Gosaba, Arampur, Bally. These villages are comparatively more developed than other regions of Sundarbans (Table 2). As is evidenced by the Census data, these villages are, more or less, representative of the general conditions in the Sundarbanss.

We can see that the literacy rate in Arampur is 75.84% while the Sundarbans's is 64.91%. We went to another two villages; Gosaba and Bally, the literacy rate of these places are respectively 73.81% and 71.68%. For work force participation Gosaba block again perform better than the other villages.

In respect of percentage of SC Gosaba block is more populated than the other villages. In Gosaba block percentage of SC is 64.28% while in Sundarbans it is 37.17% on the other hand percentage of ST in Gosaba block is 9.23% it is much higher than the other villages. In Sundarbans it is just 4.8%.

In our sample most of the ST households belongs to the Christian community. Due to the activities of the Christian missionaries, they have attended such level of economic and social opulence.

The non-working population category of Sundarbans is 78.56% while in Gosaba block it is 72.50%. All these villages are below Sundarbans in respect of non-working population except Arampur where it is 80.85% (Table 2).

Table 2: Profile of the Sampled Villages

Name	Literacy rate	Workforce participation	% of SC	% of ST	Non-working
Sundarbans	64.91	417.01	37.17	4.8	78.56
Sundarbans south	65.82	417.15	37.41	2.46	78.66
Sundarbans north	62.31	416.61	36.48	11.6	78.25

Contd...

Table 2 (Contd...)

Gosaba Block	68.93	456.14	64.28	9.23	72.5
Gosaba	73.81	407.3	30.78	2.32	74.14
Arampur	75.84	363.08	31.92	6.34	80.85
Bally	71.68	419.97	49.33	6.97	74.7

Source: Census data of 2001 and Sundarbans affairs.

We now proceed on to our findings in the next section.

3. Socio-economic Profile of the Selected Households

Any study reveals good picture if there are diversities among the various subgroups that constitute the whole. In our study also we have discussed the results of various categories. First we consider the social stratification–categorization according to social groups. In India the social gap is immense. We feel that this will be reflected in the survey area also. Our next category is the economic one. We have considered three groups economically – rich, medium and poor. For these distinctions we considered the ownership of fixed assets. In our analysis rich are those whose asset value is above Rs. 3 lakhs, medium with assert value between Rs. 2 lakhs &Rs. 3 lakhs and poor with asset value bellow Rs. 2 lakhs.

We have taken parametric values to discuss the variation across the social groups. First, we consider the condition of houses.The condition of houses been observed for the 3 classes of people i.e. rich, medium and poor. As far as the condition of house is considered the rich people are having 77.78% of pacca house whereas 11.11% are having semi pacca and KUCCHA house.

Next considering the medium class, the percentage of KUCCHA house is greater than that of semi pacca and pacca houses. The survey shows that 63.33% of medium class families are having KUCCHA house and 16.67% are having semi-pacca and 20% have pacca houses.

For the poor class families, the percentage of pacca house is zero which should be the matter of concern for west Bengal government. About 81% used to survive in KUCCHA houses and rest in semi pacca houses. For the total population, 68.86% survives in KUCCHA house and 16.98% survives in semi pacca whereas rest in paccahouse. So this is the matter of concern for the state government for development purpose in that area.

Table3: Average No of Rooms (Social Category Wise)

	Average No of Rooms
General	2.18
SC	1.85
ST	2.5
OBC	2.09
Total	2

Source: Authors' calculation from Survey data

In the above diagram we have considered the average number of rooms caste wise we have classified the total population into four categories i.e. General, SC, ST & OBC. It is quite clear from the above diagram that almost all the people in Sundarbans area have two rooms in average.

Table 4: Average No of Rooms (Asset Class Wise)

	Average No of Rooms
Rich	3
Medium	2.26
Poor	1.9
Total	2.38

Source: Authors' calculation from Survey data

In the above diagram we have considered the average number of rooms asset wise. We have classified the total number of rooms into three categories i.e. Rich, Medium and Poor. It is observed that the rich families have three numbers of rooms in an average. There after comes the medium family andpoor families are the least.

In these villages there is mostly KUCCHA type of toilet. Among minority category the percentage of KUCCHA toilets are maximum. Among SC category percentage of KUCCHA type of toilets are higher than ST, OBC and General category. There is a maximum case of no facility among ST category. There are comparatively higher rate of pucca toilets among OBC.

Among richpucca type of toilet is the most and among poor KUCCHA type of toilet is the most. Among the poor no facility of toilets is maximum. There is no case of 'no facility' of toilets among rich. Among the medium percentage of KUCCHA toilet is higher.

There are mainly three types of source of drinking water- tube well, Government tap and pond. Among general category there is a higher rate of usage of tube well and among OBC category Government tap is mostly used. There are also some cases of usage of pond as source of drinking water among SC category. For ST category of population, use of tube well and Government tap are in the similar vein.

There is a high percentage of usage of Government tap as source of drinking water among the rich people. Among the medium people tube well is mostly used for drinking water. There is a higher rate of usage of Government tap than tube well among poor people. There are also some cases of usage of pond among the rich people.

From the housing infrastructure, we now move on to the preponderance of diseases. Among SC people percentage of waterborne diseases is most & percentage of airborne disease is less. in case of OBC, GEN & OTHERS also percentage of waterborne diseases is high, but in case of ST people, they are attacked by mosquito disease type like malaria and dengue.

There are different types of diseases in those villages. We have differentiated these into four parts- a. water borne, b. air borne, c. permanent and d. mosquito borne diseases. Economically we have seen here that the rate of water borne diseases is maximum among poor people. Among the medium people rate of water borne diseases is lesser than that of poor and rich. The airborne and the permanent diseases are found among medium and poor. Among the rich people mosquito borne diseases are maximum.

An important aspect of health is the prevalence of institutional birth. First we discuss about the person who makes the child delivery. Among the SC category most of the deliveries are by untrained person. In case of OBC, general and others categories the delivery made by trained person. But among those categories also there are cases of delivery by untrained person.

By social category, we see that birth at govt. hospital is highest in others (100%) compare to general (71.43%), SC (41.67%), OBC (33.33%) & lowest in ST (0%) category. There is a highest percentage of no birth at govt. hospital in SC category (58.33%) & lowest in other category (0%). The economic categorization yields a completely new picture. In APL category birth at govt. hospital is higher (58.33%) than the BPL category (42.86%). For rich people delivery by trained person is mostly found but there are also some cases of untrained hand. Among the medium the cases of trained and untrained hands are almost similar. Among poor the case of untrained delivery is mostly found.

Table 5: Sources of Fuel

	Kerosene	Fuel wood	Cow dung	LPG	Coal
Arampur	10.42	97.92	6.25	16.67	2.08
Gosaba	62.50	100	0	12.50	0
Bally	12.00	100	10	2.00	0
Total	15.09	0.06	7.55	9.43	0.94

**A household may use more than one type of fuel. Hence the categories are not mutually exclusive so that the percentage figures may exceed 100%*
Source: Authors' calculation from Survey data

Fuel is an important necessity ofour daily life. In our socio-economic surveywe got mainly six types of fuel that are fuel wood collected, fuel wood purchased, kerosene, coal, LPG, and cow dung cake etc. in three villages of Sundarbans which is shown in the above table. It had been found that most of the people used fuel wood collected in Arampur with 97.91% while others fuel area also used in a varying but comparatively in a very less meant. LPG users are very less in Bally village. While in Arampur village the LPG user are more in comparison to other two villages. And fuel wood user is 100% in case of both Gosaba and Bally, kerosene user is maximum in Gosaba while cowdung user is maximum in Bally (10%) and least in Gosaba (0%). And last we see the coal user is very less used by the people of these villages in comparison to other fuels. In Gosaba and bally both are having zero coal user while Arampur have 2.08% of coal user.

If we see that overall percentage of different types of fuel user in different villages then we find that fuel woodis used by maximum one, coal is in very less amount and after that kerosene, LPG, and cow dung cake comes respectively.

From the table we conclude that in these backward area people are using LPG which is good signal of development, for the Sundarbans and economy also.

In our surveyed areas of Sundarbans villages, most of them are not having electricity in their houses, only few of them have electricity.

Table 6: Sources of Light (Asset Wise)

	RICH	MEDIUM	POOR	TOTAL
Electricity	44.44	30	30.8	31.13
Solar	22.22	20	4.62	10.38
Kerosene	33.33	50	63.08	55.66

**A household may use more than one type of source of lighting. Hence the categories are not mutually exclusive so that the percentage figures may exceed 100%*

Source: Authors' calculation from Survey data

An important analysis in different sources of light has been considered for the human welfare in west Bengal. The different sources of light have been observed for the 3 classes of people i.e. rich, middle class and poor.

As far as the different sources of light is considered, the rich people are quiet acquainted with electricity. But 22% & 33.33% of the population of this class are dependent on solar energy and kerosene.

Now when we are considering the middle-class families, the percentage of using electricity is about 30% as source of light whereas 50% are acquainted with kerosene as source of light. For poor class families, the percentage of usage of solar energy is less than 5% but the utility of kerosene is much higher (about 63%). As far as the total population is considered for the different sources of light, almost 55% are using kerosene as their main source of light and simultaneously about 30% of total population is having direct electricity as the source of light.

So, in conclusion part the percentage of usage of electricity must be increased as the main source of light. Therefore, West Bengal government should take care of this condition for further growth and development in rural area.

Table 7: Source of light (Social category wise)

	General	SC	ST	OBC	Total
Electricity	35.29	12.77	0.00	68.18	31.13
Solar	8.82	14.89	0.00	4.55	10.38
Kerosene	55.88	72.34	100.00	27.27	57.55

**A household may use more than one type of source of lighting. Hence the categories are not mutually exclusive so that the percentage figures may exceed 100%*

Source: Authors' calculation from Survey data

The different sources of light are used by different category people. OBC have maximum number of electricity user i.e., 68% and ST have zero number of electricity user. In general, 35% are using electricity and SC's have a smaller number of electricity users, i.e., 12.76%. The overall percentage of electricity user is 31.13%.

Next, we consider the solar userhere general category have 8.82% of solar panel or solar energy user, ST have zero number of solar users, SC have highest number i.e., 14.89% of solar user and OBC have 4.54% of solar user. The overall percentage of solar user is 10.37%.

Lastly, we have considered the kerosene user general category have 55.88% of kerosene user and SC have, maximum number of kerosene user i.e. 72.34%. Which is greater than general, and ST category have highest number i.e. 100% and OBC have 27.27% which is very less in comparison to remaining categories. The overall percentage of kerosene user is 57.54%.

From these above diagrams we conclude that the maximum people use kerosene and less of are using solar energy and in case of electricity OBC have highest number of electricity usage. Our government should take some drastic steps to bring electricity in these backward areas, so that all the categories of these village can enjoythe facility of electricity.

Ration card is an identifier to the benefit eligibility of the holder. This card is an important part of the Public distribution system (PDS) in India. On the basis of their economic condition, people can buy goods like food grains, sugar and kerosene with the help of their ration cards.

There are presently three types of ration cards:

- Antyordaya ration (AAY) cards, issued to the poorest of the poor.
- Below poverty line (BPL) cards.
- Above poverty line (APL) cards.

Table 8: Asset wise Ration Card Holders (in %)

	Rich	Medium	Poor	All Groups
APL	77.77	60	47	52.83
BPL	22.22	40	50	44.33
AAY	0	0	3.07	1.88
Total	100	100	100	100

Source: Authors' calculation from Survey data

In the above table, we had shown the ration card of asset wise. In this table we find the different percentage for different category of people. Here we get the highest percentage of APL card in case of rich people among the medium and poor, i.e., 77%. In case of medium people, we got 60% and in poor 47.69% respectively and the total percentage of ration card is 52.83%.

Next, we consider the distribution BPL card holders according to asset size. Among the sampled households, poor have highest percentage of BPL card - 50.76%. strangely, a few rich households have BPL card (22%). 40% of medium asset households have BPL card.

Lastly we have AAY card which is very rare, we got only one AAY card in our survey of Sundarbans.3.07% among the poor have AAY card in our sample.

Table 9: Caste wise Ration Card Holders (in %)

	General	SC	ST	OBC	All groups
APL	61	47	0	59	52
BPL	35	53	100	41	47
AAY	4	0	0	0	1
Total	100	100	100	100	100

Source: Authors' calculation from Survey data

In the above table we have shown the percentage of ration card in caste wise, in these table we shown the percentage of general, SC, ST and OBC. In case of APL card we got different percentages for different categories here general having 61% with highest number; OBC lays the second position with 59% and SC'S have 47% and ST having zero. And in overall we got 53% of APL card.

Now we consider the distribution of BPL cards. All the Schedule tribe peoples in our sample are BPL. This percentage is 53%, 41% and 35% for ST, OBC and general respectively. The overall percentage of BPL card holders in these four categories is 43. Lastly we concentrate on the distribution of AAY cards. There is only one AAY card holder in case of general among the sampled households.

4. Livelihood Pattern

Workforce participation refers to the share of the working age population who are either in a job or actively looking for one.

Table 10: Workforce Participation-Social Category wise (in %)

	General	SC	ST	OBC	Others	Total
Total	38.77	43.67	100	37	66.66	50.45
Male	64.1	68.62	100	61.22	50	66.23
Female	10.1	13.95	100	13.72	100	34.76

Source: Authors' calculation from Survey data

According to the survey the percentage of workforce participation for males in general category is about 64% where the female participation rate is 10%. But the total average is found to

be 38% for General Caste. As far as the workforce is concerned for Schedule Caste i.e. SC the workforce is greater for males i.e. 68.82% whereas for females it is about 14%. Surprisingly in case of Schedule Tribes i.e. ST the workforce participation is sent percent for males, females as well as in total.

For Other Backward Caste i.e. OBC the workforce participation for males, females & total is around 60%, 13% & 36% respectively.

For conclusion part we can refer the data which we have calculated as total average population including all the castes & creeds. So as far as the workforce participation is concerned it is about 66.23% for males, 34.76% for females & 50.45% for per family. Therefore, the workforce participation must be reduced in case of females so that West Bengal can hope for better & healthy rural life.

Table 11: Asset Wise Workforce Participation (in %)

	Male	Female	Total
Rich	70.59	20	43.24
Medium	61.11	15.63	41.91
Poor	62.25	12.12	38.87

Source: Authors' calculation from Survey data

In the above table we have shown that workforce participation rate for rich, medium, poor and total workforce participation in both male and female case.

Thus starting from the rich category the workforce participation is found to be 70.59% in case of male, whereas it is very less for female with 20% and total workforce participation is found to be 43%.

Then we take the medium category, here the male workforce participation rate is 61%, whereas in case of female it is very less i.e 15.6% in compare to rich female workforce participation rate, with 42% as total workforce participation rate for medium.

As we come to our last category -poor where the male workforce participation rate is found to be 62.25% and the female workforce participation rate for female is 12.12% which is very less in compare to both rich and medium category, and also it is very less in total workforce participation- 38.87%. Therefore here, workforce participation rate is reduced gradually in case of female, starting from rich to poor.

The effective area of agricultural land in Sundarbans is 3,15,500 acres. Typically the soils are deep fine textured, heavily structured and slow draining. Nearly 62% of total cultivable land of this region is low lying and suffers from elevated salinity during dry season. Soil drainage is generally inadequate and deep water stagnation occurs in monsoon season. The farming community consists of small, marginal and large farmers. Apart from this, the concentration of bargadars, pattaholders and landless agricultural labourers are very high.

For the sake of our analysis we have divided farmers by the net area cultivated. There may be various ways in categorizing these farmers. We have selected the convention as followed in our last survey report. By these tokens we find three broad categories creep out of the branch of our former data-Small, Marginal and Large.

In calculating the value of agricultural output we have lumped up the various crop output by their market price to get the gross value of output i.e., produce by the land.

Now we discuss about profit. Profit means a positive financial gain specially the difference between the amounts earned and amount spend in buying, operating or producing something. Profit is reflected in reduction in liabilities, increase in assets and/or increase in owner's equity. It furnishes resources for investing in future operations.

In our exercise, no large farmers earn negative profit (Table10). The proportion of negative profit earners is highest for the marginal while it is at an intermediate level for the small farmers. The advantage of scale economies is reaped by the large farmers.

Table 12: Proportion of Negative Profit (in %)

	Small	**Marginal**	**Large**
Positive Profit	71.43	57.9	100
Negative Profit	28.57	42.1	0

Source: Authors' calculation from Survey data

MNREGA (popularly called 100-day work program) has therefore been a silver lining for the inhabitants of Sundarbans area who have virtually remained cut off from the rest of the world. This program took attempt to generate employment & income for the poor villages in this area, who were left with no source of earning. The farmers in the flood prone area in Sundarbans have little option for additional employment. Apart from working on field, there are lots of workers willing to work on land construction, mud digging, canal excavation, and other NREGA supporting schemes. Payments are generally made through accounts established in local post offices and have a permissible lagging period of about 15 days.

Mainly this program has been a boon to many villagers who had no source of earnings, post Ayla disaster. Now with the help of the following Table-11 we see that marginal workers are mostly involved in the NREGA program. The percentage of 100 days work for marginal farmers is noted as 73% and among small farmers the percentage is 55%. The large farmers do not participate in this program.

Table 13: Percentage of Farmers Getting Benefit from MNREGA

100 day work	Small	Marginal	Large
Yes	55.55	73.64	0
No	44.44	26.31	100

Source: Authors' calculation from Survey data

Non-farm activities include activities other than farm activities. It includes activities like business, service, self-employed, a section of people not eligible for working and unemployed. The total discussion as said earlier is divided into three categories.

First of all we have considered the percentage of people (villagewise) who have engaged themselves in different types of non-farm activities.

Table 14: Percentage of Labour Engaged in Non-Farm Activities

	Non-Agri Wage Labour	Business	Service	Others	Not Eligible For Working	Unemployed
Arampur	17.768	9.50	3.31	0.83	31.40	20.24
Bally	16.88	1.30	3.46	1.30	21.21	27.70
Gosaba	45.00	5.00	0.00	10.00	10.00	20.00
Total	18.46	5.48	3.25	1.42	25.76	23.73

Source: Authors' calculation from Survey data

Here we see that the percentages of people who are non-agricultural wage labourer are 17.768%, 16.883% & 45% for Arampur, Bally and Gosaba respectively. Only 9.5% people are engaged in business in Arampur and 5% is engaged in Gosaba and negligible in Bally. Around 3.305% & 3.463% of people are engaged in service in Arampur and Bally. Here others consist of the self-employment group like worship & Harriman. Not eligible for working includes the students in Arampur it is 31.404%, in Bali it is 21.21%, and in Gosaba it is 10%. and to give importance to unemployed the highest unemployed is in Bali i.e., 25% and in other two villages it is not the lowest i.e., around 20%.

Next we will consider the percentage of no. of activities done by the people of Sundarbans (village wise).

Table 15: Number of sampled individuals engaged in various categories of activity

	only farm	only one non-farm	farm and nonfarm	more than one nonfarm	others
Arampur	**14**	**112**	**0**	**83**	**33**
Bally	**87**	**54**	**51**	**27**	**12**
Gosaba	**0**	**0**	**0**	**20**	**0**
Total	**101**	**166**	**51**	**130**	**45**

Source: Authors' calculation from Survey data

Here in the table only farming activity is done mostly in Bali. Only one non-farm activity is done most in Arampur and then in Bali. Farm and non-farm activity are done mainly in Bali. To get most attracted, more than one non-farm activity is done in Arampur. This proves that the job facility is high in Arampur. Other activities are done more in Arampur and least in Gosaba.

Next we will consider the asset wise distinction i,e. we will consider the percentage of people (asset wise) who have engaged themselves in different types of non-farm activities.

Table 16: Percentage of Labour Engaged in Non-Farm Activities (asset wise)

	Non-agri wage labour	business	service	others	student	unemployed
Rich	**13.95**	**13.95**	**4.65**	**0.00**	**23.26**	**37.21**
Poor	**20.40**	**4.68**	**1.34**	**1.34**	**18.39**	**26.76**
Medium	**10.60**	**3.31**	**5.30**	**0.00**	**15.89**	**39.07**

Source: Authors' calculation from Survey data

Asset wise the percentage of people who are rich and engaged with non-agriculture wage labour are 13.95%, poor are 20.40% and medium are 10.60%. Percentage of people who are rich, poor & medium are and are engaged with business 13.95%, 4.68% & 3.31% respectively. Percentage of people who are rich, poor & medium are and are engaged in service sector are 4.65%, 1.34%, 5.30%. Percentage of people who are not eligible for working and belongs to rich, poor and medium are 23.26%, 18.39%, 15.89%. To give importance on unemployment, the medium category are the maximum unemployed I,e. 39.07%, then comes the rich I,e. 37.21%, and the unemployed corresponding to the poor category is 26.76% (table 14).

We also find that the maximum percentage of people doing more than one non–farm activity belongs to the rich class and that is about 32.56%, 28.76% of workers belongs to the poor class & 21.19% to the medium class.

Again the maximum percentage of people doing only non-farm activities belongs to the medium class (30.46%). Thus to conclude the job opportunity is high to the rich people. And only one non-farm activity is done in maximum by the poor and that is 31.77%.

Next, we will consider the caste wise distinction i.e. we will consider the percentage of people (caste wise) who have engaged themselves in different types of non-farm activities.

Table 17: Percentage of Labour Engaged in Non-Farm Activities (social category wise)

Category	Non-agri wage labour	business	service	others	not eligible for work	unemployed
GEN	**15.52**	**4.96**	**1.24**	**3.726**	**9.93**	**37.88**
SC	**17.12**	**4.166**	**2.77**	**1.388**	**5.56**	**37.03**
ST	**16.66**	**0**	**0**	**0**	**33.33**	**16.667**
OBC	**18.18**	**10**	**4.54**	**0.90**	**14.54**	**47.27**

Source: Authors' calculation from Survey data

Caste wise the percentage of people who are engaged as non aggricultural wage labour is maximum for the obc category (18.18%) and then comes sc, st, and lastly the general category, 17.12%, 16.66%, 15.52% respectively. Business activities and service are more done by the obc category (10%, 4.54%). In st category the not elegible for working is the highest I, e. 33.33%. In case of unemployed the highest is for the obc category 47.27%, but not least for the general, SC category i.e. 37.88%, 37.03%. This is shown in the diagram below.

In our next chart we will consider the no. of activities done by the people of Sundarbans (caste wise).

Table 18: Percentage of Labour Engaged in Non-Farm Activities (asset wise)

	only farm	only one nonfarm	farm and nonfarm	more than one nonfarm	others
GEN	24.24	35.4	5.59	21.11	12.42
SC	29.16	25.93	15.27	26.85	0
ST	16.67	16.67	16.67	0	0
OBC	0	40.90	58.18	0	0.90

Source: Authors' calculation from Survey data

Only farm activity is done in maximum by the SC category (29.16%), then by gen (24.236%). Only one non farm activity is done maximum by the obc category (40.90%) and then by the general category (35.4%). Farm and non farm activity is again done in most by the obc category (58.18%). more than one non farm activity is done by the SC category (26.85%).

Further we shall consider the average number of days employed, and the average income from these activities asset wise caste wise.

Table 19: Employment and average income of Labour Engaged in Non-Farm Activities (asset wise)

Asset Category	average income (RS)	average no of days employed
Rich	17291.66	292.5
Poor	26096.30	211.61
Medium	35212.6	234.28

Source: Authors' calculation from Survey data

Our next consideration will be the average income and the average number of days Employed for that of the rich, poor & medium category. From our above chart it can be seen that the average income is highest for the medium and that is 35212.6, then it is for the poor i.e. 26096.30, and least for the rich i.e. 17291.66. When compared in the sense of average no. of days employed, the result is highest for the rich.

There appears and apparent contradiction in the wage income distribution among the asset groups and social categories. This contradiction is a mere illusion or mirage. Firstly, many members of the families belonging to the upper strata (economic and social) have migrated elsewhere for the highly remunerative jobs in the public and the private sectors. The remittances of these migrants are not included in the income generated within the area[2].

Secondly the mismatch between the number of days work and the labour income is merely a fall out of the difference in physical dexterity between these groups. Generally, for temporary nonskilled works, wages are generally related to the difficulties of the task with the danger involved. Honey fetching from forest involves a lot of physical pressure and risks. Many of these works are sub contracted by large honey companies such as Dabur and other public and private enterprises. There pay is also high compare to the other types of unskilled informal

2. The difference here is closely akin to the difference between Gross Domestic Product and Gross National Income used in the national income accounts.

jobs (such as workers in the retail shops and others). It is seen that the people belonging to the lower strata are involved in those risk and hazardous jobs. This is reflected in their earning.

Once again it must be stated that, comparison between two unskilled jobs based only on the labour time involved is wrong. Even unskilled labour is not homogeneous (at least in the case of Sundarbans). Difference had to be made on the basis of physical and mental strain taken, ability to take risks and hazards and so on[3].

Table 20: Employment and average income of Labour Engaged in Non-Farm Activities (social category wise)

Income	Average no of days employed	Average income
Gen	115.60	16743.12
SC	99.616	18106.139
ST	30	4500
OBC	105.059	15344.25

Source: Authors' calculation from Survey data

The average number of days employed is maximum for the general caste;115.60 days, and the least for the st caste; 30 days. But when compared interms of average income, SC category has the highest average income, i.e., 18106.14 and the least is for the ST category.

Migration is an important livelihood strategy in this area. Our data reveals certain interesting features about it. The data on village wise rate of migration shows that Bali has the highest rate of migration followed by Arampur. Compared to these two villages, Gosaba has significantly lower rate of migration. The migration rate in Bali and Arampur is even higher than the migration rate of all three villages taken together. A likely conclusion which can be drawn is that Bali and Arampur has lower employment opportunities in respect to the population in its villages as compared to Gosaba. This leads to higher migration rates in the villages of Bali and Arampur as compared to Gosaba.

If we consider the caste wise rate of migration, we see that the persons belonging to the SC category has the highest migration rate. This is primarily because the landless labourers and the marginal farmers generally belongs to this class and they have little livelihood opportunities

3. The argument here very closely relates to the criticism levelled against the naïve Marxian labour theory of value. In the words of Professor Kalyan Sanyal (2007) we should opt for a value theory of labour instead of a labour theory of value.

in their village. Hence they migrate to urban and semi urban areas to find jobs. The general and the OBC have castes have almost the same migration rates. However the people belonging to the ST category have the lowest migration rates. Given their extremely lower social status and insecurity and their natural instinct to reside in their own ancestral locality, they seldom migrate for jobs outside their village and hence they have the lowest migration rates.

The asset wise rate of migration portrays a very common phenomenon. The persons who are poor have the highest migration rate. Lack of any asset in the form of land or capital drives them to urban areas in search of jobs. The medium and the rich classes of the population have the lower and almost same migration rates. These two classes of people have some assets to earn a livelihood in the village. Hence their rates of migration are low.

The economics of happiness or happiness economics is the quantitative and theoretical study of happiness, positive and negative affect, well-being, quality of life, life satisfaction and related concepts, typically combining economics with other fields such as psychology and sociology. It typically treats such happiness-related measures, rather than wealth, income or profit, as something to be maximized. Given its very nature, reported happiness is subjective. It is difficult to compare one person's happiness with another's. It can be especially difficult to compare happiness across cultures.

Here we consider the happiness score among the different villages where we have been for the socio economic survey. To indicate the happiness status, i.e., how much the people of different villages in Sundarbans are actually happy, the features that should be considered are anxiety i.e., the feeling of nervousness, health i.e., condition of their body and the extent to which they are free from illness or is able to resist illness, mental i.e., how much they are mentally fit, children i.e., up to how much parents are happy with their children, hobby, work, money and education and neighborhood and relative means, i.e., up to what standard the people keep themselves in comparison to their relatives and neighborhood.

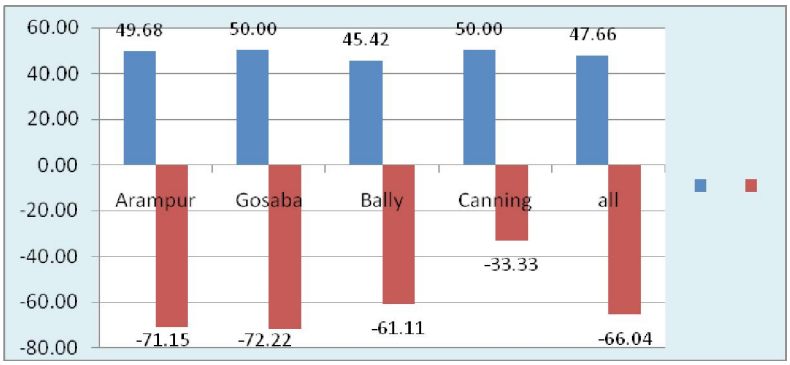
This happiness status is categorised into four parts such as:

- village wise,
- asset wise,
- caste wise, and
- farmer wise

We consider them one by one.

Here the anxiety is represented along the negative axis because anxiety is negative of happiness.

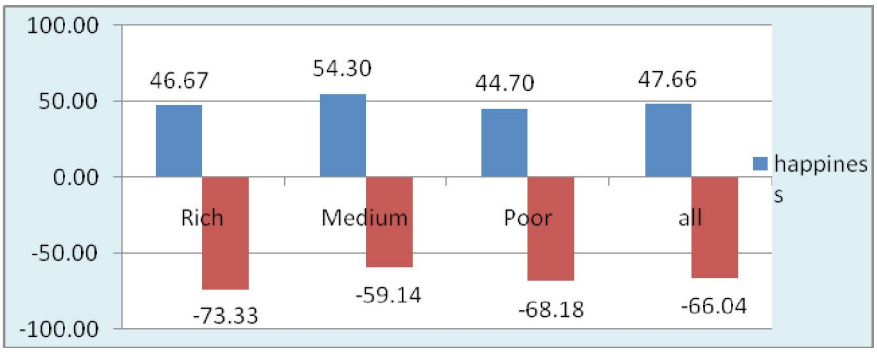
Table 1: Happiness and Anxiety (Village wise)



Source: Authors' calculation from Survey data

During the analysis of this happiness status, we take help from their respective figures through bar diagram. Here we measure the villages along the horizontal axis and the components of happiness along the vertical axis. In the figure 3, we have shown happiness and anxiety among different villages. We see that happiness is highest in Gosaba than other and lowest in Bally, anxiety is highest and equal for both Gosaba and Arampur. As a whole happiness is not very much fluctuative among different villages. But anxiety among different villages is very fluctuative. All together happiness is low in comparison to anxiety among different villages.

Fig 2: Happiness and Anxiety (Farmer wise)

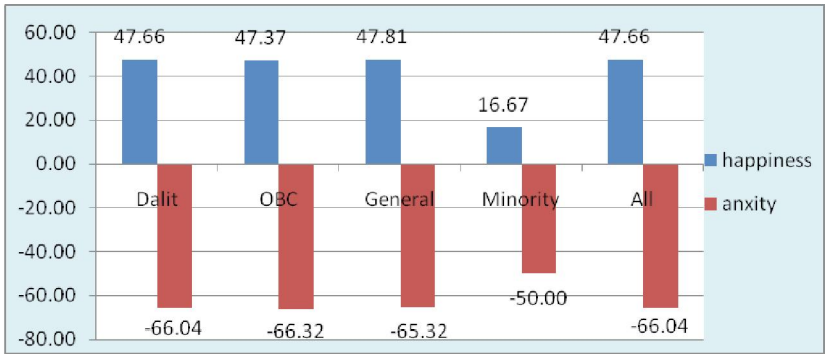


Source: Authors' calculation from Survey data

In the above figure we compare happiness and anxiety components among different asset groups as we have mentioned. Here happiness is highest in medium people and on the other side anxiety for rich people is at 66.84%, i.e., highest among other category people. Rich people are happy 46.67% and poor are 44.70%, both are very close to each other. In case of anxiety, these categories of people have almost same amount of anxiety. In total anxiety score is only 18.38% higher than happiness.

Now we discuss about the happiness score of people in Sundarbans according to their castes. We derive caste of people in to five groups such as SC, ST, OBC, general and minority. We combine SC and ST groups named as Dalit. To describe this using bar diagram, we measure castes along the horizontal axis & percentage of components of happiness along the vertical axis.

Fig 3: Happiness and Anxiety (Caste wise)



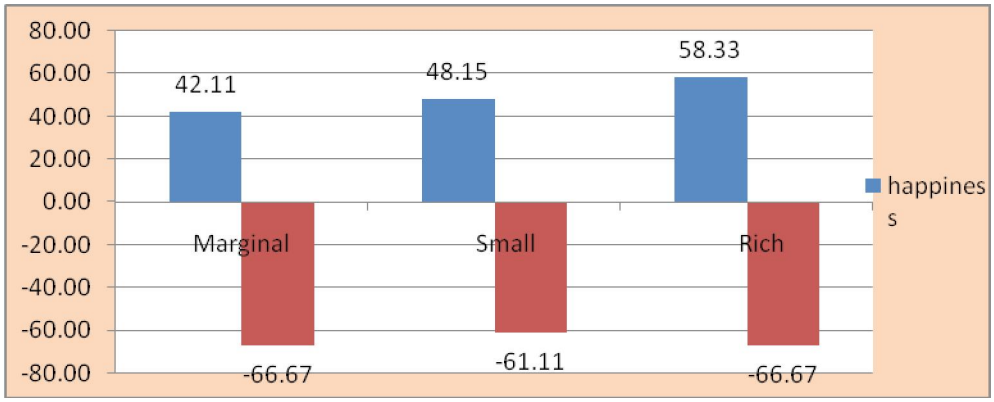
Source: Authors' calculation from Survey data

In this figure above we measure happiness & anxiety vertically in percentage. Minority groups are the least happy and their anxiety is 50.00%, i.e., greater than other groups. Other groups have happiness in average and their anxiety is also in average level. In all happiness is 18.38% less than anxiety.

After all our discussion we would like to draw people's attention and concentration towards the happiness standard of farmer. For this we first divide the farmers into 3 different groups such as marginal farmers having land up to 1 acre & small farmer having land from 1.33 to 2.66 acre & rich farmer are those having land more than 3 acre. Here we like to know the score of different happiness components compared to different farmers. So we draw score

of components of happiness along the vertical axis and 3 different farmers along the horizontal axis.

Fig 4: Happiness and Anxiety (Farmer wise)



Source: Authors' calculation from Survey data

In this figure, we can see that happiness among rich farmers is highest at 58.33% and it is lowest among marginal farmers i.e., at 42.11% which is low. Anxiety among all farmers is same but a little higher among rich farmer, i.e., 66.67%.

After our analysis in happiness, we get that some components of happiness requires more care, they are work money education and health. More concentration is needed for improving this standard, our main objective to do this project is that higher authority should take care more for the development of people in Sundarbans.

5. Conclusions

Sundarbans, the place which we visited this year as our socio – economic tour was naturally very beautiful. But this natural beauty sometimes or other took the shape of a demon and runs after the life of dwellers of Sundarbans. The people of Sundarbans though not financially strong are always mentally ready to face the challenge. Here in this report we have considered the socioeconomic profile, agriculture, nonfarm activities, migration, loan asset and expenditure, NREGS and at last the happiness.

In the socio–economic profile we have considered the type of houses, type of rooms, toilet type, types of diseases,birth at govt. hospital, sources of light, sources of fuel, drinking water,

work participation rate etc. Here we saw that there is a mixture of houses of both kuccha and semi pucca type. There is no facility of electricity, they in maximum use solar power, kerosene oil etc. Drinking water is not also available in right amount. In all they have to lead a very tough life.

Next we considered the agriculture part where we considered three types of farmers respectively: small, marginal and large farmers and accordingly we considered the unsold output, amount of profit, compared between the technologies used at present and previously and others. Here we saw the production at present has got reducedthan earlier. The main reason behind it is after Ayla the salinity and the alkalinity of the soil has increased to a high extent.

In nonfarm sector we considered the different types of non-farm activities done in Sundarbans, concentrated on more than one non-farm activates, compared the work participation rate of that of woman in nonfarm with that of the agriculture. There after we considered migration. The main reason behind migration is unavailability of work there. Next we considered the rate of migration. Lastly we considered the measures of happiness index. Here we saw they are more or less satisfied. This is mainly due to their less awareness about the outside world.

Our survey reveals how the complex process in which people of this inhospitable area copes up with the nature to bring out a meaningful livelihood. They are brave people though steeped in poverty. It is through strong affirmative actions of the government that their lot can be improved upon.

References:

- Chowdhury, A.N., Mondal, R., Brahma, A., Biswas, M.K., (2008), Eco-psychiatry and environmental conservation: study from Sundarban Delta, India. *Environmental Health Insights* 2, 61–76
- Department of Sundarbans affairs, Government of West Bengal.
- Haque N., and M. E. Blowfield (1997), Socio-Economic Methodologies for Coastal Fishing Communities: The Example of Set Bagnet Communities in Bangladesh, *Information Bulletin 10,* DFID Post-Harvest Fisheries Project: Chennai, India.
- Santhakumar, V., Enamul Haque, A. and Bhattacharya, R. (2005) An economic analysis of mangroves in South Asia. In Khan, M. (ed.) Economic Development in South Asia. Tata McGraw-Hill Publishers, New New Delhi.

- Chaudhuri, Kalyan (1976), West Bengal- Poverty and Exploitation in Sundarbans*, Economic and political weekly*, vol-11.no. 50 (dec-11 1976) pp-1914-1915].
- Sanyal Kalyan (2007), Rethinking Capitalist Development Primitive Accumulation, Governmentality and Post-Colonial Capitalism, Routledge India.
- Sarkar Khalekuzzaman (1997), Fishers livelihoods in Sundarbans, Fishers livelihoods in Sundarbans.

Analysis of Development of Primary Schools Near Road Network: A Case Study of Four Districts of West Bengal

Sweta Mondal[1] **Sudakshina Gupta[2]**

Abstract

Infrastructure plays a key role in the improvement of living conditions as development of infrastructure is essential to raise the socio-economic development. Access to roads enhances accessibility to provide socio-economic opportunities to all. Construction of rural roads is the primary means for providing education, health services as well as infrastructural facilities. Again, social infrastructure like education and health are essential for economic growth and accessibility and mobility is provided to such infrastructure through rural road investment. Promotion of rural roads has a beneficial impact on rural development as rural roads are a tool for social inclusion, economic development and environmental sustainability. In this paper, the development or improvement of rural roads, leading to accessibility, has been studied to show an effect on the development of primary schools.

The study shows that with respect to the four districts of West Bengal, majority of primary schools have developed on or near road network. On the basis of secondary data collected, out of the four districts studied we see a greater number of primary schools have developed on or adjacent to village road are the districts of Howrah and Nadia. In the district of East Medinipur and Murshidabad, we see a smaller number of primary schools developed on or adjacent to village road. Pie-diagram has been used to show the percentage of primary schools developed on or near the village road irrespective of a greater percentage or smaller percentage of primary schools developed near the village road.

Keywords: Infrastructure, accessibility, mobility, roads, primary schools

JEL Classification: I25, O18, R41

1. Assistant Professor, Department of Economics, Sarojini Naidu College For Women
2. Professor, Department of Economics, University of Calcutta

Introduction

Infrastructure can transform rural India as it plays a key role in the improvement of living conditions. Road transportation has an important impact on infrastructure and other facilities as it provides the basic infrastructure for investment (Rawat, Sharma; 2017) since road transport infrastructure is an essential component of economic growth and development, so adequate and efficient road infrastructure is crucial and a pre-requisite for the provision of accessibility and mobility (Lombard, Coetzer; 2007).

Rural roads through the provision of investment facilitate accessibility and thus help in poverty reduction, gender equality and sustaining livelihoods. Improved access to roads will reduce transport costs and enhance accessibility and mobility leading to increased transport operations, economic activity, regional integration and economic growth. So, better roads in rural areas lead to better access and opportunities leading to diversified livelihoods and income (Gayen, Sarkar; 2016). Studies show that an improvement in the physical accessibility plays an important role in the improvement of enrolment in primary schools in the rural areas (Karmakar, 2016). But rural areas often lack accessibility and mobility so there is a lack of integration with urban areas and limits access to socio-economic development. Evidence shows that, lack of developed roads has low level of education and problems in accessing essential services while poor people benefit from improvement of rural roads. So, rural roads are a tool for social inclusion, economic development and environmental sustainability (Samanta, 2015). In the Indian context rural roads should be improved in locations where economic and social opportunities exist. So, development of road network in rural areas determines the development of social opportunities for improvement of the quality of life. Development of road Infrastructure facilitates the development of education.

Social Infrastructure has a significant role in the economic development of a country. Education has the potential to "transform" every life and to give every individual a chance to compete for social opportunities (India Education Report, 2017). It is capable to bring inclusive growth by stimulating economic growth. Education quantity is measured by schooling enrolment ratios, the average years of schooling etc (Cooray, 2009). Social infrastructure like education and health are essential for economic growth and accessibility and mobility is provided to such infrastructure through rural road investment.

Accessibility includes mobility of people and the availability of services. It is also the ease with which an individual can reach the destination (Shyam, 2007). The accessibility constraint faced by the rural households in accessing the social opportunities operates with many non-physical barriers like characteristic of educational infrastructure and locational differences on primary

school participation in rural areas. In rural areas, inequalities in socio-economic status between the children are lower if more schools and teachers are available along with building more schools. How schools are distributed play an important role because that in turn determines the distance children have to travel to school. (Huisman, Rani, Smits; 2010). Distance to schools matters in rural areas for the students' participation in primary schools. Evidence shows that new schools were developed along with higher school enrolment in rural areas and school attendance has increased particularly for girls (India Infrastructure Report 2007). Again, there is a positive impact of rural roads on women which increases their productivity (Sieber, Allen; 2015). India has to evolve a strategy with focus on bridging the gaps in access to social infrastructure for enhancement of human potential for productive employment and for improving the quality of life (Economic Survey, 2015-16).

Thus, accessibility is the indicator which determines development of rural road network or through improvement of roads leading to development of primary schools along with student's enrolment. So, road infrastructure needs to be developed to facilitate the development of education.

Objectives

The objective of the paper is to analyse the development of primary schools on or near road network. We want to see the percentage of primary schools developed near or on the village road in greater or less percentage among the four districts of West Bengal. Howrah and Nadia have a greater percentage of primary schools developed on or adjacent to village road, whereas in the district of East Medinipur and Murshidabad, we see a smaller percentage of primary schools developed on or adjacent to village road. So, rural road infrastructure needs to be improved or developed to facilitate the development of education.

Is Development of Rural Road Necessary for Development of Primary Schools?

Development of rural areas is dependent on rural road connectivity as it provides access to economic and social services. The nature and extend of road network play a significant role in determining the development potential of a region. Village level data indicates that one of the reasons for Indian growth is the development of extensive road network (Banerjee, Iyer 2005), (Rao and Walton, 2004), (Omvedt, 1993). With a given amount of investment, a region leading to a better road network will generate greater development momentum compared to a region with a poor road network (Chisti, 2015). Investment in the rural road is supported to provide rural road infrastructure in the long-run as it plays a significant role in socio-economic development and economic growth (Lombard, Coetzer; 2007). To enhance the

economic growth, the Government has to ensure connectivity for all the basic needs of the poor people living in rural and urban areas. So, equitable access is important from the perspective of providing socio-economic opportunities to all (India Development Report, 2015).

The relationship between distance and schooling is critical in rural areas. In the context of rural area, access mean having a road connectivity to the smallest possible hamlets. The access norm depends on the habitational pattern and geographical accessibility to primary schools. Geographical Access is related to three variables: location of schools, location of habitations and road network. A common measure of accessibility in terms of schooling is the average distance to the nearest school, on travel time and on enrolment (Halder, 2016). The establishment of primary schools is dependent on population size and distance. The factors that influence school attendance are distance and pattern of school supply. It was found that the distance of schools from the habitation is inversely related to enrolment and participation levels. Rural Roads influence where new schools are built and where primary schools are within the walking distance from their home (Kumar, 2019). Again, Accessibility of schools can be measured by examining whether the schools are approachable by all-weather roads or not. The remoteness of habitations within rural areas seems to affect the participation of children significantly (Govinda, Bandyopadhyay; 2008). Rural schools cater for the vast majority of students nationally 85% of total enrolments in primary schools in 2005 (Consortium for Research on Education, Transitions and Equity, 2009). So, roads lead to reduced travel times, increase school attendance of pupils and teachers and promote human capital formation. A paved road has a positive impact on teacher attendance and performance (India Infrastructure Report, 2007).

The utility of this network can be appreciated with the integration of accessibility with social infrastructure (India Infrastructure Report, 2007). The Ministry of Rural Development was to ensure that every habitation with population exceeding 1000 and tribal areas with population exceeding 500 are connected with an all-weather road by 2009 (Lalvani, 2010). This was expected to generate multiplier effects in the rural economy by improving accessibility and mobility, leading to economic activity and subsequent economic growth. Studies highlighted by census data and administrative road program data, shows a positive impact of new roads on school enrolment. Enrolment increases, where new roads would increase the returns to education and drive the long-run growth (Adukia, Asher, Novosad; 2017). It reduces transport costs, allow workers to move freely and provide access to school for both teachers and students (Human Development Report, 2016).

The government spending on rural infrastructure quadrupled between 2000-01 and 2010-11. Since 2005, with the launch of Bharat Nirman, the Central government's rural infrastructure programme that include roads, investment in rural infrastructure has increased. A study on linkages between government expenditure and poverty found that investment in roads has a stronger impact on reducing poverty than investment in education, health etc. (India Rural Development report 2012/13).

Need for Development of Integrated Road Network

It is evident that economic growth and development in any country can be linked to the road network as transport improvement stimulates economic development (Lombard, Coetzer, 2007). Investment was mainly concentrated for construction and maintenance only in the higher order roads while rural roads receiving less attention than they deserve. But, over the years, both Central and State governments have intervened in the development of rural roads. From the mid-1970s, the Central Government supported rural road construction, mainly under various employment-generation programmes which proposed to provide all weather road connectivity to all villages with populations of 1500 or more, and to 50% of villages with populations between 1000 and 1500. Since 2000, and particularly since 2005, the Central Government has broadened its rural infrastructure thrust to include the range of basic infrastructure that addresses the needs of individual households (India Rural Development Report, 2012/13). In the context of rural roads, it is needed to integrate connectivity needs with scattered settlements.

India has the second largest road network in the world with 52.32 lakh km of roads comprising National Highway, State Highway and Other roads (Economic Survey 2015-2016). With a total road length of 4.69 million km in the year 2011, roads in India are broadly classified into National Highways, State Highways, Other Public Works Department Roads, Rural (Panchayati) Roads, and Project and Urban Roads (India Development Report, 2015). Total rural road length constructed has been 36,340 and 36,450 kilometres during 2014-15 and 2015-16(Chandra, Ramswaroop; 2019). This connectivity enhances the socio-economic status of rural people. In West Bengal, roads are classified as National Highway, State Highway, District Roads, Village Roads, Roads under P.W.D., under Zilla Parishad, under Gram Panchayat & Panchayat Samiti, under Prime Minister's Gramin Sarak Yojana. Rural roads constitute the major share with 58.63% of the overall road length. The year 1991 has seen a tremendous change in rural roads with the introduction of Jowhar Rozghar Yojana (JRY) in 1989 and Pradhan Mantri Gram Sadak Yojana (PMGSY) in 2000. Since then, over 3.5 lakh km of all-weather rural roads have been built, resulting to over 12% of the total rural road network

(India Rural Development Report 2012/13). National Highway & State Highway occupies only 1.51% & 3.49% respectively (India Development Report 2015). The share of the surface roads has increased from 39% to 50% in the 60-year period. About 40% roads are un-surfaced and are in poor quality. Village connectivity still remains a problem.

So, the total road length has increased from 0.4 million km in 1951 to 4.69 million kms in 2011. The total length of National Highway (NH) was 22,200 kms in 1951 and has seen an increase of 4 times only. The 10th and 11th Plans have contributed significantly to NH's, which has made a big difference to the scenario of NH's in the country. Some roads like National Highway, State Highway, Project roads, and Urban roads showed marginal growth over the period of 1951-2011, other PWD roads & rural roads showed a tremendous change with an increase of 10 times. PMGSY II was launched in August 2013, which aims to upgrade selected rural roads based on their economic potential.

The development of a road connecting a habitation must be augmented by means of transportation enhanced by facility creation in social sectors. Nearly 83% of habitations (villages) and 94% of the population has a primary school within a distance of 1 km. Household location has a close association with educational access. In 1993-94, according to the Sixth All India Educational Survey (AIES), 83.4% of the habitations in the country had primary schooling facilities within a distance of 1 km (NCERT 1998). By 2002 around 87% of the habitations had a primary school within a distance of 1 km (NCERT 2005). This means physical access to school has continued to improve over the years but at a relatively slow pace (Govinda, Bandyopadhyay; 2008). A study conducted by ADB on the socio-economic impact of road improvement in some Indian states found that more and better-quality transport services are available once the road infrastructure improves (Socio Economic Impact of Development of Highways, 2017). The utility of the road network can be evaluated with the integration of accessibility with social infrastructure (Mohapatra, Chandrasekhar, 2007). Again, better education of the children is needed to develop infrastructure which will help to increase productivity. Rural Roads determine how many rural boys and girls attend primary schools (Kumar, 2019). In the 61st round of National Sample Survey data from 2004-05 (Government of India; 2006b) reveals that 83% of males and 77% of the females in the 5-14 age group were attending educational institutions in rural areas which is a total of overall 80% in rural areas. According to the same source of data (GoI; 2006b), around 82% of the children in the 5-14 age group were currently attending schools in 2004-05, where 88% of boys and 79% of girls were attending schools. The Annual Status of Education Report (ASER) 2006 conducted by Pratham also found that more than 90% of children were enrolled in school according to Pratham, 2007(Govinda, Bandyopadhyay; 2008). The quality of the life of the people can be

improved through road-connectivity which leads to access to schools, social services etc (Economic Survey 2018-2019). Modern transport infrastructure increases efficiency, reduces costs of transportation and travel time. This in turn will create not only more local wealth but develop well -being for the community.

The utility of the development of rural road resulted in the formulation of the Pradhan Mantri Gram Sadak Yojana (PMGSY) with an aim to provide all-weather roads to almost all rural habitations in the country, a report given by NRRDC 2000 (MODR, 2000). The primary objective of PMGSY is to provide connectivity of all-weather roads to unconnected habitations in the rural areas, so that habitations with population of 1000 persons and above are covered in three years (2000-2003) and all unconnected habitations with a population of 500 persons and above by the end of the 10th plan period 2007. Targets were set out in terms of new connectivity, up-gradation and habitations to be covered under PMGSY. The programme has succeeded in providing connectivity to most habitations, although the pace of implementation in some states is slow. It has improved the accessibility of beneficiary villages. Between 2000 and 2005, about 11% of unconnected habitations were provided connectivity under PMGSY and other schemes. These roads are now being linked to NH (Socio Economic Impact of development of Highways, 2017). So, the achievement record for new connectivity is only 62% and for habitations to be covered, the achievement rate is under 60% (Lalvani, 2010). Assessment of PMGSY in the state of West Bengal found that it has significant forward and backward linkages.

PMGSY programme showed socio-economic benefits for habitations connected. With the construction of PMGSY roads, there has been an improvement in the accessibility to education facilities. It was found that fewer school days were lost due to bad weather, reduced travel time etc. This has resulted in increased school enrolment and attendance in all states, especially, in the number of girls attending schools in Assam, Madhya Pradesh, Orissa, Tamil Naidu and West Bengal. It is a positive indicator in terms of improving access resulting in economic growth in rural areas. The ADB study found that improvement in rural roads have led to sharp increase in the number of girls going to high schools and colleges outside their villages. There has been significant reduction in primary and middle school dropouts (Socio Economic Impact of development of Highways, 2017). So, a direct impact of providing rural road connectivity led to the improvement in the quality of life and have directly benefited the poor.

With respect to India and West Bengal, the Total and Surfaced length of Roads (As on 31st March 2009 to 2012) is given in Table 1.

Table1: Total and Surfaced Length of Roads in West Bengal (as on 31st March 2009 to 2012) (in km) Excluding JRY Roads

State	Total/Surfaced	2009	2010	2011	2012
West Bengal	Total	290170	291805	299209	315404
West Bengal	Surfaced	104617	108000	115534	131904
India	Total	3571510	3682439	3790342	3965394
India	Surfaced	2141302	2249611	2341480	2515388

Source: Ministry of Road Transport & Highways, Government of India (ON 403)

Table 2 shows the category-wise Total length of Surface Roads (in km) in West Bengal in the following years 1981, 1991, & 1999 to 2001 (km)

Table2: Category-Wise Total length of Surface Roads in West Bengal (1981, 1991 &1999 to 2001) (As on 31st March) (in km)

Category of Roads	1981	1991	1999	2000	2001
National Highways	1605	1710	1715	1898	1898
State Highways	3147	3248	3354	3235	3235
Major District Roads		5340	5833	5833	5833
Rural Roads	12270	7473	6455	6455	6455
Total	17022	17771	17357	17421	17421

Source: Economic Review, 2001-2002 & Bureau of Applied Economics & Statistics, Government of West Bengal.

So, an integrated road network is a positive indicator in terms of improving access and providing equal socio-economic opportunities to all. Thus, developing road network ensure economic vitality with least impacts on environment and also adds to good quality social living by making transportation accessible to meet mobility choices for all people highlighting the need of the school-going children at the primary-level having access to primary schools with the help of accessible road.

Need for Development of Primary Schools on developed or Improved Rural Roads

Social Infrastructure has a significant role in the economic development of a country. Education is the most important tool for socio-economic mobility and a key instrument for building an equitable society for its role in the micro-economy of household welfare as well as the growth of the macro-economy. Education quantity is measured by enrolment at the primary, secondary and tertiary levels which exert a positive impact on economic growth (Cooray, 2009). So,

Government can play a role for funding education to ensure access. Several recent studies suggest that education is important as an investment in human capital and using years of schooling implicitly assumes that human capital is created through formal schooling (Hanushek, Wobmann;2010). People's access to education depends on Educational Infrastructure. This is examined by using the parameters number of formal schools, spatial spread of the schools and distance from habitats, number of teachers and amenities (Majumder, Ray, Sen). If more people have access to education, it enhances social mobility, thus lowering long-term inequality. We need to raise the level of social capital, which in turn will raise knowledge capital. The capital acquisition will depend on local infrastructure. The infrastructure will be used to enhance individual's knowledge. In turn, this drives them up for the continuous knowledge spiral, so that the nation's individuals can further develop their infrastructure for building human capital through education.

With a push towards improving primary schooling in 1986 New Education Policy (NPE) together with Millennium Development Goal (MDG), focus was on getting the children into primary and middle schools in 1990s and 2000(India Development Report 2017). To increase enrolment ratios by allocating the resources efficiently and to achieve the MDG of "education for all", the quantity dimension of human capital is reflected by the enrolment ratios in the primary, secondary and tertiary levels (Cooray, 2009). At the All India-level, the Gross Enrolment Ratio of 6–14-year age group increased from 96.3 in 2001-02 to 108.6 in 2004-05 at the primary level (Govinda, Bandyopadhyay; 2008). The Gross Enrolment Ratio in 2015-16 in primary level was 99.2% (Chandra, Ramswaroop; 2019).

Table 3: Average Annual Growth Rates (%) in Enrolment at Primary Levels in India

Period	Primary Level		
	Boys	Girls	Total
1990-1991 to 2000-2001	1.2	2.1	1.6
1997-1998 to 2001-2002	1	1.4	1.8
2000-2001 to 2002-2003	0.7	7.2	3.6

Source: Govinda and Biswal (2006: 14)

Government's vision is to build an inclusive society in which equal opportunities are provided for the growth and development of all sections of the population including the marginalised and weaker section of the population to lead a productive life. The Twelfth Plan by recognising the importance of education, places a focus on the expansion of education by ensuring that educational opportunities are available to all segments of the society (Twelfth Five Year Plan 2012-2017).

The data by National University of Educational Planning and Administration (NUEPA) highlights the extraordinary growth in rural schooling that has taken place since 1994(NUEPA 2006). A total of 221,009 new elementary schools have been established in rural areas since 1994. 87% of the schools in India are in the villages. Government statistics revealed that over 90% of the rural schools at elementary level are run by the Government (India Infrastructure Report, 2007).

According to DISE data, the share of Government primary school is higher compared to private aided and un-aided schools.

Table 4: Share of Primary Schools

School category	Govt. Aided	Private Unaided	Private	Unrecognized Recognized	Madrasa Schools	Total
Primary	75.41	2.88	18.81	2.14	0.76	1207427

Source: DISE 2014-2015 NUEPA

But we see that in rural India, the socio-economic conditions have constrained the process of primary education as well as social inequalities are the major causes of educational deprivation among the children in India which are manifested in primary school participation. Distance to nearest school from residence is one of the important factors affecting access to education and attendance. In terms of physical access to primary schools' distance should be within less than 1 km radius from residence (NSS 71st Round, 2014). The Central RTE rules specify that a primary school be established within a walking distance of 1 km. According to NCERT,2005 around 87% of habitations had a primary school within a distance of 1 km in 2003 (Consortium for Research on Education, Access, Transitions and Equity, 2009). But with a high population density it is necessary to establish more than one school (Banerjee, et al; 2011). In most of the states, nearly 90% of the households had primary schools within 1km distance from their residence. In West Bengal in 1993, 61.2% of the rural children had primary schools within their habitations while with respect to India; the average for children who had this facility within their habitation is 77.8% (Nambissan, 2003). The Sarva Shiksha Abhiyan (SSA) was launched in November 2000 that sought to ensure 5 years of primary education by 2007 and 8 years of education by 2010 for all children in the age-group of 6-14 years with special focus on educational needs of girls and the dis-advantaged class (India Education Report, 2017). It is the vehicle to implement the Right of Children to Free and Compulsory Education Act (RTE). Its aim is universal access and retention, bridging the gender and social gaps in enrolment level. The number of primary schools has grown rapidly from 529,000 in 1986 to 767,000 in 2005 (Consortium for Research on Education, Access, Transitions and Equity, 2009). Under SSA,

over 3 lakh new schools have been opened along with infrastructure development at the school level. According to the DISE Flash Statistics data for the year 2009-10, the number of primary schools in the state was 74,678 (it was 51,021 in 1995-96) (Banerjee, et al; 2011). Government and local bodies are the main providers managing around 91% of primary schools. According to provisional DISE Data (2010-11), there are 51016 number of Government Primary schools in West Bengal. These primary schools cater to a population of age-group 5-9 years of 72.86 lakh pupils. Policy prescriptions have been followed by several measures like establishing new schools, improving school infrastructure, recruiting teachers and above all boosting enrolment and attendance ratio. Between 2001 & 2006, nearly 1 lakh thirty thousand new primary schools were set up nation-wide, six lakh additional primary teachers were recruited during the same period. The pace of improvement in this respect has continued through 2009-2011. Gross enrolment ratios among primary school-age children (6-11) years have risen from 96.3% in 2001-02 to 98.3% in 2003-2004. In 2005-06 it was 109.4%. India has achieved near universal enrolment in primary education in most areas. The enrolment of students up to class V is 10,545,319- up from 8,500,000 in 1995-96 (Banerjee, et al; 2011). The drop-out rate has dropped from 39.03% in 2001-02 to 31.36% in 2003-04. In 2005-06 it dropped to 25.7 % (Educational Statistics, 2005-06). Dropout rates for girls was higher than boys including 2001-2002, the trend reversed thereafter, with lower dropout rates for girls (25.4%) than for boys (31.8%) in 2004-2005 (Govinda, Bandyopadhyay;2008). According to the 61st Round National Sample Survey (2006), 35% of 5-29 years old have never been to school; and around 28.5% of children dropped out of primary school in 2004-05 (Consortium for Research on Education, Access, Transitions & Equity, 2009).

Drop-out rate in West Bengal has been around 25% for primary level (Majumder, Ray, Sen). Various rounds of NSS indicates that with respect to school-participation, between 1993-94 (the 50th round) and 1999-2000(the 55th round) there has been an increase of enrolment of about 7-10% in the age- group of 6-11 years (India Education Report, 2017). There has been an increasing enrolment of children in the schools, particularly from the dis-advantaged class. The average growth for the nation makes large difference in the primary enrolment rates across states. In the Eleventh plan, the Gross Enrolment Ratio increased from 111.2 % in 2006-07 to 115% in 2009-10 and the Net Enrolment ratio improved significantly from 92.7% to 98% during this period. Girl's enrolment accounted the majority between 2006-07 and 2009-10 (Twelfth Five Year Plan 2012-2017). In the 6-11 age groups, the GER for boys was already around or above 100%. The rise in school attendance has been impressive in rural areas. Again, the Mid-Day Meal Scheme was launched in order to enhance enrolment, retention and attendance of children apart from improving the nutritional levels. This initiative

has a considerable impact on children's access to education. Different social factors influence enrolment and drop-out rate of the pupils. It may be claimed that social, economic and locational gaps in schooling are narrowing down in the country over time. The proportion of children who would enter into formal education system (children in the age group 0-4 years) was 10.69% in 2001 which is expected to go down to 7.7% in 2011 and further to 6.68% of the total population in 2026(Banerjee, et al; 2011). Estimate shows there is a need to set up 1557 new primary schools to ensure adequate access. But availability of primary schools does not lead to universal access. So, investment should be focused in human development priorities which can produce human development benefits by delivering services along with infrastructure development, thereby directing services to dis-advantaged and marginalized groups.

Thus, physical infrastructure like transportation, water sanitation benefit households by improving their productivity and leads to welfare improvement. Similarly, social Infrastructure like education and health relies on physical infrastructure like water and sanitation to prevent health diseases, electricity for schools and hospitals and roads to access them. The levels of social infrastructure determine the pace of economic progress. Thus, social infrastructure with its positive externalities has a significant role in the economic development of the country. Social Infrastructure requires fresh impetus with focus on efficiency to improve the quality of human capital by depending on physical infrastructure like roads which can be accessed.

Dependence of Development of Primary Schools Near Developed Rural Roads

We want to show, the dependence of development of primary schools near developed rural roads where the Methodology is described below:

Methodology

The dependence of development of Primary Schools near developed Rural Roads in West Bengal is analysed with the help of secondary data collected and based on USP analysis through the website One Five Nine.com Explore India and tracking the location of road and primary schools through Google map. Here four districts of West Bengal are taken, where in each district 4 blocks are selected randomly. Within each block, a certain number of villages are taken, according to the site. In each of the villages, near a developed road network or an improved road network, a primary school is available near or to some distance which is accessible for the children to reach primary schools. The roads in the rural areas of each district corresponding to each primary school are of various types like Major District Road, Other District Road, National Highway, State Highway and Village road.

According to, IRC Classification of Roads, Roads are classified as 1) National Highways (NH) 2) State Highways (SH) 3) Major District Roads (MDR) 4) Other District Roads (ODR) 5) Village Roads (VR)

National Highways (NH), The National Highways Network of India is a network of highways that is managed and maintained by Government of India.

State Highways (SH), the state highways are the roads which link important cities, towns, district headquarters within the state and connecting them with national highways or highways of the neighbouring states.

Major District Roads (MDR) These are important roads within a district connecting areas of production with markets and connecting these with each other or with the State Highways & National Highways. It also connects Taluk headquarters and rural areas to District headquarters.

Classification of Rural Roads: The rural roads are commonly classified as: 1. Other District Roads (ODR) 2. Village Roads (VR), which is further classified as Panchayat Union roads and Panchayat roads.

Other District Roads (ODR) Other District roads are the roads serving rural areas and providing them with outlet to market centres, Taluk headquarters, block headquarters or major district roads, and would serve to connect villages with a population of 1000 and above or a cluster of villages.

Village Roads (VR) Village roads are roads connecting villages or cluster of villages with each other to the nearest road of a higher category (Technical Handbook Roads 20-01-13).

The number of primary schools distributed over different types of Road Network in the four districts and selected blocks incorporating the villages of our study area in West Bengal, is selected on the basis of the data provided on the site. Near every road network which is developed or is improved, a primary school is located according to the data given. So, the secondary data collected and compiled on the basis of data provided as well as on author's choice. The distribution of road-network is shown below with the help of pie-diagram.

Here four districts are taken. On the basis of the districts, we want to show the highest number of primary schools near or on the village road compared to other types of roads. This is done to show where village road is developed or improved for the students of rural areas to have a greater access to primary schools. On the other hand, we have taken on the basis of the data, the lowest number of village roads for the students to have an access to primary schools.

The districts where more primary schools are located near or on the village road as per the data collected are in Howrah District (51) and Nadia (49) District while a smaller number of primary schools are located near or on the village road are in East Medinipur (8) and Murshidabad (14), on the basis of the data collected. This is to show the distribution of village road where more primary schools are located compared to villages where a smaller number of primary schools are located. On the basis of pie-diagram, we want to show the percentage of village road out of other roads like National Highway, State Highway, Major District Road, Other District Road, Highways, PWD Roads etc. In Howrah District, out of 86 primary schools, the village roads constitute 59% of primary schools. In Nadia district, out of 79 primary schools, the village road constitutes 62%. On the other hand, in East Medinipur out of 44 primary schools, village road comprises 18% and in Murshidabad district, out of 50 primary school's village road constitute 28% of primary schools.

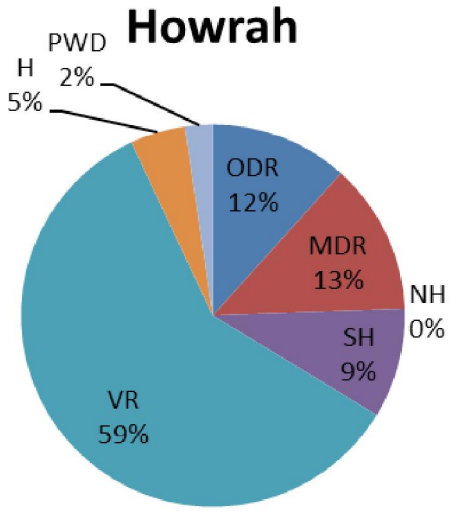


Figure:1 Percentage of Schools in Howrah

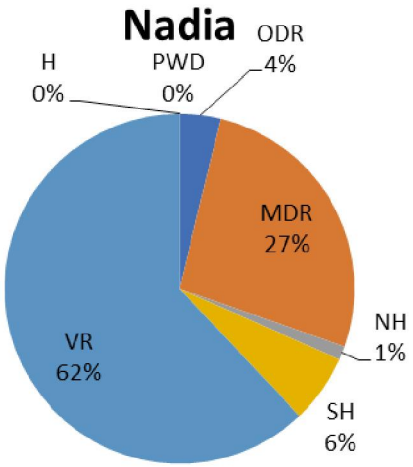


Figure: 2 Percentage of Schools in Nadia

More Number of Primary Schools on or near Village Road

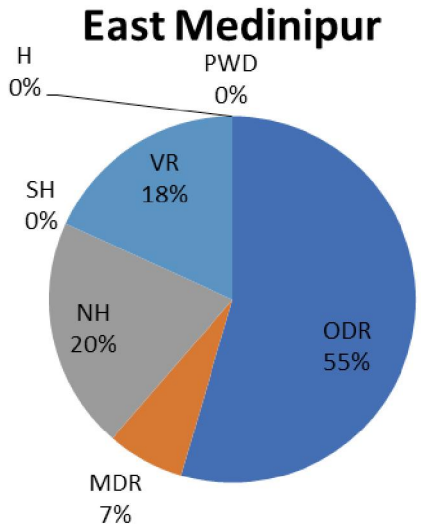


Figure:3 Percentage of Schools in East Medinipur

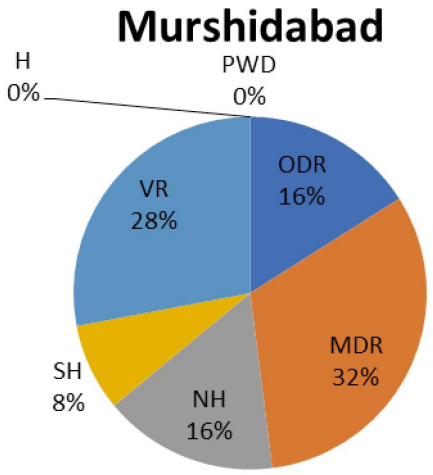


Figure:4 Percentage of Schools in Murshidabad

Less Number of Primary Schools on or near Village Road

(USP Analysis)

Findings

The pace of road development and the level of socio-economic development are inter-connected. The study indicates that in the selected 4 districts of West Bengal near every road network there is a primary school for the students to access through development or improvement of roads. Location of the schools is dependent on the road network which in turn is determined by the student's attainment to primary schools. One of the key components of Universal Primary Education is the provision of schooling facilities within the walking distance. The access norm depends on the residential pattern and geographical accessibility to primary schools. Geographical Access indicates the ability to reach a particular place from another place. It is related to three variables: location of schools, location of habitations and road network.

In the rural areas, physical location is vital for development of schools. Rural roads should be developed in those areas where primary schools are established for easy accessibility to primary schools. Thus, rural roads provide access to and help in the utilization of physical and social infrastructure. Rural access can be improved through the provision of rural infrastructure

which is dependent on improving rural transport. The process of improving rural access is by identification of real access needs and the transport patterns of the rural people. Thus, with respect to the four districts of West Bengal, the development of primary schools is dependent on the development of rural roads.

Conclusion

The location from the residence to the location of primary schools may enhance or paralyse the accessibility pattern depending on the spatial location. Spatial variations in accessibility can be measured based on the distances from the village to the school. Studies show that despite having moderately good facility at school, overall educational Infrastructural score is low whereas good accessibility pulls the educational infrastructural index score up although facilities are moderate there. Thus, accessibility is the important indicator for development of primary schools. The accessibility level of rural areas is needed to promote economic development that would improve access to opportunities. So, there is a need to identify the real access needs and priorities of the rural population and to develop a set of interventions to meet the access needs. The four districts of West Bengal show the dependency of primary schools on development or improvement of road network.

There is a link between development of roads and development of primary schools due to improved accessibility. Accessibility becomes easier with the development of primary schools near a road network. A well-developed road network is an indicator of development. The increasing level of development further attracts transport infrastructure. The key element of development includes the economic development along with the qualitative change in the social, economic and institutional realness of society. Thus, geographical mobility forms the basis for upward social mobility. Planning for rural road network should take into account the non-road interventions such as developing the village infrastructure like development of schools, health centres etc to improve mobility and access. Again, development of social sector is dependent on development of road network for improving mobility and access. So, accessibility is the indicator which is being enhanced by development of road network leading to the development of primary schools. A correspondence is being created between development of road-network and development of primary schools.

References

Ababa, a. (2019). Expert group meeting on eradicating poverty to implement the 2030 agenda for sustainable development, 27 February -1 march.

Adukia, A., Asher, S. & Novosad, P. (2017). Educational Investment Responses to Economic Opportunity: Evidence from Indian Road Construction.

Banerjee and Iyer (2005). Rao and Walton (2004). Omvedt (1993). Human Development in India Villages in a Global World, Chapter12 Pg 182-193.

Banerjee, A. et al. (2011). Restructuring of School Education System in West Bengal Interim Report. Indian Institute of Management Calcutta, May 12.

Chandra, R & Ramswaroop, S. Education and the Poverty Trap in Rural Areas.

Cooray, A.V. (2009). The Role of Education in economic growth.

Dev, M. (2015). India Development Report.

Economic Survey 2015-2016. Vol II Ch 6 Pg 146.

Education in India Report No 575 (71/25.2/1) NSS 71st Round (Jan-June, 2014).

Educational access in India. (2009). Country policy brief. Consortium for Research on Education, Access, Transitions & Equity.

Educational Statistics at a Glance 2005-06 NLES-At a Glance-MHRD.

Gayen, J & Sarkar, D. (2016). Impact of roads on income and employment of rural households in West Bengal. International Journal of Social Science, Vol. 5, Issue 1, 47-54, March.

Govinda, R. & Bandyopadhyay, M. (2008). Access to Elementary Education in India. Country Analytical Review, Consortium for Research on Educational Access, Transitions and Equity.

Halder, J. (2016). Geographical Access and Quality of Primary Schools-A Case Study of South 24 Parganas of West Bengal. Working Paper 357, The Institute for Social and Economic change.

Hanushek, W. (2010) Education and Economic Growth.

Huisman,J. , Rani, U. & Smits, J. (2010). School characteristics, socio-economic status and Culture as determinants of primary school enrolment in India. NiCE Working Paper, 10-109, September.

Human Development Report 2016.Human Development for everyone: Caring for those left out- national policy options.

India Development Report 2017.

India Education Report, 2017.

India Rural Development Report 2012/13. Infrastructure: Chapter 4 Pg. 115-158.

Karmakar, J. (2016). Assessing the enrolment and primary educational infrastructure of rural West Bengal, India: A district level analysis. Journal of South Asian studies, 04(03), 101-108.

Kumar,V.S. (2019). Rural Roads and The SDGs, April.

Lalvani, M. (2010). Bharat Nirman: A Stock taking. Economic & Political Weekly EPW, vol xlv, no 17, April 24.

Lalvani, M. (2010). Social Infrastructure, Employment and Human Development. Economic Survey 2018-19, Volume 2, Chapter 10.

Lombard, P & Coetzer, L. (2007). The estimation of the impact of rural road investments on socio-economic development, April.

Majumdar, M. (2017). India Education Report. In Govinda,R & Sedwal, M, Progress of Basic Education: Universal Elementary Education Pursuit of Equity with Quality.

Majumder, R., Ray, J. & Sen, A. (). Social Sector Development in South West Bengal. A Report prepared for the UGC-SAP-I Program, Department of Economics, University of Burdwan, 31 July.

Mohapatra, C. (2007). Socio Economic Impact of Development of Highways.

Nambissan, G.B. (2003). Educational deprivation and primary school provision: a study of providers in the city of Calcutta. IDS Working Paper 187, June.

Rawa, D.S. & Sharma, S. (1997). The Development of a Road Network and Its Impact on the Growth of Infrastructure: A study of Almora district in the central Himalaya. Mountain Research and Development, 17(2), 117-126.

Samanta, P.K. (2015). Development of rural road infrastructure in India. Pacific business review international, vol 7, issue 11.

Selim, C. (2015). Regional Disparity in the Road Transport Network of W.B. EPRA International Journal of Economic and Business Review, Vol-3, Issue-1. Jan.

Shyam, K.C. (2007). Society and infrastructure: Geographical accessibility and its effects on school enrolment in Nepal. (Doctoral dissertation) University of Maryland, Baltimore, USA.

Sieber, N. & Allen, H. (2015). Impacts of rural roads on poverty and equity. Economic Survey, 2015-2016, Vol-II.

Socio Economic Impact of development of Highways, 2017.

Technical Handbook –Roads-20-01-13 final tnrd.gov.in.

Twelfth Five Year Plan 2012-2017. Social Sectors Vol III Education Ch 21.

Ward, M. (2007). India Infrastructure Report 2007. Rural Infrastructure: Rural Education.

In-migration: Problems that prevail in Delhi

Anuja Sharma[1] A.M. Jose[2]

Abstract: *India is currently confronted with a problem of strong internal migration. As per the Economic Survey of India for the year 2016-17 there were about 454 million internal migrants and has witnessed 9 million annual migrants between the years 2011 to 2016. Data show among the states, Delhi is witnessing major inflow of internal migrants and* is *now home to 8 million in-migrants and the NCT of Delhi is one among the megacities of the world and is ranked second below Tokyo with the estimated population of Delhi about 18.5 million in the year 2018 and is expected to grow to 38.94 million by 2030. It is important to note that these migrants do contribute to the development of the city and how their speedy growth in population has increased the issues and challenges in the form of Health, Education, Child* labour *and other social and economic issues with that affects a decent living to them. The paper aims to study the scenario of internal migration to Delhi and the challenges and problems encountered by migrants, as discussed above. It also examines how rural-urban migration is a key factor in increasing internal migration in Delhi. Secondary data were used to analyze the aforementioned issues. The results underline the need to strengthen migrant policies and implement labour laws that could protect and benefit migrant workers.*

Key Words: Delhi, Migration, Internal migration, Rural-Urban Migration,

JEL Classification : J15, I32

1. Introduction

World Bank defines migration as a motto, not defined under international law, refers to the general understanding of a person moving away from his or her usual place of residence within a country or across an international border, temporarily or permanently, and for a variety of reasons. It is a global phenomenon, with both international (across borders) and national (within country) movements. Migrants are drawn to cities seeking carrier, economic and social possibilities. Since, the time being individuals have been relocating to improve their living game plan and are driven powers for the economy also, however, are they given the regard as work or are they even thought to be people and are given the courses of action which they ought

1. Research Scholar in Economics, Amity University, Manesar, Haryana
2. Professor, Amity School of Economics, Amity University, Mansur, Haryana

to, being a resident of a nation that is an issue of discussion from numerous years and hence it is undoubtedly an issue of interest among all. As per UN there were 763 million internal migrants outnumbering international migrants with the numbers of merely 244 million (UN DESA, 2013; World Economic Forum, 2017). It is observed that globally large cities attract international migrants whereas developing county cities attract internal migrants (Bhagat, 2017; IOM, 2015; UNDP, 2009). There were almost 454 million internal migrants in India and it has been gradually increasing in every census count (Government of India, 2017). India accounts for one-fourth of the fastest growing cities in the world (World Economic Forum, 2018). Mumbai, Delhi and Kolkata are having most populous urban area in the country and rural-urban migration happens to be one of the major reasons of these phenomena (World Economic Forum, 2017). Several studies have highlighted the positive and negative impacts of migration. The urban area is benefitted due to mainly agglomeration economy, reduction in cost of production, rising productivity, size of consumer and capital market corrections in the labour market, and innovations (Bhagat 2017). At the same time many of the urban problems such as increasing slum population, overcrowding of public spaces, traffic congestion, air pollution, higher rates crime and violence were attributed migration of rural people to urban area. It is to be noted that the benefits of migration is outstripping the drawbacks of the same.

This paper is intended to study the issues that are confronted by migrant labour who are significantly contributing to the development of economy and how their numbers were continuously increasing specially in Delhi. Therefore, this paper has framed the following objective of the study:

2. Objectives and Methodology

The objectives of present study are to analyse the nature and causes of internal migration and the challenges faced by the migrants while they make their way to sustenance in NCT of Delhi. To be precise it has following objectives:

1. To highlight the migration scenario in India and to explain how the Delhi has become a migrant capital.
2. To identify the challenges faced by migrants in terms of terms of health, education, job security, working conditions, housing and related issues while they make sustenance in Delhi.
3. To provide policy measures wherever necessary to merge migrant population in the capital.

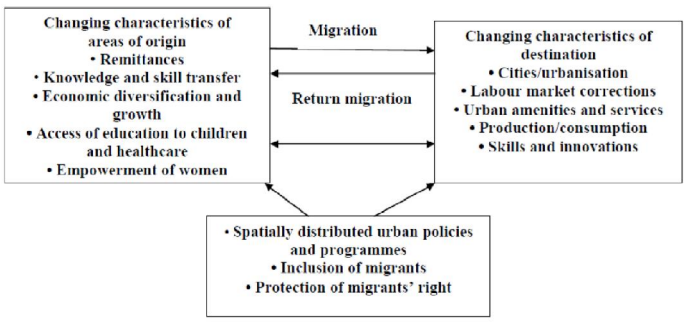
Secondary data resources were used for the study such as government websites, reports of government, published articles and other relevant publications were also consulted.

3. Internal Migration- Scenario

At the time of declaration of Millennium Development Goals (MDG) for the year 2015 by the United Nations during the summit of the year 2000, the issue of Migration was not taken into consideration. But at the time of announcement of the SDG (Sustainable Development Goals) for the year 2030 in the year 2015 *"Migration"* was given utmost importance and was included in the 17goals set by the UN. The 11goal of the SDG gives importance on 'sustainable cities and communities' which is to make cities and human settlement inclusive, safe and resilient, while goal number 8 has its target to ensure protection of labour rights and promotion of safe and secure working environments for all workers including migrant workers (Taran, 2016).

The Dual Sector Model, which was introduced by Lewis in 1954, is considered to be the cornerstone for development economics. The Dual Sector Model, which was developed further by Todaro (1976), includes internal migration as part of a long-term process of structural change, specifically from an agrarian to an industrial society. The surge of internal migration continues unabated. Agricultural sector in India is stagnant for many decades. This has led to a movement of labour from agriculture (rural) into industry and various services (urban). In most areas, a large wage gap persists between the rural and urban regions, making migration is an ongoing phenomenon (Lucas 2015). As observed by Lewis and Todaro, internal migration is an integral part of development. The model of Bhagat (2018) on impact of migration and urbanisation (see Figure 1) on overall development of the country underlines why one has to see migration's role in making positive impact both at areas of origin as well as at destination. The message is that development planners need to address any issues the migrants face in cities as it is a process of inclusive development.

Figure -1: The impact of migration and urbanization—a conceptual framework



Source: Bhagat R B (2018), 'Development Impacts of Migration and Urbanization', Economic*& Political Weekly*, Vol. LIII No. 48, Pp.: 15-19

As now-a-days we have an easy option with more transportation and communication facilities therefore, migration has become a part of process of Urbanization and Industrialization (Ansari, 2016). Internal migration has been a cause of concern for many countries including India. As per Census of India for the year 2011, there were 453.6millioninternal migrants in the country. The Economic Survey of India 2016-17 estimated that internal migration in India was 9 million annually between the years 2011 to 2016. Faster growth and development attracted people from all the parts of a country to excel and gain better life and income opportunities which have given rise to migration within the country.

Table 1: Internal Migrants in India

Year	Number of Migrants
1991	220 million
2001	315 million
2011	454 million

Source: Census of India 2011

'Migration' is about changing places in search of better living. Movement of people from their home to another city, state or country for a job, shelter or some other reasons is called migration. "Internal Migration" is all about changing places within the boundaries of a country. It is mainly of four types:-

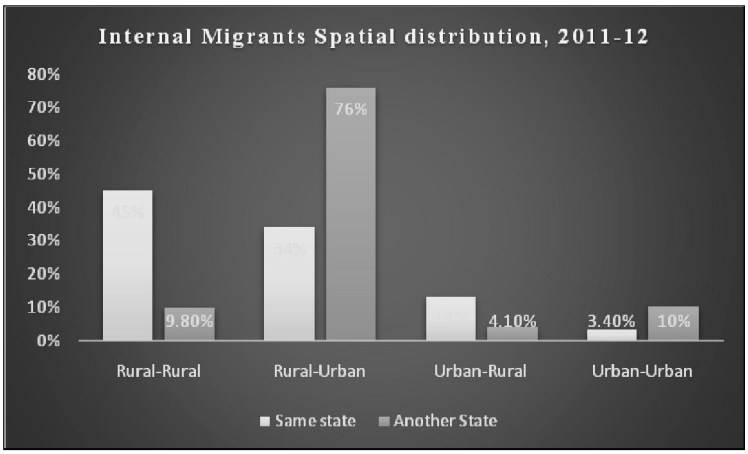
i. Rural to Rural- moving from one rural area to another.

ii. Rural to Urban- moving from rural area to urban area.

iii. Urban to Urban- changing places from one urban area to another area.

iv. Urban to Rural- it is a rare form of internal migration which is moving from urban area to rural area.

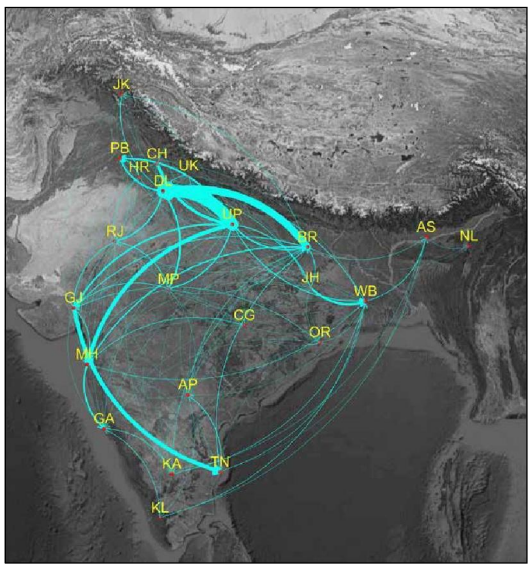
Figure 2: Spatial distribution of internal migrants, 2011-12



Source: World Bank Working Paper, 2018 (accessed on March, 15, 2018 from http://documents.worldbank.org/curated/en/429181519662555108/Indias-internal-labor-migration-paradox-the-statistical-and-the-real)

Figure 2 shows spatial distribution of internal migrants in India for the year 2011-12. Migration from one state to another on Rural to Urban basis is as much as 76 per cent whereas migration within the same state shows high Rural to Rural migration with 45 per cent migration.

Figure 3: Top Inter-State Migration Routes with Highest Passenger Density



Source: Economic Survey of India 2016-17

The Figure 3 shows Top Inter-State Migration routes with highest passenger density. As shown states like Delhi, Maharashtra, Tamil Nadu and Gujarat shows highest passenger movement from states like UP, Bihar and MP. Whereas, Kolkata attracts migrants from nearby places such as Jharkhand, UP and Odisha.

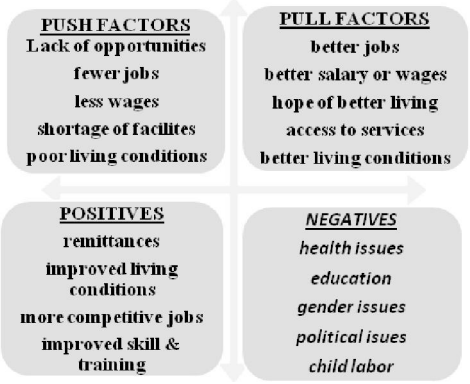
Uttar Pradesh and Bihar are the largest migrant sending state. From Bihar basically people reallocate to Delhi and West Bengal. Other migrant sending states are Andhra Pradesh, Madhya Pradesh, Rajasthan and Chhattisgarh. The cities of Mumbai, Delhi and Kolkata were the largest destination for internal migrants in India (Census of India, 2011).

The Government of India 'Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979' was passed in order to address unjust conditions of work for migrant workers which includes employment opportunities and right to wages and for having ideal working conditions was passed but still lack acceptance in many states of India and was not completely in practice. Be that as it may, Delhi being the capital of the country has been a focal point of fascination for travellers to come and make their living commendable and assist them with becoming financially as well as socially exclusive also. The coming sections will talk about how India is confronting high development inside a country and how Delhi has gotten a subsequent home and a traveller capital.

4. Why internal migration in India?

Migrant is much rational and calculative when he decides to migrate and moving to a particular city (Todaro & Smith, Economic Development, 2015). There are various reasons for people to migrate whether internally or externally those are discussed below:

Figure 4: Migration its causes and effects

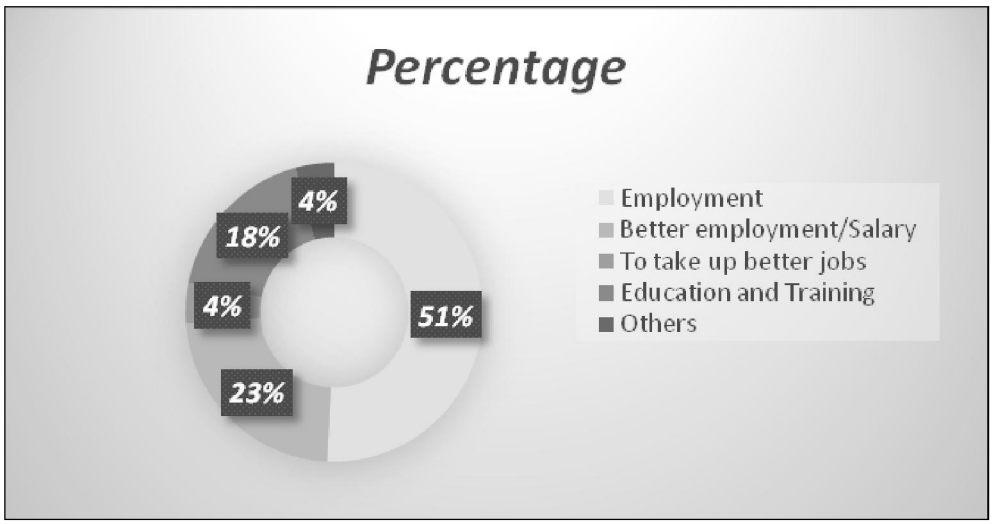


Source: own compilation (as cited in various sources)

Figure 4 shows when people decides to migrate which includes issues they are facing such as, less salary, lack of facilities or poor living conditions. Whereas, what are the expectations due to which they decided to move like better jobs, better wages or more approachable services. There are various benefits attached to it like they send remittances back home which not only improved theirs but their family living conditions as well, moving helps them to brush up their skill and knowledge and enhanced job opportunities. But as there are always two sides of a coin so they do face challenges while adjusting themselves to new places like lack of health facilities, lack of education opportunities to their kids, gender biasness towards women, and are prone to child labour a social curse in society.

Another set of data from Delhi Human Development Report 2013 (Figure 5) shows various reasons of migration as shown below. More than 50 per cent of migrants have moved from their homes in search of employment whereas, movement in hope of better salary and wages are 23 per cent and education is the reason for migration for the meagre of 18 per cent people.

Figure 5- Reasons for migration by the years of migration



Source: Delhi Human Development Report 2013accessed on April, 22, 2020

5. Growth of Urban Population in India

In order to give an understanding of the macro picture of urbanisation in India and its problems we devote this section to elaborate the growth of urban population and the places where the growth rate is higher.

Table 2 shows that Indian Urban Population is growing compared to its rural population. As seen from the table urban population shows increase whereas rural population shows decline in the year 2011 as compared to year 2001.

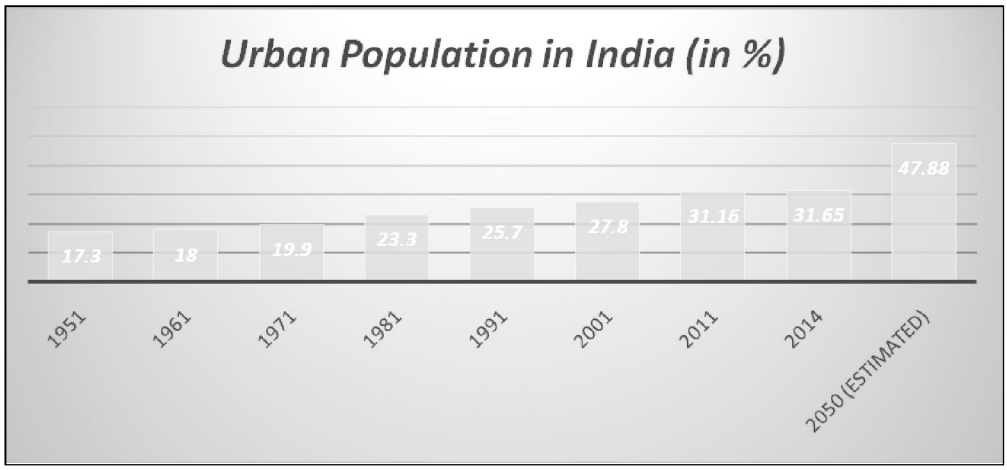
Table 2: Population and Growth rate: India

Population (in Crores)			
	2001	**2011**	**Difference**
India	102.9	121.0	18.1
Rural	74.3	83.3	9.0
Urban	28.6	37.7	9.1
Growth rate of Population (in %)			
	1991-2001	**2001-2011**	**Difference**
India	21.5	17.6	-3.9
Rural	18.1	12.2	-5.9
Urban	31.5	31.8	+0.3
Urban Population as Percentage to Total Population			
	2001	**2011**	**Difference**
India	27.8	31.2	3.4

Source: Government of India, Census of India, 2011 accessed on December, 19, 2019

There is another estimation (Figure 6) showing increase in urban population from the year 1961 to the year 2050 which says the urban population of India will increase by manifolds and around 48 percent of India's population would be urban by the year 2050. This indicates that the urban infrastructure has to expand in quality and quantity to meet the surge of growing urban population.

Figure 6: Urban population in India, 1961–2050



Source: Census of India 1961 to 2011
Note: Calculation for the year2014 and 2050 is From WMR, 2015 and World Urbanization Prospects, 2018

6. Growth of Delhi as a Major City and becoming migrant's capital

Delhi became the capital of the British Indian Empire in 1911, the population of the city rose from 238,000 in 1911 to 696,000 in 1947. After Independence, Delhi became the capital of the newly formed Indian Union and had to face a massive transfer of population following the partition. During the 1941-51 periods, the population size grew from almost 700,000 inhabitants in 1941 to 1.4 million in 1951, corresponding to an annual growth rate of 7.5 per cent. In the later census Delhi experience a rather high growth rates and still it continues as seen from Table 4. Among the metropolitan cities, Delhi's growth rate was the highest 26.69% (this was true in the previous Census of India too: 1981-1991 43.2%; 1991-2001 36.2%)

Table 3: Big Cities in India

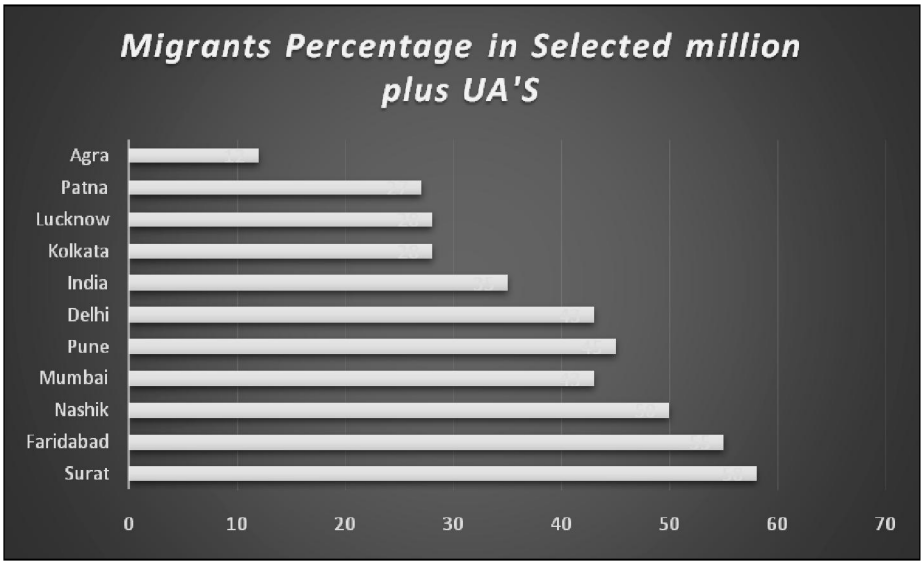
Serial No	City (Metropolitan) 2001	Population (Metropolitan) 2011	Population Growth rate 2001-2011	Population
1	Mumbai	16,434,386	18,414,288	12.05%
2	Delhi	12,877,470	16,314,838	26.69 %
3	Kolkata	13,205,697	14,112,536	6.87%

Source:http://www.censusindia.gov.in/2011-prov-results/paper2/data_files/India2/Table_3_PR_UA_Citiees_1Lakh_and_Above.pdf*accessed on January, 9, 2020*

India is one of the fastest-growing economies in the world. Delhi is one among the megacities of the world and is ranked second below Tokyo (Wold Urbanization prospects, 2018) and the estimated population of Delhi is about 18.5 million in the year 2018 (which is about 2.1% of India's population) and is expected to grow to 38.94 million by 2030 (as it has shown a population growth rate of 81.7% during 2000 -2018). States in India like Bihar, Jharkhand, Chhattisgarh, Rajasthan, Madhya Pradesh, Uttar Pradesh, West Bengal and Orissa are the home to 65 per cent of poor in India. People with the desire for a better and improved living are moving to urban areas like Delhi which is now home to 8 million in-migrants

A set of data in a (Figure 7) has clearly highlighted how Delhi has become a capital of migrant's with 43 per cent of its population constituted from migrants with half coming from Uttar Pradesh and Bihar (GoI, 2017). In the last few years Delhi has been a major attraction for large section of people and the number of migrants has shown an increase gradually from 2013-2016. Delhi is one of the top destinations for inter-state migrant labor.

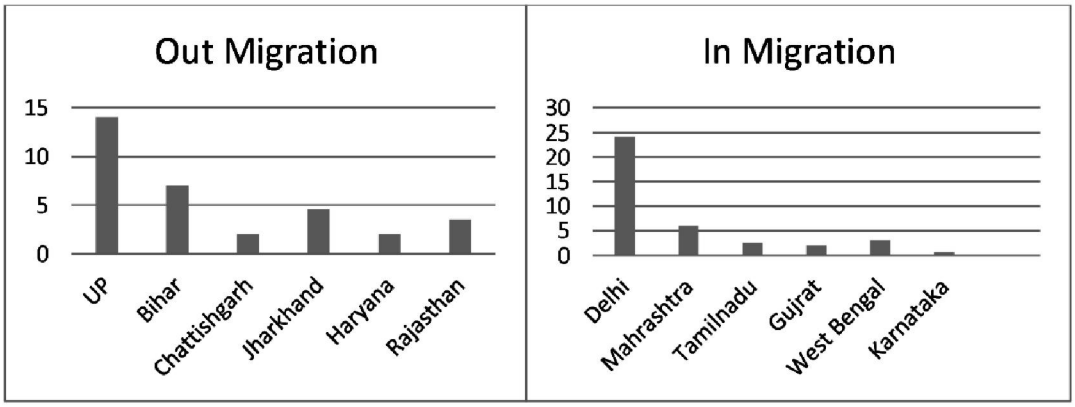
Figure 7: Percentage of Migrants in selected Million-plus Urban Agglomerations



Source: Bhagat, 2012b; WMR, 2015 https://www.iom.int/sites/default/files/our_work/ICP/MPR/WMR-2015-Background-Paper-RBhagat.pdf (accessed on January, 15, 2020)

In another set of information in The Figure 8, the Average Net Flow of Internal Migrants at State Level is shown. The largest recipient of in-migration was Delhi which accounted for more than a half of migration for the year 2015-2016 while UP and Bihar taken together covers almost half of out-migrants.

Figure 8. Average Net Flows at State Level



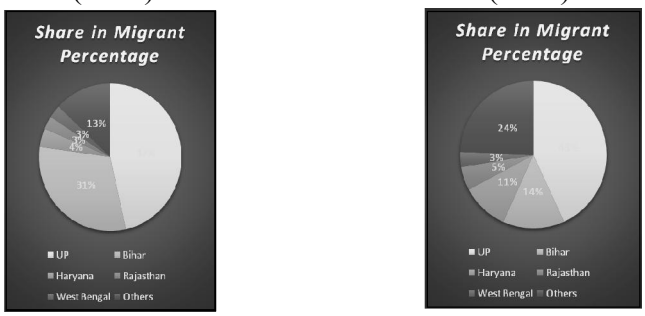
Source: Economic Survey of India 2016-17 (accessed on April, 22, 2020)

Globally large cities attract international migrants whereas developing county cities attract internal migrants. (Bhagat. 2017; IOM, 2015; UNDP, 2009). Delhi has paid a price for the rise in population and prosperity the biggest of which is internal migration. The share of Migrants in the capital's population growth has reached approximate 30 per cent in these years. The services and opportunities grooming in the city could be the reason of attraction for migrants.

The Figure 9 highlights state wise share of migrating population to Delhi from Delhi Development Report 2013. It indicates highest number of migrants from UP (47 per cent), followed by Bihar (31 per cent). Shows increase from the share of Bihar as compared to (13.63 per cent) in the year 2001, it shows increase of 2.5 times in the year 2011 with almost (31 per cent).

Figure 9: State-wise share of Migration in Delhi, 2001 and 2013 (% of the total migrants)

(2001) (2013)



Source: Delhi Human Development Report 2013
(Retrieved from http://www.in.undp.org/content/dam/india/docs/human-development/ HDR_Process_ DELHI_HDR_2013.pdf(*accessed* on January, 15, 2020)

7. Challenges and risks faced by Internal Migrants in their way of sustenance in NCT of Delhi

'Migrant workers are an asset to every country where they bring their labour. Let us give them the dignity they deserve as human beings and the respect they deserve as workers' (Former ILO Chief, 2012). Increase in Urbanization has led to increase in number of internal migrants which not only has increased number of slums and shanties in cities, but has also put their life to threat of diseases due to open defecation and lack of water and food. Those challenges were discussed below:-

i) Education

Education is one of the essential needs for one's life. After migrating, children of labourers are deprived of basic education due to lack of documents or paper work and financial crunch which is required for admissions due to which they cannot have admissions and are forced to child labour. Unlike countries in Southeast Asia and East Asia, the bulk of the migrant workforce in India has little or no education. (Srivastava and Sasikumar, 2013). Children often face difficulty to cope up different curriculum and language due to change of places (UNESCO, 2013; Deshingkar and Sandi, 2012). One more report from UNESCO'S Global Education Monitoring Report (GEM) 2019 shows that children that are left behind by migrating parents face fewer education opportunities. Average years of schooling is quiet low in Delhi Slums (Bag et.al, 2016).

ii) Health

Healthy body not only helps to gain strength but also increase one's confidence to work or perform various tasks. Lack of access to sanitation is quiet evitable in (NCAER, 2002) and NFHS-3 (2005-06) validates this statement stating that only 5 per cent of poor families in Delhi had personal toilets. Health is a must facility and is one of the essential requirements for human being but due to shifting of places migrants face lack of facilities and changes in weather and benefits provided by the government are the other deficiencies (UNDP, 2009/13). Another study says that migrants often face accidents or injuries at workplace but do not enjoy health benefits (Borhade, 2012). Another study conducted by (IOM, 2009) says that migrant women with HIV suffers a lot and face much vulnerability. Many migrants say that they depends on private health services due to incompetent public healthcare sector (Mandar and Sahgal, 2010).

iii) Working conditions

At the point when it is too important to even consider having our childhood/working-age individuals utilized the question here comes are not they should be placed into better positions with solid working conditions but as most of the migrants (laborers) mostly come through Labour contractors in the city due to which they have to face the situation like long working hours or timid lights at work place (NCEUS, 2007) working conditions of vulnerable occupations in Delhi is quite high and people are prone to work in unhygienic and inhumane environment that too with low wages and timid labor laws (Deshingkar et. Al. 2008: Srivastava and Sasikumar, 2003). Out of every 1000 workers bruised on the premises, 165 are in India (ILO, 2002). Especially Women workers, who are injured on job, are removed from jobs instead of getting compensation (Acharya and Reddy, 2016).

iv) Political needs

Slums have gotten inseparable from the traveler populace yet these are not simple peripheries of living but rather likewise underlines a bunch of the populace which battle to get by in the metro city and are upheld and utilized by different individuals for their political advantages and later are left to make an endurance. Government regulations, benefits, schemes, health benefits are factors which migrants (laborers) are deprived of. Various bills has been proposed in order to improve a living for migrants but still conditions are undernourished (NCEUS, 2007). Regulations and administrative procedures exclude migrants from social rights, political rights and access to legal rights. (UNESCO, 2011). These displaced many a times lack access to basic services and have no legal protection (Bag et. al, 2016).Many a times people working even for low skilled jobs like rickshaw pulling had to bribe and wait in long queues to get license and permit to rent rickshaws (Menon, 2000).

v) Housing

After food and clothing one of the important human needs is house. But, rush in the cities and the high cost makes it difficult for them to have house of their own and to live in mostly crowded and filthy conditions (Sheikh Et. al., 2014). A study conducted by IGSSS (2010) states that many people living on the streets of Delhi are migrants from Bihar, UP, West Bengal, Rajasthan and MP. They have left their places in distress situation in hope of better living in the city of Delhi. Housing shortage and increase in number of slums has been seen from past few years (Delhi Development Report, 2013). Another report by NFHS-3 (2005/06) says people in Delhi slums households have 7 or more people sleeping in same room with almost 48 per cent of households.

vi) Water and Electricity

Lack of potable water and housing facilities make migrants live in shanties or huts near workplace (NCEUS, 2007) with no proper supply of electricity or they have to face large power cuts or no proper wiring make it unsafe and dangerous (IOM, 2015). Bag et.al. (2016) in their survey reported that poor population of Delhi had to wait in queues to have access to water through standpipes.

vii) Lack of skills or training

Lack of skills or training of jobs put them to risk which increase number of accidents at the workplace (PRS, 2019). Lack of skills is quite evident in slum area migrants of Delhi, where people lack job training and directly put to work. Many a time's serious accidents were reported in the industries of Delhi due to lack of skill and training (SNCL, 2002; NCEUS, 2007).

viii) Job security

Migrant (labourers) are in informal sectors which lack job security and Labour laws were hardly followed. They were deprived of good working conditions and benefits associated with labourers. Migrant labourers are generally absorbed in informal sector jobs and are poorly paid and work under insecure jobs. (UNDP, 2009/13). Many females were not even recorded in stats and found invisible in the records of Brick and tiles manufacturing units in Delhi (Gupta, 2003).

ix) Distress wages

Compensation has been a significant impetus while making movements yet it isn't so natural for the transient populace to get decently paid for their work. They were paid up short for the work and administration they render and commonly the paid differentials were there whether it been a sex-based contrast or ignorance among traveller class for the base wages rule or the biasedness of bosses towards the individuals. They were force to work under distress or less wages and to cope with day to day expenses of cities they took up their jobs. Even when they take work off due to injuries or other they have to pay for their own food, fuel, water and medical expenses (Sarde, 2008) .low income levels and low levels of human development is apparent in Delhi slums (Banerji, 2005). They have no choice they either have to leave up their jobs or to return to their native place.

x) Gender biasness

Gender gap of more than 50% has shown in Labour Force Participation rate for the year 2015 (OECD, 2017). Gender biasness is common in society and migrants are no different to it, less pay to female Labour, sexual abuse at workplace, long working hours or lack of maternity benefits are quiet common which need to be strengthen with appropriate Labour laws. Delhi Development Report for the year 2013 also stresses on the need of reducing gender inequality and guaranteeing a safe environment to people. Another work by (Acharya and Reddy, 2016) highlights the issue of discrimination and exposure of females to sexual harassment in Delhi.

xi) Little or no asset

Antagonistic economic conditions make them move to cities such as debt and low income which is the major reason to move (Banerji, 2005). Labors shifts to new workplace with little or no asset of their own which make it difficult to survive in the city (NCEUS, 2007). Basically, migrants invest all the money they have a survival in the city (Mandar and Sahgal, 2010). Many laborers work as bonded laborers in the cities like Delhi, Punjab and Haryana and are trapped in debt burden with no asset or little money they were many a times exploited by upper caste (Srivastava, 2005).

xii) High expenses

Migration is difficult for the livelihood of these poverty ridden, skill and asset deficient persons who are economically and socially backward (NCEUS, 2007). The dazzles and hope of good income source attract them to cities bring them here but the high prices and expenses make it difficult for them to survive here.

xiii) Child Labor

Kid work brings ignorance though youngster schooling brings proficiency. Youngster work is a social wrong doing, each kid has an option to sparkle. Furthermore, every kid has an option to learn and make a living beneficial yet the obscurity of destitution places their future in hellfire and makes them powerless and denied. Child Labour has been an important issue from many years. Although no clear data was available but there are approximately 15 million child migrants in India (Smita, 2007). In general children of migrant's lives in unhealthy conditions, miss going to school and mostly help their parents in earning (UNICEF, 2011). As identified by Mandar and Sahgal (2010) there are many migrants in Delhi who couldn't send their children to schools and put them to work due to suppressed economic conditions.

8. Conclusions and Policy Implications

People are migrating or shifting their places for improved life since the time being and the role of migration in the form of remittances in poverty reduction and a positive impact on building assets and improving health and education could not be ignored. (Deshingkar and Sandi 2012; Ratha 2013; Kumar and Bhagat, 2017). Internal migration is a part of economic process no economy can ignore or avoid internal migration. Long back, on his visit to India in the year 1951, Kingsley David a well-known demographer has said that India is an immobile country where 3 out of 10 Indians are Internal Migrants. Hence certain means to improve their circumstance should be taken with the goal that they could be remembered for the separate states they visit, well and could add to the economy by improving theirs just as others living by better acquiring.

There are various reasons of migration and several ways to improve the conditions for migrants as discussed below:

i. Migrants provide large support in the form of Labour supply.

ii. Internal migrants not only fulfill their financial needs but also provide valuable skill and Labour to the society.

iii. Migrants can reduce income disparities and can bring poverty reduction.

iv. Better salary and skills to internal migrants could help them to earn more and send better remittances back home which will bring more flow of income in the economy.

v. Better conditions of health, social needs, political needs, and education could make them more efficient and thus they will no longer be considered as a burden on economy; internal migration leads to more job opportunities and access to better services by rising competition.

As relocation inside a nation is growing more than worldwide movement; and it has become requirements for the improvement of any country. Subsequently, superior incorporation of them in strategy measures and in the public arena is required as they are the significant work stock and without their important commitment economy can't prosper. The economy of Delhi which is home to 8 million transients, developing at an unparalleled speed and would be a mover and focus of thoughts and activities as a state by the Government needs to make a stride ahead and be a model for others to follow, as so far we have pretty much nothing thus late for them on a plate. And among policy options, the government should frame appropriate policies which can make the transition of migrants from one state to another easier. The laws

framed by ILO should be strengthened and regulated properly. In order to ensure proper functioning of labor laws and migrants welfare, awareness among migrants regarding the safeguards and benefits available to them need to be made through trade unions and other skill and training programmes. Nurseries, schools and childcare facilities should be made available near workplaces. There is also a need to eliminate intermediaries so that direct link between workers and employers could be made and more accessibility of jobs be made. Policy adoption by different States should also be made so that better inclusion of migrants be possible and better use of young population in the economy could be made possible. Also, above all, there is a requirement for strategy changes to guarantee better consideration of transients in the general public and we make their food conceivable effortlessly.

References

Acharya and Reddy (2016): 'Migrant women in construction work, examining issues and challenges in Delhi, Amity journal of healthcare management 1(1), 1-20, ADMAA, India.

Ansari (2016): 'Internal migration: An analysis of problems faced by the migrants in India, a step to the solution',Indian Journal of Applied Research, Vol. 6, Issue No. 6. Pp. 15-19.

Bag et.al. (2016): 'A Comparative study of living conditions in slums of three metro cities in India, Working Paper-253, and Centre for Development Economics, Delhi School of Economics, Delhi, India (Retrieved from https://www.researchgate.net/publication/292817886 (date of accessed May, 27, 2020).

Banerji (2005): 'Provision of basic services in the slums and resettlement colonies of Delhi', Institute of Social Studies Trust, New Delhi, India (Retrieved from https://www.researchgate.net/publication/237544186(accessed on August, 19, 2019).

Bhagat and Mohanty (2009): "Emerging Pattern of Urbanization and the contribution of Migration in Urban Growth in India,Asian Population studies, 2009/March; Available from*https://www.researchgate.net/publication/228431591*(accessed on September, 5, 2019).

Bhagat (2011): "Urbanization and access to basic amenities in India", *Urban India,* Vol 31, No 1, pp1-13.

- (2014): "Urban Migration Trends, challenges and opportunities in India", background Paper, *World Migration Report 2015, International Organization for Migration, Switzerland.*

- (2015): "Migrant Cities", International Organization for Migration, Switzerland.

- (2017): 'Migration and Urban Transition in India: Implications for Development' Un/Pop/Egm/2017/3, United Nations Expert Group Meeting On Sustainable Cities, Human Mobility and International Migration Population Division, Department of Economic and Social Affairs, United Nations Secretariat, New York.

Borhade(2012): "Migrants (denied) access to Health care in India, UNESCO/UNICEF, National workshop on Internal Migration and Human Development in India, 6-7 December,2011; Workshop Compendium, vol.2: Workshop Papers, New Delhi, UNESCO/UNICEF.

Delhi Development Report (2013): "Delhi Human Development Report, Institute for Human Development, New Delhi, India.

Deshingkar and Sandi (2012): "Migration and human development in India: new challenges and opportunities" National Workshop on Internal Migration and Human Development in India, 6–7 December 2011, Workshop Compendium, Vol. 2, Workshop Papers, UNESCO/UNICEF, 2012.

Deshingkar et. al. (2008): Circular migration in Madhya Pradesh: changing patterns and social protection needs, the European journal of development 20, 612-628.

Government of India(2017)*:* "Report of Internal Migration in India"; "India on the move and churning: New Evidence, Economic survey of India 2016-17, Ministry of Finance, Government of India.

Government of India: "Report on Urban Population in India for the years (1961-2050).

Government of India (2017): Delhi Statistical Handbook, Directorate of Economics and Statistics, Government of NCT of Delhi, India.

(Retrieved from http://indiaenvironmentportal.org.in/files/file/delhi%20statistical%20handbook%202017.pdfaccessed on April, 17, 2020.

GNCTD (2017): Delhi Economic Survey for the year (2018-2019)Ministry of Finance, Government of Delhi, India.

Gupta, J. 2003. "Informal Labour in Brick Kilns: Need for Regulation", *Economic and Political Weekly*, August 2.

Harris, White (2003): "India working: Essays on Society and Economy*", Journal of Asian Economics, V*ol.15, issue 2,441-442.

IOM and UNDP (2009): Migration, Mobility and HIV and AIDS- Facilitator's Guide 2009.

ILO (2002): Women and men in the informal economy: a statistical picture, employment sector. International Labour Organization, Geneva.

Indo-Global Social Service Society (2010): "Homeless Migrants or City Makers", Not-for-Profit Organization, India.

Kara (2012): Bonded labour. Tackling the system of slavery in South Asia. New York: Columbia University Press.

Lucas (2015): "Internal Migration in Developing Economies: An Overview." Working Paper, Global Knowledge Partnership on Migration and Development, World Bank, Washington, DC (Retrieved from.

https://www.knomad.org/sites/default/files/2017-04/KNOMAD%20Working%20Paper%206_Lucas_Internal%20Migration.pdfaccessed on January, 25, 2020).

Mandar and Sahgal (2010): 'Internal Migration in India: Distress and opportunities, a study of internal migrants to vulnerable occupations in Delhi', Dan Church, India.

Menon (2000):'Delhi: The Relentless Struggle of Rickshaw Pullers', Labour File, A6 (8).

National Council of Applied Economic Research (2002): The burden of ill-health among the urban poor: The case of slums and resettlement colonies in Chennai and Delhi, NCAER, Delhi.

OECD (2017): *"The Pursuit of Gender Equity; an Uphill Battle, OECD Publication, Paris; available from:* https://dx.doi.org/10.1787/9789264281318-en(accessed on February, 15, 2020).

Government of India (2007): "Report on conditions of work and livelihood in the unorganised sector", 2007.National commission for entrepreneurs in the unorganised sector (NCEUS), Delhi, Government of India.

PRS (2019): A Report by PRS Legislative Institute for Policy Research, Delhi, Government of India.

Registrar General of India (2011): Report on Internal Migration; Census of India, office of Registrar General, Government of India.

Sarde(2008): Migration in India, Trade Union Perspective in the context of neo-liberal globalization, International Workers Federation,IMF-SARO, New Delhi.

Sheikh,Subhadra Banda, and Ben Mandelkern (2014):Planning the Slum: JJC Resettlement in Delhi and the Case of Savda Ghevra. A report of the Cities of Delhi project, Working Paper, Centre for Policy Research, New Delhi.

Smita (2007): Locked homes empty schools: the impact of Distress Seasonal Migration on the rural poor, Zubaan Books, New Delhi.

SNCL (2002): "Second National Commission on Labour Report", Ministry of Labour, GOI.

Srivastava and Sasikumar (2003): "An overview of migration in India, its impact and key issues", Regional Conference on Migration and Pro Poor policy choices in Asia, 22-24 June, Dhaka, Bangladesh.

Srivastava (2005): "Bonded Labor in India: Its Incidence and Pattern" In Focus Programme on Promoting the Declaration on Fundamental, International Labour Office.

Cornell University.

Taran(2016): "Migration, human rights and governance", Handbook of Parliamentarians, United Nation Human Rights, International Labor Organization, Courand Associes (Retrieved from https://www.ohchr.org › MigrationHR_and_Governance_HR_PUB_15_3_EN) accessed on April, 22, 2019).

Todaro (1976): "Internal Migration in developing countries: A review of theory, evidence, methodology and research priorities, International Labor Office, Geneva.

Todaro, Smith (2015): Economic Development, New York: Pearson Publication.

UNDP (2009/13): Migration and Human Development in India, United Nation Development Programme.

United Nations, DESA (2013): United Nations, department of economic and social affairs (DESA) population division, policy section, world population policies.

World Economic Forum (2017): 'Migration and its impact on cities report', global future council on Migration, UN (retrieved from http://www3.weforum.org/docs/Migration_Impact_Cities_report_2017_HR.pdf(accessed on July, 9, 2019)

UNESCO (2011): "Report on Migrants", Paris, France.

UNESCO (2013): A book titled "Social Inclusion of Internal Migrants in India", social and human sciences, UNESCO, Delhi, India.

UNICEF (2011): "Every Child's Right to be Heard, A resource guide on UN committee on the rights of child general comment number 12, London, UK.

UNESCO (2019): Report on "Global Education and Monitoring", Paris, France.

World Bank (2008): Agriculture for Development, World Development Report, the World Bank, Washington, DC.

- (2013): Urbanization beyond municipal Boundaries: Nurturing Metropolitan Economies and Connecting Peri-Urban Areas in India, Washington, DC.

- (2018): "India's Internal Labor Migration Paradox: the statistical and the real; World Bank Group, Finance, competitiveness and innovation global practice, Washington, DC.

- (2020): Metadata glossary, World Bank (Retrieved from: https://databank.worldbank.org/metadataglossary/all/series, accessed on November, 15, 2019).

World Urbanization Prospects, 2018: The Revision of 2018, Department of Economic and Social Affairs, United Nations.

Performance of MGNREGA: A Cross State Comparison of the North-Eastern Region

Sumitra Naha (Das)

Abstract

India is a developing country where poverty and unemployment are the two serious impediments in the path of economic development. The Government of India is sensitive to the needs of the poor and had been launching various self employment, wage employment, area development and minimum needs programmes from time to time aiming at poverty alleviation and reducing unemployment. Though these programmes had a favourable impact on the country's poverty indices, the unchangeable factor is the deep rootedness of the poverty in the rural areas where three-fourths of the poor live which makes a clear demarcation between rural India and urban India. Against this backdrop, the present study is an attempt to analyze the potential of MGNREGA in terms of poverty alleviation and rural development in the North-eastern region of India. The study basically tries to identify the determinants of participation in the programme and assess the effectiveness of the scheme with respect to employment generation, asset creation, and livelihood sustainability across the states in the north eastern region. It also examines how far the programme ensures equity and inclusion by considering the participation of the marginalized groups, particularly women and also focuses on the socio-economic consequences of the MGNREGA for women workers as true beneficiaries. MGNREGA is intended to be demand driven, yet supply does not match demand in terms of actual employment generated. It is true that the programme could be instrumental in strengthening the livelihoods of the rural people and enhancing their quality of life, but what is more important is its sustainability in the long run.

Key words: MGNREGA, sustainable livelihood, asset creation, employment generation, poverty, inclusion

JEL Classifications : J21, J31, J38

Introduction

Rural poverty and unemployment have grown in India in an unprecedented manner during the last few decades. The Government of India has been sensitive to the needs of the poor and

Assistant Professor, Department of Economics, Siliguri Mahila Mahabidyalaya, West Bengal

had been launching various self employment, wage employment, area development and minimum needs programmes from time to time aiming at poverty alleviation and reducing unemployment. Though these programmes had a favourable impact on the country's poverty indices, the unchangeable factor is the deep rootedness of the poverty in the rural areas where three-fourths of the poor live, which makes a clear demarcation between rural India and urban India. Public works programme has now emerged as the strategic intervention in redressing unemployment, poverty and distress migration. In contrast to workfare programmes in many other countries, MGNREGA in India is the most comprehensive in terms of coverage and is an important step towards realization of right to work. The programme is supposed to have opened up massive number of person days, make significant headways in food security and out migration, rural poverty eradication and improve agricultural productivity and rural infrastructure. But, unless and until the programme consistently serves the geographical regions and pockets ridden with chronic poverty, the specter of poverty will continue to hobble. North East India, comprising of eight states is one of the backward regions of the country. Presently this region is at the crossroads in terms of socio-economic and political developments. Poverty, unemployment and socio-political unrests are major issues in this region that pose challenge to the development of the entire region. Against this backdrop, the present study is an attempt to analyze the progress and prospects of MGNREGA in terms of poverty alleviation and rural development in all the districts of North-eastern region of India where it has been implemented.

The paper is organized as follows. Introduction is followed by a literature review and a very short explanation of the data and methodology. The main part of the study begins with a brief description about MGNREGA. The next section evaluates the effectiveness of the scheme with respect to employment generation, asset creation, and livelihood sustainability in the North –eastern region as a whole and also at the disaggregated level i.e across the states of the region. It also examines how far the programme ensures equity and inclusion by considering the participation of the marginalized groups, particularly women. The study concludes by summarizing the main points and recommendations.

Literature Review

Several studies have evaluated the impact of MGNREGA in terms of its outreach and efficacy in ensuring manual employment to the deserving and willing sections, redistribution of income, consumption pattern, migration, etc. at the national level. A very detailed evaluation of NRERGA was undertaken by Dreze and Khera (2009) and found wide interstate variations. But studies that have assessed the implementation of MGNREGA in the North- eastern region of India are limited in number. Hazarika (2009) examined the impact of MGNREGA in Morigaon and

Bongaigaon district of Assam. The study highlighted the negative side of the existing practices of NREGA. It discussed how NREGA had disturbed the social relations, how improved position of people made them more self-centered, who were only concerned to fulfill their own requirement, sometimes at the cost of others. Panda et al. (2009) found that NREGA empowered rural tribal women in Sikkim and Meghalaya by enhancing their confidence level and by ensuring some degree of financial independence. Panda & Umdor (2011) conducted a field study on the impact of MGNREGA in Assam and found that on an average only 42% respondents remarked that MGNREGA had helped to uplift women. There had been no change in the status of women in four sample districts except Tinsukia. Bordoloi (2011) observed that the NREGA was a new lifeline of the rural people who earned their livelihood as wage earners and also helped in reducing the gender difference for some works which were in practice in rural areas. Ministry of Home Affairs, (2011) reported that MGNREGA has ushered in a new era of hope for the downtrodden states of Manipur & Nagaland. It is slowly and steadily transforming the 'Geography of Poverty.' The villagers profusely thanked the Govt. of India as MGNREGA programme has contained both hunger and poverty. Feroze, Roy and Singh (2012) made an attempt to study the progress of MGNREGA in Meghalaya. The scheme faced difficulty in implementation due to absence of panchayats and was criticized because of its potential to divert the labour availability in agriculture and affect the cost of production. Das (2013) analyzed the performance of MGNREGA in Assam and was of the opinion that NREGA has not performed well in the state. Bhowmik (2013) put forward the argument that MGNREGA was of great importance in the state of Tripura. In terms of equity, the state appears to be doing pretty well, while from the point of efficiency, it is better than many states but there are scopes for further improvement. The most important issue that crops up here is the low level of awareness regarding the features of the scheme among the rural people. Most of them are not aware that it is a 'Rights based approach' and feels privileged if favoured by the authorities with work. Shrivastava (2013) has critically examined the problems, impediments and prospects of MGNREGA in the north-eastern region of India. According to him the outcome of the scheme in this region was not very encouraging. Bhattacharya and Vauquline (2013) analyzed the participation of women in MGNREGA in Assam.

Unlike the previous studies, the present study compares the performance of NREGA in terms of its specific objectives of employment generation, asset creation and livelihood security across the states of the North-Eastern region. It also analyzes how far the scheme has been instrumental in regenerating the rural economy of the North-eastern region.

Data and Methodology

The study is cross-sectional in nature. It compares the present status of the states of the north-eastern region at a particular point of time, 2013-14 after implementation of MGNREGA. The study uses secondary data to analyze how far the scheme had been successful in this region in relation to the economy as a whole. Secondary data is obtained from the official website of NREGA. Methodology involves a comparative study based on a set of indicators.

MGNREGA: Main Objectives and its Uniqueness

MGNREGA or Mahatma Gandhi National Rural Employment Guarantee Act is a flagship programme launched by Government of India in February 2006. It was initially called NREGA or National Rural Employment Guarantee Act, which was renamed as MGNREGA in October 2, 2009. It is a pro-poor, anti poverty employment generation programme. The key purpose of MGNREGA is to protect rural household from poverty and hunger through enhancement of wage employment in the rural areas. To this end, the programme aims at providing 100 days of guaranteed employment to every rural household in a financial year whose adult members volunteer to do unskilled manual work. If works are available in the village, there would be substantial reduction of rural –urban migration. Another important objective is to aid in the empowerment of the marginalized communities especially women, Scheduled castes (SCs), scheduled tribes (STs) through providing them economic independence. It is supposed to be the largest social security and public works programme in the world. To, sum up the employment guarantee Act has high expectations in terms of employment generation, alleviation of poverty, food security, halting migration and overall rural development.

The MGNREGA marks a paradigm shift from the previous wage employment programmes that were either planned or implemented in India. Unlike other employment schemes, it is a right based programme. It is also different from the other programmes with respect to perspective, scale, thrust. It aims at strengthening decentralized participatory planning through convergence of anti-poverty and livelihood initiatives. Unlike the earlier wage employment programmes which were allocation –based; MGNREGA is demand –driven and transfer of resources from the Government of India to the states depends on the demand for work by the wage seekers in general and the poor people in particular. It follows a self targeting mechanism of beneficiary selection. It provides a legal guarantee for wage employment and also has provisions for allowances and compensations in case of failure to provide work and delays in payment of work undertaken. Transparency and accountability is another positive aspect of this programme.

In line with its unique objectives this section evaluates the effectiveness of the scheme with respect to employment generation, asset creation, and livelihood sustainability across the states of the North-eastern region.

Table 1: NREGA Outcomes in the North eastern region in 2013-14

Employment Generation

	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura
No. of HHs demanded Employment	139155	1097100	378221	321908	172228	384664	58465	595427
No. of HHs provided Employment	106286	1005137	363501	272105	170982	379172	50166	585556
DD-SS gap	32869	91963	14270	49803	1246	5492	8299	9871
Employment provided as a percentage of DD	76.4	91.7	96.1	84.5	99.3	98.6	85.8	98.3
Persondays (in lakhs)	22.43	197.92	65.30	96.63	73.07	81.43	19.80	318.57
Average persondays per HH	21	20	18	36	43	21	39	54
No. of HH availed 100 days of emp	8	2814	0	6173	0	365	1056	10786
% of HH completed 100 days of emp	0.01	0.28	0.00	2.27	0.00	0.10	2.11	1.84
Financial Outcome								
	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura
Total funds available (in crore)	132.61	690.01	203.07	275.33	322.14	287.73	87.52	899.20
Total expenditure (in crore)	34.73	480.22	119.29	134.81	133.91	116.40	34.99	575.64

Contd...

Table 1 (Contd...)

Exp on wages (Actual) in crore	22.03	315.60	87.82	97.60	112.24	88.77	20.30	418.78
% of exp on wages	63.4	65.7	73.6	72.4	83.8	76.3	58.0	72.8
Assets created								
Total works taken up	4363	76157	13570	17645	9685	10891	4277	81086
Total works completed	69	13695	511	442	1157	898	486	9298
% of works completed	1.58	17.98	3.77	2.50	12.05	8.25	11.36	11.47
Types of Asset Created: Works taken up and Percentage of works completed (in brackets)								
	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura
Rural Connectivity	2065 (2.74)	30459 (14.03)	5805 (3.79)	9532 (3.11)	6633 (10.87)	7406 (6.94)	1095 (3.93)	17101 (12.69)
Flood control and Protection	590 (0.85)	2361 (10.59)	1351 (5.48)	688 (4.9)	485 (3.3)	260 (7.7)	479 (3.76)	695 (7.77)
Water Conservation & Harvesting	93 (0)	2777 (11.6)	1259 (1.27)	2662 (1.35)	361 (2.49)	517 (3.09)	378 (5.56)	7235 (6.26)
Drought Proofing	338 (0.59)	16166 (21.9)	1219 (2.87)	1408 (1.34)	306 (3.26)	549 (32.2)	418 (4.31)	8059 (6.89)
Micro irrigation works	544 (0)	1872 (11.27)	1136 (6.6)	412 (0.73)	30 (16.7)	859 (2.44)	205 (11.7)	9990 (20.7)
Works on Individual land	30903 (44.4)	10889 (20.5)	10 (0)	23492 (27.1)	13 (0)	101079 (18.36)	62275 (36.1)	45631 (16.6)
Renovation of traditional water bodies	9920 (28.1)	3015 (26.8)	30 (6.7)	22483 (24.7)	3821 (11.8)	15959 (19.3)	21982 (9.25)	32198 (38)
Land Development	47120 (39.3)	4686 (4.16)	569 (10.5)	24104 (28.9)	3199 (11.4)	17555 (20.3)	64486 (12.89)	45708 (25.8)
Other activity approved by MRD	4368 (19.7)	2425 (29.9)	663 (11.46)	20909 (17.6)	838 (21.6)	12905 (19.2)	62295 (16.0)	3730 (13.9)

Contd...

Table 1 (Contd...)

Rajiv Gandhi Seva Kendra	1576 (5.6)	3084 (1.62)	0 (0)	2721 (17.9)	382 (3.4)	6124 (17)	347 (0)	367 (8.45)
Coastal Areas	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rural drinking water	17 (0)	0 (0)	11 (0)	92 (13)	0 (0)	2 (100)	3 (0)	19 (5.26)
Fisheries	46 (0)	371 (6.2)	20 (0)	85 (3.5)	0 (0)	8 (0)	0 (0)	180 (0.01)
Rural sanitation	38 (0)	502 (11.16)	137 (0)	78 (1.28)	0 (0)	18 (0)	6 (0)	180 (1.1)
Anganwadi	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Playground	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Source: Mahatma Gandhi National Rural Employment Guarantee Act (Official website), nrega.nic.in

The primary objective of NREGA was to provide on demand employment of at least 100 days in a financial year to every household in rural area. The demand side or the preference for the participation in NREGA scheme among rural households may be captured by enrolment for the work under NREGA scheme. So, the number of job cards issued would be indicative of the demand or preference for participation in the NREGA scheme. The demand for jobs under the NREGA scheme in the north-eastern region of India was only 7.2% of the total demand created in the country whereas the percentage of actual employment provided to households in the north-eastern region was around 7.7% of the employment provided in the economy. This is a clear indication that employment generated in the region was proportionately higher than the demand generated in the entire economy. However, employment generated could not match the demand for employment in the rural areas in the North east region, in spite of being a demand driven employment scheme. Although in terms of employment generation, NREGA could not cater to all the rural people who were willing to work and were looking for jobs in the region; but still it has ensured social protection to the vulnerable people of the rural areas in the region by providing employment opportunities to around 91% people on an average in relation to demand which is really impressive. This percentage is not only quite high but interestingly higher than the national average of 87%. The employment generation was maximum in Mizoram, Nagaland and Tripura followed by Manipur, Assam and the lowest in Arunachal Pradesh. In terms of person days of employment generated, it is observed that the number of person days varied between a minimum of 20 lakhs in Skkim to a maximum of 319

lakhs in Tripura and a total of 875 lakhs person days was generated in the north-eastern region during 2013-14. The average person days per household in the region were around 32, which is close to the national average of 35. However, percentage of households who completed 100 days of employment in the region during this period is less than 1% (0.83% on an average), which is very meager. The highest percentage of households who completed 100 days of employment is around 2.3% in the state of Meghalaya. Most of the states in the region accounted for 0 or a negligible 0.01 percent 100 days of employment. This reflects that despite making provisions of 100 days of employment in a financial year, there has been wide variation in terms of actual employment generation through NREGA programme in the region, but; it still provided basic income security to a large number of beneficiaries. This is evident from the fact that over Rs. 1163.14 crores has been spent on wages during 2013-14, which is almost 71% of the total expenditure during that period. Surprisingly, percentage of expenditure on wages in the region almost matches with the percentage at the national level**.** This implies that rate of increase in wages in the region was at par with the rate of increase in wages in the country. The increased proportion of spending on wages is expected to ensure greater food security, monthly per capita expenditure, savings, etc which together can be considered to be a positive move towards sustaining livelihood in the rural areas of the region.

The employment guarantee act is an opportunity to create useful durable assets in rural areas which would strengthen the livelihood resource base of the rural poor. With respect to asset creation a wide divergence between works taken up and works completed in the region under NREGA is reflected. Total works taken up in the states of the region is 217674, out of which only 26096 were completed (i.e only 12% of total works taken up in the region). This is slightly higher than the percentage of works completed (10%) at the national level. The maximum works were taken up in the state of Tripura followed by Assam. But, Assam could complete the highest percentage of works followed by Mizoram, Tripura and Nagaland successively. Other states of the region lagged behind both in terms of initiation of works and completion. Thus, a large percentage of works remain incomplete under MGNREGA in the north-eastern region. It is true that assets were created after implementation of the scheme in the region, but when the percentage of assets created as a proportion of total works taken up is looked at, the picture is very dismal. Out of the fifteen categories of work approved under MGNREGA, 29 percent works were only completed under land development and renovation of traditional water bodies followed by works on Individual land which accounted for 23% of work completion. In spite of the completion percentage being relatively less, the percentage of work completion in these three categories in the region was above the completion percentage at the national level (18%, 19% and 11% respectively). Within the states in the

region, Arunachal Pradesh consistently topped the list in terms of completion of work in these three categories. Other activities under MRD completed 19% of the total works taken up in the region, micro irrigation works and drought proofing each completed 16%, Rajiv Gandhi Seva Kendra types (12%), works related to rural connectivity and rural drinking water could complete only 11%. The remaining types of work could manage to complete less than 10% of the total works taken up in the region.

The creation of assets in an area requires expenditure which includes labour cost or wages and material cost. Just as asset creation is required, so is employment. The rural development ministry realizing that while some rural areas may require labour-oriented work, there may be some other areas where asset creation had to be prioritized; decided to maintain the wage-material ratio at 60:40 at the district level will facilitate both. Thus, whether the states have utilized the available wage- material cost ratio is a matter of concern as the material expenditure might be correlated with the type and quality of assets constructed. It seems that across all the states of the North-eastern region, much importance is attached to employment generation in relation to creation of durable assets as percentage expenditure on labour costs exceed the percentage expenditure on material costs. The states of Manipur, Meghalaya, Mizoram and Nagaland spent less than30 percent on material component.

Table 2: North-eastern states disaggregated wage and material expenditure (in percentage)

States	Labour (%)	Material (%)
Arunachal Pradesh	64.76	35.24
Assam	68.63	31.37
Manipur	73.49	26.51
Meghalaya	80.52	19.48
Mizoram	83.92	16.08
Nagaland	70.98	29.02
Sikkim	57.19	42.81
Tripura	68.22	31.78

Source: Mahatma Gandhi National Rural Employment Guarantee Act (Official website), nrega.nic.in

Participation of women and other minority groups in MGNREGA Programme:

One of the important objectives of NREGA is to proactively ensure social inclusion. In this respect the participation of the women and other minority groups like SC, ST in the NREGA programme is looked into across the states of the North-eastern region of India.

Table 3a: Share in Total Number of Person-days Worked on NREGA Projects (percentage) by Women, SCs and STs in North eastern region in 2013-14

	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura
Women	31.43	24.53	34.68	43.08	27.01	26.29	46.01	47.50
SC	0.07	6.34	0.65	0.63	0.02	0.76	4.28	16.86
ST	88.75	16.09	70.48	93.65	99.74	94.04	36.75	45.67
Others	11.2	77.5	28.9	5.72	0.23	5.21	58.9	37.5

Source: Mahatma Gandhi National Rural Employment Guarantee Act (Official website), nrega.nic.in

Table3b: Female literacy rates and sex ratios across the states of North-eastern region in 2013-14

	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura
Female literacy rate	57.7	66.3	72.4	72.9	89.3	71.5	75.6	83.15
Sex ratio	938	958	992	989	976	931	908	960

Source: Census 2011

The share of women in the total number of person days worked on NREGA projects in the region had been well above the minimum prescribed quota of one-third, which is indeed an achievement. Although women's participation varies across the north-eastern states, women's average participation in the region (35%) throw light on the fact that none of the North-eastern states of India could cross the national level participation of women in 2013-14 (54%). The maximum number of women employed under the NREGA scheme in the region was in Tripura followed by Sikkim and Meghalaya. On the other side women's participation was the least in Assam. The average participation of SCs in the programme was also very low. In contrast, the programme's delivery on its inclusion commitments to other deprived population groups especially STs in the region were highly encouraging. The lion's share of employment in the region was occupied by the STs. The maximum participation of STs was in the states of Mizoram, Nagaland and Meghalaya. In Mizoram nearly all the people who got the opportunity to work under the scheme belonged to the ST community, whereas in Nagaland and Meghalaya the percentage was as high as 94%. Such a huge participation of STs in the region is expected because these states are densely inhabited by tribes. At the same time the low women's participation rates also do not reflect changing power relations in the region.

The North-eastern states with low women's participation rates are concurrent with relatively low literacy rates and skewed sex ratios. This might be a manifestation of the challenges faced by women including participating in NREGA works.

It is true that economic empowerment is crucial for gender empowerment and equality, but it needs to be complemented with financial inclusion as well. Thus, it is necessary to investigate whether MGNREGA in the north-eastern states has ensured that women are included in formal banking systems. Excepting for Arunachal Pradesh and Assam, in other north-eastern states of India women beneficiary workers with bank accounts either in their individual names or holding accounts in joint names are near to 50 percent with Manipur, and Meghalya exceeding 50 percent (Table 4). In this respect the north-eastern region has performed well as the percentage of women beneficiary workers with accounts in majority of the states in the region are higher than the overall percentage at the national level. Women beneficiary accounts under MGNREGA are essential and mean that women's access to a formal financial system might act as an enabler in any pro-women, pro-poor initiative which could give them the "power to act" as opposed to "power over". The pertinent question here is: Does having accounts in their individual capacity lead to changes in women's access to finance and change their decision making as well as consumption patterns? This requires further research.

Table 4: Percentage of women beneficiary workers with accounts 2014-15

Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura
32.25	31.82	51.72	59.62	47.33	44.44	46.76	46.29

Source: Mahatma Gandhi National Rural Employment Guarantee Act (Official website), nrega.nic.in

Conclusions

Off late "Development" is not seen as an welfare activity of the government, but basic development is considered as rights of the citizens and MGNREGA is one such endeavours with legal obligation, Shah & Mohanty (2010). The rights of MGNREGA works include employment on demand, minimum wages, gender-parity of wages, 33% works reserved for women's participation and provision of basic worksite facilities. The study tried to evaluate how far such rights were enjoyed by the people of the North-eastern region of India after implementation of the scheme. The scheme had potentially far-reaching effects with respect to employment generation among rural people of the region. Although there exists a divergence between employment provided and employment demanded; the problem of job card holders not getting the guaranteed job was much less acute in this north-eastern region. There were many factors that could motivate women workers to participate in the scheme, like nature of work which did not need skilled work, limited hours of work, and availability of work locally and increased actual wage rates. However, in spite of such encouragement, women's participation in NREGA work in the region was not satisfactory. The dominance of women in intra-household decisions was common in many states

of the north-eastern region. Thus, unlike other regions of the country how far the participation of women in this region had enhanced their choice to use earnings is a matter that needs to be looked into. But, as wages are paid through formal institutions, the intra-household status of women has definitely increased as they now have control on cash resources. Thus, this is a remarkable achievement of the NREGA scheme in providing economic empowerment to women. The share of wages received by workers when working for the programme was also quite high. Therefore, even if not fully guaranteeing employment, the Act played a pivotal role in improving the standard of living of the rural mass, who were part of the scheme directly and even those who did not directly participate in the programme by increasing the minimum wages in the region. Livelihood Sustainability can be achieved not only through employment generation, but, the programme's ability to sustainably reduce poverty largely rests on the adequacy and quality of the assets created. Building of relevant and quality assets is expected to have a strong and positive impact on agricultural productivity which in turn would increase poor people's living standard. So far as assets creation is concerned, the type of works taken up is consistent with the objectives of the scheme, but what is more important is the rate of completion of the projects which is too less in the region.

To sum up, the outcome of the NREGA scheme in the north-eastern region of India is not encouraging, if the present status of the region is taken into consideration. In the region there exists wide variation in the performance of the states under NREGA. There are wide gaps in targets set and achievements accrued; in terms of work taken and works completed or assets created, providing 100 percent work to each household, low participation rates of women and not ensuring social inclusion in the true sense. Though the Act proved to be effective in case of employment generation to a great extent, complaints against the scheme with respect to job cards not provided, work not provided and wages not paid cannot be ignored. Thus, for the complete success of the scheme in the region, special efforts are required to strengthen the process of implementation. At the same time peoples' attitude and motivation should also be oriented towards the benefit of the scheme in securing a better livelihood.

References

Bhattacharya, R., & Vauquline, P., (2013), "A Mirage or a Rural Life Line? Analysing the impact of Mahatma Gandhi Rural Employment Guarantee Act on Women Beneficiaries of Assam", Space and Culture, 1(1), .83-101.

Bordoloi, J.,(2011), "Impact of NREGA on Wage rates, Food Security and Rural-Urban Migration-A Study in Assam", Project Report,Agro-Economic Research Center for North East India, Assam Agricultural University, 1-126

Das, S.K.,(2013), "A Brief Scanning of the Mahatma Gandhi national rural Employment Guarantee Act in Assam, India", American Journal of Rural Development, 1(3), 49-61

Dreze, J. & Khera, R., (Jan 2009), "The Battle for Employment Guarantee", Frontline**,** 26 (01), .03-16.

Hazarika, Pranati Gogoi (2009). Promoting Women Empowerment and Gender Equality through the Right to Decent Work: Implementation of National Rural Employment Guarantee Program (NREGP) in Assam State (India)-A Case Study. International Institute of Social Studies, Netherlands, 12-57.

Panda, B., Dutta, A. K. & Prusty, S. (2009), "Appraisal of NREGA in the States of Meghalaya and Sikkim", Project Report, Rajiv Gandhi Indian Institute of Management, Shillong, 1-192.

Panda, B. & Umdor, S., (2011), "Appraisal and Impact Assessment of MGNREGA in Assam", North- Eastern Hill University. Shillong.

Khera, R. & Nayak, N., (2009),"Woman Workers and Perceptions of the NREGA", Economic and Political Weekly, 44 (43). 49-57.

Vanaik, Anish and Siddarth,(2008), "Bank Payments: The End of Corruption?" Economic & Political Weekly, 43 (17). 33-39.

Ministry of Home Affairs, Programmes undertaken in North Eastern Region by the Ministry of Information and Broadcasting. Newsletter, XIII (8). 2011.

Bhowmik, I.,(2013), "MGNREGS in Tripura: A Study on Efficiency & Equity", V.V. Giri National Labour Institute, NLI Research Studies Series. No 102/2013.

Kelkar, G.,(2011), "MGNREGA: Change and Continuity in Gender Relations", Journal of Economic and Social Development, VII (2). 11-24.

Feroze, S.M., Roy, A., & Singh, R. (2012), "Some Issues of NREGS: Review of North-Eastern States of India with Special Reference to Meghalaya", Indian Journal of Hill Farming, 25(2), 27-32.

Shah, D.,& Mohanty, S.(2010), "Implementation of NREGa during Eleventh Plan in Maharashtra: Experiences, Challenges and Way Forward", Indian Journal of Agricultural Economics, 65(3), 540-551.

Shristava, M.K.,(2013), "Status of MGNREGA in the States of North-Eastern India", The Oriental Anthropologist, 13(1), 173-205.

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.

As per 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 Economics".

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 economics"

In March 2016 the department organized a seminar on "Contemporary issues in development economics"

In February 2016 the department organized three day 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.'

Publication of the Department of Economics

Rabindra Bharati University Journal Econimics, Vol. I (2007), II (2008), III (2009), IV (2010), V (2011), VI (2012), VII (2013), VIII (2014), IX (2015), X (2016), XI (2017), XII (2018).
Occational Papers: Volume I (1980), II (1981), III (1982), IV (1983-85), V (1997), VI (1998), VII (1999), VIII (2000), IX (2001), X (2002), XI (2003), XII (2004), XIII (2005), XIV (2006).

Monographs:

i) (1998) Myth and Reality of Development in India-Pradhan H. Prased
ii) (1998) Status of Women in India in the Fiftieth Year of Independence-Bela Dutta Gu[ta
iii) (2000) Marx after 150 Years of the Manifesto
iv) (2000) Foreign Investment in India-Amalesh Chandra Banerjee
v) (2000) একুশ শতকে রবীন্দ্রনাথের অর্থনৈতিক চিন্তা
vi) (2001) Globalisation : On Failure of the Process of Planning and Rise of Human Distress Gurudas Dasgupta
vii) (2001) Corruption and Development
viii) (2001) Some Selected Sources of Official Socio-Economic Data on West Bengal
ix) (2004) Uncertain Growth and Growing Uncertainties : Some Thoughts on Globalisation-Anup Sinha
x) (2005) জানার বিষয় ঃ একটা যাত্রা পথের বিবরণ - ড. শুভেন্দু দাশগুপ্তা (স্মারক বক্তৃতা)
xi) (2006) Problem of Transition from Planned Economy to Market Economy in India-Deb Kumar Bose
xii) Newsletter of the Department : Inside
xiii) (2011) Liberalisation, Economic Development and some related issues-Prof. Hiron Kumar Banerjee.
xiv) (2011) 'সমাজবিকাশের প্রেক্ষিতে নারী' - অধ্যাপিকা অপরাজিতা মুখার্জী (স্মারক বক্তৃতা)
xv) (2014) Contemporary issues on Macroeconomics

Rabindra Bharati University Publication on Economics

1. (1990) The Changing Pattern of Consumption Expenditure in India : Raj Kumar Sen
2. (1991) Consumer Cooperatives in India : Durgadas Roy
3. (1999) অমর্ত্য ভাবনা, ১,২ (রবীন্দ্রভারতী গ্রন্থমালা, ২,৩)
4. (2000) Amartya Sen's Economics I.II. 9Rabindra Bharati Books2,3) : (ed) Raj Kumar Sen
5. (2000) The Indian Economic Issues : Essays in honour of Professor Santikumar Ghosh (ed) Raj Kumar Sen
6. (2002) Indian Labour in the post-Liberalization period : (ed). Raj Kumar Sen (K.P. Bagchi & Co.)
7. (2008) Emerging Issues in Indian Economic Development and Reforms, (ed). Raj Kumar Sen (Deep & Deep Publications Pvt. Ltd.)
8. (2013) Emerging Rural Transformation and Resource Utilisation in the Post Globalisation Period.
9. (2014) Rural Resource credit and livelihood the question of Inclusion.