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ARTHA VIJÑĀNA

JOURNAL OF THE GOKHALE INSTITUTE OF POLITICS & ECONOMICS

Articles

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Book Review

A Brief History of Equality
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ii. The manuscript should be accompanied by an abstract of not more than 100 words.

iii. Footnotes should be numbered consecutively and should appear at the bottom of the corresponding pages.

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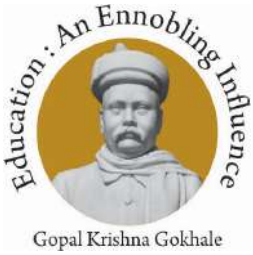

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Education and Intergenerational Mobility

Kranti Kapoor

Education is a key component in generating upward intergenerational class mobility in a society. The present study defines seven models of class transmission intermediated by education. Three methods, Regression, Lottery and Log-linear Modelling, are used to test these models. The data from two assembly constituencies of Jodhpur is collected by multistage random sampling. The results reveal that background variables are still very important in determining class position even in the presence of respondent's own educational achievements. The direct intergenerational transmission and the one mediated by class based education are both prominently observed. But the good performance of the neo-liberal society model gives a ray of hope that high class positions can be attained through own education alone.

Key Words: Origin-destination transmission, Social reproduction, Structural mobility, Models of society

A liberal democratic system should ensure intergenerational upwards class mobility. In a rigid class society, the class structure of the society will reproduce itself from generation to generation. Ever since the beginning of the first industrial revolution, questions have arisen about the efficacy, sustainability and moral desirability of such system. One extreme rigid form of such a society is the class and caste system prevalent in India for centuries. However, in the modern times, such systems obstruct rapid development of the society as also of the elites. Rapid economic development requires that opportunities for mobility be available to all segments of the society and education is that one tool through which this can be achieved. The contribution of education in intergenerational class mobility is examined in this paper.

The intergenerational linkages between education and occupation can operate through a number of channels. Some of these channels are tangible, like parents' investment in children's education and access to parents' social connections, knowledge and experience. But some are intangible like nurturing, guiding as well as teaching one's own wards as well as genetic transmission of ability and preferences (Bowels, Gintis and Osborne Groves 2001, Durlauf 2000).

In general, the cultural reproduction hypothesis stating that social, parental, family and cultural backgrounds and father's education are the strongest determinant of the child's education is validated from foreign as well as Indian

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studies, old and new (Graham an Hernendez 1994, Govinda and Varghese 1992, Upendranath 1993). Several empirical studies suggest that the expansion of education itself reduces educational inequality after a threshold level of education is achieved (Ram 1990, Jonsson 1989, Mehta 1993). Mehta obtains a threshold level of 4.55 years of schooling, as against 6.8 years obtained by Ram.

Emran and Shilpi (2012) examined post reform trends and patterns of intergenerational mobility among new entrants in the labour force (16-27 year olds) between 1992/93 – a year immediately following the economic liberalization in India – and 2006 – nearly 15 years after liberalization. Using data from National Family Health Survey (NFHS), they find that educational mobility is almost stagnant for majority of Indian children. Similarly, Jalan and Murgai (2007) find a declining effect of parental education for the younger age cohorts for both the survey years. They also observe increasing educational mobility across groups of individuals.

The relation between educational and occupational/class mobility has been examined by preparing and examining origin-destination flow tables and using affinity or cohesion measures (Erikson and Goldthorpe 1992, 2002), (Jonsson 1989, 1993a), (Kapoor and Mehta 1997), (Kumar, Heath and Heath 2002a, 2002b), (Behrman, A. Gaviria and M. Szekely 2001), (Beller and Hout 2006), (Louw, Van Der Berg, Servaas and Yu 2006).

In their research, (Hnatkovskay, Lahiri and Paul 2012) use five rounds of NSS surveys (1983, 1987-1988, 1993-1994, 1999-2000, and 2004-2005), and aggregate occupations in three groups (white collar, blue collar and agriculture). Based on occupation switches, in which sons' occupation is different than fathers' occupation, they find that the probability of an occupation switch has steadily increased from 32 per cent in 1983 to 41 per cent in 2004-2005. For social groups other than SC/STs the switch probability increased from 33 per cent to 42 per cent while for SC/STs it has gone from 30 to 39 per cent. They conclude that difference in intergenerational mobility between SC/STs and non-SC/STs has not changed over this period.

I Education and Class Structure: The Models of Class Transmission

Various possibilities of origin-destination transmission of class position from parents to children with the intermediation of education can be stated. Six models of transformation of social relations in modern day societies as described by (Jonsson 1993**)** are relevant here. One more variant of the Aristocracy is added here for serving as a bench mark model.

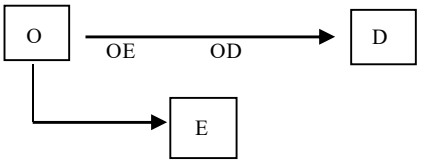
1. *The Low Class Society*: This model describes a low-technology feudal society that reproduces class structure without assigning any role to education.
2. *The Aristocratic Society:* It is a low class society where only aristocratic class gets higher education for reasons other than economic.

3. *The Neo-Liberal Society Model:* In this type of society, importance is accorded to education as well as class of origin in determining destination class position. While class positions are inherited from parents in some occupations like farming, crafts and business, in many others, class positions can be attained on the basis of achieved qualities of the individuals through education and training. This model represents a liberal capitalist society.
4. *The Meritocracy Model:* This is a high education society. In this ideal society, both educational attainment and social destination are independent of social origin. Education is the only criterion on which class position depends. For attaining a high position, an individual must have excellent educational background. Moreover, every citizen has effective equal opportunities to obtain whatever level, type and quality of education he or she chooses to have.
5. *The Unequal Achievement Society Model:* Class reproduction in this model is routed through education. It is not determined directly by origin. However, education is itself class based. Merit is rewarded. But the option of acquisition of merit is not open to all.
6. *The Class Society Model:* In this type of society, both education and class positions are determined by origin and background characteristics. This is a class reproduction society in which class position is inherited directly as well as indirectly through the mediation of education. Education is just an instrument in class reproduction and class rigidity. Here education opportunities are not available to the poor and deprived.
7. *The Equal Opportunity Society Model:* This is an ideal society. In this type of society, social mobility is very high and is not at all related to an individual's socio-economic background whether through education or otherwise. Society provides equal opportunities to all its citizens, irrespective of their caste, ethnicity, parental class, parental cultural grouping, community of residence, religion or any other background characteristic.

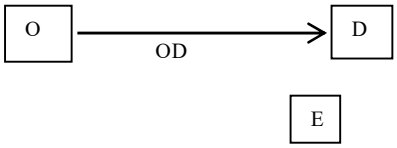
Historically, most of the societies start as Low Class societies, developing into Aristocracies, and, in the absence of state intervention in the education and job markets, develop into Unequal Opportunity societies or pure Class Reproduction societies. State intervention in education and job markets will have to become a reality for transforming the Class Society to a Neo-Liberal society and ultimately to a Meritocracy.

The six models described above are presented graphically in flow charts in Figure1. In these flow charts, O denotes social origin (respondent's father's social class), E level of education of the respondent and D destination class of the respondent. An arrow shows the direction of the relationship.

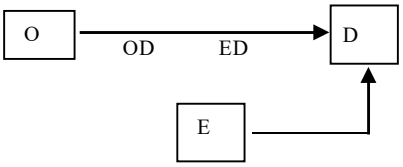
Figure 1: Models of Society



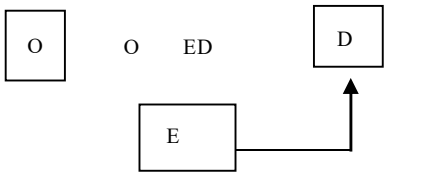
The Aristocratic Society



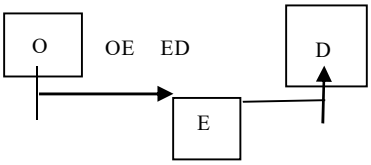
The Low Class Society



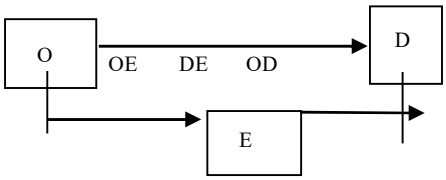
The Neo-Liberal Society



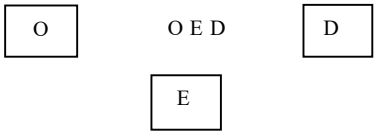
The Meritocracy Society



The Unequal Achievement Society



The Class-Society



The Equal Opportunity Society

II Testing the Social Reproduction Hypothesis

The models can be tested in several ways. Three methods are used here:

(1) The simplest method is to study the influence of social and cultural origins and other background factors on (i) education, and (ii) economic outcome separately as also the influence of education on economic outcome. The Regression method is used.

(2) The second method is named as Lottery method: Class/Social outcome is the result of two lotteries: Education Lottery and Employment Lottery. The expected origin-destination pattern is predicted on the basis of these lotteries and compared with the actual distribution.
(3) Log-linear Modelling. The respondents are cross-classified by class of origin, education level attained and class of destination. The distribution of cell frequencies is explained on the basis of the interaction terms introduced one by one or in combination as implied by each of the seven models. These results are then compared and interpreted.

III The Study Area

The study is confined to Jodhpur Parliamentary constituency of Rajasthan in India. Two assembly constituencies *Soorsagar* and *Luni* out of the total nine constituencies were selected randomly for this study. "Electoral roll Rajasthan 2014" was downloaded from the site on May 18, 2014. At the second stage, 10 per cent of the booths in each constituency were randomly selected. *Luni a*nd *Soorsagar* have 244 and 178 polling booths, respectively. Thus, 24 and 18 polling booths of *Luni* and *Soorsagar* constituencies were selected. At the third stage, 10 per cent of the voters in the list of these randomly selected polling booths were randomly selected for intensive investigation. Thus, more than 5000 male and female voters between ages 20 to 60 years from rural and urban areas were covered. Field study was conducted during August 2014 to May 2015. In all, the responses of 2788 male and 2150 female respondents were found to be complete and reliable. Since only 156 women out of a total sample of 2150 women reported working in this survey, only male respondents have been considered in the class models in the present paper.

Testing through Separate Regressions

The following equations are estimated for male respondents:

dedu2 = f(fo2 , fe2 , MUS, SCST, High Caste, Urban, Trend) …(1)

doc2 = f(fo2, fe2, edu2, MUS, SCST, High Caste, Urban, Trend) …(2)

doc2 = f(fo2, fe2, edu2, MUS, SCST, High Caste, Urban, School type, Medium, Trend …(3)

It is to be noted that d stands for destination (respondent's) score[1] and o for origin (respondent's father's) score. dedu2 is the education score (or E is total years of education) of the respondent, doc2 is the class score of the respondent and fe2 and fo2 are the education and class scores of origin, that is better or higher out of the parent's scores, High Caste stands for High caste Hindus including Jains,

MUS for Muslims, SCST for scheduled castes and tribes and OBC for OBC castes. Urban/Rural origin variable is also introduced. Trend variable from the oldest to the youngest respondent is also introduced.

Origin Characteristics and Education

In Table 1, father's education and caste/social group are the most significant factors affecting the achievement of education level by the respondents. SCST, Muslim and rural origin male respondents are the most disadvantaged sections. It should be remembered that OBC caste is the reference caste category. Boys born in High caste urban families get far higher education than those born to Muslim and SCST families both in urban and rural areas. Father's class score is also significant even in the presence of these other background characteristics.

Table 1: Regression Results for Respondent's Education Scores dedu2

Explanatory Variable	Regression Coefficient	Partial Correlation Coefficient
(Constant)	56.478	(Constant)
Parent's edu score	0.524 ***	.412
Father's Class Score	0.112 ***	.170
SCST	-5.614 ***	-.048
HIGH CASTE	8.304 ***	.077
Muslims	-26.035 ***	-.226
Urban origin	16.655 ***	.176
Trend	0.503 ***	.136
R^2	0.530 ***	
F RATIO	446.868	

The explanatory power of the model is weak in the case of male respondents. In the destination education model for the *male respondents*, from the partial correlation coefficients, we see that parent's education and urban birth, each explain about 17 per cent of the variance, followed by Muslims (five per cent) and origin class (three per cent). Others factors explain even smaller proportions, though the coefficients are statistically highly significant. The total so explained is much smaller than R^2 value of 0.53. Thus, interaction between different origin characteristics explains the remainder. Background variables are dominant factors in the education of the respondents. Educational inequities are transmitted from generation to generation. However, significant positive trend over time, points towards significant overall improvement and lift in education level over time.

Determinants of Destination Class

Regression results for destination class-score (doc2) throw up interesting results (Table 2 and 3). All origin class and other background variables are not only

significant with proper signs but retain their significance even in the presence of own education variable. Introducing destination education score as explanatory variable, R^2 is raised to .780 from .578. This result points towards existence of a class reproduction society. About 34 per cent of the variance is explained by father's class (class origin)[1], followed by own education (about nine per cent), interaction explaining the rest.

Table 2: Regression Results for Respondent's Class Scores

Explanatory Variable	Eq3	Eq4	Step by Step
(Constant)	51.468 ***	24.87 **	30.274
Parent's edu score	.123 ***	-.132 ***	-.136 ***
Father's Class Score	.780 ***	.724 ***	.716 ***
SCST	-16.558 ***	-13.950	-10.266 *
HIGH CASTE	1.791	-2.160	
Muslims	-26.477 ***	-14.45 ***	-13.756 ***
Urban origin	17.835 ***	9.938 ***	7.644 *
Trend	-.521 ***	-.717 ***	-.949 ***
EduScore		.478 ***	.482 ***
Medium			22.711 ***
R^2	0.578 ***	. 615 ***	.779 ***
F RATIO	522.018	-532.6	

Table 3: Class Regressions for Separate Cohorts for Male Respondents

Explanatory Variable	COH 51-60 Regression1 Coefficient	COH 41-50 Regression2 Coefficient	COH 31-40 Regression3 Coefficient	COH 21-30 Regression4 Coefficient
(Constant)	-23.551 **	4.580	-28.967	49.053 **
Parent's edu- score			-.125 *	
Father's Class Score	.619 ***	.664 ***	.754 ***	.750 ***
SCST			-14.732 ***	-12.862 **
Muslims		-13.936 **		
Trend			1.632 **	-1.562 **
EduScore	.798 ***	.509 ***	.427 ***	.374 ***
ADJ R^2	.573 ***	.546 ***	.622 ***	.694 ***
R^2	.576 ***	.548 ***	.624 ***	.695 ***

The Pattern in Cohorts

Applying step by step regression for different cohort data on the Male respondents, the first thing to note is that the fit has considerably improved from the oldest cohort to the youngest one evidenced by a rise of R^2 from .576 to .695 and that the intercept term has become positive and statistically significant in the youngest cohort (Table 3, p. 11). There is significant negative trend within the cohort. Thus, in general class position has improved between the cohorts. However, SCSTs

continue to be at a disadvantage. The coefficient for origin class has improved and is still highly significant determinant of destination class position. Another feature is that own education continues to have positive influence on class position, though the coefficient has declined considerably from the oldest to the youngest cohort. Thus it seems that over time the importance of class origin has become dominant and intergenerational class mobility has declined.

It is, thus, firmly established that social class, cultural class and caste origins are the crucial factors in determining schooling achievements. Though taken separately, caste, cultural origin and class origin explain the very high proportion of the differentials in educational achievement; when all these are put together in the list of regressors, the importance of class is reduced drastically and that of cultural origin substantially, caste is still the main discriminating factor in the education market. Again, though the model explains about 53 per cent of educational differentials, a large part of the variance is explained by the joint effect (covariance) of these variables, showing that there is a large association between the background characteristics.

Social, class origin, cultural origin and schooling are the crucial factors in determining class positions. Taken separately, the origin class, caste and origin education factors influence about 55, 40 and 44 per cent variance in class destination. However, since the importance of the class origin and caste dummies are reduced considerably in the presence of the schooling variables, the transmission of class position is mediated through education. However, the partial effect of class variables controlling for schooling, is not so strong.

Education and Class structure in India: Lottery Model

In Lottery Analysis the idea of ultimate class and income positions as an outcome of several lotteries has been developed on the basis of the work of Checchi D, 1997.

Lifetime prospects may be considered to be an outcome of two lotteries:

1. Educational lottery
2. Job lottery given education

Two transition matrices correspond to these lotteries:

1. A child origin class (OC) to his education (DE) lottery: (OC-DE)
2. An education DE - destination class lottery: (DE-DC)

Current occupational class is taken to represent the class position of the respondent. The best class position of father is taken to be the origin class position. Hence, two flow matrices are prepared: OC-DE (or simply, OE, origin determining off-spring's education) and DE-DC (or ED, education determining class)).

Hence, the origin to destination probability *expected* on the basis of the two lotteries is given by the compound probability matrix:

$OD^e = (OE)(ED)$,

where $(OD)^e$ is the expected origin to destination class flow matrix. Comparing this expected matrix with the actual flow matrix between origin and destination occupations or classes (OD) will tell us the extent to which inter-generational social mobility (or lack of it) is mediated through education. Simple Chi-square is calculated to test the association.

To reduce the possibility of zero or very low cell frequencies, the class and education categories are reduced to four each.

The new class categories are:

1. High, combining High Economic Class and Petit bourgeoisie class
2. NMW+SW, combining the Non-Manual Workers and Skilled Worker classes
3. CULT., the cultivators
4. UNSW+ AgL, Unskilled Working Class and Agricultural Labourers

The education levels are:

1. Illiterate including literate without schooling
2. Elementary, those educated up to Eighth Class
3. High School, Secondary, Senior Secondary School educated
4. Degree and Higher educated

Class Origin and Destination Education - OE: The Education Lottery

The chances of obtaining different levels of education by male respondents of different class origin are given by Table 4. The relationship is very strong as revealed by the χ^2 value (886) of the distribution of son's education level by his father's class position. The very high value of chi-square substantiates the hypothesis that education is basically class based in India. Of the 10.13 per cent respondents originating in HIGH class nearly 46 per cent are degree holders and 32 per cent have completed schooling, illiteracy/low education is reported by only by 3.5 per cent. In contrast, of the working class respondents, about 43 per cent are near illiterate and about the same per cent are only elementary level educated.

Table 4: OE Origin Class * Destination Education

origin class destination education					
Male	Illiteracy	Elementary	SSEC	Deg & above	Total
HIGH	0.36	1.94	3.20	4.63	10.13
NMW+SW	3.70	10.88	8.58	10.24	33.41
CULT	11.17	12.25	5.68	1.72	30.82
UNSW+ AgL	11.10	10.92	3.02	0.61	25.65
Total	26.33	35.99	20.47	17.21	100

Notes: χ^2 = 886, d.f.=9, Sig. =0.

The Labour Market Lottery: Education and Occupation - ED

Education is an important screening factor in the labour market. Table 5 confirms the hypothesis that education of the respondent is highly significant in explaining his or her class attainment. The chi-square value is very high implying that class position is not independent of education. Highly educated (Degree) males achieve high class position (TOP and PB = 43.80 per cent) and NMW (52.90 per cent) whereas illiterate are exclusively fated to be in the rural and urban proletariat classes. To be in the SW class school education is enough. To be in the TOP class requires a university degree.

Table 5: ED: Destination Education *Destination Class Destination Class

Destination Education	HIGH	NMW+SW	CULT	UNSW+ AgL ALL	
Illiterate	1.23	7.43	5.53	12.81	27.00
Elementary	4.33	17.21	4.82	10.79	37.15
Completed schooling	4.89	10.79	1.72	2.58	19.98
Degree & above	6.95	8.40	0.30	0.22	15.87
ALL	17.40	43.84	12.36	26.40	100

Notes: χ^2 =682, d.f.= 9, sig.= 0.

Thus, class of origin determines education of the off-spring and their education determines their economic achievement. Let us see the end result of the two lotteries.

The Result of the two Lotteries: Origin and Destination

The 4x4 OE matrix is multiplied by 4x4 ED matrix, normalized with respect to total respondents equal to 100. Table 6.1 gives the expected class composition $(OE)^e$ of the male respondents on the basis of the two lotteries. It predicts the chances of sons inheriting the same occupational stratum as the father's or entering the other strata on the basis of level of education achieved. More exactly, the present class position of an individual is predicted on the basis of his or her education level achieved on the basis of the class origin. Table 6.2 gives the actual or observed origin to destination class distribution.

Table 6.1: Male - Predicted OCLASS by DCLASS

OCLASS	DCLASS				
	HIGH	NMW+SW	CULT	UNSW+ AgL ALL	
HIGH	2.08	4.01	0.67	1.28	8.03
NMW+SW	6.04	14.41	3.32	6.93	30.70
CULT	3.90	13.54	4.80	10.63	32.87
UNSW+ AgL	2.93	11.29	4.37	9.81	28.40
ALL	14.94	43.24	13.17	28.65	100

Table 6.2: Male - Actual OCLASS by DCLASS

	HIGH	NMW+SW	CULT	UNSW+ AgL
HIGH	8.93	0.75	0.00	0.04
NMW+SW	5.68	24.22	0.34	2.36
CULT	2.58	9.42	11.70	7.74
UNSW+ AgL	0.22	9.50	0.34	16.19

Notes: χ^2 =2422 d.f.= 9, sig.= 0.

Chi-square values are then calculated for each class and all classes combined by the formula:

$$\chi^2 = \sum(f_{ij} - f_{ij}^e)^2 / f_{ij}$$

where, f_{ij} is the frequency in i^{th} origin and j^{th} destination class. The exponent stands for the expected frequency from the matrix (OE) (ED). Table 7 gives the Chi-Square values so calculated.

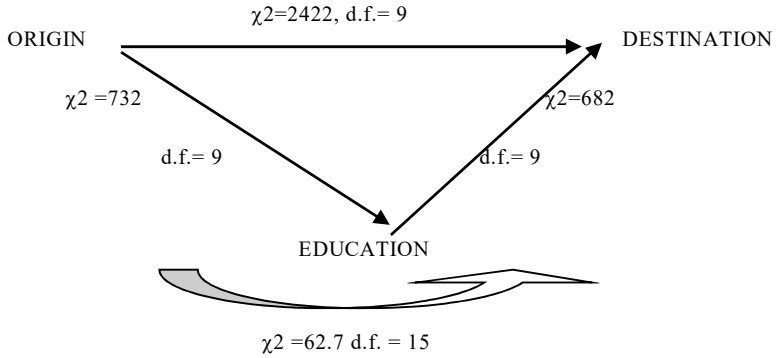
Table 7: Calculation of χ^2

CLASS	χ^2	d.f.
HIGH	27.19***	3
NMW+SW	12.41***	3
CULT	12.40***	3
UNSW+AgL	10.64***	3
ALL	62.65***	15

Notes: $\chi^{2.01}$ = 11.35 for 3 d.f, and, 21.7 and 30.6 for 9 and 15 d.f.

Chi-Square values reveal that the actual transmission of class positions is significantly different from that warranted by class based education. However, it may also be noted that χ^2 value for the actual distribution of O by D is 2422 for males for 9 degrees of freedom which reveals class reproduction. However, χ^2 on the basis of the distribution predicted by (OE) (ED) is much lower at 62.7 for the same number of degrees of freedom (*see* Figure 2, p. 16). Thus, considerable class reproduction is through class based education. Hence, there is direct transmission as well as that mediated by class based education. However, since χ^2 for distribution of destination occupation/class by education (ED) is very high at 682 for only 9 degrees of freedom in men, hence, education determines to a very large extent the ultimate class distribution in the society. Taking all these into consideration, it may be concluded that a large part of class distribution can be explained on the basis of class based education and the rest emerges because of (i) structural changes in the occupational distribution with development, (ii) direct transmission of class positions (through inheritance and privileged position), and (iii) through general expansion of education benefitting all sections.

Figure 2: Class Origin-Destination Path Diagram



Testing the Mobility Models: Log-Linear Modelling

Regression models for social and cultural classes used in this and other exercises in social sciences require using summary measures of social class. The Lottery method does not give attention to the various interactions between the cultural and class variables considered. The method of Log-linear modelling has been devised to consider the interrelation of the origin class, destination education and destination class variables (Knoke and Burke 1980, Jonsson 1993) to arrive at the nature of intergenerational mobility. However, in the process, the other origin factors like caste/social group, gender, community of residence and educational/cultural origin are not considered in this exercise.

In our log-linear models, the interaction between two or all of the multinomial variables - class origin, class destination and education - are considered. The effect of different interactions of the variables can be found out step by step by suppressing one or more of the possible interactions. The Equal Opportunity Model is taken to be the bench mark model. The model is expected to throw light on the role of education in intergenerational class mobility, other things remaining same.

As in the case of the Lottery method, the various educational and class categories have been reduced to four categories each, so that zero and very small cell frequencies and cell totals are avoided since these (small frequencies) may arise because of sampling fluctuations. It helps in taking log of the frequency as the dependent variable. Moreover, by reducing the chances of small frequencies, the results are rendered more reliable.

Destination class (D) by origin class (O) by destination education (E) are cross-tabulated for respondents. There are, thus, 64 cells. The frequencies in these cells are noted. Let $F_{i,j,k}$ be the cell frequency for i^{th} destination class, j^{th} origin class and kth destination education level. Natural logarithm of F is taken as the dependent variable. Had there been random distribution of positions, all cell frequencies would have been in proportion to the column and row sub-totals. Obviously, this is not so. The divergence from randomness is to be explained by

the three origin and destination factors. Log-linear modelling is attempted for this. The model is:

$$\text{Log } F_{i,j,k} = a + b_1 O + b_2 E + b_3 D + b_{12} OE + b_{13} OD + b_{23} ED + b_{123} OED$$

Where, i.j.k vary from 1 to 4, and **a** is the log of the intercept term and **b**'s are vectors of the estimated parameters for measuring the effects of Class origin, Education and Class destination and their interactions.

O, E, D are the matrices of three origin class dummies, three destination education dummies and three destination class dummies. One dummy in each of these is dropped to avoid multi-collinearity and to make it possible to estimate with the intercept. OE, OD, ED each represents matrices of 9 cross products of dummies. Their coefficients will represent the effect of the interaction of a combination of two factors at a time.

As mentioned above, there are 64 cell frequencies. However, 12 of these are found to be zero. These cases are dropped. Thus n is equal to 51. The total sum of squares (TSS) in the dependent variable (log F) is 26.69 for 51 degrees of freedom. Different models are fitted. The explained (ExSS) and error or residual sum of squares (RSS) are obtained for each of these models. These are given in the upper panel of Table 8.

The first model tested is the Equal Opportunity Model. Total sum of squares is reduced by 5.70 for a loss of nine degrees of freedom. Adj.R^2 is quite low, the fit is poor. Almost 79 per cent of the variance is left unexplained. Thus, the Equal Opportunity Model does not hold true here. If one interaction between education and destination (ED) is introduced (Meritocracy Model), the explained sum of squares doubles and R^2 rises to 0 .42 with a further loss of nine degrees of freedom and is statistically not significant. The Jodhpur society is still far away from Meritocracy.

The "Neo-Liberal" model is tested with two interactions: between origin and education (OE), and between origin and destination (OD) added to the baseline line model. The Explained sum of squares rises to 23.78 for a loss of 8 more degrees of freedom. There is a very large improvement in the fit (R^2=0.89) over the Equal Opportunity model as well as Meritocracy model. The relationship is also statistically highly significant. However, the Aristocracy model also gives equally good fit (R^2= 0.87).

The best model seems to be the Class Society Model wherein three way interactions between class of origin and education (OE), between education and class of destination (ED) and between class of origin and class of destination (OD) are introduced, R^2 is as high as 0.98 and R^2adjusted for the loss of 35 degrees of freedom, is also at 0.94. Almost all variance is explained.

Table 8: Log-linear models of Interactions between Social class of Origin (0), Level of Education (E) and Destination Social Class (D)

	Total Sum of Squares TSS	Model	R^2/Adj. R^2	=26.698 Residual Sum of Squares RSS	DF 51	Change in Explained Sum of Squares EXSS	Change in DF
1	Equal Opportunity	O E D	.21/.045	21.00	42	5.695	9
2	Meritocracy	O E D ED	.42/0.10	15.544	33	11.154	18
3	Neo-Liberal	O E D OD ED	.89***/.77	2.916	25	23.782	26
4	Low Class	O E D OD	.69***/.54	8.204	34	18.494	17
5	Aristocracy	O E D OE OD	.87***/.74	3.380	25	23.317	26
6	Unequal Opportunity	O E D OE ED	0.56/0.063	11.776	24	14.921	27
7	Class Society	O E D OE OD ED	.98***/.94	.517	16:	26.180	35

Middle Panel: Relation to Class Society Model (OE ED OD): Explained Sum of Squares = 26.180

	BASE MODEL		ASSOCIATION TESTED	CHANGE IN RSS=26.180	CHANGE IN df 16
A	MODEL	NEO-LIBERAL	OE	2.398	9
B	MODEL	ARISTOCRACY	ED	2.863	9
C	MODEL	UNEQUAL ACHIEVEMENT	OD	16.051	17

Lower Panel: Relation to Equal Opportunity Model (O E D): Explained Sum of squares = 5.695

	BASE MODEL		ASSOCIATION TESTED	CHANGE IN RSS=5.695	CHANGE IN df=42
A	MODEL	NEO-LIBERAL	OD ED	18.087	17
B	MODEL	ARISTOCRACY	OE OD	17.622	17
C	MODEL	UNEQUAL ACHIEVEMENT	OE ED	4.434	9
D	MODEL	MERITOCRACY	ED	5.459	9
E	MODEL	CLASS SOCIETY	OE ED OD	20.485	26

Note: *** statistically significant at one per cent level.

It may be noted that the "Low Class Society Model" which includes an education mediation term, though statistically significant, does not perform so well. Adjusted R^2 is only 0.54 which is much lower than in the other class models. It can thus be said that the Indian economy can no more be described as a pure low level feudal economy.

Thus all class significant models are class reproduction models with or without the intervention of education, ranging from Low Class Society, Aristocracy and Neo-liberal, to the Class Society models.

Since perfect mobility and rigid social reproduction are the extreme points on a scale measuring association between class origin and class destination, an attempt is made to compare the associations in relation to these two extreme cases.

Departure from Perfect Mobility Model-the Equal Opportunity Model (Table 8 Lower Panel)

The upper panel of the table shows that the equal opportunity model leaves 79 per cent of the total variance to be explained. The perfect mobility model explains only 5.69 of the total variance of 26.698, leaving the rest unexplained. In the lower panel of the table all other models of are judged in terms of reduction of variance with respect to equal opportunity model and the loss of degrees of freedom involved. Compared to Equal Opportunity Model, the Neo-Liberal model cuts 18.087 points from the total sum of squares for a loss of 17 degrees of freedom. The Aristocracy Model reduces variance by a total of 17.62 for a loss of 17 degrees of freedom. The class society model knocks down 20.49 points from the variance for a loss of 26 degrees of freedom. These are the farthest from the equal opportunity model.

Departure from the Class Society (Reproduction) Model (Table 8, Middle Panel)

In the middle panel, the relative strength of neo-liberal, aristocracy and unequal achievement models is explained. The importance of three interactions is tested by dropping one by one. The strongest relation is between origin and destination (OD). By removing this association, i.e., OD from the class society model, 16.051 points of the sum of squares lost for 17 degrees of freedom. By removing origin-education from this model, 2.398 points and by removing education- destination class, 2.863 are lost for a gain of 9 degrees of freedom. The result shows highest independent importance of origin class in determining destination class directly. In comparison, the influence of education-class and class-education relationships are much smaller.

IV Conclusions and Lessons

The process of economic and technological development is causing structural changes in the class structure of the society. Thus, there has been considerable structural mobility of all social classes. However, class origin is still the dominant factor determining class destination. In fact, the performance of the "Class Society" Model is the best. Thus, the existing social inequalities in the society are either inherited directly or achieved through education. The next best fit is that of the Neo-liberal society which shows that educational attainment independent of social origin also helps in achieving social positions. This process, therefore, helps in inter-generational social mobility and acts as a social-lift. It is also seen that in the regression analysis, father's education is not significant in the presence of own education in determination. Thus education has started playing its role in accelerating class mobility. The weakest association, though still highly

significant, is the one between origin and education, whereas the strongest association is between education and class destination.

In all the models, a large proportion of the variance remains unexplained; there is considerable mobility independent of the background or origin characteristics or factors not included in the study. The effect of some of these e.g., caste, gender, community of origin have been considered at different places in this study while the effect of some others could not be studied.

Endnote

1. Education and occupation scales or scores (as designated by Erikson) were prepared after the data was collected and processed. For assigning scores on a scale, average income earned by the respondent in various educational and occupational categories was computed from the data collected. The lowest educational category is taken as the respective reference categories equivalent to 100.

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Intra-Industry Trade in Manufactured Goods: A Case of India

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Since the Second World War, it was observed that trade between two countries could not be explained entirely by the classical and neoclassical models of trade that emphasised inter-industry trade. It was found that trade between countries was increasingly dominated by Intra-Industry Trade (IIT), where countries exchanged products that fell in the same category. In this paper, we try to determine the IIT between India and its top fifteen trading patterns. Unlike other papers, we do not simply calculate aggregate IIT for all merchandise trade. Instead, we focus on manufactured products and divide them into ten categories based on their technological content. Our analysis reveals that while India's IIT has increased in recent years, it is not the dominant form of trade between India and its most important partners. When we look at the factors that determine IIT, we find that India's comparative advantage and trade agreements play a positive and significant role in increasing IIT. Lastly, a unique analysis of the category Medium Technology Manufactures - Process reveals that this sector has potential for higher IIT and gains from it if India can enhance its efficiency and increase its size.

Key Words: Intra-industry trade, Technological content, Trade partners

I Introduction

For a long time, trade between any two countries was explained by the Ricardian/Heckscher-Ohlin models, which theorised trade to be driven by differences in technology or factor endowment. The classical and neo-classical models emphasised inter-industry trade, where each country would specialise in the production of a particular commodity (the assumption here was that all processes required for the production of a commodity would be performed in the country) and would then exchange it with its trading partner. However, in the post-war period, it was observed that trade between economies was no longer the cheese for wine type as believed by theorists. Instead, the exchange between commodities

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comprised of goods that belonged to the same category. This pattern of exchange was termed as Intra-industry trade (Balassa 1966).

The initial research in intra-industry trade (IIT) focussed on the trading patterns of developed economies. Economists such as Verdoorn (1960) and Balassa (1963) observed the changes in patterns of trade in European countries after the formation of Benelux and the European Economic Community (EEC). They found that developed countries showed an increasing proportion of intra-industry rather than inter-industry trade. This pattern was repeatedly observed in most developed countries.

The same pattern, however, was not observed in developing countries. Few researchers found evidence of IIT between developing countries and between developed and developing countries. The notion that developing countries primarily engaged in inter-industry trade stemmed from two beliefs: the inability of developing countries to exploit economies of scale and the significant differences in factor endowment between countries, especially in the North and the South, constrained IIT. Despite such beliefs, some economists showed the presence of IIT in trade in manufactures between developing countries (Balassa 1979). IIT was found to be high between developing countries and between developed and developing countries. Both studies found that regional integration in the form of trade blocs and bilateral agreements played an essential role in increasing IIT. Moreover, in recent years, there have been a large number of studies that show theoretically and empirically the existence of IIT between developing countries and their trading partners (Manrique 1987, Globerman 1992)

This paper explores the nature of trade between one of the largest developing countries, India, and its 15 most significant trading partners. These countries were chosen because over half of India's trade is accounted for by them. The objective is to identify the factors that drive IIT in India. However, unlike the other studies in the area, we do not simply calculate IIT for all manufacturing products. Instead, we stick to merchandise trade in chemicals and manufacturing products (groups 5 to 8 in SITC Rev. 3.), and we categorise these products into groups based on their technological content. The categorisation of these products is done using the Lall Classification, which classifies products into ten separate groups. We conduct this exercise to understand better the type of goods in which India exhibits higher IIT and the factors that influence IIT in different categories.

The paper is structured as follows. In Section II, we look at the literature on IIT, focusing on studies done in the Indian context. In Section III, we describe the methodology adopted for empirical analysis. Next, in Section IV, we provide a background for India's trade, specifically IIT. In Sections V and VI, we delve into the empirical analysis and the discussion of the results. Section VII concludes the paper.

II Literature Review

Beginning with Verdoorn (1960), several studies found that countries increasingly exhibited specialisation within the same category of goods being traded (Balassa 1963, Kojima 1965, Grubel 1967); this pattern of trade was termed Intra-industry trade (Balassa 1963). These findings were contrary to traditional theories of trade, which predicted that countries would specialise in different goods (depending on their comparative advantage or factor endowments) and trade with each other to enjoy gains from trade. Even before Verdoorn (1960), Leontief (1936) had indicated that the HO theorem failed to explain the trade pattern of countries with similar factor endowments. The advent of studies on IIT further extended support to his point. The book by Grubel and Lloyd, "Intra-Industry trade", published in 1975, dealt with aggregation and measurement of IIT and provided additional impetus to studies in this field.

The initial studies on IIT were largely empirical with little theoretical backing, which was initially provided by Krugman (1979). Krugman (1979) shows that trade in similar but different commodities between countries was induced by two factors, economies of scale in production and consumer's love for variety, which also gave rise to GFT from IIT. Subsequent studies by him found that as countries become similar in their endowment, IIT between them increases (Krugman 1981). Linder (1961) had put forth a similar hypothesis which suggested that similarity in demand patterns would increase the volume of reciprocal trade between economies in differentiated goods. Lancaster (1980), too, argues that countries with the same factor endowments would exhibit pure IIT. As the extent of similarity between endowments reduces, IIT would reduce. Helpman (1981) measured similarity as an absolute difference in income between countries and showed the negative correlation between similarity and bilateral IIT.

Since Krugman, subsequent theoretical and empirical work has tried to determine factors other than similarity (in factor endowment or incomes) that influence IIT. Factors such as the size of the economies (Helpman 1987), regional integration (Balassa, 1979), comparative advantage in production were also said to play an essential role, as were gravity variables such as distance between the economies (Helpman 1987).

Given this background of literature on IIT, we now turn to the literature on India's pattern of trade. Several studies have repeatedly examined the presence of IIT between India and its trading partners, the distinctiveness of the patterns and the determining factors.

First and foremost, trade liberalisation has proved to be an essential factor in increasing IIT. Veeramani (2002) showed that trade liberalisation in India since the 1990s has been biased towards IIT. He argues that this increase in IIT is a manifestation of resource re-allocation within industries. Similarly, Burange and Chaddha (2008) found that reducing trade barriers and efficient allocation of resources gave rise to specialisation within unique varieties of goods and hence increased IIT. A recent paper by Aggarwal and Chakraborty (2019) finds that

multilateral reforms and trade liberalisation have enhanced India's IIT at aggregate and sectoral levels.

Coming to the impact of free trade agreements, the evidence so far unilaterally dictates that FTAs and RTAs have enhanced IIT in India. Aggarwal and Chakraborty (2019), Das and Dubey (2014) find that India's signing of FTAs and bilateral agreements with trade partners have been instrumental in driving IIT. Varma and Ramakrishnan (2014) show that SAFTA and agreements with ASEAN members have not only influenced manufacturing IIT but has also increased the extent of IIT in agri-food products. The studies argue that further integration will help in sustaining such trade flows. Next, studies have tried to examine whether the rising IIT results from an increase in exports or imports. Veeramani (2002) shows that the rising exports by India have contributed to the increase in IIT. In an examination of the Indian textile industry, Bhadouria and Verma (2012) show that IIT in textiles has gone down since the start of the 21st century due to increased net exports. On the other hand, Bagchi (2017) found that it is the rise in imports that has been responsible for rising IIT.

Examining the more traditional factors driving IIT, such as similarity and factor endowment, the literature shows exciting results. According to the theory on IIT, India's IIT should be higher than other developing countries due to similarity in income and factor endowments. However, Veeramani (2002) and Srivastava and Medury (2011) find that India has a higher proportion of IIT with developed economies, i.e., highly dissimilar economies. They attribute this finding to a higher share of vertical IIT in India's trade.

Lastly, factors such as distance, India's increasing income and economic size, efficiency, relative comparative advantage are also said to play a positive and significant role (Srivastava and Medhury 2011, Bagchi 2017, Aggarwal and Chakraborty 2019). An increase in income and size of the economy increase the demand for products giving rise to IIT, whereas RCA indicates efficiencies in production which influences the supply of products.

III Methodology

In this paper, we aim to study the patterns of IIT between India and its top 15 trading partners. These 15 partners are Bangladesh, Belgium, China, Germany, Hong Kong, Italy, Malaysia, Nepal, Netherlands, Saudi Arabia, Singapore, United Arab Emirates, United Kingdom, United States and Vietnam. We calculate IIT between India and its partner countries using the Grubel-Llyod Index. The formula used is as follows

$$IIT_j = \frac{\sum_i (X_i^j + M_i^j) - \sum_i |X_i^j - M_i^j|}{\sum_i (X_i^j + M_i^j)}$$

Where i represents the industries at the third level from groups 5 to 8 in SITC Rev 3, and j is the partner country.

In the formula, $|X_i^j - M_i^j|$ measures the inter-industry trade in each industry, which is then removed from the total trade, $\left(X_i^j + M_i^j\right)$ between the economies. Thus, what we are left with is the intra-industry trade in the industry. The economy-wise measure of IIT is then obtained by averaging each industry measure across the n industries. The weights used are the relative shares of industry exports and imports. The most essential feature of the measure is that it was derived by matching the value of exports and imports in each industry and then averaging these measures (Llyod 2002). Studies have shown that the index is an appropriate measure in studies that aim to explain comparative advantage, specialisation and predict patterns of trade. However, there are arguments that this index is downward biased, since it does not adjust for aggregate trade imbalances, which tend to be large, mainly when applied to bilateral flows. Despite this shortcoming, the index remains a popular measure of IIT used in studies.

The data for imports and exports for the study was collected from WITS. Unlike other studies that have looked at the manufacturing sector or specific sectors of an economy, we focus on the products from SITC groups 5 to 8. Group 5 consists of Chemicals, Groups 6 and 8 comprise all manufactured goods, whereas Group 7 is made up of machinery and transport equipment. Additionally, to better understand India's trade pattern, we divide these products into ten technological groups. The categories are Primary Products, Resource-based Manufactures (RBM): Agro, RBM: Other, Low Technology Manufactures (LTM): Textile, Garments and Footwear, LTM: Other Products, Medium Technology Manufactures (MTM): Automotive, MTM: Process, MTM: Engineering, High Technology Manufactures (HTM): Electronic and Electrical (E&E) and HTM: Other. The categorisation of products into the groups was provided by Sanjay Lall and is often known as the Lall classification.

By dividing products into these categories and analysing the categories individually, we can determine the differences in which factors influence the trade patterns in each type of product and thus have specific policy recommendations for them.

The time period chosen for analysis is 1988 to 2015. This time-period captures the pre- and post-liberalisation periods, as well as the period during which India began entering into regional trade agreements and started experiencing the repercussions of it.

IV Background Statistics

In table 1, we show some details of India's trade. We find that India's trade with the world has grown quite rapidly. The growth in exports and imports has been close to or over ten per cent in each period. When we look at the share of India's top 15 trading partners in exports and imports, we find that over half of India's

exports are destined for these locations. Similarly, over 40 per cent of India's imports originate in these countries.[1] An interesting trend here is that after the global financial crisis, the share of India's exports to these countries has reduced, whereas India's imports from the same countries have increased. When we focus only on groups 5 to 8, we find the same growth patterns. However, the share of the top 15 countries in these commodities is much higher. Over 60 per cent of total trade in these commodities has been concentrated to India's top 15 trading partners in recent years.

Table 1: India's Trade Statistics

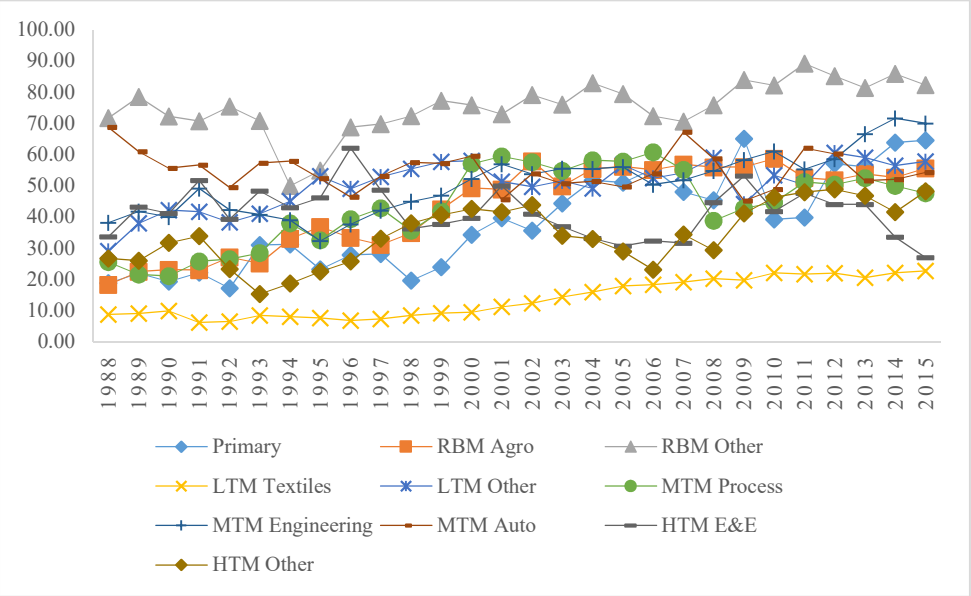
	Year	All Products		Groups 5 to 8	
		Exports	Imports	Exports	Imports
Trade with World (US$ Thousand)	1988	1,38,15,156	1,93,50,897	98,32,114	1,15,42,354
	1995	3,16,49,922	3,65,92,062	2,33,43,288	2,05,55,272
	2005	10,03,52,637	14,08,61,667	7,25,38,504	6,97,34,656
	2015	26,43,81,004	39,07,44,731	18,75,43,344	19,82,50,672
Compound Annual Growth Rate (%)	1988-1995	12.6	9.5	13.1	8.6
	1995-2005	12.2	14.4	12.0	13.0
	2005-2015	10.2	10.7	10.0	11.0
Share of the 15 countries (%)	1988	41.1	38.8	45.1	34.5
	1995	56.6	43.8	61.1	49.8
	2005	64.0	36.3	64.0	60.8
	2015	58.9	46.6	60.2	66.3

Source: WITS and Author's calculations using data from WITS.

Of the 15 countries in consideration, India has trade agreements (either directly or through a more comprehensive group agreement) with five of them, Bangladesh, Nepal, Singapore, Vietnam and Malaysia. All agreements were either signed or came into force after 2005.

As seen from Figure 1 and Table 2, IIT for the products under consideration has increased for all ten categories since 1990 except HTM E&E. India has the lowest IIT in LTM textiles whereas proportion of IIT is the highest in RBM Other, followed by MTM Engineering. Primary products have seen the highest increase in IIT since 1990. We also find that no two groups follow the same pattern. Moreover, the increase in IIT has not been constant. There have been sudden ups and downs, especially around crisis periods such as the Asian Financial Crisis and the Global Financial Crisis. For instance, IIT in MTM Automotive declined after the GFC while it increased in HTM other. Lastly, we see that out of the ten categories, IIT is the dominant form of trade for approximately 7 of them in 2015 compared to just 2 in 1990.

Figure 1: India's IIT with the World (by Technological Groups)



Source: Author's calculations using data from WITS.

Table 2: India's IIT with the World (by Technological Groups)

Year	1990	2000	2010	2015	Change (1990-2015)
Primary	19.23	34.23	39.18	64.51	233.3
RBM Agro	23.02	49.26	58.69	55.58	141.4
RBM Other	72.23	75.82	82.23	82.3	13.9
LTM Textiles	9.85	9.39	22.04	22.68	130.3
LTM Other	42.11	57.94	53.38	57.75	37.1
MTM Process	20.98	57.08	44.63	47.62	127
MTM Engineering	39.96	52.26	61.01	70.02	75.2
MTM Auto	55.66	59.51	48.85	54.31	-2.4
HTM E&E	41.15	39.64	41.74	26.98	-31.4
HTM Other	31.68	42.62	46.25	48.18	52.1

Source: Author's calculations using data from WITS.

When we look at the mean IIT between India and its top 15 trading partners (Table 3), we see that mean IIT has increased for all groups except MTM Auto. Just as in India's IIT with the world, the lowest IIT is in LTM Textiles while the highest is in RBM Other. We find that the average proportion of IIT with these 15 countries is much lower than India's IIT with the world. Moreover, these numbers

indicate that a large proportion of India's trade with its major trading partners can still be categorised as inter-industry rather than intra-industry trade.

Table 3: Mean IIT between India and Its Top 15 Trade Partners

Group	1990	2000	2010	2015	Change (1990-2015)
Primary	13.2	22.2	27.3	28.8	118.2
RBM	16.4	28.1	23.7	23.8	45.1
RBM Other	12.0	34.1	46.3	39.4	228.3
LTM Textiles	8.7	13.4	13.5	17.7	103.4
LTM Other	18.0	34.2	29.2	27.9	55.0
MTM Auto	32.2	28.3	18.4	29.6	-8.1
MTM Engineer	9.3	26.8	30.7	33.1	255.9
MTM Process	11.1	26.6	27.5	28.8	159.5
HTM E&E	15.8	31.2	30.7	27.2	72.2
HTM Other	16.9	29.2	28.7	27.9	65.1

Source: Author's calculations using data from WITS.

V Empirical Analysis

The brief literature in Section II gave us an overview of the factors that theoretically and empirically affect IIT. This section uses these factors to determine their impact on India's IIT with its partners in different product categories based on their technology. For this purpose, we employ the gravity model wherein we model IIT as a function of the distance between the two countries and the sizes of the two economies. We expect the coefficient of the distance variable to be negative and the size of the two economies to be positive. Next, we include a measure of dissimilarity, measured as the absolute difference between per capita between the two economies. As per the theory, the dissimilarity should have a negative coefficient. However, past literature on India indicates that dissimilarity may also be positive. We also include the variables that measure the RCA of India and its partner country in the industry. If RCA is positive, then IIT is trade creating and enhances efficiency. We expect it to be positive. Lastly, we include dummy variables that indicate whether India has an FTA with the partner country. We also allow for country fixed effects to capture country-specific factors that might be influencing IIT.

$$IIT_j^k = \alpha + +\beta_1 Dissimilarity + \beta_2 Log(GDP_j) + \beta_3 Log(GDP_{India}) + \beta_4 Distance + \beta_5 FTA + \beta_6 RCA_j^k + \beta_7 RCA_{India}^k + Country\ Fixed\ Effects + \varepsilon$$

Where j is the partner country, and k represents the technological grouping.

Table 4: Description of Variables

Variable	Definition/Formula	Expected coefficient
Dissimilarity	The absolute difference in the log of GDPPC of countries	Negative
Size of Partner Country's Economy	Log GDP of Partner Country	Positive
Size of India's Economy	Log GDP of India	Positive
Distance (in '000s km)	Distance between capitals of countries	Negative
FTA dummy	Takes the value 1 if the two countries have an FTA	Positive
RCA of Partner Country (in group k)	$RCA = \frac{Share\ of\ k\ in\ total\ exports\ of\ the\ country}{Share\ of\ k\ in\ total\ world\ exports}$	Positive
RCA of India (in group k)		Positive

We run this equation for each of the ten technological groupings (k). Since our dependent variable, IIT, measured using the Grubel-Llyod Index, is a continuous variable bounded between 0 and 1, we employ the fractional Probit response model for panel data using QMLE. This estimation technique, developed by Papke and Wooldridge (2008), has two merits over the traditional OLS regression estimates. First, if the dependent variable takes the value 0, we do not encounter the missing data problem. Second, we can estimate the marginal effects of the independent variables on the dependent variable. All variables were checked for stationarity and stationarized before running the regression.

The results from the regression analysis and the estimated marginal effects are shown in Tables 5 and 6, respectively.

The results from our regression analysis show some interesting results. First, we find that income dissimilarity, although not significant, has a positive coefficient. Just like income similarity, the size of the economies, India's or the partner country's, also does not influence IIT. The only exception to these is the group MTM Process. Another result that is contrary to theoretical predictions is the coefficient of the distance variable. The distance coefficient is consistently positive and significant for all groups. The impact of India's FTAs on IIT reveals mixed results. While the coefficient is significant for 6 out of the ten groups, the impact is harmful to two of them, MTM Process and HTM E&E. On coming to the impact of the partner's country RCA on IIT, and we find that in the cases where the coefficient is significant, it is mainly negative. On the other hand, India's RCA is significant for most groups, and it is positive for all of them except RBM other and LTM textiles.

Table 5: Regression Output

	Primary	RBM	RBM Other	LTM Textiles	LTM Other
Absolute difference in income	2.44	3.57	-0.6	0.45	2.34
	(2.29)	(3.28)	(2.72)	(1.72)	(2.2)
Size of Partner country's Economy	-2.81	-4	-0.48	-2.15	-2.12
	(2.41)	(3.3)	(2.78)	(1.87)	(2.25)
Size of India's Economy	3.89	4.74	2.99	1.51	1.81
	(2.43)	(3.38)	(2.77)	(1.82)	(2.33)
Distance (in 1000 kms)	0.24	0.36**	0.45***	0.45***	0.61***
	(0.16)	(0.17)	(0.09)	(0.1)	(0.13)
FTA	0.48***	-0.02	0.12	0.26***	0.11
	(0.12)	(0.09)	(0.09)	(0.08)	(0.1)
RCA	-0.01***	-0.08	0.09	0.01	-0.1
	(0)	(0.22)	(0.14)	(0.01)	(0.13)
RCA-India	0.30***	0.60*	-0.24***	-0.12*	0.38***
	(0.1)	(0.32)	(0.04)	(0.07)	(0.07)
Constant	-2.48***	-2.72***	-1.21***	-2.10***	-3.20***
	(0.36)	(0.48)	(0.28)	(0.34)	(0.27)
BIC	460.76	481.86	526.84	351.3	504.22
N	344	352	352	352	352
Country Fixed Effects?	Yes	Yes	Yes	Yes	Yes

	MTM Auto	MTM Engineering	MTM Process	HTM E&E	HTM Other
Absolute difference in income	3.02	1.98	4.27**	-1.75	0.53
	(4.5)	(2.81)	(1.96)	(2.31)	(4.53)
Size of Partner country's Economy	-5.22	-2.85	-5.09**	1.21	-2.58
	(4.66)	(2.84)	(2.02)	(2.35)	(4.57)
Size of India's Economy	2.25	3.14	6.08***	0.74	-0.43
	(4.69)	(2.84)	(1.95)	(2.3)	(4.57)
Distance (in 1000 kms)	0.92***	0.76***	0.04	0.32**	0.79***
	(0.12)	(0.11)	(0.11)	(0.13)	(0.09)
FTA	0.27	0.19*	-0.20***	-0.25**	0.38***
	(0.17)	(0.1)	(0.08)	(0.11)	(0.11)
RCA	-0.48*	0.14	0.31**	-0.13*	0.01
	(0.29)	(0.14)	(0.12)	(0.07)	(0.03)
RCA-India	0.02	1.33***	0.80***	1.14***	-0.16
	(0.3)	(0.15)	(0.13)	(0.35)	(0.14)
Constant	-3.39***	-3.92***	-2.12***	-2.02***	-4.01***
	(0.32)	(0.24)	(0.28)	(0.31)	(0.27)
BIC	465.19	483.33	498.34	496.55	474.9
N	336	352	352	352	352
Country Fixed Effects?	Yes	Yes	Yes	Yes	Yes

Notes: *** p<0.01, **p<0.05, *p<0.1; Values in parentheses represent standard errors.

Table 6: Marginal Effects Calculated using the Regression Output

	Primary	RBM	RBM Other	LTM Textiles	LTM Other
Absolute difference in income	0.67	1.03	-0.19	0.08	0.72
	(0.63)	(0.94)	(0.89)	(0.31)	(0.67)
Log (GDP-Partner)	-0.77	-1.15	-0.16	-0.38	-0.65
	(0.66)	(0.95)	(0.9)	(0.33)	(0.69)
Log (GDP-India)	1.07	1.37	0.97	0.27	0.55
	(0.67)	(0.97)	(0.9)	(0.32)	(0.71)
Distance (in 1000 kms)	0.07	0.10 **	0.15 ***	0.08 ***	0.19 ***
	(0.05)	(0.05)	(0.03)	(0.02)	(0.04)
FTA	0.13 ***	0	0.04	0.05 ***	0.04
	(0.03)	(0.03)	(0.03)	(0.01)	(0.03)
RCA	-0.00 ***	-0.02	0.03	0	-0.03
	(0)	(0.06)	(0.04)	(0)	(0.04)
RCA-India	0.08 ***	0.17 *	-0.08 ***	-0.02 *	0.12 ***
	(0.03)	(0.09)	(0.01)	(0.01)	(0.02)

	MTM Auto	MTM Engineering	MTM Process	HTM E&E	HTM Other
Absolute difference in income	0.87	0.57	1.28 **	-0.52	0.15
	(1.3)	(0.81)	(0.59)	(0.69)	(1.28)
Log (GDP-Partner)	-1.51	-0.82	-1.53 **	0.36	-0.73
	(1.34)	(0.82)	(0.61)	(0.71)	(1.29)
Log (GDP-India)	0.65	0.91	1.83 ***	0.22	-0.12
	(1.35)	(0.82)	(0.59)	(0.69)	(1.29)
Distance (in 1000 kms)	0.27 ***	0.22 ***	0.01	0.09**	0.22 ***
	(0.04)	(0.03)	(0.03)	(0.04)	(0.02)
FTA	0.08	0.06 *	-0.06 **	-0.08**	0.11 ***
	(0.05)	(0.03)	(0.02)	(0.03)	(0.03)
RCA	-0.14 *	0.04	0.09 **	-0.04*	0
	(0.08)	(0.04)	(0.04)	(0.02)	(0.01)
RCA-India	0.01	0.38 ***	0.24 ***	0.34***	-0.04
	(0.09)	(0.04)	(0.04)	(0.1)	(0.04)

Notes: *** p<0.01, **p<0.05, *p<0.1; Values in parentheses represent standard errors.

VI Discussion

Although the coefficient of the difference in income is not significant, the results show that India's IIT is higher with countries whose income (and thus demand patterns) are different. This result is in line with the results of Veeramani (2002) and Srivastava and Medury (2011). These studies have shown that India has higher IIT with countries that have higher income. If we calculate the mean IIT for developed and developing countries in our sample, we find that India's IIT is consistently higher with the high-income countries for all groups other than

textiles. Table 7 shows that India's IIT is much lower with its neighbouring developing countries compared to other developing and developing countries.

Table 7: Mean IIT by Country Groups (1988-2015)

	Developed countries – High Income	Developing countries – Neighbouring	Developing countries – Other
Primary	23.5	15.9	22.5
RBM	28.4	13.6	22.7
RBM Other	36.9	15.4	34.3
LTM Textiles	7.9	26.8	23.9
LTM Other	32.8	14.0	24.1
MTM Auto	30.1	14.2	20.3
MTM Engineering	31.4	7.6	31.6
MTM process	28.0	20.8	17.3
HTM E&E	33.1	7.4	25.2
HTM Other	27.8	12.6	21.4

Source: Author's calculations using data from WITS.

This indicates that India's IIT leans more towards vertical IIT than horizontal. This is because it is generally assumed that countries with similar incomes have similar technological capacities and demand patterns. Thus, their trade is more horizontal (trade in similar but differentiated products). On the other hand, higher-income countries are more technologically advanced with different demand patterns. Thus, the trade with these countries would be more vertical, i.e., trade in the same product group but products at different production stages. The effect is the highest and significant only for one group, MTM Process, indicating that India is the supplier of parts and components to high-income economies in the MTM category.

The coefficient of the distance variable further lends support to the vertical IIT hypothesis. The distance variable is consistently positive and significant across all product categories, except MTM-Process. On the one hand, the countries close to India included in the sample (Nepal, Bangladesh and China) fall in the same income category, whereas the countries that lie further away are higher-income economies. However, the marginal effect of changes in the distance is small. The insignificant coefficients of the GDP variables indicate that the countries' size (India and Partner) has no impact on IIT.

The size of the Indian economy has a positive effect on IIT for all product groups other than HTM-other. Thus, as India's economy grows, we can expect the IIT to increase. However, this variable is insignificant for all groups except MTM-Process. On the other hand, the size of the partner country's economy is consistently negative (the only exception being HTM E&E). The negative coefficient implies that as India's trade partners grow and develop, India will not be able to keep up with its production capabilities which will reduce IIT. However,

even in this case, the coefficients are small and insignificant. MTM Process is the only exception, where the coefficient and the marginal effect are large.

When we try to determine the impact that competitiveness has on IIT between India and its partner countries, we find that the coefficient of India's RCA is significant for eight out of the ten categories. Moreover, of the eight categories, it is positive for all except RBM-Other and LTM-textiles. Thus, we find that an increase in India's comparative advantage increases its IIT. The positive coefficient of India's RCA shows that Indian trade is efficiency-enhancing. The marginal effect of RCA is, in fact, highest in medium and high technology manufactures, indicating that India has the potential to increase its skill and efficiency levels in these products and benefit from added IIT. There is also potential for developing new skills. The two products for which RCA is negative (RBM-Other and LTM-Textiles) fall on the lower end of the skill spectrum and are largely labour-intensive. Moreover, the marginal effect of an increase in RCA is also smaller for them. The negative coefficient thus hints at a lack of labour in the high-income economies. Thus, these results suggest that India should focus on increasing its RCA in higher technology commodities.

Coming to the impact of the partner countries' comparative advantage on IIT, we find that it is small and insignificant in most cases. However, out of the four groups for which it is significant, it is negative for three out of four of them (only exception – MTM Process). The result indicates that an increase in the comparative advantage of partner countries reduces their IIT with India, implying that India lacks either the technological capacity or the capacity to acquire technological know-how to compete with its partner countries. However, the marginal effects are quite small.

Lastly, we look at the impact of India's FTA on IIT. The coefficients for FTA are significant for 6 out of the ten income categories. However, it is negative for 2 out of the 6 categories – MTM Process and HTM E&E. This negative coefficient implies that the agreements signed by India have not increased IIT in these categories but have instead had a trade diverting effect. However, for all other categories, FTA has been beneficial as IIT is welfare increasing (exploits economies of scale and allows for increased variety in consumption). Thus, contrary to the argument that India's FTAs have not been beneficial as they have resulted in an increased trade deficit, we do find that the signing of FTAs has been welfare enhancing.

What is Happening with MTM Process?

Having discussed all our variables, we would like to focus on one product group that has consistently emerged as an exception in our discussion, MTM Process. This category is primarily made up of chemicals (paints, pigments, perfumes, soaps) and plastic products (tubes, plates, sheets). It also includes a few other products such as railway vehicles, trailers, and steel pipes and tubes.

Our results indicate that India and its partner countries' RCAs have a positive effect on IIT. Thus, an increase in efficiency by either country (India or partner) increases IIT in this category. When we look at India's RCA in the MTM process, we see that India does not have a comparative advantage in this category. Nevertheless, the RCA values have gradually been increasing. The value of RCA was 0.4 in 1988 and has increased to 0.8, even reaching a value of 1 in some years. Thus, India has potential in this sector, and an improvement in efficiency will bring about added benefits in increasing IIT.

Next, we see that an increase in the size of the partner country reduces IIT while an increase in India's size increases IIT. The significant marginal effects of the two variables indicate that the group is susceptible to changes in the sizes of the economies. We believe that this trend is there because the share of this sector in India is minimal. If we look at the share of plastics and rubber in manufacturing output, we find that the share has hovered around 15-18 per cent since 1988. However, the sector's share (only SITC 5-8)[2] in exports is minimal. In 1988, it accounted for only 3 per cent of India's exports, and it grew to approximately 7 per cent by 2015.

On the other hand, the share of imports was high initially, hovering between 9-11 per cent between 1988 and 1991. Although it came down to five per cent in the early 2000s, it has increased to approximately eight per cent in recent years. Thus, as partner economies grow, India's sector becomes even smaller relatively. On the other hand, as India and its sector grow, the size of the sector becomes more comparable to other countries. This story is further corroborated by the sign and the marginal effect of the similarity variable, which is positive and large. As the economies become similar and more comparable, the IIT is likely to increase between the economies.

The relatively small size of the sector also explains why the results indicate that the group is susceptible to trade diversion.

Therefore, an analysis of this category reveals that this sector has potential for higher IIT and gains from it if India can enhance its efficiency and increase its size.

VII Conclusion

The paper sought to examine India's IIT with its top 15 partner countries. For this purpose, the products from SITC Rev. 3 groups 5 to 8 were divided into ten categories based on their technological content. The analysis of India's IIT in these categories showed that although IIT has increased in recent years and is the dominant form of trade with the world, India's trade with its top 15 partners still largely falls under the category of inter-industry trade. India has the highest IIT in Resource-based manufactures, whereas IIT is the lowest in low technology-intensive textiles.

The empirical analysis conducted to determine the factors of IIT revealed that India's RCA plays a significant role in increasing IIT for technological categories. We also find that India's FTAs have been IIT enhancing. Thus, in contrast to the

notion that India has not benefitted from its FTAs, we find that IIT has increased with FTA partners. Thus, there are benefits to be derived from trade agreements. Moreover, contrary to theory and previous empirical findings in this area, we find that India's IIT increases with distance. However, this result, we believe, indicates the dominance of India's IIT with developed countries that are located far away and lower IIT with its developing neighbours.

Lastly, a particular focus on medium technology process-based manufactures reveals the existence of potential to be exploited in this category. An increase in efficiency and overall growth in the Indian economy can benefit this sector. However, the sector is susceptible to trade diversion from FTAs due to its relatively small size.

Thus, the paper provides some insightful results about the nature of India's IIT and the factors that play an essential role in driving it. This paper is a vital addition to the literature on IIT in India, mainly because of its innovative way of categorising products. However, it is essential to remember that while the classification of goods into technological categories using the Lall classification is widely accepted and used, it is subjective. Also, the nature of goods constantly changes due to technological changes. Hence, several products may be wrongly categorised.

An important point to note here is that the study does not consider the role of multinationals or FDI in IIT. In recent years, MNCs and FDI have been instrumental in driving the extent of IIT between countries. As more and more MNCs outsource or offshore their production processes, there is an increase in IIT due to trade in parts and unfinished goods. This IIT is, more often than not, vertical. Despite the importance of MNCs and FDI, these factors have been ignored since they use different indices to measure the share of IIT that is vertical and horizontal. Such distinction between the two types would give us more insight into the factors determining IIT and lead to better policy recommendations.

Endnotes

1. Crude oil forms a large part of these imports.
2. The group has 28 products at the 3rd digit in total of which 26 are from SITC groups 5-8. The two products thus excluded from our study in this group are products 266 (Synthetic fibres suitable for spinning) and 267 (Other man-made fibres suitable for spinning).

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Deprivation and Health of Elderly in India: An NSS Based Analysis

Sabitri Dutta

Social deprivation of elderly individuals aggravates their health problems, giving it a socio-economic dimension. The purpose of this study is to quantify the extent of this deprivation and suggest policies to reduce this menace. This work uses NSSO (71st round, 2014) data. Social Deprivation Index (SDI) for the elderly has been constructed and ordered logit regression techniques have been used to find the effects of social deprivation on self-perceived health. Deprivation is found higher for people who perceive their current health as poor. Female and rural elderly suffer more deprivation. Education and marital status also influence the deprivation.

Key Words: Social deprivation, Elderly, Health

I Introduction

Social exclusion has several dimensions in which people became disengaged from the mainstream society and are deprived of the services, rights and resources available to the rest of the population (Sacker, Ross, Macleod, Netuveli, Windle 2017). The manifestation of exclusion or deprivation happens in a number of interlinked problems that lead to the denial of opportunities available to majority present in the society. The major drivers of exclusion include ill health, poor economic condition, lower educational attainment, unemployment, homelessness, poor transport access and lack of sufficient social support (Bradshaw, Kemp, Baldwin, Rowe 2004). The mutual dependence of these factors makes it difficult to identify the direct risk factors, mediating factors and outcome of exclusion. Ill-health is generally considered as an outcome of exclusion (Burchardt 2003, Grundy and Sloggett 2003, Leone and Hessel 2016, Hawton, Green, Dickens, Richards, Taylor, Edwards, Greaves, Campbell 2011). There are interactions between social deprivation and health that consequently result in health inequality.

Exclusion or deprivation of the elderly gains concentration in today's world, as population ageing is an inevitable and irreversible demographic process experienced by the entire world. Alam, Sivaraju, Gangadharan, Syamala, Verma, Gupta (2017) (India Ageing Report, 2017, UNFPA) report that by 2050 the number of elderlies at a global level will outnumber those who are under the age of 15. India is also experiencing this change in the demographic profile that throws

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a challenge to the social, economic and political domains. The major problem in this stretch of life is identified as deprivation from society and family.

The main reason for this deprivation is physical incapability that grows at this age and thereby non-participation in economic activities. There is a need of a policy that would increase their opportunity for physical, social and mental well-being. The process would also facilitate their participation in the society according to their desires, needs and capacities. They should also be provided with adequate security, care and assistance when they require them. A well-designed policy with this focus has a chance to reduce in practice, the deprivation and feeling of being excluded on the part of the elders.

It is important to identify factors that are responsible for deprivation and what effect they leave on the health of the elderly (aged 60 years and above). This paper attempts to find out those factors and then to quantify the extent of deprivation. It constructs a Social Deprivation index (SDI) combining the factors identified. It also attempts to examine the change in the deprivation across different socio-economic and health perception indicators. The feeling of being excluded may have some effect on self-perception about health. The association between the deprivation and self-rated state of health and change in state of health over the previous year (health transitions) have been studied.

II Data

The study uses National Sample Survey (NSS) 71st round unit level data (2014) on *Social Consumption: Health*. NSS adopted stratified multi-stage sampling method to collect data. The census villages in the rural sector and the Urban Frame Survey (UFS) blocks in the urban sector were considered as the First Stage Units (FSU). Probability Proportional to Size with Replacement (PPSWR) has been used for selection of FSUs in both the sectors. Households of both the sectors were treated as the Ultimate Stage Units (USU) to collect information from all Indian States and Union Territories (UTs). In the dataset, specific information is available about people of age 60 years and above. This includes their socio-demographic profile along with information related to their financial independence, living arrangement, physical mobility, number of living sons and daughters, number of dependents, their own perception about their current state of health and change in state of health. Data on use of health care services and allied information have been used in this work. Only the spell of one record of ailment in the last 15 days of survey has been considered.

The number of such individuals is 6, 607 on whom the entire analysis has been carried out.

III Method

Construction of Social Deprivation Index (SDI)

The methodology has been followed from Sacker, *et. al.* (2017). The work identifies eight different indicators that represent social deprivation that may lead to health complications. On the basis of these indicators, eight variables have been created. They are whether the older person has availed medical advice for own illness (if not availed then 1 is assigned, 0 otherwise), the rating of the health care facility as 'satisfactory' or 'unsatisfactory' by the person (1 is allotted if rated 'unsatisfactory'), whether the person is not using medical facility due to high cost (1 for not use), the ailment has been considered serious or not (1 for not considering serious), whether the person is covered under any health expenditure coverage scheme (1 if not covered), whether the person receives financial support from his children or grandchildren when the person is not financially independent and support comes from spouse and others (1 if not received), whether the elder is mobile on his own (1 when not mobile) and whether he or she is living alone or not (1 for living alone). All the variables are dichotomous in nature as only '0' and '1' values have been assigned.

The reasons for considering the above-mentioned variables are as follows. The social deprivation is considered higher if the respondent does not avail the medical treatment after falling ill. This represents lack of access and has been treated as an indicator of measuring health deprivation. If the health care facility is rated 'unsatisfactory' by the older respondent, it is also considered to indicate lack of access to good quality facility and hence deprivation. If the person's illness is not treated as serious and hence is not given any treatment, it is considered that he/she is not given proper care, either by oneself or by the members of his/her family. So, it represents deprivation. If the respondent is living alone (either as an inmate of old age home or simply alone), he/she is treated to be excluded from the family. If the elder person is not mobile or needs help to move, it indicates his/her deprivation from the rest of the society. The social deprivation related to health also considers the deprivation arising out of financial reasons. If the person does not use the health care facility due to high cost, it is treated as an indicator of deprivation. Also, deprivation is considered to be present if the person is not covered under any health expenditure coverage scheme. If the respondent has sons or daughters living and is not receiving any financial support from them and he is financially dependent on others, then he/she is considered to be excluded.

Social Deprivation Index (SDI) is constructed by summing up the values of these eight indicators. As there are eight variables, the SDI, theoretically can take values from 0 to 8. Here, the data reveals that SDI value does not exceed 5. Higher value indicates higher deprivation as in all the cases, 1 is assigned when the person is excluded.

In the dataset there are 6, 450 individuals for whom data on all the relevant variables for construction of SDI is available. So, the analyses which involve SDI consider only 6, 450 individuals.

Health Measures

Health measures include self-perceived current state of health (denoted onwards as SPHS) and self-perception about change in state of health over the year previous to the year of survey (denoted onwards as CHS). SPHS has three categories: excellent/very good (code 1), good/fair (code 2) and poor (code 3). CHS takes five values: much better (code 1), somewhat better (code 2), nearly the same (code 3), somewhat worse (code 4) and worse (code 5).

Confounders

The association between the SPHS and the SDI and also between CHS and SDI have been studied. The potential confounders identified from literatures are age (Arber 2004), age-squared, sex (male/female), education, place of residence (rural/urban) (Scharf, T., C. Phillipson and A. Smith 2005), marital status and the social group the person belongs to. On the basis of NSS data, some of the confounders have been recoded. The age used in the study is split into two categories: 60-75 years and above 75 years; education has been reclassified into six categories: illiterate, literate without formal schooling, with schooling-up to primary, up to secondary, up to higher secondary and graduation and above. Marital status has four classes: never married, currently married, widowed, divorced/separated. Social groups are Scheduled Caste (SC), Scheduled Tribe (ST), Other Backward Classes (OBC) and General. Marital status and social groups are taken in the raw form as available in the NSSO data.

Data Analysis Methods

ANOVA is applied for testing the mean difference in the SDI values across different categories of SPHS. As one-way ANOVA can be applied only when the groups have equal variances, the Levene's test for equality of variance has been carried out. The Levene's test for equality of variance is coming out to be significant, implying the variances are not equal across groups (shown in Table 1). This discards the applicability of one-way ANOVA. Welch ANOVA is not sensitive to unequal variances and can be applied in this case. A similar test has been conducted to find any statistically significant difference in the means of SDI across different CHS groups. Significance of Levene's statistic indicates that groups have unequal variances. Levene's test is applied for the confounders as well.

As the ANOVA shows significance of overall mean difference and does not provide for difference between any two specific pairs, post-hoc test has been

attempted. Dunnett T3 Test has been applied for the purpose of multiple comparison. The confounders also go through the same analysis. Independent sample t-test has been used for the confounders which has two categories. Dunnett T3 Test has been applied for multi-category confounders.

The association of health measures with SDI and other confounders is first checked by calculating pairwise correlation among the variables. In order to find the causality, two levels of regressions are run. In this connection two hypotheses are formed. First, the SDI affects self-perceived health status (SPHS). This is perhaps likely as SDI includes deprivation from health services as described before, along with other indicators of social deprivation. In this case SPHS is the response variable and SDI is the independent variable. Other independent variables included in the model are sex, age and age-squared, place of residence, marital status, education and social group. Age - squared is taken to capture the presence of any kind of non-linearity in age within the elderly group. An ordered logit model is used here as the response variable, SPHS is an ordinal multi-category variable with ordering from 1 to 3. The model is

$logit\ (g_{ci}) = \alpha_c - (\beta_1\ SDI + \beta_2\ sex_i + \beta_3\ age_i + \beta_4\ (age_i)^2 + \beta_5\ sector_i + \beta_6\ marital\ status_i + \beta_7\ education_i + \beta_8\ social\ group_i);$ where g_{ci} is the cumulative probability $g_{ci} = Pr(Y_i \leq y_C | \mathbf{x_i});\ C = 1, 2\ and\ \alpha_C$'s are called *thresholds* or *cut-points*.

The second hypothesis is that social deprivation predicts decline in health status over the previous year. In other words, SDI explains decline in CHS. Here the response variable is CHS with 5 categories with ordering. The regression model chosen is ordered logit. The explanatory variables are same as were in the previous regression. The model is

$logit\ (g_{ki}) = \alpha_k - (\beta_1\ SDI + \beta_2\ sex_i + \beta_3\ age_i + \beta_4\ (age_i)^2 + \beta_5\ sector_i + \beta_6\ marital\ status_i + \beta_7\ education_i + \beta_8\ social\ group_i);$ where g_{ki} is the cumulative probability $g_{ki} = Pr(Y_i \leq y_k | \mathbf{x_i});\ C = 1, 2, 3, 4\ and\ \alpha_k$'s are called *thresholds* or *cutpoints*.

Finally, investigations were carried out for obtaining the relation between health based SDI and sex, age, marital status, education and social group. Linear regression is conducted with SDI as the dependent variable.

IV Result

Social Deprivation and Self- Perceived Health State

Welch ANOVA between SDI is carried out across different health perception status. The Welch statistic turns out to be statistically significant. This implies that the means of SDI are different across SPHS categories. Dunnett T3 test has been conducted to check the statistical significance of the pair-wise difference. Mean

difference between the categories of SPSH 'excellent/very good' (code 1) and 'good/fair' (code 2) is not statistically significant but the difference between 'good/fair' (code 2) to 'poor' (code 3) is becoming significant with less than 5% level. Difference between codes 1 and 3 is also significant at less than 5% level. this is shown in Table 1. Figure 1 shows the difference in the means among the three categories of SPHS. A slight increase in SDI is observed from state 1 to 2 and sharp increase is found from state 2 to 3. Mean deprivation is higher as the self-perceived health state deteriorates. The statistical significance of the mean difference between state 2 and 3 is depicted by the steep rise of the curve in figure 1. Maximum mean SDI is found for the elderly who consider they have a poor state of current health.

Table 1: Mean SDI across Health Measures and Confounders (ANOVA, Dunnett T3 Test and Independent Sample t-Test)

Explanatory Variables	SDI		SDI			
	Mean	ANOVA	Mean Comparison		95% CI	
		Welch Test	SPHS Categories	Mean Difference	Lower Bound	Upper Bound
Self-perceived health state (SPHS)-ANOVA (Welch Test) Levene's Test for equality of variances			Dunnett T3 Test (Post Hoc test for multiple comparisons)			
Excellent/very good (1)	1.27	Welch statistic 96.23***	1 & 2	-0.022	-.18	.14
			1 & 3	-0.331*	-.49	-.17
		Levene statistic 47.03***				
Good/fair (2)	1.30		2 & 1	0.022	-.14	.18
			2 & 3	-0.309*	-.36	-.26
Poor (3)	1.60		3 & 1	0.331*	.17	.49
			3 & 2	0.309*	.26	.36
Self-perceived change of health status (CHS)-ANOVA (Welch Test) Levene's Test for equality of variances			Dunnett T3 Test (Post Hoc test for multiple comparisons)			
Much better (1)	1.32	Welch statistic 39.96***	1 & 2	-0.086	-.25	.08
			1 & 3	-0.023	-.17	.13
		Levene statistic 4.62***	1 & 4	-0.090	-.24	.06
			1 & 5	-0.537*	-.71	-.36
Somewhat better (2)	1.41		2 & 1	0.086	-.08	.25
			2 & 3	0.063	-.03	.15
			2 & 4	-0.004	-.10	.09
			2 & 5	-0.451*	-.58	-.32
Nearly the same (3)	1.34		3 & 1	0.023	-.13	.17
			3 & 2	-0.063	-.15	.03
			3 & 4	-0.067*	-.14	.00
			3 & 5	-0.514*	-.63	-.40

Contd…

Table 1: Mean SDI across Health Measures and Confounders (ANOVA, Dunnett T3 Test and Independent Sample t-Test)

Explanatory Variables	SDI		SDI			
	Mean	ANOVA	Mean Comparison		95% CI	
		Welch Test	SPHS Categories	Mean Difference	Lower Bound	Upper Bound
Somewhat worse (4)	1.41	Welch statistic 39.96*** Levene statistic 4.62***	4 & 1	0.090	-.06	.24
			4 & 2	0.004	-.09	.10
			4 & 3	0.067*	.00	.14
			4 & 5	0.447*	-.57	-.33
Worse (5)	1.86		5 & 1	0.537*	.36	.71
			5 & 2	0.451*	.32	.58
			5 & 3	0.514*	.40	.63
			5 & 4	0.447*	.33	.57
Age-Independent sample t test (Equal variance not assumed); Levene's Test for equality of variances						
<75 years	1.39	t statistic: -5.30***; Levene statistic 7.20***				
>75 years	1.53					
Sex-Independent sample t test (Equal variance not assumed); Levene's Test for equality of variances						
Male	1.33	t statistic: -10.29***; Levene statistic 57.60***				
Female	1.56					
Place of residence-Independent sample t test (Equal variance not assumed); Levene's Test for equality of variances						
Rural	1.45	t statistic -2.77 ***; Levene statistic 4.24**				
Urban	1.39					
Education-ANOVA (Welch Test) Levene's Test for equality of variances			Dunnett T3 Test (Post Hoc test for multiple comparisons)			
Illiterate (1)	1.52	Welch statistic 14.12***; Levene statistic 4.95***	1 & 2	-0.73	-0.40	0.25
			1 & 3	0.169*	0.09	0.25
			1 & 4	0.180*	0.09	0.27
			1 & 5	0.120	-0.03	0.27
			1 & 6	0.224*	0.11	0.34
Literate without formal schooling (2)	1.59		2 & 1	0.073	-0.25	0.40
			2 & 3	0.242	-0.08	0.57
			2 & 4	0.253	-0.07	0.58
			2 & 5	0.193	-0.16	0.54
			2 & 6	0.297	-0.04	0.63
Up to primary (3)	1.35		3 & 1	-0.169*	-0.25	-0.09
			3 & 2	-0.242	-0.57	0.08
			3 & 4	0.011	-0.08	0.11
			3 & 5	-0.049	-0.21	0.11
			3 & 6	0.055	-0.07	0.18

Contd…

Table 1: Mean SDI across Health Measures and Confounders (ANOVA, Dunnett T3 Test and Independent Sample t-Test)

Explanatory Variables	SDI		SDI			
	Mean	ANOVA	Mean Comparison		95% CI	
		Welch Test	SPHS Categories	Mean Difference	Lower Bound	Upper Bound
Up to secondary (4)	1.34	Welch statistic 14.12***; Levene statistic 4.95***	4 & 1	-0.180*	-0.27	-0.09
			4 & 2	-0.253	-0.58	0.07
			4 & 3	-0.011	-0.11	0.08
			4 & 5	-0.060	-0.22	0.10
			4 & 6	0.044	-0.08	0.17
Up to higher secondary (5)	1.40		5 & 1	-0.120	-0.27	0.03
			5 & 2	-0.193	-0.54	0.16
			5 & 3	0.049	-0.11	0.21
			5 & 4	0.060	-0.10	0.22
			5 & 6	0.104	-0.07	0.28
Graduation & above (6)	1.29		5 & 1	-0.224*	-0.34	-0.11
			5 & 2	-0.297	-0.63	0.04
			5 & 3	-0.055	-0.18	0.07
			5 & 4	-0.044	-0.17	0.08
			5 & 6	0.061	-0.28	0.07
Marital Status-ANOVA (Welch Test) Levene's Test for equality of variances			Dunnett T3 Test (Post Hoc test for multiple comparisons)			
Never Married (1)	1.91	Welch statistic 10.26***; Levene statistic 3.75***	1 & 2	0.533*	0.06	1.01
			1 & 3	0.429	-0.05	0.91
			1 & 4	0.197	-0.53	0.92
Currently Married (2)	1.38		2 & 1	-0.533*	-1.01	-0.06
			2 & 3	-0.104*	-0.16	-0.04
			2 & 4	-0.335	-0.91	-.24
Widowed (3)	1.48		3 & 1	-0.429	-0.91	0.05
			3 & 2	0.104*	0.04	0.16
			3 & 4	-0.232	-0.81	0.35
Divorced/separated (4)	1.71		4 & 1	-0.197	-0.92	0.53
			4 & 2	0.335	-0.24	0.91
			4 & 3	0.232	-0.35	0.81
Social Group-ANOVA (Welch Test) Levene's Test for equality of variances			Dunnett T3 Test (Post Hoc test for multiple comparisons)			
SC	1.39	Welch statistic 2.54*; Levene statistic 0.909	1 & 2	-0.059	-0.21	0.10
			1 & 3	0.006	-0.13	0.15
			1 & 4	-0.052	-0.19	0.09
ST	1.45		2 & 1	0.059	-0.10	0.21
			2 & 3	0.066	-0.02	0.16
			2 & 4	0.007	-0.08	0.10

Contd…

Table 1: Mean SDI across Health Measures and Confounders (ANOVA, Dunnett T3 Test and Independent Sample t-Test)

Explanatory Variables	SDI		SDI			
	Mean	ANOVA	Mean Comparison		95% CI	
		Welch Test	SPHS Categories	Mean Difference	Lower Bound	Upper Bound
OBC	1.39	Welch statistic 2.54*; Levene statistic 0.909	3 & 1	-0.006	-0.15	0.13
			3 & 2	-0.066	-0.16	0.02
			3 & 4	-0.059*	-0.12	0.00
General	1.45		4 & 1	0.052	-0.09	0.19
			4 & 2	-0.007	-0.10	0.08
			4 & 3	0.059*	0.00	0.12

Source: author's calculation.

Figure 1: Mean SDI and Self-Perceived Current Health Status

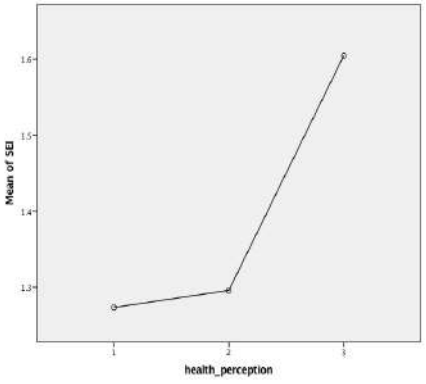
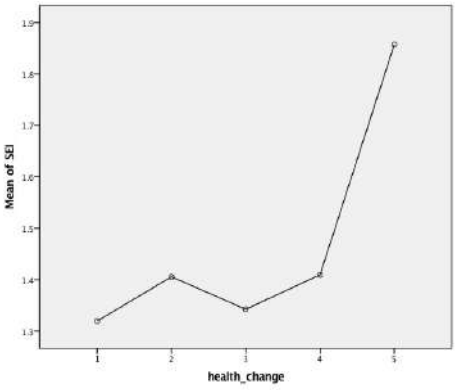


Figure 2: Mean SDI and Self-Perceived Change of Health Status



Social Deprivation and Self-Perceived Change of Health Status

The change of health status (CHS) has five categories as mentioned before. Levene's test and Welch ANOVA come significant indication overall difference across CHS. The mean SDI alters significantly as the CHS changes to category 5 (worse) from each of rest of the four categories. Significance is also obtained when the CHS changes from category 3 (nearly the same) to category 4 (somewhat worse). It means social deprivation is higher for the elder individuals who perceive that their state of health has been worse over the year previous to the survey year than the elders who have said their health is much better than the previous year. Same is true between the groups who have a perception that their health is of nearly the same state (code 3) and those who thinks that their health state is somewhat worse (code 4) than the previous year. Statistical significance is not obtained for changes between other categories. Among all, elderly who perceive that their health has worsened has the maximum mean SDI. Figure 2 depicts the mean SDI

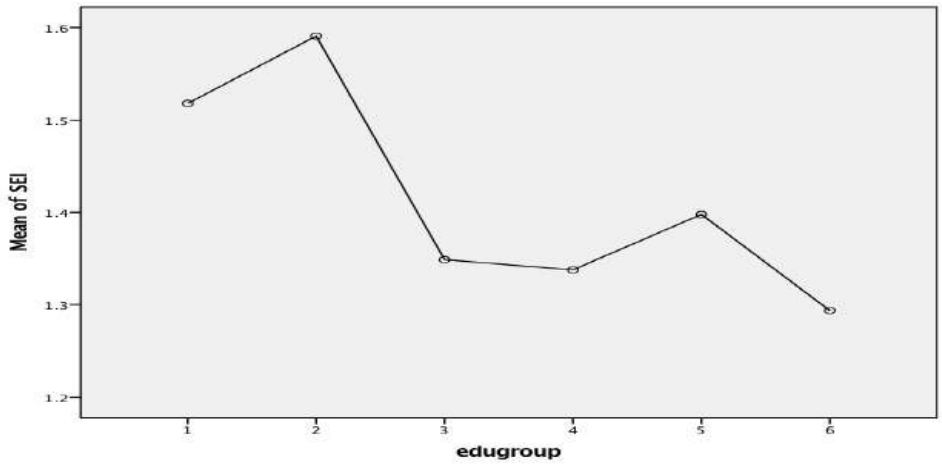
for different categories of change of health. The average deprivation for category 2 is higher than that for category 3 but difference is not significant. Result is shown in Table 1.

Social Deprivation and Confounders

Levene's test is significant across different confounders. Independent sample t-test (equality of variance is not assumed) shows that the deprivation of older elderly (more than 75 years of age) is significantly higher than that of younger elderly (less than 75 years of age). Age leads to deprivation after a certain threshold. At the age 75 or more, mobility problem is likely to become more serious and the individual is a victim of deprivation because he or she either cannot participate in the social activity or cannot socialise with relatives. In addition, the chance of getting coverage under a health scheme goes down as an individual enters the older elderly cohort from younger elderly cohort. Results from independent sample t-test shows that the average social deprivation for female elderly is more than their male counterpart. The difference is statistically significant at less than one per cent level. More deprivation has been found among older individuals residing in rural areas than those in urban areas. Statistical significance at less than one per cent level makes the result valid and meaningful. The result is shown in Table 1.

The difference of mean SDI between the illiterate (code 1) elderly individuals and those who are educated up to primary level (code 3) is significant. The average SDI for the former is higher. Same is true for those who are illiterate and educated up to secondary level (code 4) and educated up to graduation and above (code 6). Surprisingly, the difference is not significant between illiterate and educated up to higher secondary level (code 5). Figure 3 describes the mean SDI across different categories of education.

Figure 3: Mean SDI and Education



The highest mean deprivation (1.59) is observed for the elderly population who are literate without formal schooling though its difference with other categories is not coming significant. Mean SDI is the lowest (1.29) for the category having highest education namely graduation and above. Table 1 shows that people who are never married face higher deprivation than the married elderly and also than those who are widowed. The significance levels reported are one per cent and 10 per cent respectively. Widowed persons are more excluded than those who are currently married. Mean SDI (1.91) is the highest for the elderly people who are never married and lowest (1.38) for elderly married persons.

The differences in mean SDI among the categories of social groups are not coming significant except the difference between elderly belonging to OBC and General category. In fact, the mean deprivation is higher for General category than for the OBC with 10 per cent level.

Correlation

The correlation analysis is shown in Table 2. The pairwise correlations between both of the health measures and SDI are positive and significant implying presence of direct association of SDI with SPHS and CHS. It says that health and deprivation are related. Females are vulnerable in terms of both of the health measures as shown by the significant positive correlation of the variable 'sex' with SPHS and CHS. Age also has a direct relation with SPHS and CHS. Deprivation also increases with age. Urban people are well-off in terms of SPHS, CHS and SDI. Marital status is positively correlated with both health and deprivation measures. Negative significant correlation is found between education level and SPHS, CHS and SDI. Social group is showing a negative significant relation with SPHS and no significance is obtained for the CHS and SDI.

Table 2: Correlation Analysis

	SPHS	CHS	SDI	Sex	Age	Sector	Marital status	Education Level	Social Group
SPHS	1								
CHS	0.5057*	1							
SDI	0.1681*	0.1088*	1						
Sex	0.0766*	0.0713*	0.1301*	1					
Age	0.1780*	0.1356*	0.0722*	-0.0297*	1				
Sector	-0.0577*	-0.0532*	-0.0345*	0.0291*	0.0339*	1			
Marital status	0.0938*	0.0746*	0.0511*	0.5384*	0.1756*	0.0286*	1		
Education Level	-0.1718*	-0.1357*	-0.0938*	-0.3441*	-0.0387*	0.3202*	-0.2424*	1	
Social Group	-0.0275*	-0.0235	0.0216	-0.0409*	0.0875*	0.1704*	-0.0329*	0.2900*	1

Source: Author's calculation.

Regression Analysis Result

The results of the regression analyses are shown in Table 3 and 4. Category 1 for all the categorical variables has been taken as the reference category.

Table 3 shows the impact of SDI and other explanatory variables on SPHS. Deprivation affects self-perceived health status with less than one per cent significance level. Positive coefficient implies a decline in health status due to increase in deprivation. The sex of the elderly does not affect SPHS significantly. Health deteriorates as age increases, but no non-linearity was observed in age. Place of residence, marital status and social group do not show any significant influence on SPHS. Education level is an important factor in determining SPHS and shows significant coefficients with expected sign. Cut points are 2.69 and 6.89 which determine the latent structure of the SPHS variable. Long run χ^2 is significant at one per cent level, making the overall regression meaningful.

Table 4 depicts the effect of social deprivation on the change in health status over the previous year. It is found that deprivation leads to decline in health from the previous period. The result is significant at one per cent level. This work fails to find any significant relation between CHs and sex, age, place of residence, marital status and social group. Improvement in education level helps to attain improved health in the current period over the previous. Upliftment from 'illiterate' to 'primary' and higher show significant improvement in the health transition. As CHS has five categories, four cut points are obtained and reported in the table with 95 per cent confidence interval. Significant value of long run χ^2 keeps the overall regression meaningful.

Table 3: Ordered Logit Regression Estimates for SPHS as Dependent Variable

Ordered Logit: Dependent variable SPHS	
Independent variables	
SDI	0.37 ***
Sex	
Male-female	-0.01
Age	
Age	0.13 **
Age-squared	-0.0005
Place of residence	
Rural-urban	-0.05
Marital status	
Never Married (1)- Currently Married (2)	-0.09
Never Married (1)- Widowed (3)	0.03
Never Married (1)- Divorced/separated (4)	0.08

Contd…

Table 3: Ordered Logit Regression Estimates for SPHS as Dependent Variable

Ordered Logit: Dependent variable SPHS	
Education	
Illiterate (1) - Literate without formal schooling (2)	-0.05
Illiterate (1) – Up to primary (3)	-0.19 ***
Illiterate (1) – Up to secondary (4)	-0.49 ***
Illiterate (1) – Up to higher secondary (5)	-0.77 ***
Illiterate (1) - Graduation & above (6)	-1.05 ***
Social group	
SC-ST	0.16
SC-OBC	0.14
SC- General	0.14
Cut points (95% Confidence interval)	
Cut 1	2.69 (-1.15, 6.54)
Cut 2	6.89 (3.04, 10.74)
Long Run χ^2	540.56 ***
No. of observations	6450

Source: calculation based on data; * p<0.10, ** p<0.05, *** p<0.01.

Table 4: Ordered Logit Regression Estimates for CHS as Dependent Variable

Ordered Logit: Dependent variable CHS	
Independent variables	
SDI	0.18 ***
Sex	
Male-female	0.08
Age	
Age	0.002
Age-squared	0.0002
Place of residence	
Rural-urban	-0.04
Marital status	
Never Married (1)- Currently Married (2)	-0.02
Never Married (1)- Widowed (3)	0.004
Never Married (1)- Divorced/separated (4)	-0.28
Education	
Illiterate (1) - Literate without formal schooling (2)	-0.13
Illiterate (1) – Up to primary (3)	-0.16 ***
Illiterate (1) – Up to secondary (4)	-0.33 ***
Illiterate (1) – Up to higher secondary (5)	-0.64 ***
Illiterate (1) - Graduation & above (6)	-0.66 ***

Contd…

Table 4: Ordered Logit Regression Estimates for CHS as Dependent Variable

Ordered Logit: Dependent variable CHS	
Social group	
SC-ST	0.08
SC-OBC	-0.04
SC- General	0.02
Cut points (95% Confidence interval)	
Cut 1	-2.17 (-5.61, 1.28)
Cut 2	-0.44 (-3.88, 3.00)
Cut 3	1.62 (-1.82, 5.06)
Cut 4	3.55 (0.11, 7.00)
Long Run χ^2	288.88 ***
No. of observations	6450

Source: calculation based on data; *** p<0.01.

Regression analysis results described in Table 3 and 4 show that current health status and health transition are influenced by the social deprivation when control is given for other confounders. The odd ratios are shown in Table 5.

Table 5: Odd ratio of SPHS and CHS (ordered LOGIT)

	SDI
SPHS	1.44***
CHS	1.19***

Source: calculation based on data; *** p<0.001.

Findings show that increase in deprivation results in deterioration of SPHS as well as CHS. For one-unit increase in SDI the odds of high values (poor) of SPHS versus the combined middle (good/fair) and low values (excellent/very good) of SPHS is 1.44 times greater, when other variables are taken constant. Similarly, the odds of CHS to be worse with respect to other categories taken together is 1.19 times higher for each unit increase in SDI. So, health and deprivation are related. The results are significant at less than one per cent level.

Table 6 reports the response of SDI across sex, age, marital status, and education. This establishes the relation between the social deprivation and different confounders. As social group has not shown any significant result, the variable has been dropped in this analysis. Females suffer more deprivation. The result is statistically significant. The variation of SDI with age is obtained after a threshold age within the elderly age group is reached. The positive significant coefficient of age-squared reflects that. Urban elderly people are less excluded. Deprivation increases for currently married and widowed individuals. Education plays an important role in reducing deprivation. Deprivation is less when education level among elderly rises.

Table 6: Linear Regression Estimates for SDI as Dependent Variable

Linear Regression: Dependent variable SDI	
Independent variables	
Sex	0.26 ***
Age	-0.03
Age-squared	0.0002 **
Place of residence (sector)	-0.04 **
Marital Status	-0.09 ***
Education	-0.02 ***
Constant	2.01 ***
No. of observations	6450

Source: calculation based on data; ** p<0.05, *** p<0.01.

V Discussion

This work tries to use an analytical framework for understanding health and social deprivation among elderly by establishing a link between measures of health and those of social deprivation. Confounders have been chosen to understand the factors affecting the deprivation in older age. Results are more or less consistent with expectations. Positive and significant coefficients of SDI in both of the regressions indicate that the deprivation and health are related. This happens because the SDI includes indicators that considers deprivation from health services along with other measures of social deprivation. So, it is likely that the higher SDI and poor health status are associated. The poor perceived health may happen as there is lack of access to the health facility, not considering the health problem as serious, financial stringency, problems of mobility, of living alone and of not being covered under any health scheme. The same explanation applies for the cohort which says that their health has been worse than the previous year. Higher deprivation explains worse transition of health. Social deprivation predicts the change in health perception. The indicators used for constructing the SDI are likely to be absent grossly or partially in the groups that consider their health to be excellent or good. The current health status declines as age increases. Higher age at this period comes with less mobility and less participation in the society. The relative risk strengthens the claim that those who are poor and have worse health suffer more deprivation.

The variation in current health status is not found within the elderly age group. Once they reach the elderly stage and lose ability to participate in the production activity, they suffer from limited mobility and get excluded from accessing health services and consequently, health is affected. Probability of Older adults suffering from physical and mental decline is associated with old age. This symptom of senility leads to deterioration of cognitive functioning. They need more attention from near ones, more frequent treatment and the required financial coverage. Females are more excluded, in general. The lack of financial

independence is an added problem for the Indian females, particularly at this age. Health facilities of satisfactory quality is not generally available in rural areas leading to higher deprivation for the rural residents. Being unmarried leads to higher deprivation probably due to lack of company at the time when spouses need one another more intensely, mainly to cope up with the physical problem and more for getting rid of the mental loneliness at this age. Education is identified as a factor that significantly affects the deprivation. It may be so because of the enhancement of awareness and financial strength due to better job in the working age for the educated elderly. Education is also important in predicting SPHS and CHS. More education implies better perception about current health as well as change in the health status. Better education is a saviour from deprivation.

This work fails to find association between the social group and the deprivation. There exist a number of other mechanisms that might explain the relation between social deprivation and health. Examples include access to car, mobile phone, internet, material and financial consequences of poor health, environmental factors and others beyond those considered here. The study may improve with the help of civic participation data for elderly, transport data, data on participation in the association of elders etc. Due to want of relevant data inclusion of these indicators in the analysis is beyond the scope of this study.

VI Conclusion

Health and social deprivation are associated. There exists synergy between the two. The finding of the study suggests that risk is higher for those who are suffering from greater deprivation. Both current health and transition in health are affected. Reduction in deprivation is a way-out for gaining better health. Improvement in the access to the satisfactory health facility may be a potential solution. Along with that, better education for the younger people may provide a remedy. It has, in fact, a two-way benefit. On the one hand, education for the younger generation would create awareness and better sense among them which would stop them from abuse of the elderly and to take measures to provide solutions to the problems of loneliness that their parents face. On the other hand, those who are younger today will be elders tomorrow. Better educational background would help them to find a better job so that they become financially dependent and take care of their health expenditure on their own when they enter into older age. Moreover, education enhances awareness. This increases the chance of elderly receiving health care in time instead of postponing the treatment considering the illness as ‘not so serious’. A wider coverage of the Government health scheme for the elderly should be in place as a possible solution to the problem of health-based deprivation. Any specialised scheme for the widowed elderly may reduce deprivation. More inclusive supply of Government health facilities specially in the remotest part of the country is necessary to cater to the needs of the rural elderly. A free or subsidised provision of old-age homes by the Government with necessary health facility at villages as well as city level can serve

a large part of elderly population that suffers health problems due to lack of timely care. In addition, the association that they get at the old-age homes can reduce the feeling of being excluded which, in turn, has a favourable effect on health. Another potential solution to this health and financial deprivation of the elderly people can be brought through inclusion. This can be made possible if the people of this age cohort can participate in productive activities. This is not practically possible because of their physical inability. Increase in the retirement age can be one possible way to include the early elders in the production. But the solution may not sustain as the age increases. Physical incapacity may not always lead to mental ineptitude. Elders can be included in the production process by transmitting their ideas to the younger generation. They can be used to innovate plans leading to new production possibilities. Care activities by the younger for the older along with this flow of knowledge and ideas from the latter to the former have the potential to address the unemployment problem for the youngsters as well as deprivation blues for the elders, at one go.

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The Role of Tertiary Education and Good Health in Determining Female Labour Participation in India

Parwinder Kaur and Suraj Sharma

The purpose of this study is to look into the factors that influence Female Labour Force Participation (FLFP) in India. The data spans of the years from 1990 to 2019. The primary source is the World Development Indicator. For data analysis, the unit root test, Granger causality, and the VAR model are used. Causality analysis revealed bidirectional causality between Female Life Expectancy (FLE) and FLFP as well as Consumer Price Index (CPI) and FLFP, unidirectional causality between Gross Value Added (GVA) and FLFP, and no causality between Female Tertiary School Enrolment (FSET) and FLFP. According to the findings of the vector autoregressive model, tertiary education has no direct significant impact on FLFP in India, whereas GVA and the CPI have a negative impact on FLFP. In the beginning, female life expectancy has a negative impact on FLFP, but it later has a positive impact on FLFP. Policymakers are encouraged to make a conscious effort to align with the sustainable development goals.

Key Words: Female labour force participation, Tertiary education, Female life expectancy at birth, Gross value added, Consumer price index.

I Introduction

Women constitute slightly more than half of the global population, but their contribution to planned economic growth and development is less than their capacity (Bills 2018). Women currently account for roughly 46 per cent of the global labour force (World Bank 2020). However, women's labour-force participation in most countries is significantly lower than men's labour-force. The rate of women's wage labour growth was a topic of discussion among emerging economists all over the world. A glance at the global trend reveals that there are differences in the extent to which females have access to the labour market (Verick 2018). The gender participation gap is wider in developing countries than in developed countries (International Labour Organization) (ILO 2016).

Female Labour Participation (FLP) is critical for a country's social and economic growth because it promotes productivity and justice. Women's strong

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labour-force participation usually entails an improvement in their economic and social status, as well as their emancipation. In the case of developing countries, this not only alleviates poverty but also reduces the impact of various shocks (Verick 2018). Despite the fact that the world hopes to have no gender-based dichotomy by 2018, gender-based difference is still a reality. The world is moving closer to full-fledged gender equality and women's empowerment; however, women continue to face discrimination in many parts of the world (United Nations Women 2018). The Sustainable Development Goals (SDGs) are critical to achieving previous millennium goals (Le Blanc 2015).

Gender equality is a human right as well as a necessary component of creating a prosperous, equal, and sustainable world. As a result, sustainable development and gender equality are inextricably linked and mentioned as "leave no one behind" strategy, which emphasizes the importance of women's participation in economic development (Esquivel and Sweet Man 2016). The 2030 Sustainable Development Agenda not only aims to eliminate this discrimination, but also to priorities women-centric growth as a means of achieving long-term development (Rosche 2016). According to the United Nations Women (2018), there can never be sustainable development if women are mistreated and abused.

Earlier studies have acknowledged that women's overall conditions and status have improved over the decades and add that the government and other institutions are also interfering to increase female participation in education and training, as well as access to better health and living standards (Becker 1994, Denison 1985, Guilloches and Mason 1972, Huq, CluniesRoss, and Mincer 1974). As a result, Nussbaum (2003) believes that this should result in increased female employment opportunities.

The importance and impact of education on the participation of both men and women in the labour force is widely acknowledged (Cameron, *et. al.* 2001). Several studies have found that educational attainment is a persistent and significant determinant of labour-force participation in both developing and underdeveloped countries.

In a cross-sectional data set, Sudarshan (2014) found there is a U-shaped correlation between education system and female labour force participation, with innumerate and university educated women having the highest levels of participation. Nwosu and Woolard (2017) found positive and significant impact of self-reporting outstanding, very good, or good health (as opposed to fair or poor health) on labour participation. The effect is found to be more noticeable in men than in women. Along with a decrease in mortality, the population has seen a significant increase in educational attainment (Lutz, *et. al.* 2014).

Using the reasoning given above, the purpose of this research is to determine the relationship between the female tertiary education, female life expectancy, consumer price index, gross value-added, and female labour force participation in India. Previous research has looked into the association between education and labour force participation extensively; however, the author is unaware of any research that has looked into the relationship between tertiary education and

female labour participation using life expectancy, price level and economic growth as other explanatory variables. Furthermore, it serves as a research contribution to the economic model based on the factors listed.

India was chosen for this study because of the obvious improvements in female schooling and health data, but also because of the rising rate of unemployment, particularly among youth and females. The purpose of this research is to determine whether or not sustainable development has aided India. The research is divided into five sections. The second section of the study provides a brief overview of female labour force participation in India, the third examines empirical methods, the fourth examines empirical analysis of data, and the final fifth section discusses conclusions and policy implications.

II Female Labour Force Participation in India

India is the most populous country, with a population of approximately 1366.4 million people. The population is expected to grow from 1388.4 million in 2020 to 1639.1 million in 2050. India is also expected to overtake China as the world's most populous country by 2050 (World Meter 2020). Unfortunately, approximately 103,137,054 people are currently living below the poverty line (World Poverty Clock 2020). Among emerging markets and developed countries, India has one of the lowest percentages of Female Labour Force Participation (FLFP) – usually defined as the percentage of women employed or seeking employment as part of the working-age female population (World Bank 2016, Bills 2018).

India's GDP increased from 320.97 billion US dollars to 2.83 trillion US dollars between 1990 and 2019, but the FLFP fell from around 30.2 per cent to 20.3 per cent (World Bank 2020). India is unusual, but not unique, in having lower labour-force participation rates among adult women with a secondary education. Only 14 countries have lower rates of labour force participation for adult women with secondary education than for women with less than primary school completion in the 71 countries with appropriate census data in the IPUMS-I data archive (Minnesota Population Centre 2017). Only Rwanda has a greater disparity (19 per cent *vs.* 35 per cent) than India (72 per cent *vs.* 92 per cent). However, several other countries have lower labour force participation rates for secondary educated women (e.g., Indonesia, 47 per cent *vs.* 63 per cent; Turkey, 34 per cent *vs.* 46 per cent; and Ghana, 76 per cent *vs*. 84 per cent (Chatterjee, *et. al.* 2018). Increasing longevity and declining labour-to-worker ratios are two of the developing world's major demographic threats. Acting later on could be a cure. However, nothing is known about the distribution of increased lifespan between jobs and retirement (Myrskyla, *et. al.* 2013). Female life expectancy was 59.6 years in 1990 and 71.6 years in 2020. In terms of life expectancy, India ranked 136th out of 196 countries (World Meter 2020).

According to the global gender gap report, India ranks 149th out of 153 countries in terms of economic participation, with a score of 0.354. With a score

of 0.962, India ranked 112 in educational attainment. India ranks 150th in health and survival, with a score of 0.944, and 18th in political representation, with a score of 0.411. Women's labour-force participation is an important driver and effect of growth and progress, especially in light of the international context and recognition of the Millennium and Sustainable Development Goals for women's education. Despite the fact that the representation of women in jobs continues to rise in tandem with economic growth, female labour-force participation has been declining. In 2020, the female labour force participation rate was at its lowest in the last 20 years, at 20.3 per cent.

Table 1: Trend in the Well-being and Productivity of India

Indicator	1990	2020
Population	873.3 million	1366.4 million
Urban population (%)	25.5 %	35.0%
Life expectancy (years)	Male 58.6, Female 59.6	Male 69.2, Female 71.2
Fertility rate	4.3 births per female	2.2 births per female
Infant mortality rate (death per 1,000 live births)	82.11	26.62
% of population with improved water source	72%	Urban 96%, Rural 91%
Literacy rate (% aged 15+)	52.2%	69.3%
Health expenditure (% share of GDP)	1.2 %	3.5% (2018)
Education expenditure	3.7 %	3.8% of GDP (2013)
Unemployment rate	5.45%	Male 22.2, Female 24.2(2018 est.)
% of pupils Tertiary school enrolment	5.95	28.57(2019 est.)
Female labour force participation rate	30.3%	20.3%

Source: Author's computation from World Fact book (2018) and World Poverty Clock (2019), Census of India (2011).

Table 1 shows that women's lives have changed significantly since the situation a few decades ago. In the field of gender representation in education, progress has been made. Although there has been progress in the performance of health facilities, the female labour force participation rate in India has been declining.

III Data and Methodology

This study made use of time series data from 1990 to 2019. These 28 years of data were chosen to investigate in depth, the relationship between women's labour participation rate, tertiary education, and life expectancy of females. The World Development Indicators (WDI) are the primary data collection source. It is the World Bank's first international collection of sustainable growth figures derived from publicly available documents. The WDI incorporates domestic, regional and global projections and provides data for 217 economies with access to over 1600 metrics. In general, the WDI discusses poverty, health, population data,

commerce, environment, etc. This demonstrates that WDI is the most reliable data source. The variables used in this study are described in Table 2.

Table 2: Data Description

Statistical indicators	Label	Unit/description	Source
Female labour force participation	FLFP	Labour force participation rate, female (% of female population ages 15+)	International Labour Organization, ILOSTAT database and World Development Indicator
Female tertiary school enrolment	FSET	School enrolment, tertiary, female (% gross)	World Development Indicator
Female life expectancy at birth	FLE	Life expectancy at birth, female (years)	World Development Indicator
Consumer price index	CPI	Consumer price index (2010 = 100)	World Development Indicator
Gross value added	GVA	Gross value added at basic prices (GVA) (constant 2010 US$)	World Development Indicator

Model Specification

The model constructed for this study is modelled after the work of Klasen and Lamanna (2009). Equation (1) is the functional form of the model, whereas Equation (2) is the model in its econometric form.

$$FLFP = f(FSET, FLE, CPI, GVA) \quad \ldots(1)$$

$$FLFP_t = \alpha + \beta_1 FSET_t + \beta_2 FLE_t + \beta_3 CPI_t + \beta_4 GVA_t + \varepsilon_t \quad \ldots(2)$$

Where α represents the model intercept and β_1, β_2, β_3 and β_4 are the coefficients for the repressors; Female School Enrolment in Tertiary (FSET), Female Life Expectancy (FLE) Consumer Price Index (CPI) and Gross Value Added (GVA). Female Labour Force Participation (FLFP) is the dependent variable.

Stationary Tests

To prevent inappropriate conclusions and policy implications as a result of spurious regression, the stationary properties of the variables employed in the study are investigated. The augmented Dickey–Fuller and Phillip–Perron tests are employed.

VAR Model Estimate

A multivariate VAR model with log transformed is shown as:

$$LNFLFP_t = \sigma + \sum_{i=1}^{k} \beta_i LNFLFP_{t-i} + \sum_{j=1}^{k} \phi_j LNFSET_{t-j} + \sum_{m=1}^{k} \varphi_m LNFLE_{t-m} + \sum_{n=1}^{k} \eta_n LNCPI_{t-n} + \sum_{p=1}^{k} \lambda_p LNGVA_{t-p} + \upsilon_{1t} \quad \ldots(3)$$

Here we show only one system equation for convenience which shows that on L.H.S. log of Female labour force participation i.e., the dependent variable, is a function of its own lag and the lagged values of order regressors in the system.

IV Empirical Analysis and Results

Visual inspection is important in time series research for preliminary examination. Appendix A contains visual inspections of the variables used in the analysis (*see* Figure 1). The graphical study shows a downward trend in female labour force participation and an upward trend in life expectancy, consumer price index, gross value added, and tertiary education over time, which reflects major economic and political developments in India. However, declining female labour force participation is a cause for concern in India.

Table 3: Descriptive Statistics

Statistics	LNFLFP	LNFSET	LNFLE	LNCPI	LNGVA
Mean	3.31	2.30	4.18	4.24	27.72
Median	3.41	2.18	4.18	4.17	27.70
Maximum	3.46	3.41	4.26	5.20	28.62
Minimum	3.03	1.38	4.06	3.13	26.87
Std. Dev.	0.16	0.72	0.06	0.60	0.55
Coefficient of Variation	0.0467	0.3111	0.0144	0.1422	0.0198
Skewness	-0.79	0.22	-0.20	-0.03	0.05
Kurtosis	1.89	1.63	1.86	1.94	1.77
Shapiro-Wilk test(p-value)	0.77 (0.00)	0.89 (0.01)	0.95 (0.18)	0.96 (0.32)	0.95 (0.17)

Source: Authors' calculation.

Table 3 shows a straightforward descriptive statistical analysis. Female Labour Force Participation (FLFP), Female Life Expectancy (FLE), and Gross Value Added (GVA) have low variability when compared to Female School Enrolment in Tertiary Education (FSET) and Consumer Price Index (CPI) for India from 1990 to 2019. Female life expectancy (1.4 per cent) has the lowest variability, while female school enrolment in tertiary education (31.1 per cent) has the highest variability for the sample period. It is clear from the skewness values that none of them are greater than +1 or less than -1, indicating that none of our variables of interest have a significantly skewed distribution. Except for female labour force participation and the consumer price index, all of the variables observed are positively skewed. Kurtosis values greater than one, on the other hand, indicate peaked distributions.

Table 4: Pearson Correlation Coefficient Estimates

Variables	LNFLFP	LNFSET	LNFLE	LNCPI	LNGVA
LNFLFP	1.00				
LNFSET	-0.91 (0.0000)	1.00			
LNFLE	-0.83 (0.0000)	0.97 (0.0000)	1.00		
LNCPI	-0.87 (0.0000)	0.98 (0.0000)	0.99 (0.0000)	1.00	
LNGVA	-0.87 (0.0000)	0.98 (0.0000)	0.99 (0.0000)	0.99(0.0000)	1.00

Note: Figures in parentheses are corresponding p-values.
Source: Authors' calculation.

The investigation quickly revealed the correlation between all of the parameters utilized in the study to investigate the relationship between female enrolment in tertiary education, life expectancy, consumer price index, gross value added and labour force participation rate in India and is shown in Table 4. The Pearson correlation coefficients for the factors under consideration provide useful information about the essence of the parameters' associations. The findings indicate a statistically significant inverse relationship between FLFP and all other variables studied. Female enrolments in tertiary education and female labour-force participation have a statistically significant negative relationship. Furthermore, the presence of correlations is insufficient to validate the observed relationships. As a result, more econometric analyses are needed.

Table 5: Unit Root Tests

Variables	Augmented Dickey-Fuller Test		Phillips-Perron Test z(t)	
	Levels	I (1)	Levels	I (1)
Constant				
LNFLFP	-1.212 (0.6684)	-1.676 (0.4433)	1.079 (0.9950)	-1.681 (0.4411)
LNFSET	0.258 (0.9753)	-3.609 (0.0056)	0.248 (0.9748)	-6.195 (0.0000)
LNFLE	-1.009 (0.7500)	-4.101 (0.0010)	-6.885 (0.0000)	-0.087 (0.9507)
LNCPI	-0.367 (0.9155)	-2.625 (0.0879)	-1.573 (0.4973)	-3.129 (0.0245)
LNGVA	-0.074 (0.9519)	-3.763 (0.0033)	0.964 (0.9939)	-5.183 (0.0000)
Constant and trend				
LNFLFP	-2.410 (0.3744)	-1.436 (0.8501)	-1.394 (0.8628)	-1.499 (0.8296)
LNFSET	-2.545 (0.3060)	-3.564 (0.0330)	-2.665 (0.2511)	-6.165 (0.0000)
LNFLE	-0.846 (0.9616)	-10.987 (0.0000)	-0.442 (0.9855)	-1.063 (0.9350)
LNCPI	-2.270 (0.4508)	-2.443 (0.3571)	-2.187 (0.4974)	-2.933 (0.1517)
LNGVA	-2.839 (0.1829)	-3.496 (0.0398)	-4.098 (0.0064)	-4.797 (0.0005)

Note: Figures in parentheses are corresponding p-values and all bolded estimates indicate $P \leq 0.05$.
Source: Authors' calculation.

Table 5 displays the results of the stationary test, which is required before delving deeper into the time series data. In this analysis, we used augmented Dickey Fuller and Phillips Perron tests to validate the absence or presence of a unit

root in the series. For precise estimations, we estimated both constant and trend coefficients. The insignificant ADF coefficients of FLFP show that the criterion variable has a unit root at both level and 1st difference. The PP test backs up the argument. Female School Enrolment in Tertiary Education (FSET) is discovered to be of order one. Using the ADF and PP tests, the Female Life Expectancy (FLE) and Consumer Price Index (CPI) series produce mixed results, while the Gross Value Added (GVA) series is found to be integrated of order one.

The stationary tests show that we cannot use Vector Error Correction (VEC) or Auto-Regressive Distributed Lag (ARDL) because our variables of interest are integrated at different orders, and the criterion variable, FLFP, is neither integrated at zero nor integrated at one. The findings compel us to employ a vector autoregressive model to capture the relationship between female labour supply and enrolment in tertiary education for females, as well as female life expectancy, in a multivariate time series framework that includes variables such as the consumer price index and gross value added for India from 1990 to 2019.

Table 6: Granger Causality

Granger Causation (X →Y)	F-stat (p-value) (X → Y)	F-stat (p-value) (Y → X)	Decision
LNFSET ∧ LNFLFP	4.1137 (0.128)	1.3736 (0.503)	No causality
LNFLE ↔ LNFLFP	26.995 (0.000)	19.891 (0.000)	Bi-directional
LNCPI ↔ LNFLFP	12.412 (0.002)	9.5372 (0.008)	Bi-directional
LNGVA → LNFLFP	32.823 (0.000)	3.8977 (0.142)	Unidirectional
LNFLE ← LNFSET	2.4383 (0.295)	9.1278 (0.010)	Unidirectional
LNCPI ← LNFSET	2.2538 (0.324)	22.767 (0.000)	Unidirectional
LNGVA ∧ LNFSET	1.7491 (0.417)	1.2676 (0.531)	No causality
LNCPI ← LNFLE	3.8488 (0.146)	31.505 (0.000)	Unidirectional
LNGVA → LNFLE	85.955 (0.000)	3.5283 (0.171)	Unidirectional
LNGVA → LNCPI	14.187 (0.001)	2.6016 (0.272)	Unidirectional

Note: The symbol → indicates unidirectional causality running from tail to head, symbol ↔ indicates bidirectional causality and symbol ∧ indicates no causality. For X → Y, H0: Lagged X series does not cause series Y and for Y → X, H0: Lagged Y series does not cause series X. All bolded estimates indicate P ≤ 0.05.

It is critical to use the Granger causality test to confirm the causality between variables of interest, as shown in Table 6. The Granger causality test is used to investigate the causal relationship between variables. Female Life Expectancy (FLE), Consumer Price Index (CPI), and Gross Value Added (GVA) all have a strong influence on Female Labour Force Participation (FLFP), but Tertiary School Enrolment for Females (FSET) does not We find bidirectional causality between FLE and FLFP as well as CPI and FLFP, unidirectional causality between GVA and FLFP, and no causality between FSET and FLFP. Female Tertiary School Enrolment (FSET) Granger causes FLE and CPI, and FLE and CPI ultimately Granger cause FLFP. Therefore, it can be inferred that FSET indirectly influences FLFP. Furthermore, unidirectional causality runs from FLE to CPI, GVA to FLE, and GVA to CPI.

Table 7: Coefficients of the VAR Model

	LNFLFP	LNFSET	LNFLE	LNCPI	LNGVA
L1. LNFLFP	0.49 (0.020)	1.65 (0.531)	0.004 (0.003)	-0.26 (0.476)	0.32 (0.354)
L2. LNFLFP	-0.13 (0.415)	0.41 (0.834)	0.0001 (0.896)	-0.42 (0.131)	-0.48 (0.063)
L1. LNFSET	-0.02 (0.300)	0.39 (0.047)	0.0001 (0.185)	-0.12 (0.000)	-0.02 (0.358)
L2. LNFSET	-0.03 (0.181)	0.32 (0.168)	0.0003 (0.030)	-0.04 (0.233)	0.03 (0.367)
L1. LNFLE	-32.08 (0.000)	119.47 (0.118)	1.94 (0.000)	16.51 (0.132)	-0.02 (0.998)
L2. LNFLE	39.56 (0.000)	-147.93 (0.123)	-0.97 (0.000)	-7.86 (0.567)	4.02 (0.749)
L1. LNCPI	-0.35 (0.002)	1.18 (0.400)	-0.00004 (0.953)	0.36 (0.076)	0.01 (0.946)
L2. LNCPI	-0.18 (0.068)	1.52 (0.207)	-0.001 (0.050)	-0.07 (0.686)	-0.25 (0.107)
L1. LNGVA	-0.22 (0.037)	-0.62 (0.632)	0.002 (0.015)	-0.67 (0.000)	0.95 (0.000)
L2. LNGVA	-0.26 (0.080)	2.08 (0.251)	0.004 (0.000)	0.54 (0.035)	-0.17 (0.477)

Notes: Figures in parentheses are corresponding p-values and all bolded estimates indicate $P \leq 0.10$, Jarque-Bera Chi^2 for normally distributed disturbances was 4.746 (p-value = 0.90746).

A basic VAR model was estimated in a multivariate framework to fit a VAR model, as shown in Table 7. The model's order with lag 2 was determined using the BIC criterion. Each column contains an outcome variable as well as the lagged regressors. We concentrate on the FLFP equation; it is clear that the first and second lags of FSET have no effect on FLFP; however, the coefficients have negative signs, indicating a negative impact. The first lag of FLE has a negative impact on FLFP while the second lag of FLE has a positive impact on FLFP at a significant level of 1.0 per cent on average ceteris paribus, indicating that increasing FLE decreases FLFP in the early stages but has a positive impact on FLFP in the later stages.

Increasing general prices have a negative impact on female labour supply, as shown in Table 7 where the first and second lags of CPI have a significant negative impact on FLFP at 1.0 per cent and 10.0 per cent on average ceteris paribus. Table 7 shows that the first and second lags of GVA have a negative impact on FLFP at a significant level of 5.0 per cent and 10.0 per cent, respectively, on average ceteris paribus.

V Conclusion and Policy Implications

This study examines the impact of tertiary education, life expectancy, the consumer price index, and gross value added on Indian women's participation in the labour force. Utilizing current and accurate econometric methods, statistical facts are extracted from annual databases spanning the years 1990 to 2019.

Tertiary education has no direct significant impact on FLFP in India, according to the findings of the vector autoregressive model, however gross value added and the consumer price index have a negative impact on FLFP. Female life expectancy has a negative impact on FLFP at first, but it later has a beneficial impact. Policymakers are urged to make a concerted effort to align with the United

Nations' Sustainable Development Goals. This is a clarion call to Indian government officials and politicians to behave more pragmatically in order to limit or eradicate the gender disparity in labour force participation. As observed by this report, there is a need to boost macroeconomic practices in a way that promotes girl and woman empowerment, as this will transform into greater female labour force participation

Indian policymakers are urged to actively comply towards gender related guidelines provided by international organizations such as the International Labour Organization and the United Nations Educational, Scientific, and Cultural Organization. The corporate sector of the economy assistance is also needed in developing a gender friendly workplace culture, which would trigger more female labour force participation, considering their historically measurable contribution on national output—especially in less developed countries, where women representation in national productivity is severely lacking.

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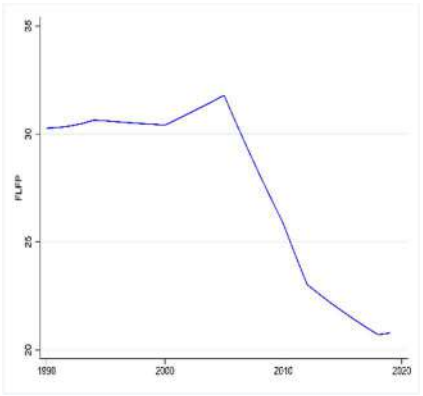
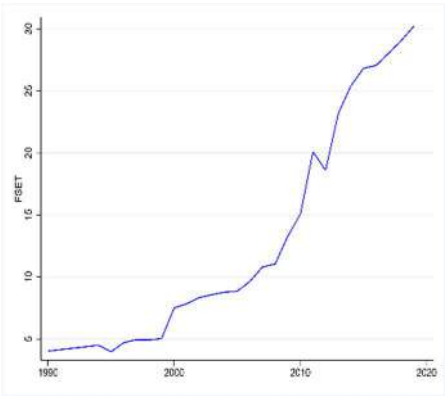
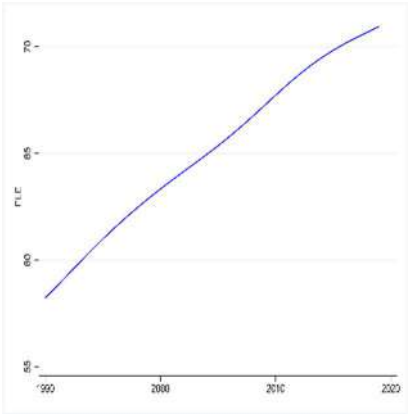
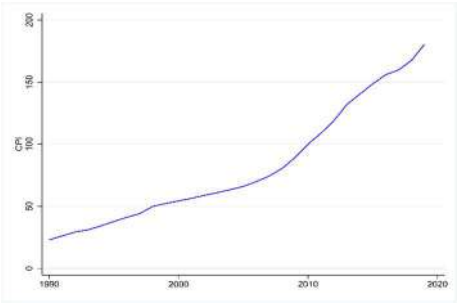
Appendix A

Figure 1: Graphic of the Original Series









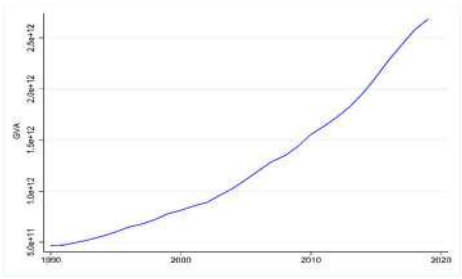
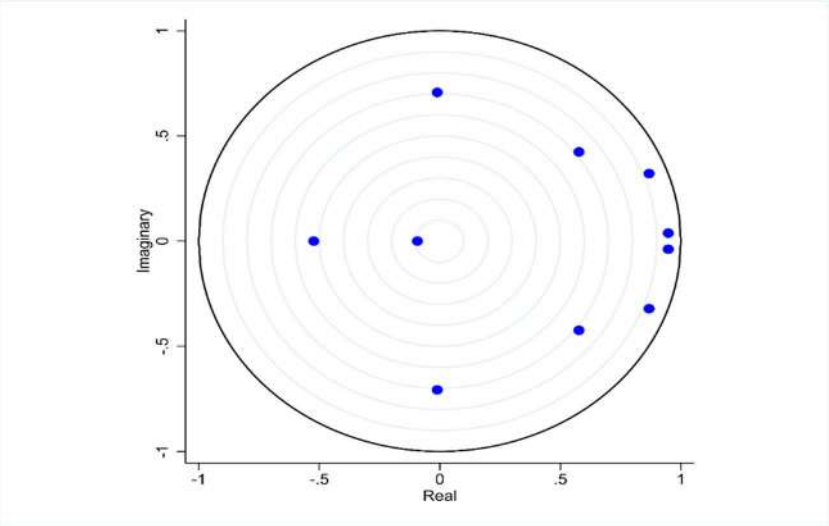


Figure 2: Roots of the Companion Matrix (VAR Stability Graph)



Note: All the eigenvalues lie inside the unit circle and VAR satisfies stability condition.

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The Analysis of Dynamic Relationship among Indian Sectoral Indices: Evidence from the 'First 100 Days' of Covid-19 Pandemic

Ruchita Verma and Janaki Singh Rathore

The present study investigates dynamic relationships among key sectoral indices of the Indian stock market, considering the recent shocks brought about by the Covid-19 pandemic. Aiming to determine the existence and changes in relationships among the seven selected National Stock Exchange (NSE) indices, the Augmented Dickey Fuller (ADF) test and the Johansen and Juselius approach to cointegration analysis have been employed. The Granger causality test is utilised to determine uni-directional and bi-directional relationships, as well as investigating lead-lag association among the interrelated series. Such relationships can be utilised to make predictions of lagging indices in the short run. The results indicate existence of a dynamic relationship, causality linkages and identify leading indices of sector co-movements in the Indian stock market. The findings of the present study have implications for investors and policy makers alike. It provides empirical evidence in favour of sector-focused investment management and policy development in general and highlights its importance during periods of crisis in particular.

Key Words: Sectoral index, Financial markets, Cointegration, Granger causality, Covid-19, India, Crisis, Pandemic, Causality

I Introduction

The historical trend shows that crisis in any particular industry might possess an inherent potential to elevate pessimism among all stakeholders, leading to higher volatility in the market, which in turns spills over to other industries and sectors as well as international financial markets in the form of global contagion (Dungey and Gajurel 2015). When it comes to dangerous and infectious diseases, the contagion effect can be expected on both, the main street as well as the wall street (Donadelli, Kizys, and Riedel 2017). In the recent past, SARS, Ebola, and H1N1 outbreaks wreaked relatively contained but intense damages on the stock markets of several countries. However, none are comparable to the Covid-19 pandemic in

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its reach, pace of spread, and potential to dismantle (completely or partially) the healthcare and financial systems of almost all the countries on the planet. Overpopulated countries like India, with major defects in their healthcare management policies are prone to the worst-case scenarios in this situation (SK 2020, Sarkar 2020). While medical research is on its rightful global focus, financial scholars and economists must also do their part to analyse the present and anticipate the future impact of the pandemic on every section of the Indian financial market. For the survival, recovery, and revival of the national economy, exploration and recommendations by the research community would be a potent weapon against the long-term financial impact of this pandemic.

In the context of the Covid-19 crisis, international implications are of secondary importance (Goyal 2020). The primary aim should be of assessing the present and impending damaging to different sectors within the economy, so that government can devise appropriate plans of their rehabilitation and market participants can manage their survival and growth. Logically, as with the relationships between different financial markets, the relations within a financial market can also be highly dynamic (Goodell 2020). Such relationships among the different sectors would change as the consequence of a global health crisis and must be analysed.

The present study investigates the dynamic relationships among the key sectoral indices of the Indian stock market. It has been conducted considering the recent shocks to national financial market, brought about by the Covid-19 pandemic. It determines the existence and changes in the nature of relationships among the seven selected indices. The study aims to highlight the importance of sector-focused assessment in designing investment portfolios for risk diversification, as well as building policy frameworks for managing economic response and recovery in times of crises. It attempts to answer the following research questions:

1. Are the different sectoral indices cointegrated?
2. In the short run, which indices have a tendency to lead (or lag) in comparison to other indices?
3. Do these relationships change substantially during crisis periods?

This study provides an incremental contribution to the scant literature on the financial impact of pandemics in three major aspects. Firstly, it is conducted considering the health and emerging financial crisis caused by the Covid-19 pandemic. Secondly, only a few previous studies have explored the inter-sectoral relationships in the Indian market. Lastly, the findings from the study can be referred to for designing diversified portfolios and formulating policies to deal with any future crises caused by unforeseen events such as pandemics, terrorist attacks, etc.

The structure of the rest of the paper is as follows. Section II provides a review of the related literature for the study. Section III gives a description of sample

selections, sources of data, and the estimation methodology. Section IV presents the results of empirical analysis and findings and finally, Section V concludes the study along with implications.

II Review of Related Literature

From an extensive review of related literature, it is observed that there are many studies on the relationship among prices of difference stocks and commodities, macroeconomic variables such as inflation, GDP, and exchange rate, and their impact on the stock market indices. However, this collection becomes relatively small in the context of emerging markets (Gil-Alana and Yaya 2014, Bouria, Jain, Biswal, and Roubaud 2017).

Since, the Global Financial Crisis (GFC) of 2007-2008, researchers have recognized the importance of considering or allowing for the 'crisis-fear' effect or 'crisis-opportunity' effect while analysing financial markets. Almost all studies provide for the crisis effects to control for international volatility contagion during this specific period. Several researchers even proved that the relationship among international financial markets as well as indices within a national market altered significantly during and post the GFC (Ghosh and Kanjilal 2014). Interestingly, results during the crisis period were found to hint at the post-crisis relationships. There is ample evidence in the literature to prove that financial markets are highly dynamic and a global event such as the GFC bears enough influence to radically alter the interrelationships among its participants (Singh and Sharma 2018).

A recent article by Goodell (2020) motivated the present study by highlighting the potential effects of global crisis events on financial markets. He pointed out that literature in this field is ominously inadequate, and even more so in the context of unforeseen natural and man-made disasters that could trigger health and financial crises. Such events create and spread disruptions across the globe, even faster than a purely economic event. The survival and recovery measures by the governments as well as the corporate leaders also become considerably more complicated, and the markets grow volatile due to its sensitivity to investor mindset and emotions. As opposed to natural disasters which can be anticipated and prepared for using scientific instruments and methods, or purely financial downturns which spread and spillover at a relatively slower pace; unforeseen events such as terrorist attacks (sentiments of fear, anger and pessimism spread across countries almost instantly) and pandemics/epidemics are much more complicated to manage and to recover from. Hence, while analysing the financial effects of a global pandemic such as Covid-19, imperfect parallels can be drawn not just from studies on financial crises but also from those concerning terrorist attacks and past epidemics/pandemics. A few crucial studies are shown in Table 1.

In the context of emerging markets such as India; already dealing with overpopulation, religious turmoil, and inefficient healthcare system; international implications of global events are of secondary importance. The primary aim

should be of assessing the impact on different sectors within the economy (Goodell 2020). Logically, as with the relationships between different financial markets, the relations within a financial market can also be highly dynamic. Such relationships among the different sectors would change as a consequence of a global event and must be analysed. As per the knowledge of authors of the present study, very few researchers (Chesney, Reshetar, and Karaman 2011) have conducted such studies pertaining to the Indian financial market. Though the incremental contribution of such a study in survival and economic recovery policies is evident, the existing literature is scant, and results are mixed. The present study is unique in its aim to investigate the relationship among different sectoral indices in India, considering the health crisis and emerging financial downturn caused by the Covid-19 pandemic.

Table 1: Summary of Literature

Author	Year	Objective	Country	Findings
Srinivas Nippani and Kenneth M. Washer	2004	To examine the effects of Severe Acute Respiratory Syndrome (*SARS)* on the stock markets.	Canada, China, Hong Kong, Indonesia, Philippines, Singapore, Thailand, Vietnam	Negative impact of SARS detected only on the stock markets of China and Vietnam.
Ming-Hsiang Chen, SooCheong (Shawn) Jang, and Woo Gon Kim	2007	To determine the impact of *SARS* epidemic on hotel stock price movements.	Taiwan	Found significantly negative impact during and immediately after the day of outbreak.
Chun-Da Chen, Chin-Chun Chen, Wan-Wei Tang, and Bor-Yi Huang	2009	To identify the effects of *SARS* on different sectors of the stock market.	Taiwan	Study identified negative impact on tourism, wholesale and retail sectors but the prices of biotechnology sector spiked.
Dirk Brounrn and Jeroen Derwall	2010	To analyse the effects of *terrorist attacks* on stock markets. Comparison made with market reaction to earthquakes.	Canada, France, Germany, Italy, Japan, Netherlands, UK, USA.	Market declined slightly in reaction to terrorist attacks, but the fall was more pronounced than the effect of earthquakes. Also, related industries and local markets reacted strongly. Effects were short term.
Alfonso Del Giudicea and Andrea Paltrinieri	2017	To examine the impact *Ebola and the Arab Spring* on performance of 71 equity mutual funds.	Funds geographically specialized in African countries	Study found significant impact on fund flows caused by pessimism among the retail investors. Intensity of media coverage found to have a positive effect.
Michael Donadelli, Renatas Kizys, and Max Riedel	2017	To find out if official and media disseminated Disease-Related News (DRNs) impact the stock prices of pharmaceutical companies.	USA	A significant positive impact identified on the returns of companies. The DRNs found to be more positive for small firms.

Contd…

Table 1: Summary of Literature

Author	Year	Objective	Country	Findings
Shaen Corbet, Constantin Gurdgiev, and Andrew Meegan	2017	To examine the impact of *terrorist attacks* on the volatility of stock markets.	Ireland, Spain France, Germany, Greece, Italy, UK	Results were found to be mixed across countries, as well as the geographical location and type of terrorist attack.
Riste Ichev and Matej Marinč	2018	To determine if geographic proximity of disseminated information and media coverage affected stock prices during *Ebola outbreak*.	USA	Significant impact of both variables found on stocks on specific countries. Market suffered elevated implied volatility in the post-Ebola period.
Mei-Ping Chen, Chien-Chiang Lee, Yu-Hui Lin, and Wen-Yi Chen	2018	To analyse the impact of the *SARS* epidemic on the long-run relationship among selected countries.	China, Hong Kong, Taiwan, Singapore and Japan	Study found evidence supporting theexistence of a long-run relationship among the four markets, and that this relationship diminished because of the epidemic.
Abdullah M. Al-Awadhi, Khaled Alsaifi, Ahmad Al-Awadhi, and Salah Alhammadi	2020	To determine the effect of contagious diseases (*Covid-19*) on stock market returns.	China	The study found significant negative impact of the disease across all companies in the sample.
HaiYue Liu, Aqsa Manzoor, CangYu Wang, Lei Zhang, and Zaira Manzoor	2020	To analyse the impact of *Covid-19* outbreak on 21 globally leading stock market indices.	Japan, Korea, Singapore, USA, Germany, Italy, UK, and others.	Stock market fell quickly across all countries, with Asian indices hit more strongly than the rest.
HaiYue Liu, Yile Wang, Dongmei He and Cangyu Wang	2020	To measure the abnormal returns generated in the stock market during the first ten days of *Covid-19*. Also assessed individual industry indices.	China	Returns in the stock market severely declined with negative returns accruing to the transportation, lodging and catering industries. Positive abnormal returns were seen in cases of pharmaceutical manufacturing, software and IT services.

III Methodology

Sample Selection and Data Sources

The data for the study are the closing prices for seven National Stock Exchange (NSE) sectoral indices – NIFTY Bank (Banking), NIFTY Financial Services (Financial Market), NIFTY IT (Information Technology), NIFTY FMCG (Fast Moving Consumer Goods), NIFTY Metal (Metal and Mining), NIFTY Pharma (Pharmaceutical), and NIFTY Media (Media and Entertainment). Two samples of data comprising of 100 daily observations each are obtained from NSE historical prices database and subsequently transformed into their natural logarithms. The two samples pertain to the pre-pandemic[1] (non-crisis) and pandemic (health and economic crisis) periods, and separate analyses are conducted for each sample.

The period of the first 100 days is selected to encompass the events of pandemic identification, informational and viral contagion, and early response of the market. Numerous studies in the fields of political (Keith 2017), management (Angwin 2004) and medical sciences (Weisman and Worden 1977) demonstrate the significance of this arbitrary but critical timeline in the assessment of preliminary preparedness, initial response, accelerated recovery and subsequent success, concerning a major change in the existing state of affairs of the system.

Estimation

The relationship between the selected sectoral indices can be examined for cointegration only if all the variables (transformed series of closing prices) are not stationary at level or trend. If they are not stationary at level (have a unit root), but stationary at first differences, there is a possible existence of cointegrating relationship which can be analysed. Next, the Granger causality can be employed to navigate direction of causation in the short run. The present study adopts the Johansen and Juselius (1990) cointegration approach to assess the changes in interrelationships among the different sectoral indices. Such examination might also be undertaken through the bivariate (Engle and Granger 1987) protocol. While the bivariate approach can be extended to adopt a multivariate framework, it falls inferior to the Johansen and Juselius (1990) technique in many ways (Chaudhuri 1997).

Test for Stationarity and Lag-Length Selection

As mentioned previously, variables integrated at different orders cannot be cointegrated. The stationarity of the selected variables is checked by Augmented Dickey-Fuller (ADF) test (Singh and Sharma 2018). The null hypothesis indicates the presence of unit root (non-stationarity). The aim is to ensure that any shocks observed in the values at level are only passing and will succumb to mean-reversion in the long run. The equation of ADF test regression can be given as follows:

$$\Delta Y_t = \beta_1 + \beta_2 t + \gamma Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-1} + \varepsilon_t \quad \ldots(1)$$

Next, the multivariate Akaike's Information Criterion (AIC) and the Schwartz Bayesian Criterion (SBC) are used for the selection of a suitable lag length which is neither too long (loss of degrees of freedom reduces power of the test), nor too short. Both criteria were developed to aid in maximum likelihood estimation techniques of cointegration analysis.

Cointegration

In the next step, provided that all the variables become stationary at first differences, presence of cointegrating relationship(s) among them can be examined using the Johansen and Juselius approach. It identifies if there are some stationary combinations of the non-stationary variable series, revealing the existence of a cointegrating relationship. It signifies a unique common trend among the variables, where they might not appear to be correlated in the short-run but converge to a long-run equilibrium. The equation of vector autoregressive model (kth order) cointegration test is as follows:

$$\Delta Y_t = \mu + \prod Y_{t-1} + \sum_{i=1}^{k-1} \neg_i Y_{t-1} + \varepsilon_t \quad \ldots(2)$$

Trace and Maximum Eigenvalue statistics are utilised for determining the existence of cointegrating relationships among the variables. The values of the two statistics must be higher than the critical values, to support the existence of cointegration.

Granger Causality

Finally, the Granger causality test[2] is employed to identify uni-directional and bi-directional relationship(s) among the variables. It also investigates the lead-lag relationship among the interrelated variables which can be utilised to make predictions concerning the lagging ones in the short run (Singh and Sharma, 2018). An illustrative bivariate vector autoregressive model (kth order) to conduct the test of granger causality is given in equation (3) and (4). The equations are illustrative as a total of 42 null hypotheses (for seven variables) are tested in the present study.

$$Y_t = \alpha_0 + \sum_{i=1}^{k} \alpha_i Y_{t-i} + \sum_{j=1}^{k} \beta_j X_{t-j} + \epsilon_t \quad \ldots(3)$$

$$X_t = \delta_0 + \sum_{i=1}^{k} \delta_i X_{t-i} + \sum_{j=1}^{k} \beta\gamma_j Y_{t-j} + \epsilon'_t \quad \ldots(4)$$

For Equation (3), null hypothesis: X_t does not Granger cause Y_t. If rejected, lead-lag relationship exists from X to Y. Similarly, for Equation (4), null hypothesis: Y_t does not Granger cause X_t. If rejected, lead-lag relationship exists from Y to X. If both hypotheses are rejected, bi-directional relationship exists. Existence of cointegration provides a preliminary evidence of causality (granger) in at least one direction.

IV Empirical Results and Findings of the Study

This section presents the results of empirical analysis and the inferred findings. It is divided into four sub-sections. The first part provides a descriptive summary

and correlation matrix of the selected variables. The second part tests the stationarity of the series using ADF test and determines the optimal lag-length for further analysis. Cointegration analysis is conducted in the third part and finally, short-run causality and lead-lag relationships are assessed in the fourth part.

Summary Statistics

Summary statistics of return series are computed for the pre-pandemic and the pandemic periods for the seven sectoral indices. Table 2 indicates a marginal fall in average value of NIFTY Bank from 10.28045 in the pre-pandemic period to 10.10823 in the pandemic period, further magnified by much wider variations in relative standard deviations across the samples. This depicts the rise in volatility of NIFTY FMCG, NIFTY Financial Services, NIFTY IT, NIFTY Metal, NIFTY Media, and NIFTY pharma in the pandemic period. The distribution of the variable series is examined using Jarque-Bera probability test. The results revealed that except for NIFTY IT (pre-pandemic) and NIFTY Pharma (pandemic), all other variables are not normally distributed.

Table 2: Summary Statistics for Pre and During Pandemic Periods

	BANK	FMCG	FS	IT	METAL	MEDIA	PHARMA
Pre-pandemic							
Mean	10.28045	10.30505	9.472878	9.650894	7.83744	7.545324	8.968988
Maximum	10.35697	10.3901	9.548311	9.699957	8.013988	7.665449	9.029771
Minimum	10.19458	10.2491	9.392766	9.59483	7.697848	7.442639	8.874721
Std. Dev.	0.046867	0.040868	0.042132	0.021499	0.086623	0.064248	0.030691
Skewness	-0.05823	0.659244	-0.09073	0.103433	0.528801	0.226129	-0.86683
Kurtosis	1.7299	2.046501	1.8247	2.935207	2.13609	1.87105	3.80211
Jarque-Bera	6.777981	11.03154	5.892731	0.195799	7.770264	6.162772	15.20408
Probability	0.033743	0.004023	0.05253	0.90674	0.020545	0.045896	0.000499
Observations	100	100	100	100	100	100	100
During Pandemic							
Mean	10.10823	10.26504	9.365199	9.578611	7.650714	7.251963	9.017356
Maximum	10.38727	10.35695	9.595433	9.727493	7.979835	7.554335	9.169732
Minimum	9.736113	10.05122	9.02383	9.321846	7.310851	6.894873	8.769087
Std. Dev.	0.23732	0.074617	0.209042	0.121816	0.232972	0.242957	0.101957
Skewness	-0.14553	-0.8465	-0.15255	-0.26854	0.067941	-0.02647	-0.48863
Kurtosis	1.233348	2.905325	1.22522	1.5607	1.284637	1.167908	2.624507
Jarque-Bera	13.3574	11.98016	13.51223	9.833464	12.33722	13.99736	4.566859
Probability	0.001257	0.002503	0.001164	0.007323	0.002094	0.000913	0.101934
Observations	100	100	100	100	100	100	100

ADF Test for Unit Root

The results of ADF test for unit root are given in Table 3. It can be observed that all the series are non-stationary at their levels in pre and during-pandemic periods, and stationary at first-differences across both the sub-periods. Hence, it can be concluded that the series are integrated at the first order, which gives the values of return series.

Table 3: ADF Test Results of Variables at Levels and First-Differences

Variable	Pre-pandemic		Pandemic	
	Level	First-difference	Level	First-difference
BANK	-1.562007 (0.49)	-8.967327 (0.00)	-0.774881 (0.82)	-10.11132 (0.00)
FMCG	-0.866345 (0.79)	-7.972517 (0.00)	-1.338431 (0.61)	-12.44646 (0.00)
FS	-1.301389 (0.62)	-8.84651 (0.00)	-0.809224 (0.81)	-10.55361 (0.00)
IT	-3.028535 (0.07)	-11.60272 (0.00)	-0.988275 (0.75)	-12.44424 (0.00)
METAL	-1.619199 (0.46)	-10.33666 (0.00)	-1.099072 (0.71)	-11.76153 (0.00)
MEDIA	-1.749481 (0.40)	-9.898878 (0.00)	-0.700446 (0.84)	-9.976716 (0.00)
PHARMA	-1.981246 (0.29)	-10.45573 (0.00)	-0.799549 (0.81)	-5.30127 (0.00)

Notes: t-values and p-values (figures in parenthesis) have been presented. The one-sided p-values are according to critical values at one per cent level of significance given by (MacKinnon, 1996)

Johansen's Cointegration Analysis

The ADF unit root test results, indicated in the previous sub-section, support the applicability of Johansen's cointegration test on all the seven variables' series. The size of ideal lag length is determined on basis of the SBC and the AIC criteria. As per AIC values, the lag length is indicated as 2 and 3 in the pre-pandemic period and during the pandemic period, respectively. SBC gives the optimal lag length as 1 and 2 for the pre and during pandemic periods, respectively. In cases of such inconsistency, AIC criterion is generally considered preferable (Vrieze, 2012). From Table 4, it can be observed that the seven variables have no cointegrating relation in the pre-pandemic period. During the pandemic, the results of the trace test suggests two cointegrating relationships, at 5 percent level of significance. The results of cointegration test thus determines the existence of a long-run equilibrium among the key sectoral indices of NSE during the pandemic period but not in the immediately preceding period. Thus, the present study provides evidence of a dynamic relationship among the selected indices, intensified during periods of crisis. The findings for the crisis (here, pandemic) and non-crisis (here, pre-pandemic) periods are in congruence with the results reported by several researchers studying the impact of Global Financial Crisis (GFC) on markets.

Table 4: Johansen's Cointegration Results

			Trace test		Max eigen value test	
Period	Null hypothesis	Eigen value	Statistics	p-value	Statistics	p-value
Pre-pandemic	r = 0 (None)	0.245868	90.32768	0.8604	27.65435	0.8928
	r⩽1 (at most 1)	0.176018	62.67333	0.9117	18.97343	0.9842
	r⩽2 (at most 2)	0.149531	43.6999	0.8695	15.87281	0.9575
	r⩽3 (at most 3)	0.122742	27.82709	0.8211	12.83345	0.8939
Pandemic	r = 0 (None)	0.521354	174.1998	0.00*	71.46898	0.00*
	r⩽1 (at most 1)	0.30517	102.7308	0.0152*	35.31647	0.1561
	r⩽2 (at most 2)	0.237031	67.41436	0.0766	26.24219	0.3062
	r⩽3 (at most 3)	0.176652	41.17217	0.1833	18.85455	0.4258

Notes: *Represents significant results at five per cent level of significance.

Granger Causality Results

To determine the short-run causality among the cointegrated variables, Table 5 depicts the results of Granger causality/block exogeneity Wald test for the pandemic period (Singh and Sharma 2018). The existence of short-run causality relationship is reported for NIFTY Bank, NIFTY FMCG, NIFTY Financial Services, NIFTY Pharma, and NIFTY Media in the pandemic crisis period. Each of these five variables is influenced by at least one (up to three) other variable/s. During the pandemic period, NIFTY IT and NIFTY Metal are influenced by themselves only. In Table 6, concerning the pre-pandemic period, Granger test results show that there is one-way causality running from FMCG to Media and from Metal to Bank, FMCG and Financial Services.

Table 5: Granger Causality/Block Exogeneity Wald Test Results for Pandemic Period

Dependent variable (differenced series)	Independent Variables (differenced series)	Statistic	Prob.
BANK	FS, IT, FMCG, METAL, MEDIA, PHARMA	42.90527	0.00 *
FMCG	FS, IT, METAL, MEDIA, PHARMA, BANK	39.84631	0.00 *
FS	IT, METAL, MEDIA, PHARMA, BANK, FMCG	43.92403	0.00 *
IT	METAL, MEDIA, PHARMA, BANK, FMCG, FS	20.60686	0.05
METAL	MEDIA, PHARMA, BANK, FMCG, FS, IT	20.14937	0.06
MEDIA	PHARMA, BANK, FMCG, FS, IT, METAL	24.64155	0.01 *
PHARMA	BANK, FMCG, FS, IT, METAL, MEDIA	21.82096	0.03 *

Note: *Represents significant results at five per cent level of significance.

Table 6: Granger Causality Test Results for Pre-Pandemic Period (only Significant Results Reported)

Null hypothesis	Statistic	Prob.
METAL does not Granger Cause BANK	15.08258	0.00*
METAL does not Granger Cause FMCG	7.035082	0.03*
METAL does not Granger Cause FS	12.02975	0.00*
FMCG does not Granger Cause Media	6.050292	0.04*

Note: *Represents significant results at five per cent level of significance.

From the above analysis, it can be inferred that the relationship among key sectoral indices is dynamic across the two sub-periods, pre-pandemic and pandemic. These variables display a cointegrating relationship only in the pandemic period. Also, in the short run, no consistent relationships or lead-lag behaviour that remains pervasive across the sub-periods can be identified. However, NIFTY Metal and NIFTY FMCG are found to granger cause several other indices in the pre-pandemic period, and could regain their positions in the post-pandemic time. During the period of crisis caused due to the pandemic, NIFTY IT, NIFTY FMCG, NIFTY Media and NIFTY Pharma emerged as the most leading indices on the NSE.

V Conclusion

In the pre-pandemic period, no cointegrating relationship could be identified among the selected indices. Additionally, the results showed very weak evidence of Granger causality among the indices, thus revealing considerable opportunities for investment strategies aiming at portfolio diversification, but models for future predictions of a sectoral index could not be formulated on the basis of past returns of other indices. Out of the 42 pairs of possible pairwise-combinations, only four showed uni-directional granger causality, mooting the opportunity to employ lead-lag relationships among indices to make short-run predictions in the stock market. NIFTY Metal was found to have a relatively dominant role in the market and could be utilised to anticipate short-run changes in Bank, FMCG, and Financial Services indices. The lagged values of FMCG index were also found to granger cause Media index.

However, during the sample period of pandemic, the multivariate cointegration analysis revealed the existence of two cointegrating equations. Thus, it can be inferred that the seven indices share cointegrating relationship, and information from past performance of other indices could be utilised to predict future fluctuations in prices of the market. The results provide evidence against investment strategies that encourage longer holding periods for extraordinary gains during times of crisis. Earnings for such investors could be moderate at best. During the period of crisis caused due to the pandemic, NIFTY IT, NIFTY FMCG, NIFTY Media and NIFTY Pharma emerged as the most leading indices on the

NSE. Thus, the crisis period enabled a comparatively higher number of short-run relationships among the NSE indices.

The findings of the present study have implications for investors and policy makers alike. It provides empirical evidence in favour of sector-focused investment management and policy development in general and highlights its importance during periods of crisis in particular. The results determine existence of dynamic relationships, causality linkages and identify leading indices of sector co-movements in the Indian stock market.

Endnotes

1. Cut-off date of the two samples considered to be 31st December, 2019 as per (Novel Coronavirus (2019-nCoV), 2020)
2. Refer (Granger 1969)

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Aggregate Economic Activity: Measuring the Unmeasurable

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In the Business Cycle Theory (BCT), the concept of aggregate economic activity (AEA) is treated as notional, since it is directly unobservable. A variety of reference time series that are used in the empirical literature does not convincingly justify its usage as a proxy for AEA. In this study, I propose a theoretically plausible definition of AEA that can be empirically measured with ease. AEA is empirically derived from the real GDP measured by the expenditure approach. Further, the essential attributes of the quantitative measure of AEA are elaborated.

Key Words: Business cycle, Aggregate economic activity, Macroeconomic theory, Indicator approach, Business cycle dating, Expansion, Recession

I Introduction

The Business Cycle Theory (BCT) is one of the earliest and most vibrant areas of macroeconomic research. The existence of vast and rich literature is a testimony to this fact. The recurrence of economic instability has a long-documented history. Zarnowitz (1991: 1-2) has quoted instances from the literature mentioning economic fluctuations, the earliest one being from Adam Smith's *The Wealth of Nations* which was published in 1776. The existence of multi-stage cycles as we know it today was mentioned long back in 1837 by Lord Overstone (Overstone, 1837), an approach for which he is credited (Zarnowitz 1991: 2). Over two centuries have passed since the earliest documentation of the business cycle phenomenon, and still it is the cause of these fluctuations which has persistently been a subject matter of debate. Countless theories have been developed till date to explain the economic fluctuations, yet the economists have not agreed upon any specific nature of cause behind the said phenomenon.

To pinpoint the cause of this disagreement, the process of how an economic theory evolves needs to be looked at. The process of economic theory development progresses sequentially through three broad phases. In the first phase, a phenomenon is observed which concerns the economy. In the second phase, a theory is conceptualised to explain the observed phenomenon. To conceptualise the theory, there are two commonly adopted approaches. The first one is the

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deductive approach where a generalised theory is conceptualised by proposing a plausible explanation for the occurrence of the observed phenomenon. The second approach is the inductive approach in which data collection takes place, which acts as an input for subsequent analysis to conceptualise the theory. Lastly, the theory is validated using the subsequently observed data. A theory is valid and accepted only if it stands the test of time and works across time frames. A noteworthy conclusion that can be deduced from both approaches is that the observed data plays a vital role in theory conceptualisation as well as in its validation.

Colloquially, business cycles are defined as fluctuations in the Aggregate Economic Activity (AEA). The problem with the business cycle phenomenon is that it is an unobserved macroeconomic variable. There is no well-defined, widely accepted macroeconomic time series with the help of which the state of the aggregate economy can be gauged. Numerous time series have been deployed as a proxy for AEA by the researchers. Every such attempt has been criticised either for being too narrow or too wide to be a representative indicator of the state of the economy. Therefore, since business cycles are directly unobservable, it is difficult to identify and measure them. In BCT, it is at the very first step of theory development where the disagreement originates. Every school of economic thought observes the same phenomenon from a different perspective. As a result, there exists no definitive answer as to what constitutes the AEA. Observing an unobserved variable is indeed a tricky task and finding the cause for such a variable is even trickier. Once the methodology to observe the AEA is established, we can move to the subsequent phases of theory conceptualisation and validation with relatively fewer disagreements. The BCT has progressed to the second and third phases, disregarding the first phase of theory development. As a consequence, the theories explaining the business cycle phenomenon are based on a wide variety of time series that are treated as proxies for AEA. It is thus quite obvious to disagree on the source of economic fluctuations.

In order to resolve the theoretical dispute over the cause of fluctuations, firstly there is a need for resolution of the controversy concerned with identification and measurement of AEA. This paper is a step towards the resolution of the intellectual debate by defining AEA and accordingly suggesting theoretically consistent changes to empirical business cycle measurement. Appropriately defining and measuring the AEA will make the theoretical justification for its fluctuation clearer. In this paper, I begin by discussing the origin of business cycle measurement literature and how it has influenced the current business cycle measurement practice. Next, in the second part, the novel contribution of this paper is discussed whereby a theoretical framework is developed to explain the concept of AEA. This theoretical idea is finally translated into empirical terms in the fourth part, by identifying and measuring the time series that closely represents the aggregate state of the economy. The fifth part summarises the proposition.

II The Inception of the Idea and Its Influence on Current Research

The idea of the business cycles as fluctuation in AEA was popularised by a seminal monograph of Burns and Mitchell (1946) where they gave the following working definition of business cycles which became a norm in BCT. "*Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own.*" (Burns and Mitchell 1946: 3) (emphasis added).

In the definition, business cycles are defined to be fluctuation in the AEA. However, AEA has not been defined on purpose, the primary cause for which is that the objective of Burns and Mitchell's (B-M) research was the determination of the cyclical features for the purpose of theory development. For identifying the features of the cyclic fluctuation, analysing individual time series was indispensable. They point out that, had the multiple time series been aggregated as a proxy measurement of AEA, the cyclical movement of the specific series would have been obscured because of the netting-off effect, making the analysis of its causality even tougher (Burns and Mitchell 1946: 6). Another reason for not using an aggregate measure was the dynamic nature of business cycles. The proponents of this approach observed that the economy, being a complex and evolving entity, is not bound by deterministic laws and hence, seldom acts uniformly across the cyclic episodes. Therefore, no specific macroeconomic time series can be used as a representative proxy series. Zarnowitz unequivocally makes this observation, "*What matters is that many diverse activities tend to expand and contract together; also, it should be added, that they evolve over time and cannot be reduced to any single aggregate (Moore and Zarnowitz 1986, p. 737). Hence the question of what precisely constitutes the aggregate economic activity' is purposely and properly left open. The nature of business cycles depends on, and changes with, the major characteristics of the economy, society and polity. The most common and salient feature of business cycles is their pervasiveness and persistence (the high cyclical conformity or coherence of numerous variables and their pronounced serial correlation). It is not the fluctuation of any single aggregate, however important.*" (Zarnowitz 1991: 8-9).

The research of B-M was subsequently carried forward at the National Bureau of Economic Research (NBER). In 1978, the Business Cycle Dating Committee was set up at the NBER to date the turning points in the United States economy. Since then, it has been keeping a record of peaks and troughs by adopting the non-parametric approach derived from B-M's research. The NBER's dating committee blended the two different areas of research, viz., identification of cycle

characteristics and dating of the cyclic turning points, into one. The business cycle dating procedure was an offshoot to the B-M's project. Their methodology was replicated by the NBER to be used for the empirical exercise of detecting the peaks and troughs of business cycles. As a result, the process of identification of cyclical peaks and troughs is now labelled as a complex statistical exercise that requires analysis of hundreds of economic time series to ensure the existence of co-movement, a feature mentioned in the B-M's definition. The proponents of this approach claim that using multiple time series as a representative of AEA endows robustness to the business cycle dating process as it helps in differentiating the business cycle fluctuation from other types of fluctuations like seasonal and stochastic fluctuations. Banerji (1999), on the lines of B-M, argued that the movement in the aggregate economy must be pronounced, pervasive, and persistent (the three Ps) to separate the cyclic movement from the rest of the noise. To measure the three Ps, he prescribes indicators and statistical techniques which may aid early identification of turning points. This idea was a partial modification of the three Ds, viz., duration, depth, and diffusion, used as criteria to differentiate recessions from slowdowns by the NBER (Fabricant 1972). However, the multiple time series approach is often criticised for being *a theoretical* and for its overuse of empirics involving substantial subjectivity.

Two schools of thought evolved simultaneously out of the NBER's business cycle measurement approach. The first one believes that a single comprehensive time series is sufficient to capture the state of AEA. The proponents of this approach usually treat Gross Domestic Product (GDP) or Index of Industrial Production (IIP) as an appropriate reference series to track the economic fluctuation. Several studies have been conducted in India using the single time series approach to date the cyclical phases. Gangopadhyay and Wadhwa (1997), Mall (1999), Patnaik and Sharma (2002), Mohanty, Singh and Jain (2003), Reserve Bank of India (2006), Nandi (2011), and Pandey, Patnaik and Shah (2017, 2018) identified the business cycle phases in the Indian economy using a single time series as a representative of AEA in India. The single indicator approach invited criticism on several grounds. The foremost criticism is that a single time series fails to capture all the dimensions of the economic activity, hence cannot be used as a representative measurement of the aggregate activity (Moore 1982). Other common problems pointed out were the existence of measurement errors, significant lag in publication of data and its frequent revision after publishing. Layton and Banerji (2001) discuss in detail, the perils of using output as a measure of AEA. They reiterate the arguments of Burns and Mitchell (1946), Burns (1952), Moore (1982), Stock and Watson (1988), Crone (2000), and the NBER to justify the use of multiple indicators to determine aggregate fluctuations in the economy as the issues with the approach diminish the credibility of business cycle measurement process. Though all the criticisms of this approach are derived from B-M's work, they agreed to the fact that Gross National Product (GNP) was a suitable candidate to act as a proxy for AEA. Although, GNP was not used by them, the reason for it was the non-availability of substantial data for analysis and

not its unidimensional nature, for which it is often criticised (Burns and Mitchell 1946: 72-73).

With time, the researchers at the NBER progressed a step further in business cycle measurement and developed the composite indicator approach. They were the proponents of the second school of thought who followed the NBER's approach of multiple time series, but with a slightly different objective. Instead of merely dating the historical cycles, the composite indicator approach was developed with the aim of predicting the turning points. From the empirical analysis of numerous time series at the NBER, it was observed that every time series possesses leading, lagging or coincident attribute in context to a reference series. Time series possessing similar traits can be filtered and aggregated together to form composite leading, lagging or coincident indicators which can be used to predict the turning points by using leading indicators or to confirm it by using lagging indicators. Coincident indicators are developed with an intention to act as a proxy measurement for aggregate activity since aggregate macroeconomic data gets published with a significant lag. The composite indicator approach has been well received in India. Abundant literature is available where the Indian business cycle has been dated using the composite indicator approach. Chitre (1982) pioneered the turning point dating procedure using the composite indicator approach in India. This study was followed by Dua and Banerji (2000, 2001, 2007, 2012), Patnaik and Sharma (2002), and Pandey, Patnaik and Shah (2019). Although, this approach is also not free from defects. Like its predecessor, the composite indicator approach is also criticised for its subjectivity in developing the indicators. From the initial stage of selection of constituent time series to the final stage of their aggregation, judgement is involved at every step. With judgement comes biases, diminishing the credibility of the results obtained. Another defect lies in its methodology of developing the composite indicators. For developing an indicator, a reference time series needs to be identified. It is this reference series, based on which the leading, coincident and lagging nature of the constituent time series is determined. By identifying a single time series as a reference series, this approach invites the same criticisms as those of the single indicator approach like measurement error and lag in data availability. It is imperative to have defects in the composite indicators if it is based on a defective reference series.

The reference series used as a proxy indicator of AEA is an important step in dating the turning points. A common feature amongst all the derivative approaches of B-M's research is that the theory behind using a specific time series or composite indicator as representative of AEA is seldom discussed. Taking into consideration a faulty time series and detecting the peaks and troughs in such series will be a futile exercise. Further, the above-discussed conventional business cycle measurement processes have failed to capture the critical aspect of the dynamic nature of the cycles. The very fact that more than two centuries have passed and yet the phenomenon of business cycles is eluding us inductively indicates the dynamic nature of business cycles. As discussed previously, the research by B-M

was conducted with the objective of the identification of quantitative aspects or stylised facts of business cycles that were to be subsequently used for theory development. Although to the contrary, Zarnowitz makes a tenable point that inadvertently raises doubts over the utility of the B-M's research. He points out that had there been any statistical regularity, they would have been identified by now, considering a long history of repeated occurrences of cyclical fluctuations (Zarnowitz 1991: 16-17). Further, the prevailing approaches give the impression that the business cycle phenomenon is separate from the agents' economic activities and that their economic decisions have no impact on business cycles as none of the approaches talk of the role of the agents in influencing business cycles. In the next part, a definition of AEA from the agents' perspective is proposed while incorporating the behavioural attributes to BCT.

III The Theoretical Proposition

Since the fluctuation in AEA is referred to as business cycles, defining AEA would fulfil the objective of identifying and measuring business cycles empirically. AEA has not yet been defined in a way that may aid its empirical identification and measurement. Therefore, a definition is proposed here that is theoretically robust and would make it empirically measurable. The AEA can be defined as the spending by the domestic households and firms in an economy during a specified period.

There are two implicit theoretical ideas in this definition that require elaboration. The first idea is that of treating spending as a measure of AEA. Conventionally, the concept of AEA is treated as notional, similar to that of the concepts of the natural rate of unemployment and interest and the likes. It is because of their unobservable nature that such concepts invite more disputes. The prevailing state of the economy is experienced by the agents which cannot be measured by any macroeconomic variable directly. I propose to measure the same by inference. Even though the prevailing state of the economy cannot be measured, the response of agents to it in the form of economic decisions they make can be measured. The agents take into consideration all the available information to formulate their economic decision. Such economic decisions are quantifiable and hence measurable. The economic decisions of the agents manifest in the form of the monetary transactions conducted by them. A monetary transaction can be measured from three different perspectives viz., production, income, and expenditure. Economic activity measured from the production perspective will capture only the firms' opinion on the state of the economy, ignoring the households. The income of the agents is beyond their control and cannot be altered solely by the agents' decision. Hence, expenditure is the most plausible perspective to capture the state of aggregate economy, as the decision to spend is controlled by the agents themselves, after factoring in all the variables. Therefore, expenditure is identified to be the most plausible measure of the three.

Expenditure by the agents represents the dollar votes which they cast as an expression of their economic opinion. The decision of conducting expenditure by the agents, encompasses within itself the effect of changes in all the macroeconomic variables. After taking into consideration the prevailing macroeconomic phenomena, the agent spends money. For instance, income precedes expenditure for any household. Any effect on the income will reflect on their decision to spend. Also, employment is a key source of livelihood for households. A decline in employment in an economy is bound to have consequences on their expenditure at the aggregate level. Similarly, for firms, sales for a specified period will influence their capital expenditure in the subsequent period. Labour is an indispensable input in the production process. A firm reduces its labour only under such circumstances where its profitability and sustainability are expected to be adversely impacted. When revenue declines, firms tend to curtail their expenditure on labour. Any negative shock which impacts any of the macroeconomic variables will be reflected in the decision of the agents to spend. If the case is not so, then the agents believe that the shock is temporary in nature and may not possess the potential to cause a structural shift in the long term.

The second theoretical aspect of the definition of the AEA pertains to the agents whose economic activity is to be considered. In the proposed definition, I took into consideration only the expenditure of households and firms. A four-sector model of an open economy comprises households, firms, regulators, and the external sector. It is contended that, of all the types of agents, it is only the households and firms who perform the economic activity with the capitalistic objective of profit maximisation that is relevant for AEA measurement. It is their participation in the economy which results in the economic activity that is intended to be measured. Therefore, the households and firms are hereinafter collectively referred to as the Participating Agents for ease of reference. The government too conducts the economic activities albeit not with the profit maximisation objective, but for the collective welfare of its citizens. It also performs the function of developing and implementing the regulatory framework for the economy to minimise the effects of negative externalities that causes market failure. Similarly, a central bank performs the regulatory function of the oversight of money supply in the economy. The government and central bank regulate the economy with the help of fiscal policy and monetary policy tools respectively, to steer the economy towards the stability and sustainability of economic growth. The government and the central bank are henceforth collectively termed as the Regulating Agents. The economic activities performed by the regulating agents are intuitively meant to be counter-cyclical since their objective is to induce economic stability by intervention. Including the economic activity of regulating agents in the AEA will diminish the effect of fluctuations in the economic activity of participating agents, muting the cyclicality and making the identification of business cycles tougher. Thus, the economic activity performed only by the participating agents in aggregation is relevant for the business cycle measurement. From the above exposition, it can be concluded that the participating agents are explicitly

responsible for conducting economic activities, the aggregation of which results in AEA.

The economic activity of the external sector is more representative of the state of the external economy than that of the domestic economy; thus, a part of it requires to be excluded from the definition of AEA. The transactions of the external sector comprise exports and imports in an economy. Exports form part of domestic production because the economic activity concerning these goods and services is carried out within the domestic territory of an economy, although the same gets consumed by the external economies. While, imports are excluded from domestic production because the imported goods and services are not produced within the domestic territory, although they are consumed within the economy. To determine the AEA, we require only the spending of participating agents. Since exports consist of the domestic goods and services demanded by the external agents, it does not form part of AEA. Any changes in exports will depict the economic decisions of the external agents. However, imports represent expenditure by domestic agents on foreign goods and services, hence required to be included in AEA. Though imports do not originate within the domestic economy, they do represent the manifestation of expenditure decisions carried out by the domestic agents, which is intended to be measured.

The AEA possesses a crucial behavioural attribute that makes it a dynamic phenomenon. The agents use the currently available information about the state of the aggregate economy to take economic decisions for the subsequent period. This creates a feedback loop resulting in the persistence of business cycle phases. Hence, the agents expand their respective economic activities when the aggregate economy is in the expansion phase and when the economy is contracting, the agents curtail their activities to minimise the negative effects of contraction. Such behaviour thus accentuates the prevailing state of the economy unless interrupted by shocks. The agents require information about the state of the economy at a localised level as well as the aggregate economy level, to take any decision for the future course of their economic activity. For the information to be used by the agents, it should possess three key attributes viz., availability, affordability, and acceptability. The information must be available to all the agents as a public good without any restriction of access, which limits its use only to a few eligible agents. Secondly, access to information ought to be economically feasible for the agents. Restricted availability of information at a high cost of access deters its use. Finally, the acceptability of information is determined by the reliability of its source. Information from a credible source is accepted and used by a greater number of agents as compared to that from an unreliable source. Information about the local state of the economy is available to the agents from sources like the local grapevine network and reports of local trade bodies and associations. Information from informal sources like grapevine networks has a negligible cost but possesses questionable reliability, while access to reports from reliable and legitimate sources involves the cost of acquiring information. To analyse the trade-off between availability, affordability, and acceptability and to take appropriate action

is a prerogative of the agents. The agents form an opinion about the prevailing state of the economy by taking into consideration the available information based on the above-mentioned trade-off. Economic decisions taken are based on such opinion. Hence the time series that is required to be measured should possess the three attributes of availability, affordability, and acceptability. Only then would we be measuring the actual AEA. Measuring the AEA using a time series lacking any of the three attributes will yield inconsistent results, since agents may not be using that specific time series to take decisions. A true measure of the aggregate economy would be a time series that is available to the agents for observation, so as to form an opinion about the economy and take decisions accordingly.

IV The Empirics

The objective here is to measure the spending of the participating agents, for which a time series that consists of all the three attributes discussed above is required. The National Accounts is the most suitable data which confirms our criteria since it is published by the governments, which is a reliable source which is also made available to all, at practically zero cost as a public good. Further, the real GDP for National Accounts is computed using the expenditure approach, as required by our theory. The real GDP requires minor tweaking to arrive at our theoretically proposed AEA. There are four constituents of real GDP (Y) as per the expenditure approach. These are private final consumption expenditure (C), gross fixed capital formation (I), government final consumption expenditure (G) and net exports (X − M). The aggregation of all the constituents results in what is referred to as the national income identity, denoted by the below equation.

$$Y = C + I + G + (X - M)$$

In measuring the GDP by expenditure approach, the spending of all the agents across the economy is aggregated to arrive at the aggregate production. However, the objective here is not to precisely measure the production but to gauge the prevailing state of the economy. In my theoretical exposition, I proposed the exclusion of economic activities of the regulating agents and exports from AEA. In the national income identity, C and I indicate the economic activity of households and firms respectively, i.e., participating agents. It is the only economic activity we are concerned with while computing the AEA. G indicates the economic activity of the regulating agents, hence, to be excluded. Similarly, export transactions of an economy, represented by X are also not concerned with AEA. The imports (M), comprise of demand for foreign goods and services by households, firms and the government, which may be represented by the following equation:

$$M = M_C + M_I + M_G$$

In the earlier section, it was proposed that the imports should form part of the AEA. Imports indicate the expenditure by domestic agents on foreign goods and services. The prevailing state of the economy impacts the import demand of the agents, making it a relevant metric for cyclical measurement. Expenditure by the participating agents on domestic as well as imported production indicate the prevailing state of the economy. Thus, after eliminating the unwarranted components of GDP, we are left with private final consumption expenditure (C) and gross fixed capital formation (I) including imports as a measure for AEA. The change in AEA will represent business cycles. Hence, the AEA can be represented by the following equation:

$$AEA = C + I$$

Where $C = C_D + C_M$ and $I = I_D + I_M$

The subscript D in the above equations denote expenditure on domestic goods and services and M refers to expenditure on imports. The above equation of AEA is the final product of our exposition. It does not require any statistical adjustment or filtering. Any modification in this indicator will diminish its efficacy. This is so because the participating agents directly use the information as disseminated, since they possess limited computational capabilities. This assumption does not imply that the agents lack intelligence. But the aggregate level of the computational competence of the agents cannot be assumed to be the same as that of a statistician or an econometrician. The agents are adept in their respective economic activities, and they require a benchmark aggregate level of economic activity, to compare their individual-level activity. The publicly available information about the aggregate economy acts as a benchmark. So, they view the information about the aggregate economy as is disseminated. It is unlikely that the majority of the agents would perform any statistical procedure to further refine the data, as is done by the economists. It was proposed that the agents use the information about AEA to conduct economic activity, which becomes the economic activity for the subsequent period. To capture this feedback loop, the same indicator must be used as a measure of AEA as is made available to the participating agents.

The derived equation is the closest representation of AEA. It is the quantified embodiment of the economic decisions taken by the agents who perform economic activities for profit-motive. Such decisions are taken in accordance with the prevailing state of the economy, hence acting as an inferential indicator of the AEA. It is derived from the publicly available national accounts data without conducting any complicated statistical modifications, as used by the agents. Thus, the derived AEA possesses the three attributes of availability, affordability, and acceptability.

V Conclusion

The business cycle measurement exercise has been over-reliant on the working definition given by B-M, disregarding the context in which it was developed. The problem of insufficient data and its poor quality compelled them to corroborate their work by using numerous time series. The B-M's approach portrayed the business cycle as an extremely complex phenomenon requiring an enormous volume of data for its analysis. Their research led to the creation of two popular non-parametric business cycle measurement approaches. Although, these approaches have a dichotomous view on the concept of AEA. Either the idea of AEA is oversimplified, where it is represented by a single time series, which lacks substantial theoretical backing or it is overcomplicated and is depicted as an incomprehensible phenomenon that is difficult to explain theoretically. Both these approaches fail in theoretically describing the AEA. Hence, a definition is proposed that plausibly explains it and can be conveniently measured empirically. More importantly, the proposed definition of AEA makes it implicitly dynamic in nature as it is defined to be the manifestation of agents' economic decisions after taking into consideration the prevailing state of the economy. The dynamic nature is also enforced by the feedback loop of information, whereby the agents use the information about the AEA to make decisions for the future, thereby influencing the future value of AEA. Precisely measuring the economic activity will aid in macroeconomic stabilisation policy decisions. When the regulating agents will track the economic activities of participating agents and identify the causes for its unfavourable trajectory, more effective policy measures can be formulated to stabilise the business cycle in the economy.

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Comprehending Urbanization, Urban Schemes and Urban Villages in Contemporary India

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The population of Indian Cities is constantly rising post 1990s, which is putting pressure on the land, as a result of which they are expanding outwards. This has aggravated the need to plan them. The cities while expanding or when they are planned by the authorities engulf a number of villages within themselves, which are known as 'urban villages'. Relying on qualitative methodology this paper tries to map out the discourses on urbanization and urban villages in India. It primarily argues that the consistent neglect of these areas by the Central and State government has led to their deteriorated condition.

Key Words: Urbanization, Urban Villages

I Introduction

Most of the population of the Global South would be migrating from the villages to the cities in search of more opportunities in terms of employment, better educational and health facilities and physical infrastructure in the 21st Century. A distinctive feature of urbanization in Asian countries has been the rise of mega cities, which means that most of the economic activities and urban population of these countries is concentrated in a few large cities such as Delhi, Bengaluru, Kolkata, Chennai, Seoul, Beijing, Shanghai, etc. They have been functioning as prominent actors in the global economic system. The emergence of these cities in competition with the cities of the West has shifted the attention of scholars towards understanding them. Indian cities are also predicted to witness rapid urbanization during this century. The McKinsey Report, " India's Urban Awakening: Building inclusive cities, Sustaining economic growth" released in 2010 notes the fact that India's urban population grew from 290 million in 2001 to an estimated 340 million in 2008 and it could soar up to 590 million by 2030. It also projected that Indian cities would create 70 percent of net new jobs in 2030 and produce more than 70 percent of Indian GDP and drive a near fourfold increase in per capita income across the nation

These cities have also experienced a construction boom as industries, residential accomodations, malls, factories, highways and offices of multinational corporations are opening up not only within the city but also in its vicinity (Shaw

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2012). In other words, Indian cities have undergone drastic changes in their demographic composition, economic activities and landscape in the post-liberalization era that started in the 1990s as they have attracted high foreign investment and largely contributed to the Gross Domestic Product (GDP) of the country. All these things are increasing the population of the city and the pressure on the land of these areas is increasing. As a consequence, the population is dispersing outside generally because of the availability of cheaper housing and more green spaces. This has led to urban sprawl, i.e., haphazard growth of cities and inclusion and planning of these areas within the city is becoming essential.

While expanding, these cities engulf a number of villages within themselves. The agricultural land of the farmers is taken away either by the government or the real estate agents, but the residential areas known as *'abadideh'* in Hindi remain in place. These traditional village-like residential settlements within a well-developed city are then called 'urban villages'. However, expansion of cities is not the only reason for the creation of these urbanized villages in India where they are also formed, when new planned cities such as Chandigarh, Rajarhat in Kolkata, Electronic City in Bengaluru, Navi Mumbai and Lavasa in Pune are constructed for different purposes on the periphery of metropolitan areas.

The understanding of urban villages in developing countries is way different then as they are understood in the developed countries such as America, where they refer to a planning design. In East Asian countries these places are a result of urban expansion. Beijing, Shanghai, Shenzen and Guangzhou are examples of cities in China which are swelling up and enveloping the farmlands of the hamlets in the vicinity. These newly acquired farmlands are then used for constructing residential, commercial and industrial start-ups (Cenzatti 2014). The closest equivalent term to urban villages is "*Desakota"* as framed by Mc Gee in order to understand the distinctive model of urbanization emerging in South East Asia. By this he meant zones that are a mix of agricultural and non-agricultural activities.With time, these villages have degenerated in terms of access to service delivery and overall infrastructure.

Studying urban villages today is of immense importance as analyzing them provides important insights towards the nature of urbanization in cities of developing countries and also these are the areas that are witnessing dynamic changes and crisis in terms of environment, land use changes, service delivery and governance challenges.

In this paper I answer three major questions: (i) What have been the problematic issues of urban areas in India, according to the five-year plans and urban policies and what have been the ideological shifts in addressing them? (ii) When does the condition of urban villages gain policy attention? and (iii) How have master plans of planned cities tried to solve the problem of urban villages?

I give three arguments in this paper. Firstly, according to the Five year plans the major issues till 1991 of urban areas were that of building housing for the refugees, ensuring planned development of cities, slum upgradation and problems of employment among the urban poor. After 1991, problems of upgradation of

infrastructure in cities such as sanitization, sewerage disposal, drainage, solid waste management, transportation facilities start to surface. Secondly, Rajiv Awas Yojana is the only centrally financed urban policy which talks about developing the infrastructure of urban villages but it also at the same time equates them to slums. All the other urban policies continue to neglect these areas. Thirdly, in the initially planned cities, these areas were not included in the master plan approach and were governed by different building bye laws. Due to this, illegal encroachments, congested development, degraded infrastructure in terms of sanitization, solid waste management, drainage and sewerage disposal could be seen in these areas. After 1991, the master plans of newly planned cities have included these areas within them and talked about the need for their infrastructural development but often treated these areas as sites where the new service class could find cheap accommodation

This paper is divided into two sections. Section I would first trace the trajectory of urban policies in India and reflect on how they talk about urbanization and urban villages. The second part will look into the initiatives taken by the local bodies through master plans of planned cities towards these areas. This will help us in mapping out the shifts regarding the perception of these areas since independence.

II Area of Research

The pertinent research area for this research is urban studies which involves comprehending urban planning, spatial spread of cities, evolution of new urban areas and institutes to govern them, crises faced by them in terms of environment, problems of service delivery such as water, roads, electricity, solid waste management, drainage and urban politics. The following research objectives have been framed with regard to all these matters .

III Objectives

1. To understand the nature of urbanization in planned cities of India post-liberalization.
2. To apprehend the way urban policies post 1990s have perceived the condition of urban villages.

IV Methodology

The paper relies on qualitative methodology. To understand the perspectives of the policy makers and our leaders towards urban areas, a textual analysis of the Five-Year Plans and urban policies has been attempted. Apart from this, the official documents of Ministry of Urban Development and other relevant Ministries have been scrutinized. To understand the state level initiatives towards

urban villages, the master plans of a few planned cities such as Delhi, Mumbai, etc., have been analysed. A case study approach has allowed me to study the urban villages in their natural setting. The use of secondary sources such as books and newspaper reports has also been done.

V Five-Year Plans and the Debate on Urbanization

Urbanization in India is a state subject but the attempts of the states regarding the management of cities have been largely guided by the central guidelines reflected in the Five-Year Plans and centrally financed schemes. It is for this reason that studying central government's ideas regarding urbanization is important. On the insistence of Jawaharlal Nehru, Planning Commission (presently NITIAYOG) was set up in 1950 and was given the task to ensure uniform development in all aspects in all parts of the country. To achieve this objective, it used to formulate Five-Year Plans. Though the making of Five Year Plans has been discontinued from 2017, they form an important document to understand the initial deliberations on the question of urbanization in the country.

In the initial years of independence, addressing the urban problems was not the dominant concern of the national leaders as maximum of our population was living in the rural areas, i.e., the villages. The idea behind the first three Five-Year Plans was two-fold: (i) to accumulate capital through state sponsored development of urban areas which would help in achieving economic growth (Shaw 1996) and (ii) to provide housing to the refugees who were coming in large numbers from across the border. These concerns for economic development of the nation and rehabilitation of the refugees resulted in the construction of number of new cities and towns such as Bokaro, Faridabad and Chandigarh specifically in North India. The plans were also obsessed with slum clearance. The Second Plan concentrated on developing master plans for organized development of cities and proposed that low income households should be provided with housing facilities. It is only in the Third Five-Year Plan that addressing urban issues acquires logical and systematic attention. As a result of this plan, new authorities for facilitating the implementation of master plans were opened up. It was also recognized that the new industries need to be established far away from the cities so that balanced regional development could be ensured (Batra 2009).

The Fourth, Fifth and Sixth Plans which fall in the second phase show a shift as in the issues it is concentrating on and how it tries to resolve them. In the mid-1960s, the agrarian elite and the urban residents criticized the excessive centralization of state actions. They called for more development in their areas, better living conditions and rational land management (Shaw 2007). It was found necessary that the small towns had to be invested in, as the population in the large cities such as Delhi, Chennai, Hyderabad was increasing which was creating a housing shortage. To deal with the problem of rising prices of land and housing shortage, the states were made in-charge and Housing and Urban Development Corporation was set up to provide loans to state so that they could develop their

infrastructure and create housing specifically for the low- and middle-income groups. For slums it was recognized that in-situ development is important rather than slum clearance. The Fifth Plan largely talked about measures to control land prices which were escalating. This led to the formation of Urban Land Ceiling and Regulation Act (ULCRA). It also talked about the need to develop the infrastructure of the cities which had a population of more than three lakhs. The Sixth Plan focussed on ameliorating the environmental conditions of the slums by ameliorating the basic service conditions of these areas. It also talked about the development of small and medium towns specifically which had a population of about one lakh.

The era of liberalization started in the mid-1980s, in which the role of the State was reduced and investment through private sector was encouraged. Emphasis was laid on linking urbanization and economic development and in 1988, National Commission on Urbanization was set up. It was discovered that the Centre could not provide funds for the development of the city and the civic bodies had to be made self-sustainable. Consequently, the 73rd and 74th Constitutional Amendment Acts (CAA) were passed in 1993 to strengthen the financial status of these bodies. The emphasis of the Five-Year Plans then, was also on encouraging the coming up of private sector and urban policies, launched post liberalization (as will be discussed in the following section), do favour this approach.

The Seventh Plan, which marks the beginning of the third phase, is a considerable shift from the previous plans as the Indian economy was opening up and privatization in various sectors was being encouraged. The housing responsibility was shifted to the private sector. Removing poverty by community participation was discussed. Generating employment for the poor was also identified as a problem. Before the the launching of the Eighth Plan, India opened up the economy as a response to the balance of payment crises. This neo-liberal shift was reflected in the eighth plan which recognized urban poverty as a problem and talked about linking urban development with economic growth of the country. Need was also felt to financially strengthen the municipalities by allowing them to mobilize corporate sector to invest in the infrastructural development of their areas. In the Ninth Plan, it was also recognized that centrally sponsored schemes for development of small and medium towns have largely failed and the impetus of this was now largely transferred to the state governments who would mobilize the private sector for raising finances for their development. The difference between smaller and larger urban local bodies was also identified. It was observed that the larger Urban Local Bodies (ULBs) would be able to attract private investment but not the smaller ones. So, provisions of providing loans to the smaller ULBs were made. It favoured creating platforms for self-employment and for housing, it focussed on creating housing only for the most deprived section of the society.

The Tenth Plan again pushed for strengthening of legislative, financial and administrative structure of the cities by encouraging the public-private partnership model for ULBs and market friendly reforms for the betterment of infrastructure

and other services. It was considered necessary to focus on the development of urban infrastructure. The ULBs were supposed to mobilize their own resources by reforming property taxes, levying user charges and increasing the non-tax revenues. If the ULBs were able to implement these reforms, the Central Government would provide extra financial assistance. The Eleventh and the Twelfth Plan focussed on ensuring that the private sector participation is encouraged when it comes to infrastructure building such as sewerage management, solid waste management, etc.

We can thus see that urbanization for the first time catches the eye of the government in the 1960s. The First Three Plans were largely a response to the immediate need to develop the country economically and provide residence to refugees who were migrating from across the border in millions. The inability of the leaders to provide employment in the rural areas led to the migration of people who could not find affordable accommodation which led to the formation of slums and there was an argument of slum clearance. Though the Second Plan talked about the importance of master plans, proper institutions to implement them were only installed during the third plan. The first shift came because of the demands of the agrarian elite who argued for a balanced development. In the second phase, government started to focus on the in-situ development of slums. The final shift came at a time when the country faced balance of payment crises and was unable to provide services at the grass-root level. To cope up with this it encouraged private sector participation and upgrading the financial and constitutional status of municipalities.

VI Urban Policies and Urban Villages in India

Policies are formulated within a specific ideological and intellectual framework and based on a set of assumptions regarding the problem in question and the suitable mechanisms to resolve the problem. A public policy is thus the entry point to the framework that shapes the determination of the problem and proposes specific solutions. Only such an analysis will allow us to mark the continuities between policies and discern whether there are shifts, and understand the nature of such shifts, from one policy to another.

As already mentioned, in pre liberalization era, the urban policies recognized housing for the refugees, state planned development, industrialization, emergence of slums, unemployment among the poor, pressure on land in the core metropolitan areas as the major concerns related to urbanization. To solve these troubles, planned cities such as Chandigarh, Faridabad, Rourkela, Bhillai, etc., were constructed. Government organizations such as Ministry of Works and Housing, National Buildings Organizations and Town and Country Planning Organizations were set up to guide institutions such as Delhi Development Authority, Mumbai Metropolitan Regional Development Authority and Madras Metropolitan Development Authority, were entrusted with the task of developing planned cities and acquiring land by framing master plans.

The Second Phase led to the launching of schemes such as environmental Improvement of Slums (meant to provide water and other basic services to 11 cities having a population of eight lakhs), Integrated Urban Development Program, Sites and Service Scheme for slums, Integrated Development of Small and Medium Towns for a population below 100,000 were launched to ensure development of small towns. For the urban poor, the policies focused on controlling the land prices by passing the Urban Land Ceiling and Regulation Act (ULCRA) and by providing housing by setting up Housing and Urban Development Corporation (HUDCO) and focusing on in-situ development of slums.

The Third Phase saw the coming up of National Housing Policy to remove lack of housing/shelter, Nehru Rojgar Yojana, Urban Basic Service for the poor for the urban poor, for women and children of low income families, Nehru Rozgar Yojana for employment, Scheme for Educated Unemployed for Employment Generation in Urban Localities for creating self-employment, National Slum Development Programme (NSDP), Prime Minister's Integrated Urban Poverty Eradication Programme and Urban Reform Incentive Fund (URIF) were launched to deal with problems among the urban poor. This period also saw the enactment of the 74th Constitutional Amendment Act which provided a better electoral and financial status to the municipalities.

In the post liberalization era, the discourse shifts and building of upgraded infrastructure is recognized as something which needs immediate attention for which policies such as Mega City Scheme (MCS), Jawaharlal National Urban Renewal Mission (JNNURM), Rajiv Awas Yojana (RAY) and Atal Mission for Rejuvenation and Urban Transformation (AMRUT) were launched. MCS was targeted towards five metropolitan cities: Mumbai, Calcutta, Chennai, Bengaluru and Hyderabad were launched. The UPA launched JNNURM- the largest centrally financed policy in 2006. It was divided into four components: Urban Infrastructure and Governance (UIG) and Basic Services for the Urban Poor (BSUP), targeted towards the 65 mission cities and Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT) and Integrated Housing and Slum Development Scheme (IHSDP) for the rest of the non- mission cities. The mission did not mention urban villages but some of the City Development Plans talked about them while referring to the development of the inner-city areas. Out of all these schemes RAY for the first time talked about the development of urbanized villages but equated them to slums.

We can say that in the pre liberalization era, urban villages do not gain policy attention. They become the focus of urban policies only after 1991 but still are not directly addressed by them. In other words, the national level urban policies in India have failed to recognize or address the problems of urban villages and have often equated them to slums.

VII State Boards and Urban Villages

The Indian cities are planned using various devices: master plans which consist of zonal plans and local area plans. The objective of these plans is to promote balanced development of a city which is expanding and engulfing the surrounding villages. The idea is to plan in such a way that the population is dispersed to the hinterland. Under the local area plans; a concept which was introduced in the Delhi Master Plan 2021, planning is done through ward levels through stakeholder participation. The idea is to ensure public participation. The other tool used for planning cities is Regional plan which is meant for small and medium towns. Out of all these plans, I have emphasised studying the master plans of new planned cities as this remains the dominant model.

Under the master planning approach, the land is properly segregated by the planners to be used for various purposes in future like residential use, office areas, industrial regions, hospitals, parks, gardens, parking, roads, schools and universities. The Urban Local Bodies such as Municipalities or Municipal Corporations and the parastatal agencies are in-charge of planning and implementation of the master plans.

The talk about urban villages in India can be traced back to the colonial times when Delhi was being designed by Edward Lutyens and Herbert Baker in 1912. The villages were marked in two parts: the agricultural land was known as *khasra* and the residential areas were known as *abadi*. The two together formed the 'revenue village' the land was taken from both the areas and was initially used to build the Parliament building, railway station, University Campus and also for rehabilitating displaced people (Sheth 2017).

In the 1950s, i.e., post-independence, the charge of managing the city's growth and preparation of Master plans was handed over to Delhi Development Authority (DDA) – a parastatal agency which went on to acquire more villages. But this time, the villagers resisted the taking up of their residential land which led to the government taking only the agricultural lands. These residential units gradually came to be known as urban villages in Delhi. In other words, in post-independence cities, statutory bodies such as DDA have been able to convince the villagers to give up their land and convert it for residential and industrial purposes in order to cater to the needs of the growing population. For example: the urban villages of Delhi, specifically, Masjid Moth, Munirka and Jwahar Heri have lost their land to DDA in the 1950s for the construction of housing. The urban planners of the Capital have normally excluded these villages from the urban design and they have no building codes since 1962 when the first master plan of the city was formulated. As a result of this, they have often faced degradation and neglect and suffer from infrastructure deformities. Many of these villages have given space for the low-income groups, migrant labours and students to acquire housing and for small commercial units to open up specifically in places like Haus Khas. The time gap between the actual notification and acquisition of land is 15-20 years, because of which the area was left ungoverned for a long duration of time (Sheth 2017).

During this time, illegal housing, commercial complexes and new networks of leadership started forming here.

The Master Plan of 2021 however, for the first time mentioned that these urban villages would be brought under special regulations and any construction within the notified areas would be governed by building bye laws.

After independence, the first planned city was Chandigarh. Framed with the objective of providing housing to the refugees and giving an administrative centre to the Punjab, the city was also supposed to be a modern city and not have villages. The city was built in three phases, and the urban villages appear only in the second phase of its development. (Kalia 1987). The LE Corbusier Plan and the subsequent city development plan under JNNURM of the city have continuously ignored the condition of these areas due to which they have deteriorated in terms of infrastructure, i.e., they have no proper drainage facility, no sewerage management, poor solid waste management (some villages are treated as waste disposal sites), no street lights and no building bye-laws. It is here that the major illegal encroachments of the city can be seen. The master plan 2031 is the first plan to recognize all these problems and argue for specific developmental plans for each village.

In the 1970s, we see a shift in the purpose of building of cities. Prior to 1970s, the cities were built to settle refugees, as administrative capitals or for industrialization. After 1970s, It was felt that the pressure on the land was building up in the metropolitan regions because of the rise in population and thus there was a need to build cities on the periphery to disperse the population.

One of the first projects aimed towards dispersing the population from the main city is the Navi Mumbai Project. In 1971, the Navi Mumbai project was launched to ease down the pressure in Mumbai which was becoming overpopulated, congested and its infrastructure was collapsing. The State government along with the business elites of the city conceived the idea of the project and established the City and Industrial Development Corporation of Maharashtra (henceforth, CIDCO) for execution of the project. There are 57 villages within Navi Mumbai (Shaw 2004) which have witnessed a rapid transformation since their integration.

The land acquisition process is often accompanied by protests on behalf of the villagers who are reluctant to give up their lands as can be seen in Thane, Uran and Panvel during the construction of Navi Mumbai The construction of the residential colonies here increases the population of these areas and slowly in some areas they start deteriorating into slums with inadequate infrastructure or basic amenities as can be seen in Navi Mumbai's Vashi and Kotukbandh villages which have degenerated as they have been neglected by the authorities (Chaterji 2013). The land of these areas which was given to project affected people has been taken up by the real estate developers for building residences for middle income groups and commercial centres. The remaining land, specifically in Vashi has become a slum as low-income groups come and settle here.

CIDCO put urban villages of Navi Mumbai in the informal sector as the constructions mostly did not follow the construction and building guidelines. Therefore, urban villages became the site of informal settlements of the planned nodes of the new city. This also implied that the settlements were bereft of important components required for functioning of the society like basic services. Therefore, since these structures did not conform to new regulations imposed by CIDCO, the New Town Development Authority (NTDA) of Navi Mumbai regarded them as part of the informal sector of the new city. These settlements became islands of congestion with poor services through a political leadership holding surrounding development to ransom. The city however, formulated schemes to return land which was being acquired to the population.

Two most important schemes which were based on return of land to the village people and therefore transferring ownership to the 'project affected people' (henceforth PAP) were the *Gaonthan* Expansion Scheme and Twelve and a Half per cent Scheme. Under the *Gaonthan* Expansion Scheme (GES) 10 per cent of the total land acquired from a village is reserved for development and eventual return to the villagers. Half of the reserved land is allotted directly to project-affected persons after development and the remaining half is used to make roads, drainage, opens spaces and social facilities which will benefit the village as a whole. The PAPs were considered to be those who have lost a minimum of 100 sq. meters of land or were residing in such land or doing business on such land. The other scheme was the twelve and a half schemes. It was for the land owners who were entitled to this scheme. Under this scheme maximum size of 500 meters was returned to the land owners at double the land acquisition cost. Out of the total of the 12 and a half percent allotment, 30 per cent was reserved for providing basic amenities and social facilities. Thus, the net allotment was 8.75 per cent of the total land acquired. The allotted land would be in the residential zone and would be for residential purpose only. These two schemes were the major two factors which created the urban villages of Navi Mumbai.

The development plan stated that the original villages of New Mumbai were physically not to be adversely affected by the development of the nodes but were instead to be provided with a minimum of physical and social infrastructure and were to be fully integrated into the new urban environment. The New Bombay Development Plan stated as one of its objectives to enable urban villagers to adapt to the new urban setting and to participate fully and actively in the economic and social life of the new city. However, the most striking feature of growth and development of New Bombay is the physical impact of the growing nodes on the urban villages. Interestingly, after 25 years of project implementation a number of nodes are growing and expanding so rapidly that they directly threaten to swallow up the nearby villages. At several locations the multi-storied buildings of a node are within the village periphery. Again, within the villages that are located in the vicinity of an expanding node, land or property is gradually being taken over by outsiders and real estate developers and in several villages, two or three storied buildings are mushrooming and sometimes replacing the old village houses. This

displaces and pushes out the original residents of the village. The case of Vashi Gaon is a good example where only 30 per cent population is original villagers and land has also been taken up by private developers. (Shaw 2004).

Taking another case study as that of Bengaluru, the opening up of residential and commercial units also leads to haphazard growth of the peripheries which leads to engulfing of villages and loss of ecology Here Bengaluru Development Authority, Bengaluru Metropolitan and Rural Development Agency and Bruhat Bengaluru Mahanagra Palike have failed to control the haphazard urbanization of the area (Nair 2007).

Another prominent township that has been constructed to ease down the pressure on land in the central city by creating new business district and housing units for the people is in the north eastern periphery of Kolkatta. Conceived in 1993, the Rajarhat Township Project, being developed by West Bengal Housing Infrastructure Development Corporation (HIDCO). The agricultural land acquired from the reluctant farmers has been utilized mainly for residential purposes while the rest of the area is utilized for building up higher educational institutions, malls or hotel chains. The planned area of the township is well developed but the residential areas remained an eyesore. To cope up with the challenge, the master plan of the Township, has integrated these urban villages by calling them service villages which will provide cheap accommodation to the new service class that comes here. Villagers would be engulfed in the informal service sector as the new residents of the township would require servants, housekeepers, drivers and cleaners. Attempts here have been made to integrate the villages in the building activity (Kundu 2016).

We can thus see that attempts have been made to integrate urban villages in the master plans but they have mostly been treated as sites which would provide affordable housing to the people in the informal sector or their land has been given to project affected people. Most of the agricultural land of the villages is being utilized by the real estate developers for constructing food chains, high rise apartments of office complexes.

VIII Conclusion

When it comes to dealing with urban areas, the Centre continues to play an important role in policy formulation. The urban issues do not get much attention and it is only in the Third Five-Year Plan that these ideas about urbanization start to gain some shape. From 1947-1991, the government has mostly in many cities exempted the urban villages from building bye laws so that their rural identity can be sustained. As a result of this, illegal encroachments and congestion has become a prominent feature of these localities. Post 1991, the authorities have integrated these areas in their master plans to aid their development and mostly to serve as sites for providing cheap accommodation to the new migrant workers coming to work in the city.

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Book Review

Piketty, Thomas, *A Brief History of Equality*, Translated by Steven Rendall, The Belknap Press of Harvard University Press, 2022, pp. 320, Price ₹699/-

One may ask, why did Thomas Piketty write another book on equality or inequality? So much has been written on it by the greatest Philosophers, Political Scientists and Economists. Piketty believes the battle for equality is not over (pg. 203), and we are only in the process of radical equalization. The history of equality is important because knowledge of this past is indispensable for improving our understanding of the origins and injustices of the present social and economic system. Still, it (the knowledge) does not suffice to formulate solutions and remedies (pg. 93). Piketty believes the march toward equality is full of the revolutionary moment when Political institutions are redefined in order to make it possible to transfer social and economic structures (pg. 111).

When he elucidates inequality between the North and South, he finds a central role of slavery and colonialism in the development and prosperity of the Western World (pg. 48). The first European commercial companies, such as the British East India Company or the Dutch East Indies Company, were like genuine enterprises of transnational militarized robbery, with private armies subjugating whole populations under their ruthless control (pg. 60). According to available estimates, China's and India's share in worldwide manufacturing, which was still 53 per cent in 1800, was no more than five per cent in 1900 (pg. 59). The Anti-India protectionist policies helped British markets to flourish. Concerning deforestation; he cites Pomeranz who stresses the fact that by the end of the 18th century, Europe had spent nearly all its available resources (pg. 50). It means that after that, they looted the forests of the Colonies for their need. A superior military capability allowed them to exploit the Planet's natural resources. The case of Haiti is emblematic, not only because it was the first abolition of slavery in the modern age after a victorious slave revolt and the first independence from European power won by a Black population, but also because this episode ended with an enormous public debt that undermined Haiti's development over the following two centuries. Although in 1825, France finally agreed to accept the county's independence and to put an end to its threats to send troops to invade the island, that was only because Charles 10th had obtained from the Haitian government a commitment to repay France a debt of 150 million gold francs to indemnify the slaveholders for the loss of their property (pg. 72). These are small examples of western exploitation. Colonial history is full of exploitation. In the course of establishing a Reparatory Justice and Universalistic Justice, Piketty proposed reimbursement of debt paid by Haiti. A simple, transparent solution might set the amount at 300 per cent of the Haitian national income in 2020, or about 30 billion euros (pg. 74). Piketty has

brilliantly analyzed the nuances of every exploitative relationship, whether within society or among societies.

The Post-Colonial world is relatively egalitarian. The heart of the new (global) rule is the free circulation of capital without compensation in the form of regulation or common taxation (pg. 170). The Idea of using international treaties to depoliticize the economy to protect and prevent redistribution was, moreover, one of the Hayekian (pg. 172) proposals. These Ordoliberal rules and norms have established a quasi-sacred right to extract profit for a few global actors. As Piketty writes, they (influential actors and hegemons) generally utilize public infrastructures and social institutions (such as the educational and healthcare systems) to create benefits without following a fair, coherent tax system. Global North has established many institutional mechanisms to deepen the international division of labor. U.S. and Europe try to develop a set of regulations for fair international trade, but these rules do not seem reasonable from a developing country's position.

Therefore, some tools are inevitable to face the emerging challenges which Piketty suggested. The system of "participatory socialism" he described has only one objective: to illustrate the great diversity of possible economic systems (pg. 117). This (participatory socialism) will solve the problem of power-sharing in enterprises and transform the economic system toward a better democratic financial system. It enhances efficiency and productivity due to the principle of 'co-management and Burden sharing (Lastenausgleich)'. Co-management also contributes to the de-concentration of power. Progress and development emanate from egalitarian roots and electoral democracy (pg. 150); otherwise, it generates inequalities. Property is always a relationship of power (pg. 36, pg. 40) and inequality is, first, a social, historical and political construction (pg. 9). He is fascinated by the innovative definition of property which the German constitution has adopted- ...Right to Property is legitimate only insofar as it shall... serve the public good (pg. 115). However, he also imagined a creative role of small private property supervised and limited in scope. This project by Thomas Piketty is radically extraordinary. The reason for claiming this is not the abundance of more profound discussion of equality but the spirit and intention to hope for human emancipation.

However, a critical scrutiny of 'A Brief History of Equality' finds that it firmly hides the more profound implication of the limited sense of capitalism. This Idea paves the way for a nexus between the political protagonist and business houses in the form of State/Crony Capitalism. Unfortunately, he does not pay much attention to this intricate complaint. Primarily and convincingly, facts and figures are remarkably arranged in the book, for which appreciation is inevitable. In the alternative front (social inequality) the problem is not with his understanding of disparity but with the 'easy to follow' nature of his solution. No doubt, the reparation examples subscribed by Piketty will be a considerable part of the inequality discourse. Nevertheless, the brute challenge before the scholarship is to rescue the Idea of equality from the liberal trap, and the schema of progressive

taxation (Piketty believes this mechanism can solely solve the problem of unequal distribution) seems distant from the prescribed goal.

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