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Foreword

Bringing out *Sarvekshana* has always been a pleasant and enlightening endeavour. First issue of *Sarvekshana* was released in July, 1977. The present, 110th & 111th combined issue contains four papers on the subjects of "Measure of Dynamic Mobility for Changes in Employment Activity Category based on Transition Probability Matrix", "Health Care in India: Evaluation of Health Insurance in India using NSS Data", "Theoretical Probability Models for the Distribution of Household Land Ownership Holding" and "A Subjective Approach of Firm's Performance: A Multinomial Analysis". In addition, the highlights of the Annual Report of PLFS 2018-2019 and PLFS 2019-2020 have also been included in this issue.

110th issue was scheduled to be released in March, 2021. But due to the unforeseen situation of COVID-19 pandemic, the release got delayed. Hence, it is combined with 111th issue of *Sarvekshana*.

Referees have been very kind in examining the papers in detail and offering their suggestions in a short span of time and so have been the Members of the Editorial Advisory Board. I offer my sincere gratitude to them and solicit continued support for the Journal. Authors of the papers too have been cooperative in acceding to the suggestions for repetitive revisions. I congratulate them for their hard work. Officers of Survey Coordination Division of NSO have been very meticulous at various stages of publication and their hard work deserves unqualified appreciation.

Sarvekshana is a known Journal among researchers, academicians and policy makers. I welcome students, researchers, academia, Government officials and others to contribute unpublished papers for this Journal. Suggestions for improvement in the various aspects of the Journal are welcome.

New Delhi
September, 2021

Chairman
Editorial Advisory Board

Contents

PART-I

TECHNICAL PAPERS

Measure of Dynamic Mobility for Changes in Employment Activity Category based on Transition Probability Matrix

P. D. Joshi[1]

Abstract

This paper defines a summary measure (*J*) for dynamic mobility (move from one position to another) using a transition probability matrix to evaluate the magnitude of changes in employment and unemployment status compared to complete immobility and entire mobility. It is based on how much people move and how much is the distance of any value from the diagonal of the transition probability matrix. The minimum and maximum values of mobility measure are zero and one respectively. Application of this mobility measure (*J*) along with Joshi and Singh (1977) measure for analysing gender specific changes, sectoral changes and inter temporal changes in mobility measure has been made using National Sample Survey (NSS) data of selected rounds on labour force (employed and un-employed together) and not in labour force.

Key words: Economic Activity, Labour Force, Dynamic, Mobility, Measure, Index.
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1. Introduction

Mobility is visualised as a movement process governed by the laws of chance. It takes into account not only the number of moving and non-moving individuals but also the way they are exchanged between the classes i.e., the nature of movements. In the words of Lipset and Bendix (1959), mobility refers to the forces by which the individuals move from one position to another in society. Dynamic mobility refers to the movement of individuals from positions possessing a certain rank to positions either higher or lower in the social system. Several scholars including Prais (1955), Matrass (1950), Bartholomew (1967), Joshi and Singh (1977), Mukherjee and Basu (1979), Mukherjee and Chattopadhya (1986) have suggested measures of economic and social mobility for representing transitions during generations and over time. Among these, Joshi and Singh (1977) derived a measure *D* of mobility under the homogeneous Markov chain model using entropies. It is given by,

$$D = -\sum_i \sum_j p_{ij} \, Log \, p_{ij}$$

where, p_{ij} given below is the transition probability matrix 'P' (mobility from state i= 1, 2, 3,...,n to state j=1, 2, 3,...,n).

Next State (Period n=1)

	States	S_1	S_2	S_3	**...**	S_j	**...**	S_n
States	Index	1	2	3	...	J	...	n
S_1	1	p_{11}	p_{12}	p_{13}	...	p_{1j}	...	p_{1n}
S_2	2	p_{21}	p_{22}	p_{23}	...	p_{2j}	...	p_{2n}
S_3	3	p_{31}	p_{32}	p_{33}	...	p_{3j}	...	p_{3n}
.	.	.	.	.	.	.	...	.
.	.	.	.	.	.	.	...	.
.	.	.	.	.	.	.	...	.
S_i	I	p_{i1}	p_{i2}	p_{i3}	...	p_{ij}	...	p_{in}
.	.	.	.	.	.	.	...	.
.	.	.	.	.	.	.	...	.
.	.	.	.	.	.	.	...	.
S_n	N	p_{n1}	p_{n2}	p_{n3}		p_{nj}	...	p_{nn}

P=

Retention and gains (from)

Retention and Loss (t_0)

The measure is

(i) Well defined continuous function of elements of p_{ij} of the transition probability matrix P.

(ii) Independent of the ordering of the classes.

(iii) Finite and attains absolute minimum when there is no mobility.

(iv) Maximum when and only when the system attains some ideal situation.

However, measure *D* is not suited if one or more elements (p_{ij}) in the transition probability matrix '*P*' is zero. To overcome this problem we have defined a summary measure (*J*) for dynamic mobility using transition probability to evaluate the magnitude of changes in labour force and out of labour force compared to complete immobility. It is based on how much people move and how much is the distance of any value from the diagonal. The distance of any value from the diagonal reflects by how much (how far) the movement is. The diagonal values in the matrix so formed will be equal to one if the number of persons in each state is the same. In that case, all the non-diagonal values in the transition matrix will be equal to zero. Thus, the minimum and maximum value of mobility will be zero and one respectively. The value of off-diagonal elements i.e., p_{ij} of the mobility matrix determines how much quantity in proportionate terms moved from usual status to current weekly status. The measure has therefore been derived by taking the position of complete immobility as the point of comparison. It weights the value of off-diagonal elements by their distance from the diagonal. In doing so we have ignored the fact that some of the deviations are positive and some negative because if we do not ignore the signs the algebraic sum of deviations equals zero. Thus, our measure of dynamic mobility free from shortcomings of *D* Measure is given by,

$$J = \delta/(1/(k-1)) * \left(\sum_i \sum_j (i-j)^2 \right)$$

where, $\delta = \sum_i \sum_j (i-j)^2 p_{ij}$.

Under immobile situations (i.e. all diagonal values in the transition probability matrix ' p_{ij} ' equals 1, the value of '*J*' will be *0*). Under perfectly mobile situation (i.e. none of the diagonal values in the transition probability matrix ' p_{ij} ' equals *1* or *0*, the value of '*J*' will be {1 - (1/*k*)}) and extremely mobile situation (i.e., none of the diagonal values in the transition probability matrix ' p_{ij} ' equals *0*, the value of '*J*' will be 1). We now present the results on measure of dynamic mobility for changes in three states viz., employed, unemployed and out of labour force based on the application of proposed dynamic measure (*J*) along with the other measure of mobility viz., Joshi and Singh's (1977) entropy based measure (*D*).

2. Data Used

The National Sample Survey (NSS) has been conducting sample surveys on labour force (employment, unemployment together) in rural and urban areas of India since early fifties i.e.1954-1955 (9^{th} round). The surveys with large sample size of households have been conducted quinquennial from the 27th round (October 1972 - September 1973) onwards. The NSS 68th round carried out during July 2011-June 2012 was the ninth quinquennial round in the series. The concepts and definitions

used in the survey are stabilised and are available in the instructions to field staff vol.2, reports on employment unemployment and Golden Jubilee publication of NSSO (2001). A brief note on the same has been presented in Annex-A.

The findings of these surveys have been used for planning, policy formulation and decision support and as input for further statistical exercises by various Government organisations at the National and State levels, academicians, researchers and scholars. Now, Quarterly Reports based on Periodic Labour Force Survey (PLFS) conducted from July 2017 and onwards are being released by National Statistical Office (NSO), Ministry of Statistics and Programme Implementation, Government of India. These reports have generated a lot of interest and attention because of the high rates of unemployment and the low rates of WPR that were reported. However, the estimated parameters presented in these reports from the point of inter temporal comparison are under criticism and debate among the scholars and media on varied grounds. Important among them include Kundu and Mohanan (2019). As the comparability of the PLFS with the past NSSO surveys remains a contested issue, we have presented our analysis based on data available from large scale periodical sample surveys on employment un-employment. Database is published reports of 43rd round (1987-1988) and onwards by the then National Sample Survey (NSS) office. The sample size has been presented in Annex-B.

The data used for working out statistical dimension of dynamic mobility has been computed using per 1000 distribution of persons by current weekly activity (reference period last 7 days) for each usual activity (reference period last 365 days). Persons involved in subsidiary economic activity are categorised as not working in the principal usual activity status. Based on this, transition probabilities p_{ij} were calculated for three states employed unemployed and out of the labour force and presented in Annex-C.

3. Analysis of Data

The two measures of mobility in activity status viz., *J* and *D* stated above have been presented in Table 1 for the rural and urban sectors separately for males, females at all India level. It provides mobility in activity status of persons from usual activity status (reference period of last 365 days) to current weekly activity status (reference period of last 7 days) for selected periods (NSS rounds).

Table 1: Gender Specific Sectoral Measures of Mobility (*J* and *D*) from usual Activity Status to Current Weekly Activity Status for Selected Periods (NSS Rounds) at All India Level in the Rural and Urban Sector

Rural				
Mobility Measures	***J* Index**		***D* Index**	
NSS Round(Period)	**Male**	**Female**	**Male**	**Female**
(1)	**(2)**	**(3)**	**(4)**	**(5)**
43 (July 1987- June 1988)	0.051	0.227	0.285	0.422
50 (July 1993- June 1994)	0.032	0.141	0.203	0.395
55 (July 1999- June 2000)	0.032	0.118	0.218	0.370
61 (July 2004- June 2005)	0.026	0.133	0.181	0.454
66 (July 2009- June 2010)	0.019	0.107	0.134	0.327
68 (July 2011- June 2012)	0.019	0.121	0.132	0.346
Urban				
43 (July 1987- June 1988)	0.024	0.165	0.178	0.432
50 (July 1993- June 1994)	0.018	0.082	0.139	0.259
55 (July 1999- June 2000)	0.019	0.077	0.135	0.291
61 (July 2004- June 2005)	0.014	0.065	0.124	0.285
66 (July 2009- June 2010)	0.011	0.045	0.111	0.216
68 (July 2011- June 2012)	0.009	0.040	0.079	0.174

The above table reveals that there are gender differences, sectoral differences and intertemporal differences for mobility in activity status.

4. Gender Differences in Measures of Mobility (*J* and *D*)

Sector specific mobility measures *J* and *D* for sex ratio presented in Table 2 reveal that the sex ratio is in favour of females. It has increased over time in both the rural and urban sectors. However, their statistical dimensions are wide.

Table 2: Sector Specific Measures of Mobility Ratio (Female/Male)

NSS Round (Period)	**Mobility Ratio (Female/Male) based on *J* Index**	**Mobility Ratio (Female/Male) based on *D* Index**		
	Rural	**Urban**	**Rural**	**Urban**
	***J* Index**	***J* Index**	***D* Index**	***D* Index**
(1)	**(2)**	**(3)**	**(4)**	**(5)**
43 (July 1987- June 1988)	4.476	7.014	1.482	2.425
50 (July 1993- June 1994)	4.391	4.444	1.952	1.858
55 (July 1999- June 2000)	3.714	4.098	1.694	2.157
61 (July 2004- June 2005)	5.165	4.611	2.504	2.297
66 (July 2009- June 2010)	5.552	4.032	2.443	1.942
68 (July 2011- June 2012)	6.462	4.513	2.615	2.211

The maximum mobility based on *J* measure in the rural sector was 6.462 in the year 2011- 2012 (68th Rd.) and the minimum mobility based on *J* measure was 3.714 in the year 1999-2000 (55th Rd.). However, in the urban sector, the maximum mobility based on *J* measure was 7.014 in the year 1987-1988 (43rd Rd.) and the minimum mobility based on *J* measure was 4.032 in the year 2009-2010 (66th Rd.). The scenario is slightly different for *D* measure. The maximum mobility based on *D* measure in the rural sector was 2.615 in the year 2011-2012 and the minimum mobility based on *D* measure was 1.482 in 1987-1988. In the urban sector, the maximum mobility based on *D* measure was 2.425 in the year 1987-1988 (43rd Rd.) and, the minimum mobility based on *D* measure was 1.858 in the year 1993-1994. Mobility rose in 2011-2012 compared to 2009-2010 in rural and urban sector as shown by both the measures *J* and *D*. The rise was more in urban sector compared to rural sector.

5. Sectoral Differences in Measures of Mobility (*J* and *D*)

Sectoral differences in measures of mobility *J* and *D* presented in Table 3 shows that over time, mobility in females is higher compared to mobility in males in the selected periods.

Table 3: Sectoral Difference in Measures of Mobility for Males and Females over Time

Mobility Measures	***J* Index**		***D* Index**	
NSS Round(Period)	**Male**	**Female**	**Male**	**Female**
(1)	**(2)**	**(3)**	**(4)**	**(5)**
43 (July 1987- June 1988)	-0.027	-0.062	-0.107	0.010
50 (July 1993- June 1994)	-0.014	-0.059	-0.063	-0.136
55 (July 1999- June 2000)	-0.013	-0.042	-0.084	-0.079
61 (July 2004- June 2005)	-0.012	-0.068	-0.057	-0.168
66 (July 2009- June 2010)	-0.008	-0.062	-0.023	-0.112
68 (July 2011- June 2012)	-0.010	-0.081	-0.054	-0.173

Negative signs in the above table show that over time, mobility for males in urban sector is less compared to rural sector as well as for females as shown by both the measures *J* and *D*. For looking changes in mobility measure, relevant normalized results i.e. with base value separately for males and females have also been presented in following tables. Table 4 presents sectoral difference normalized with base value of measures of mobility i.e. (Urban-Rural)/Rural for males and females over time.

Table 4: Sectoral Difference Normalized with Base value of Measures of Mobility for Males and Females over Time in Percent

Normalized Sectoral Difference (Urban-Rural)/Rural				
Mobility Measures	***J* Index**		***D* Index**	
Round	**Male**	**Female**	**Male**	**Female**
(1)	**(2)**	**(3)**	**(4)**	**(5)**
1987-1988 (43)	-0.536	-0.273	-0.374	0.024
1993-1994 (50)	-0.427	-0.420	-0.312	-0.345
1999-2000 (55)	-0.414	-0.353	-0.383	-0.215
2004-2005 (61)	-0.451	-0.510	-0.314	-0.371
2009-2010 (66)	-0.423	-0.581	-0.171	-0.341
2011-2012 (68)	-0.526	-0.669	-0.406	-0.498

It depicts that the maximum sectoral difference normalized with base value for *J* measure is 52.6% in the year 2011-2012 for males and 66.9% for females in the year

2011-2012. The maximum difference based on *D* measure was 40.6% for males and 49.8 percent for females in the same year i.e., year 2011-2012, *D* measure for male was lowest 17.1%. The minimum difference for *J* measure was 41.4 percent for males and 35.3 percent for females in the year 1999-2000. In the same year, *D* measure for normalized sectoral difference was 38.3 percent for males and 21.5 percent for females.

6. Temporal change for mobility measures (*J* and *D*)

Inter temporal change in mobility measures *J* and *D* for males and females, in the rural and urban sector has been presented in Table 5.

Table 5: Inter Temporal Change in Mobility Measures *J* and *D* for Males and Females in the Rural and Urban Sector in India

	Rural				**Urban**			
Period: Between	**Mobility Measure**				**Mobility Measure**			
	***J* Index**		***D* Index**		***J* Index**		***D* Index**	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
1987-1988 and 1993-1994	-1.865	-8.621	-8.250	-2.704	-0.516	-8.333	-3.889	-17.334
1993-1994 and 1999-2000	-0.017	-2.227	1.590	-2.529	0.033	-0.500	-0.472	3.149
1999-2000 and 2004-2005	-0.602	1.510	-3.723	8.379	-0.450	-1.118	-1.046	-0.508
2004-2005 and 2009-2010	-0.648	-2.600	-4.734	-12.674	-0.301	-2.032	-1.327	-6.991
2009-2010 and 2011-2012	-0.068	1.317	-0.139	1.941	-0.233	-0.513	-3.231	-4.164

In the above table, *J* measures of mobility showing inter temporal changes in the rural sector for males depicts fall between 2009-2010 and 2011-2012 for males. In between 2004-2005 and 2009-2010, mobility measure for females rose in the same period. However, decline in *D* measure of mobility was highest in between 1987-1988 and 1993-1994 for males. For females, the highest decline was between 2004-2005 and 2009-2010 compared to 2009-2010 and 2011-2012. In the urban sector, the maximum decline in *D* and *J* measure of mobility for males as well as females was between1987-1988 and 1993-1994. The minimum mobility for males was between 1993-1994 and 1999-2000. For females, minimum mobility was seen between 1999-

2000 and 2004-2005. The maximum value of *J* measure of mobility was also between 1987-1988 and 1993-1994 for males as well as for females. The minimum mobility for males was between 2009-2010 and 2011-2012 and for females between 2004-2005 and 2009-2010. Inter temporal sectoral difference and normalised inter temporal difference in measures of mobility has been presented in Table 6.

Table 6: Inter Temporal Sectoral Difference and Normalised Inter Temporal Difference in Measures of Mobility Separately for Males and Females

Mobility Measures	**Inter Temporal Sectoral Difference**				**Normalised Inter Temporal Sectoral Difference**			
	***J* Index**		***D* Index**		***J* Index**		***D* Index**	
Round	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
1987-1988 and 1993-1994	0.013	0.003	0.044	-0.146	0.109	-0.147	0.063	-0.368
1993-1994 and 1999-2000	0.000	0.017	-0.021	0.057	0.013	0.067	-0.072	0.130
1999-2000 and 2004-2005	0.002	-0.026	0.027	-0.089	-0.038	-0.157	0.069	-0.156
2004-2005 and 2009-2010	0.003	0.006	0.034	0.057	0.029	-0.071	0.143	0.030
2009-2010 and 2011-2012	-0.002	-0.018	-0.031	-0.061	-0.104	-0.088	-0.235	-0.157

Here, the negative sign shows improvement in Inter temporal sectoral difference. Accordingly, both the measures *J* and *D* show improvement for males and females in regard to inter temporal sectoral difference between 2009-2010 and 2011-2012. Further there is fall in *J* measure and *D* measure for males and females in the year 2009-2010 in regard to normalised intertemporal difference.

7. Average Annual Change in Measures of Mobility

Annual changes in mobility measure normalised for length of time have been presented in Table 7.

Table 7: Annual Change in Measures of Mobility Normalised with Base value Separately for Males and Females in the Rural and Urban Sector of India

Rural : Measures of Mobility				
	Male	**Female**	**Male**	**Female**
Period : Between	***J* Index**	***J* Index**	***D* Index**	***D* Index**
(1)	**(2)**	**(3)**	**(4)**	**(5)**
1987-1988 and 1993-1994	-0.311	-1.437	-1.375	-0.451
1993-1994 and 1999-2000	-0.003	-0.371	0.265	-0.422
1999-2000 and 2004-2005	-0.120	0.302	-0.745	1.676
2004-2005 and 2009-2010	-0.130	-0.520	-0.947	-2.535
2009-2010 and 2011-2012	-0.034	0.658	-0.069	0.971
Urban : Measures of Mobility				
1987-1988 and 1993-1994	-0.086	-1.389	-0.648	-2.889
1993-1994 and 1999-2000	0.005	-0.083	-0.079	0.525
1999-2000 and 2004-2005	-0.090	-0.224	-0.209	-0.102
2004-2005 and 2009-2010	-0.060	-0.406	-0.265	-1.398
2009-2010 and 2011-2012	-0.116	-0.257	-1.616	-2.082

Here also the negative figure for *J* and *D* measure separately for males and females shows improvement in mobility maximum improvement depicted by *J* measure was 13.0% for males in rural sector between 2004-2005 and 2009-2010 and 11.6% in the urban sector. However for females, it was 30.2% between 1999-2000 and 2004-2005. Further the *J* measure of mobility for males in the year 2011-12 was less compared to 2009-2010 but for females, the scenario is opposite. *D* measure shows mobility for males in the year 2011-2012 was less compared to 2009-2010 and was much less for females.

Annex-A

Important Concepts

National Sample Survey on employment unemployment follows clearly defined stabilized concepts given in instructions to field staff Vol.1 as well as in NSS reports on employment unemployment. They are also available in Golden Jubilee publication (2001) of NSSO entitled "Concepts and definitions used in NSS." Section 4, *pp*. 38-55. Accordingly, employed are those who work for pay, profit, or family work by gainful activities, i.e. activities which add value to national product. Unemployed are those who are not employed but seeking or available for work. Labour Force means employed and unemployed together. Thus, those who are neither working nor available for work are not in the Labour Force. Further details on the status of activity on which a person spent relatively longer time of the preceding 365 days prior to the date of survey was considered the principal usual activity status (PUS) of the person. A person who pursued in a subsidiary capacity some gainful activity as well along with their principal usual activity (non-gainful) was considered to be usually working in a subsidiary capacity (SUS). Combinations of these two groups constitute all workers in usual status (US). The current weekly status (CWS) of the labour force rests on a longer time of the preceding *7* days prior to the date of survey. The detailed activity statuses under each of the three broad activity statuses (viz., '**employed**', '**unemployed**' and '**not in labour force'**) and the corresponding codes used in the survey are as under:

Code Description

Working (or employed)
Self-employed
11 worked in household enterprises (self-employed) as own-account worker
12 worked in household enterprises (self-employed) as an employer
21 worked in household enterprises (self-employed) as helper
Regular wage/ salaried employee
31 worked as regular wage/salaried employee
Casual labour
41 worked as casual labour in public works other than MGNREG public works
42 worked as casual labour in Mahatma Gandhi NREG public works
51 worked as casual labour in other types of works
61 did not work owing to sickness though there was work in household enterprise
62 did not work owing to other reasons though there was work in household enterprise
71 did not work owing to sickness but had regular salaried/wage employment
72 did not work owing to other reasons but had regular salaried/wage employment
Not working but seeking/available for work (or unemployed)

81 sought work or did not seek but was available for work (for usual status approach)
81 sought work (for current weekly status approach)
82 did not seek but was available for work (for current weekly status approach)
Neither working nor available for work (or not in labour force)
91 attended educational institutions
92 attended to domestic duties as only
93 attended to domestic duties and was also engaged in free collection of goods (vegetables,
Roots, firewood, cattle feed, etc.), sewing, tailoring, weaving, etc. for household use
94 rentiers, pensioners, remittance recipients, etc.
95 not able to work owing to disability
97 others (including beggars, prostitutes, etc.)
98 did not work owing to sickness (for casual workers only)
99 children of age 0-4 years

Annex B

Sample Size at the all India Level in Selected Years (Rounds) – Labour Force Survey

Period (Round)	**Rural**			**Urban**		
	M	**F**	**P**	**M**	**F**	**P**
1987-1988 (43rd Rd.)	230671	218330	449001	114590	104257	218847
1993-1994 (50th Rd.)	183464	172825	356351	109067	99283	208389
1999- 2000(55th Rd.)	261081	248698	509779	161136	148098	309234
2004- 2005 (61st Rd.)	203315	194710	398025	105312	99495	204808
2009- 2010 (66th Rd.)	144249	137078	281327	92234	86223	178457
2011- 2012 (68th Rd.)	143076	137687	398025	90728	85508	176236

Note: M-Male, F-Female and P-Persons

Annex-C

Gender Specific Mobility Matrix in the Rural Sector

Usual Status	**43 R-M**			**Usual Status**	**43 R-F**		
	Current Weekly Status				**Current Weekly Status**		
	E	**UE**	**OLF**		**E**	**UE**	**OLF**
E	0.931	0.023	0.046	**E**	0.675	0.008	0.317
UE	0.049	0.919	0.032	**UE**	0.007	0.925	0.068
OLF	0.004	0.000	0.996	**OLF**	0.002	0.000	0.998
	50 R-M				**50 RF**		
E	0.957	0.015	0.028	**E**	0.807	0.014	0.179
UE	0.030	0.948	0.022	**UE**	0.008	0.905	0.087
OLF	0.003	0.001	0.996	**OLF**	0.004	0.002	0.994
	55 R- M				**55 R- F**		
E	0.956	0.022	0.022	**E**	0.831	0.021	0.148

UE	0.046	0.940	0.014	**UE**	0.016	0.928	0.056
OLF	0.005	0.001	0.994	**OLF**	0.006	0.001	0.993
	61 R- M				**61 R –F**		
E	0.957	0.022	0.021	**E**	0.833	0.020	0.147
UE	0.024	0.960	0.016	**UE**	0.011	0.821	0.168
OLF	0.002	0.001	0.997	**OLF**	0.003	0.001	0.996
	66 R –M				**66 R –F**		
E	0.968	0.015	0.017	**E**	0.847	0.015	0.138
UE	0.009	0.976	0.015	**UE**	0.003	0.932	0.065
OLF	0.002	0.001	0.997	**OLF**	0.002	0.001	0.997
	68 R- M				**66 R –F**		
E	0.967	0.016	0.017	**E**	0.828	0.014	0.158
UE	0.010	0.976	0.014	**UE**	0.008	0.931	0.061
OLF	0.001	0.000	0.999	**OLF**	0.002	0.000	0.998

Note: R-M-Rural Male, R-F-Rural Female, E-Employment, UE-Unemployment, OLF-Out of Labour Force.

Gender Specific Mobility Matrix in the Urban Sector

Usual Status	**43 U-M**			**Usual Status**	**43 U-F**		
	Current Weekly Status				**Current Weekly Status**		
	E	**UE**	**OLF**		**E**	**UE**	**OLF**
E	0.967	0.017	0.016	**E**	0.768	0.017	0.215
UE	0.028	0.953	0.019	**UE**	0.017	0.897	0.086
OLF	0.003	0.001	0.996	**OLF**	0.002	0.001	0.997
	50U M				**50U F**		
E	0.977	0.011	0.012	**E**	0.884	0.009	0.107
UE	0.014	0.967	0.019	**UE**	0.005	0.958	0.037
OLF	0.004	0.002	0.994	**OLF**	0.002	0.002	0.996
	U55M				**U55F**		
E	0.977	0.011	0.012	**E**	0.900	0.009	0.091
UE	0.014	0.972	0.014	**UE**	0.011	0.927	0.062
OLF	0.006	0.001	0.993	**OLF**	0.003	0.001	0.996
	U61 M				U61F		
E	0.977	0.014	0.009	**E**	0.914	0.015	0.071
UE	0.014	0.971	0.015	**UE**	0.005	0.913	0.082
OLF	0.001	0.002	0.997	**OLF**	0.001	0.002	0.997
	U66M				**U66F**		
E	0.986	0.008	0.006	**E**	0.939	0.011	0.050
UE	0.014	0.966	0.020	**UE**	0.006	0.946	0.048
OLF	0.000	0.001	0.999	**OLF**	0.001	0.001	0.998
	U68M				**U68F**		
E	0.986	0.008	0.006	**E**	0.940	0.010	0.050
UE	0.006	0.985	0.009	**UE**	0.009	0.972	0.019
OLF	0.001	0.002	0.997	**OLF**	0.000	0.001	0.999

Note: U-M-Urban Male, U-F-Urban Female, E-Employment, UE-Unemployment, OLF-Out of Labour Force.

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Health Care in India: Evaluation of Health Insurance in India using NSS Data

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Abstract

Aiming towards Universal health coverage has been one of the agendas envisaged in the 12th five year plan. In this backdrop, the Central Government has commenced various health insurance programmes to improve the coverage across the country and take on the astounding state of healthcare. The Union Cabinet announced Ayushman Bharat recently. With the exception of 3 states, all other states and union territories have entered into the MoU with the Government to implement the scheme.

In this context, this paper intends to study the previous insurance coverage schemes launched by the Government of India using the NSS Data. Using nationally representative NSSO data at the individual level, for the period 2004 to 2014, it provides a linkage of the existing insurance schemes on the twin aspects of access to health care services i.e. affect on health care demand and financial protection. The 71st round of NSSO (2014) is the first comprehensive survey conducted post the launch of various health schemes initiated by the Government. The health seeking behaviour shows a positive trend in reporting ailments with a rise in hospitalization among rural females. The effect of insurance schemes is visible through higher probability of being hospitalized in the presence of insurance. Utilization of private care is higher among those covered by insurance programmes. However, expenditures do not reflect a drop, which presents the restricted impact.

Keywords: Health Care, Ayushman Bharat, OOP, NSS Data 60th and 71st Round.
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1. Introduction

Health status of individuals in a country is linked to the economic growth of a nation, as it relates to the livelihood generating capacity of an individual. Given its importance, it is included in the Sustainable Development Goals (SDG-3). The Draft National Health Policy (DNHP) 2015 highlighted the linkage between economic growth and health condition of individuals. It aimed to increase public expenditure on health to 2.5 percent of the GDP and reach higher levels of achievable health levels.

The significance of a comprehensive healthcare system was realized 38 years back when India's first National Health Policy (NHP, 1983) was introduced. It envisaged provision of comprehensive Primary Health Care Centres (PHC), along with community participation. Following this, NHP 2002 gave out goals of eliminating various diseases like polio, leprosy etc. and increasing expenditure in public health infrastructure.

The NHP 2017 had been the third health policy of India, to provide direction to the healthcare system in the country. The huge development of health industry accompanied by high out of pocket expenditures, leading householdsto poverty, are the major issues which the NHP 2017 considered. It aimed to provide Universal Health Coverage (UHC) to all following the principles of equity, affordability and universality. Emerging as a pathway to better health care in the country, it placed emphasis on increasing the expenditure on health to 2.5 percent of the GDP; given that allocation on healthcare in the central budget is representing a decline. The idea of UHC is to provide health assurance to all and making healthcare an entitled provision.

In 2018, the government announced the Ayushman Bharat Scheme to achieve UHC. It involves two sections; first involves setting up of health and wellness centres and the second relates to the insurance scheme 'Pradhan Mantri Jan Arogya Yojana' (PMJAY). It aims to cover 10 crores poor and vulnerable households (approximately 50 crores individuals) by making a provision of 5 lakh rupees per household for secondary and tertiary care. The scheme would subsume the ongoing RashtriyaSwasthyaBimaYojana, programme operational since 2008 and aims to expedite the process towards achieving UHC and SDG 3. The scheme is being implemented in all states and union territories, barring Delhi, Odisha and Telangana. West Bengal has also recently (January 2019) opted out of the scheme. The government funded health insurance programme involves first purchase of insurance from health insurance companies and consequently, purchase of healthcare services from public and private providers.

1.1 Health Care Access and Expenses in India

In India, the health care expenses per capita (current USD) have increased from 27$ in 2004 to 75$ in 2014 (World Bank Database)[1]. This is attributed to the rising costs in the health care industry due to the rapid influx of technology and growth of the private

sector. DNHP 2015 reports this compounded average growth rate (CAGR) to be 15 percent, which is twice the rate of growth of all other services. The data by National Health Accounts 2013-2014 shows that India's spending on health care is mere 4.02 percent of the GDP, of which the government health expenditure is 1.15 percent of the GDP. Individual households bear 69.1 percent of the current expenditure as out of pocket expenditure (OOP)[2].

High expenses on healthcare works have been an obstacle to attempt to reduce poverty by reducing the disposable income of the poor households (NHP 2015). Healthcare expenses now are considered one of the major triggers of impoverishment in developing countries but also elsewhere (Van Doorslaer et al. 2006).

The low spending by the states is seen as a reason for high out of pocket expenses by the individual's. Recognizing the importance of government intervention in health care, National Health Policy 2017 propounded equity, affordability and universality as its three main components. The policy emerges as a pathway for Universal Health Coverage. Acting upon the condition of high expenses and poor health indicators, the policymakers have also initiated various health care programs.

1.2 Health Care Provision Models

Worldwide there are two economic models being followed to provide health care services. The first is a pure public health care system providing services at no cost to all citizens. The private sector could pitch in to fill any gaps, which the public health infrastructure is not able to fulfil. The public infrastructure setup suffers from the problems of long queues; lack of proper infrastructure, absenteeism etc. and its utilization has remained low for the treatment of chronic diseases across states.

The second model is delivery of 'defined services' by any health care provider (regardless of being public or private) with a fee being charged. This fee would be then paid for by the government instituted insurance schemes. The Ayushman Bharat Scheme is a version of the second model. The programme involves two components; the first is purchase of insurance from health insurance companies and the second involves purchase of health care services from public and private health care providers. The insurance financing provision is associated with a market failure, preventing a competitive outcome. Sujatha Rao (2004) stresses that the priority being given to insurance in health can be attributed to the idea of increasing the demand for private and corporate hospitals, so that their returns can be maximized.

India is moving towards the second version through the PMJAY scheme. There is an emphasis on insurance based financing and dilution for tax based insurance. The coverage of health insurance in India has gone up from 45.9 million individuals in 2004-2005 to 296.8 million individuals in 2009-2010 (Ravi and Bergkvist 2015). The public

health insurance schemes have increased enrolment, but their purpose is justified if they contribute to reduction in the out of pocket expenditures of the households. Financial protection in terms of insurance coverage remains low. Despite a large number of insurance based schemes at the state and central level, the coverage remains weak and fragmented. Traditional schemes like Central Government Health Scheme (CGHS) and Employee State Insurance Scheme (ESIS) cover only a handful of formal sector workers. Other insurance schemes provide coverage for hospitalization but not for outpatient services and medicines. High frequency-low cost outpatient treatments lead to drip-by-drip expenses on medicines which collectively lead to high out of pocket expenditures.

The rolling out of insurance schemes by the government needs to be reviewed since they are mainly focused on inpatient care while it has been found that the overall financial burden and aggregate impoverishing effect is higher in the care of non-hospitalized treatment. This paper thus, evaluates the healthcare schemes already in operation namely RSBY and the state insurance schemes using NSS Data (60^{th} and 71^{st} Round). First a comprehensive literature review is done followed by empirical work using disaggregated NSS Data. A binary response model brings out the relationship between health care and health insurance demand (how does presence of insurance affect access to hospitalization) and a pooled OLS is run to estimate the effect of insurance schemes on out of pocket expenditures (capturing the outcome of insurance implementation).

2. Literature Review

In India, households are contributing 71.13 percent of the total health care expenditures, forcing them to remain stuck in poverty. If health care expenses are reduced, households could increase their non-medical expenses which would improve their standard of living (as these expenses are considered synonymous with household welfare) (Berman et al. 2010). High OOP is also present due to private provisioning of health care for profit motive. It is regarded as a regressive form of financing healthcare (Sengupta et al. 2017). OOP has led 39 million people in India to go below poverty line in 2004-2005 and more than 80 percent of OOP is shared by the private sector (Selvaraj and Karan 2009).

Based on a comparison across income quintiles, Gupta and Trivedi (2005) report that it is the poor individuals who do not seek care when they are ill. Only 9 percent among the rich (highest quintile) and as high as 24 percent among the poor (lowest quintile) do not use health care services when sick. Women in higher income groups (richest quintile) were 6 times more likely to use institutional delivery systems than those in lower income quintiles. Utilization of health care services presents inequality by caste as well. The immunization rates coverage for Scheduled Tribe and Scheduled Caste has been 31.3 percent and 39.7 percent (2005-2006) while for other castes it's 53.8 percent. The burden of healthcare is higher for people in rural areas and expenses on medicines contribute as

the biggest burden, further exacerbated by the inefficient controls on prices of medicines (Balarajan et al. 2011).

Inequality across Indian states in the service delivery in public hospitals and healthcare financing is shown by Balarajan et al. (2011) using 3 rounds of NFHS data. They report that expenditure on public health per person varies among states ranging from Rs. 93 in Bihar to Rs. 630 in Himachal Pradesh, almost seven times higher (2004-2005). The country's average is found to be Rs. 268 (Balarajan et al. 2011, Kumar et al. 2011). Measuring inequality by per capita expenditure across states, the coefficient of variation has increased from 0.19 to 0.26 between 1993 and 2008 (Rao and Choudhury 2012). The inter-state inequality is evident by the large gap between the spending on health care and the required amount to be spent. There is a need to increase the transfers of Central Government to lacking states to "offset their fiscal disabilities" (Choudhury 2014). The differences in health expenditures across states reveal that southern states are better off than northern states.

The enrolment under the health insurance schemes is higher in better off villages where there is lesser number of BPL families. Insurance (RSBY) is positively related to availing of private care facilities with Bihar, Madhya Pradesh and Rajasthan reporting 100 percent enrolment in private care (Prinja et. al. 2017). Having insurance is positively related to demanding hospitalization care (Ravi et al. 2016).

The impact of health insurance schemes has been tested by Hooda (2015) using NSS data for 60^{th} and 68^{th} rounds using a case control approach. To finance 40 percent of the hospitalization cases, the major sources of finance were found to be income/savings (48 percent), followed by borrowing (33 percent) and help from friends (12 percent), in 2004-2005. Health Insurance (HI) coverage provided reimbursement for 4.1 percent of the total spending. The health insurance initiatives of the government have been successful to increase the access to hospitals for inpatient care, however they have majorly failed to reduce the costs associated with it (mean hospitalization cost).

Oxfam (2011) report highlights a similar failure of health insurance. Using a primary survey data of 5 states, it was reported that where there was presence of insurance, the OOP expenditures of the households increased twofold (during 2004-2010). Tamil Nadu had the highest increase in OOP, despite it being lauded for a good public health care system. It is pointed out that, for the poorest households, the need is to provide a network of healthcare facilities rather than enrolment under any health insurance scheme (Hooda 2015).

Selvaraj and Karan (2012) do an impact evaluation of the various health insurance schemes launched post 2003, in reducing the financial risk of households using the consumer expenditure survey (CES) of NSS 2004-2005 and 2009-2010. Using a pre and

post insurance approach, they divide the districts as intervention districts and non-intervention districts. A decline in the share of household expenditures on health is seen in 2009-2010 owing to a fall in outpatient expenditures. They have been falling in both covered and non-covered districts. Inpatient expenses have increased, as a share of total household expenditure. The breakup of OOP expenses shows that one-third of the OOP expenses are on hospitalization while the remaining are outpatient and expenses on medicines. Per capita OOP expenses have increased over the 5 years, along with the number of households incurring catastrophic expenditures (specifically those with hospitalization cases). The insurance schemes mainly provide coverage for hospitalizations.

Breaking down the impact of insurance schemes it is shown that health care expenses have been on rise in the districts covered by insurance schemes. Districts covered under RSBY have a higher percentage of households reporting catastrophic expenses. Analysis across income quintile groups reveals that lower income groups in covered districts have had a rise in the number of households reporting catastrophic expenditures.

With the CES of NSS, the authors show that the publicly funded health insurance schemes have failed to deliver protection to households from financial risks. They report that the provision of healthcare has been turned into another poverty reduction programme. The insurance schemes do not focus on primary care facilities. There is mushrooming of the private sector and the insurance schemes have acted like an 'open ended cheque' by the government to the private care centres. Government has abandoned its own role of providing health care to all.

The failure of government health insurance schemes is also indicated by Ravi and Bergkvist (2015) conducting an impact analysis of various health insurance schemes. Similar to Selvaraj and Karan (2012), they use difference in different methodology to study the impact of insurance schemes. Using CES of NSS, they analyse the impact on household expenses, on changes in the access to healthcare services. Three indicators, namely OOP impoverishment; household's consumption net of health care expenditures goes below poverty line, catastrophic health expenditures; health spending relative to household's own aggregate consumption expenditure and poverty gap index; average distance from the poverty line are studied in the districts where the schemes were implemented and have existed for at least a year.

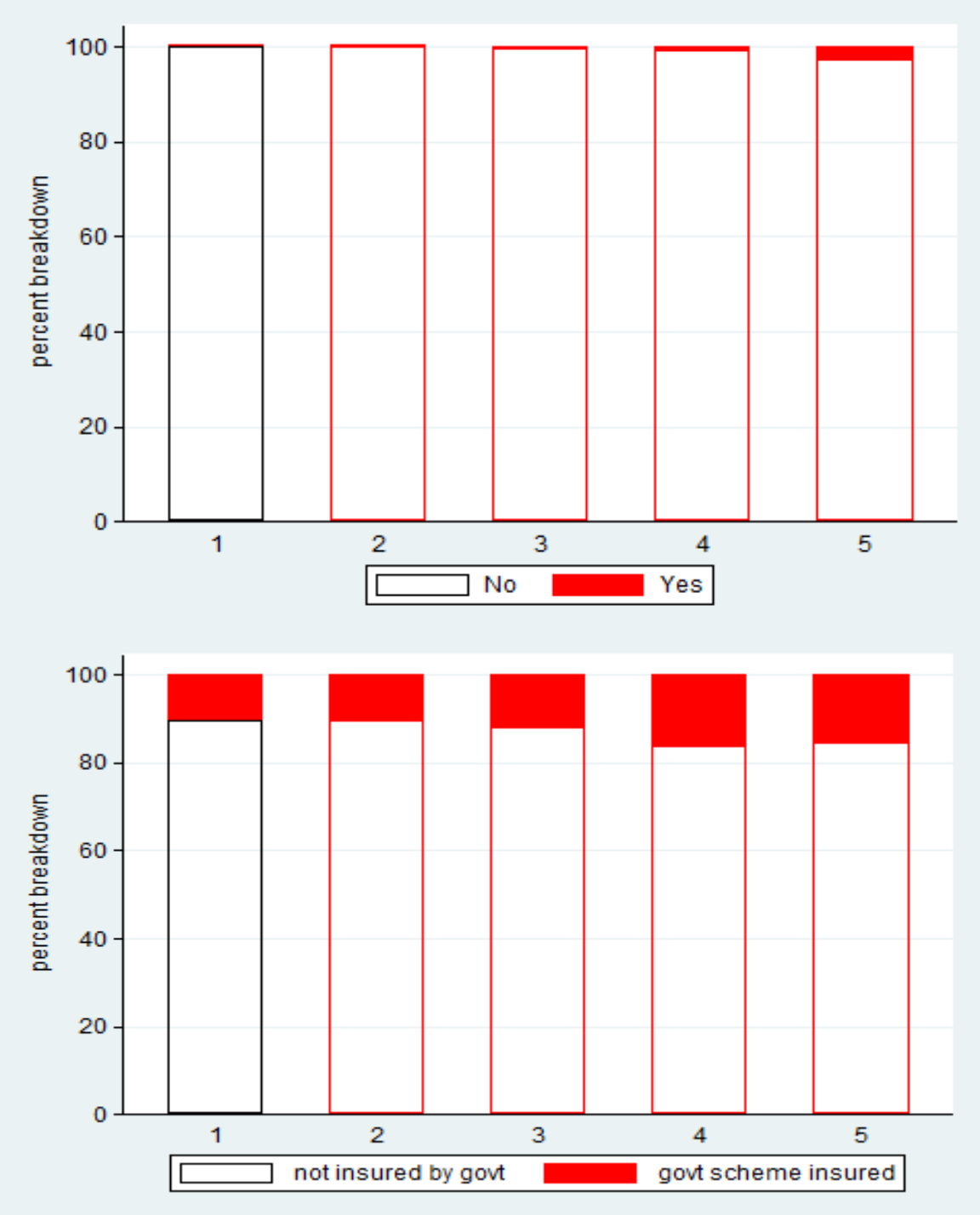
There has been a fall in the impoverishment suffered by households on account of health care expenses. Catastrophic headcount has gone up for hospitalization cases and stayed high even after a year. Overall, using regression analysis they report a failure of Government health insurance schemes in providing financial assurance.

With the NSS data of 60th and 71st round, Ravi et al. (2016) bring out the impact of various Government sponsored health insurance schemes. Being insured increased the probability of being hospitalized (17 percent in government care and 8 percent in private care). However, the costs associated with hospitalization have been on a rise, falling majorly as an OOP expense on the households. Inpatient expenditures visibly increased in the last decade without much change in the outpatient expenses. Catastrophic health expenses (as defined previously by Selvaraj and Karan 2012) have gone up noticeably. Savings and income are found to be major sources of financing health care. These results by the authors point towards the less than expected impact of insurance schemes on reducing health care costs of individual households. Hospitalizations have gone up and access to services has increased but in terms of costs, the situation is still bleak. However, in terms of access to services there has been a positive impact. A positive effect of Aarogyasri scheme on OOP expenditures is reported by Fan et al. (2012) by using CES data of NSS.

3. Data and Methodology

To study the health care situation in India, NSSO data for the 60th (2004) and 71st (2014) round is used for the analysis. All the analysis is done after taking into consideration the appropriate NSS Multipliers. Merely 0.74 percent of individuals had insurance enrolment in 2004 while in 2014, 12.32 percent of individuals had Government insurance. Government insurance schemes in the data include the RSBY, state insurance schemes and the premium CGHS and ESIS. In 2004, insurance was majorly among the highest income quintile groups with 72 percent of those insured in the fifth income quintile. In 2014, the percentage is not skewed towards the highest income quintile, instead only fairly equally distributed. Figures 1 & 2 below provide insurance enrolment in 2004 and 2014, disaggregated by MPCE Quintiles.

Figure 1: Insurance Enrolment by MPCE Quintile Classes in 2004 and 2014



Source: Author's Calculation using NSS Data

3.1 Methodology

A descriptive analysis of two rounds of NSS Data is first done followed by regression analysis. The following regressions are estimated following Ravi et al. (2016):

1. Logistic regression of hospitalization (government and private) to analyse the health seeking behaviour and insurance association at the individual level.

$$\Pr(y_i = 1) = \alpha_0 + \alpha_1 Govt.Insurance + \alpha_i X_i + \varepsilon_i$$

2. Pooled OLS regression (by appending the two rounds of NSS Data) to analyse the insurance and OOP expenditures (for hospitalization only) association at the household level, so as to capture the association of Government health insurance with out of pocket expenditures. Following equation is estimated similar to Karan et al. (2014) and Ravi et al. (2016):

$$\log(y_{it}) = \beta_0 + \beta_1 Govt.Insurance + \beta_2 Year + \beta_3 Govt.Insurance * MPCE\,Qunitile + \beta_i X_{it} + \varepsilon_{it}$$

The log of out of pocket expenditures is taken to counter the high variability in the dependent variable. Consequently, the number of observations is reduced since households with zero out of pocket expenditures are dropped.

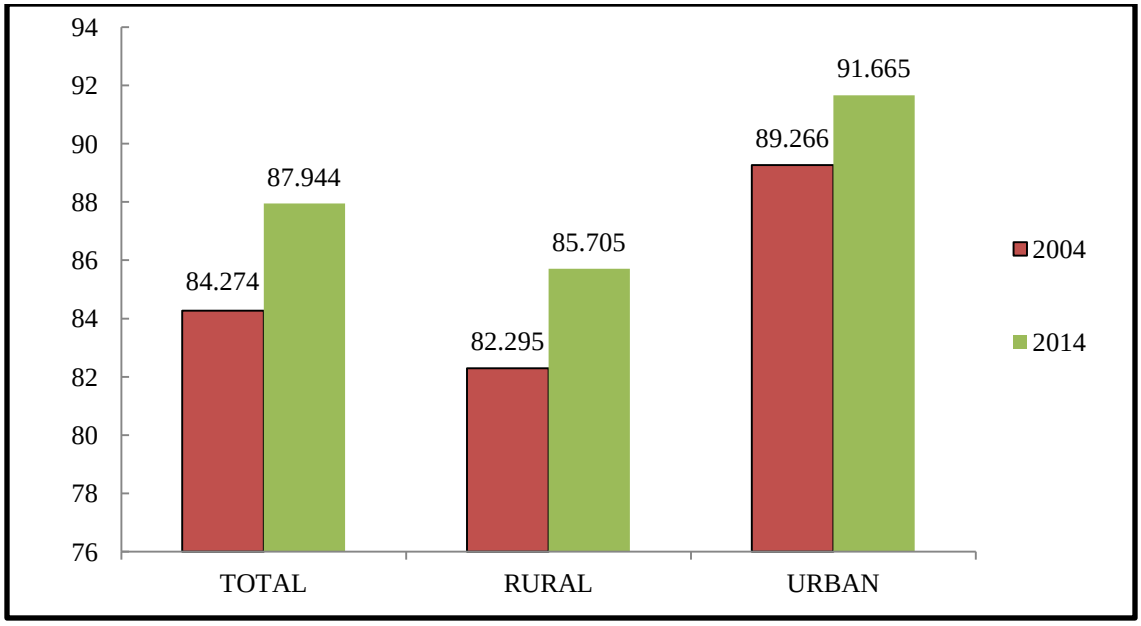
4. Results

4.1 Descriptive Analysis

4.1.1 Health Seeking Behaviour of Individuals

There has been an improvement in the health seeking pattern in 2014 where the number of individuals failing to get treatment on medical advice has gone down. An increase of about 3.70 percent (or 3.67 percentage points) from 2004 to 2014 in seeking treatment on medical advice shows a positive trend. The improvement has been predominantly higher in urban areas than rural areas. Union Territories and North-Eastern states have higher improvement in urban areas.

Figure 2: Percentage of People Seeking Treatment on Medical Advice



Source: Author's Calculation using NSS Data

Union Territories have higher percent of people seeking medical care than All-India levels with Chandigarh having 100 percent of its ailing population seeking treatment in 2014. Further disaggregating treatment on medical advice at outpatient and inpatient levels in 2014; the number is higher for inpatient treatment. Some of the North Eastern states (Nagaland, Manipur, and Mizoram) and union territories (Chandigarh, Daman & Diu, Lakshadweep, Pondicherry and A & N Islands) have 100 percent of the ailing individuals availing medical advice for inpatient treatment.

The reason for not seeking medical care is attributed increasingly to ailment not considered serious, rather than the expected financial constraint/expensive medical care. In 2014, financial constraint acting as a block to access to health care has reduced, which can be attributed to either higher income levels and hence the increased affordability for access to health care facilities or Government/employer support in health care expenditures by way of insurance or subsidized care.

For treatment of ailments, Government care facilities were utilized by 25.55 percent of individuals in 2014 and 23.11 percent in 2004. An increase in utilization of government care facilities by 2.44 percentage points over the decade is realized. However, private doctors and hospitals still remain the key source for availing health care, with 75 percent individuals still availing of private services in 2014. Moreover, this number is likely to be underestimated because NSS data marks individuals seeking both Government and private care to be utilizing Government care (Ravi et al. 2016).

Individuals accessing outpatient care make use of private facilities far more than individuals availing inpatient care. In 2014, 75 percent of outpatient care individuals opted for private health care facilities while among the inpatient individuals, 67 percent made use of private care facilities. Most of the national health insurance schemes provide coverage for hospitalization, leaving out outpatient care which points to the difference in utilization mentioned above.

Government health care facilities are not considered to be providing satisfactory quality and hence there is reduced preference for it. Lack of faith in government facilities has led citizens to approach private doctors and hospitals for medical care. The data cites unsatisfactory government care facilities as the focal justification for not availing them (42 percent in 2014; 48 percent in 2004). Long waiting (2014) and government health care centres being too far (2004) have been other predominant reasons, besides poor quality, which deter individuals from seeking Government care.

The health seeking pattern shows that individuals not taking treatment on medical advice have reduced after 2004. Treatment without medical advice is higher for outpatient ailments. Expensive medical care is less of a problem in 2014, while ailment not considered serious is the primary reason for not seeking medical care. Utilization of Government care facilities has increased but private care is still dominant in providing health care (especially for outpatient care).

Further, disaggregating the health seeking behaviour at inpatient and outpatient levels it is seen that the proportion of individuals hospitalized has increased over the years. Cases of hospitalization are higher in urban areas than rural areas for the entire period although the rate of increase is higher in rural areas. Across states, the percentage of people hospitalized has been the highest in Kerala with higher inpatient treatment in rural areas than in urban areas. This is followed by union territories namely Lakshadweep, Pondicherry, and A & N Islands.

The spurt in growth is attributed to the significant increase in the number of females hospitalized in 2014, especially in rural areas. 6 percent of females were hospitalized in 2014 vis-à-vis 3 percent of males. Females' reporting of ailments (outpatient and inpatient) had always been higher, but the access to hospitals has moved up significantly only in 2014. Utilization by type of health care units shows that the primary burden of inpatient care is borne by private care facilities; which have been accessed more appreciably, than public health care units. This difference is observed higher in urban areas, than in rural areas.

Table 1: Type of Hospital Accessed for Hospitalization (2004-2014)

Type of Hospital	2014	2004
Public care	45.41	40.63
Private care	54.59	59.37
Total	**100**	**100**

Source: Author's Calculation using NSS Data. Public Care includes HSC/ASHA/AWW, PHC/Dispensary and Public Hospital for 2014. For 2004, Public Care includes Public Hospital and Public Dispensary. Private Care implies Private Hospital.

Utilization of public health care facilities for inpatient care has increased by 5 percentage points during the last decade (2004-2014), however; dominance of private care is still there.

An inter-state analysis across years, albeit depicts a different scenario than all-India figures. Hospitalization in public hospitals is higher for North Eastern states and some union territories (A& N Islands, Chandigarh, and Lakshadweep), rather than aligning with the all-India figures of higher private care access (1995, 2004 and 2014).

The utilization of private hospitals for inpatient care is also high due to the insurance provision. Hospitalization frequency is higher among the insured individuals than those without any insurance coverage over the 20 year period.

Table 2: Inpatient Care by Type of Hospitals for Insured Individuals

Type of Hospital	2014	2004
Public	43.74	32.61
Private	56.26	67.39

Source: Author's Calculation using NSS Data

4.1.2 Health care expenses, Reimbursement and Burden of Health Care Services

The number of individuals enrolled under any health insurance programme (public or private) has increased over the years (Figure 1& 2 above). Clearly, the Government schemes are to be attributed for the manifold rise in insured individuals. Insurance coverage has been higher in urban areas than rural areas across the three rounds of data. Thus, the burden of health care on individuals has reduced over time as presented by the increase in insurance coverage. States which have launched their own health insurance schemes in addition to the national health insurance schemes have a higher number of individuals covered presenting reduced burden on their citizens.

In 2014, the enrolment under insurance schemes can be further disaggregated as government schemes and private or employer provided insurance. It is observed that more than 80 percent of the insurance coverage is provided by government sponsored health insurance schemes (All-India level). Among major states, Rajasthan (98.76),

Orissa (92.7), Madhya Pradesh (96.18), combined Andhra Pradesh (96.97) and Goa (99.48) have more than 90 percent of insurance coverage under government schemes. Jammu & Kashmir, Haryana, Gujarat and Karnataka have higher percentage of enrolment under private/employer sponsored insurance schemes in 2014 at 52.53 percent, 44.74 percent, 50.14 percent and 50.71 percent respectively.

The trends of medical expenditure must change due to increasing insurance provision. The costs, however, also include a change in the level of prices over the years. Average medical expenditures for inpatient care have been consistently higher in urban areas than rural areas over the years and the difference has been increasing. The price index for urban areas is higher than that of rural areas and some of the difference is explained by that. The rising expenditures of health care may also be attributed to the increasing insurance coverage. With their benefits of improving access to health care, insurance schemes are also pointed out to be raising the costs of healthcare manifold (Hooda 2015). Research by Oxfam (2011) also indicated that districts which had enrolees under any insurance coverage have higher out of pocket expenses.

The major source of finance for hospitalization expenditures has been households' savings and income with 73.85 percent of the individuals using it to handle expenses (2014). It is surprising that though insurance provision has increased over the period, the percentage of expenses being financed by income and savings has also increased. It was 53.71 percent in 2004. Income and savings have a greater role in urban areas vis-à-vis rural areas.

Borrowing to finance hospitalization expenses is higher in rural areas than urban areas across the 2 rounds of data. In 2014, 22 percent of individuals financed expenses by borrowing in rural areas while 17 percent did in urban areas. Previously, the difference was greater with borrowings in rural areas at 38 percent while in urban areas it is 23 percent in 2004. For outpatient expenses as well, household income and savings is the major source of finance for individuals and the percentage of households is higher than those for inpatient expenses. 71.23 percent and 89.6 percent of individuals financed their outpatient expenses using their income and savings in 2004 and 2014 respectively.

Thus, provision of insurance (especially under publicly financed schemes) has increased over the years with a considerable increase after 2014 presenting a possible reduction in healthcare burden of individuals. Andhra Pradesh is the major state with 62 percent of its population now covered by insurance. Expenditures for medical care have also gone up. It is worth noting, that despite increase in insurance coverage, household savings and income is still the primary source of financing healthcare expenditures.

The trends of health care utilization and provision, expenditures were analysed in this section. It is seen that the burden of healthcare on savings and income of the households has gone up, along with insurance coverage. There is also an increase in healthcare

expenditures. It remains a question to seek as to what is determining the pull in different directions in healthcare financing and reimbursement.

4.2 Regression Analysis

4.2.1 Hospitalization (Demand for Inpatient Care) and Insurance: Individual level

Insurance is expected to affect the demand for hospitalization or the health seeking behaviour of individuals. Since insurance schemes are targeted towards hospitalization, only demand for inpatient care was looked at.

A cross tabulation of insurance and type of hospitalization reveals that in 2004, the insured individuals seeking hospitalization were similar in government and private care with a slightly higher percentage in private care. However, in 2014 the percentage of insured individuals accessing hospitalization in public care was higher than those who accessed private care. Insurance schemes in 2014 are related to increased access to government health care services.

Further, a logit model is used to analyse the probability of hospitalization with respect to insurance status. Hospitalization is further divided into government and private hospitalization. The data for 2014 allows a division for private and government insurance as well.

The logistic regression for insurance status gives us the predicted probabilities of being insured, conditional on the explanatory variables. The predicted probabilities are interpreted following Torres-Reyna (2014). The predicted probability of being hospitalized, with insurance as predictor, reveals that insurance increases the probability of seeking healthcare. Probability of being hospitalized is higher among the insured individuals vis-à-vis those not insured.

Table 3: Predicted Probability of being Hospitalized, Insurance as Predictor

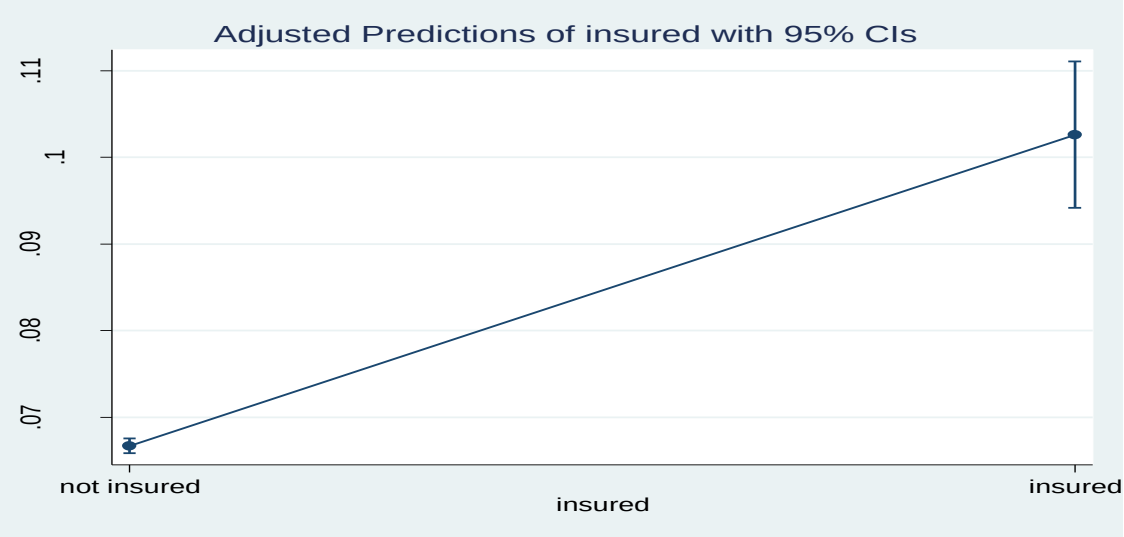
Year	Insured	Not Insured	Difference
2004	0.102	0.067	0.035
2014	0.146	0.120	0.026

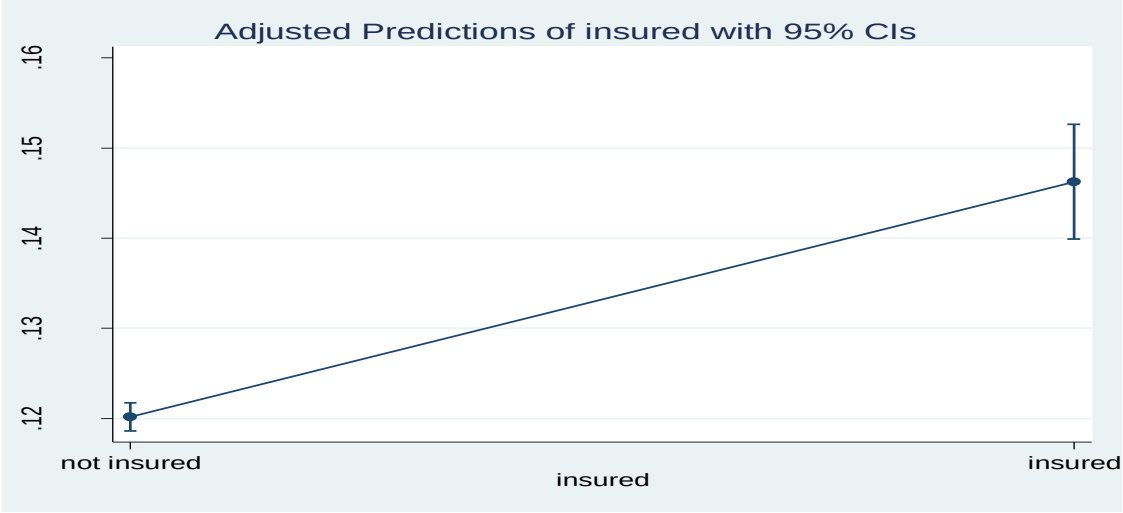
Source: Author's Calculation using NSS Data

Probability of being hospitalized among the insured rises in 2014. It is higher among the insured vis-à-vis those not insured, across the decade.

The logit model is run with following independent variables besides the binary insurance variable: Sector, Social Group, Religion, Sex, Age Category, MPCE Quintiles, Marital Status, Occupation type (only in Round 60), Education Level and State Fixed Effects. They are not reported here.

Figure 3: Predicted Probability of Hospitalization in 2004 and 2014





Source: Author's Calculation using NSS Data

Table 4: Insurance and Hospitalization, 2004

VARIABLES	(1) Hospitalization logit coefficients	(2) Govt. Hospitalization logit coefficients	(3) Pvt. Hospitalization logit coefficients
Govt. Insured=1	0.330***	0.373***	-0.0251
	(0.0599)	(0.0980)	(0.0853)
Odds Ratio	1.390***	1.451***	0.975
Observations	382,836	382,828	382,836

Source: Author's Calculation using NSS Data.

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 Model is run with State Fixed effects, coefficients are not reported.

Table 5: Insurance and Hospitalization, 2014

Variables	(1) Hospitalization logit coefficients	(2) Govt. Hospitalization logit coefficients	(3) Pvt. Hospitalization logit coefficients
Govt. Insured = 1	0.126***	0.258***	0.0112
	(0.0167)	(0.0245)	(0.0233)
Odds Ratio	1.133***	1.294***	1.011
Pvt. Insured = 1	0.113***	-0.339***	0.168***
	(0.0296)	(0.0616)	(0.0354)
Odds Ratio	1.119***	0.712***	1.183***
Observations	333,061	333,061	333,061

Source: Author's Calculation using NSS Data

The results reported are logit coefficients. For analysing the differences in the probabilities of categorical variables, odds ratio is used. Odds ratio gives a relative measure of effect, enabling a comparison of the intervention category with the reference category.

In 2004, similar to descriptive analysis, Government insurance was a significant variable in Government hospitalization and total hospitalization. It is not a significant variable in affecting private hospitalization. Being covered under government insurance increases the odds of being hospitalized (in any type of care) by 40 percent compared to those who are not insured. The odds increase to 45 percent in the case of Government hospitalization. The odds of hospitalization increase with a rise in income levels. For Government hospitalization, income quintile is not a significant variable. Presence of Government insurance reduces the odds of being hospitalized in private care; the variable is not significant though. Similar to total hospitalization, the odds for inpatient private care are higher for those in higher income groups.

In 2014, the data allowed for bifurcation of Government and private insurance schemes. The presence of Government insurance is related to increasing the probability of being hospitalized in Government care while private insurance is negatively related to hospitalization in Government hospitals. Both types of insurance are significantly affecting the hospitalization behaviour among individuals. The odds of those having Government insurance are 13 percent higher for hospitalization, than those not insured. The percentage is 12 percent in the case of private insurance.

Government insurance increases the odds of being hospitalized in private care but is not a significant variable in determining private hospitalization. Thus, the presence of government insurance schemes raised the probability of accessing hospitals for inpatient

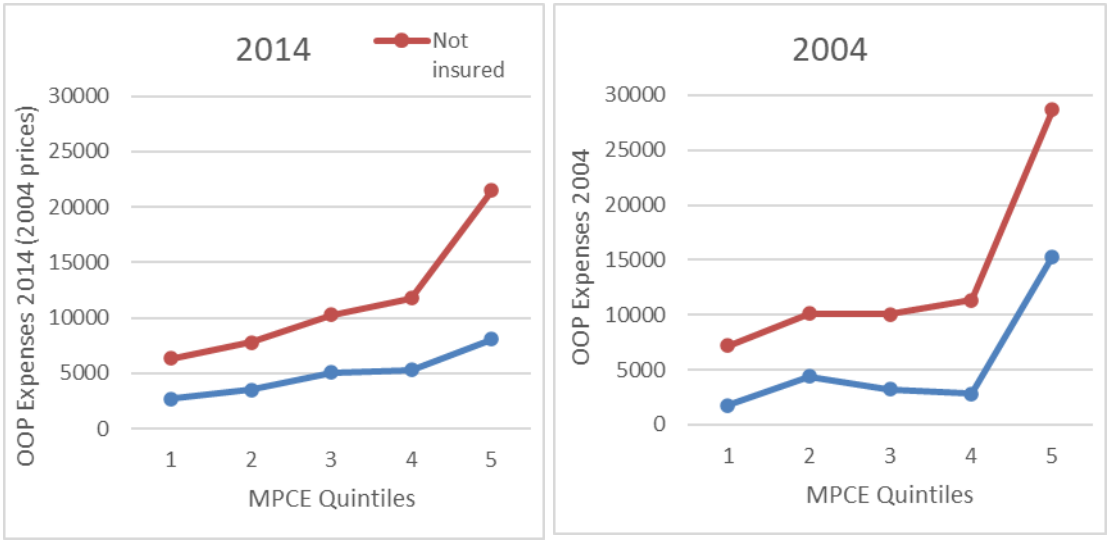
care. By social group, it has increased the access to Government hospitalization for SC, ST and OBC compared to other castes. Analysis by income quintiles reveals that the highest income quintile has lower odds of being hospitalized in government care, and monthly per capita expenditure (MPCE) is not significant for the highest income quintile.

Enrolment in private insurance schemes as compared to enrolment in government insurance schemes increases the odds of being hospitalized in private care by 18 percent.

4.2.2 OOP Expenditure and Insurance: Household Level

The out of pocket expenditures for 2014 have been deflated to 2004 prices using the Consumer Price Index for Industrial Workers (CPI-IW General). A comparison across insurance categories brings out that among the insured, expenditures for hospitalization have come down in 2014. This may be attributed to the fact that insurance schemes in 2014 include those households who are below the poverty line. Their lower expenditures bring down the average out of pocket expenditures in 2014.

Figure 2: Average Out of Pocket Expense by MPCE Quintiles, 2014 (2004 prices) and 2004



Source: Author's Calculation using NSS Data

Table 6: Average OOP Expenditures (Rs.), for those Hospitalized (2004 prices)

2004					2014			
MPCE Quintile	**Total**	**Insured**	**Not Insured**		**MPCE Quintile**	**Total**	**Insured**	**Not Insured**
1	5423.59	1763.86	5426.46		**1**	3523.70	2713.10	3633.84
2	5739.07	4384.30	5741.47		**2**	4174.29	3508.10	4271.25
3	6826.53	3214.71	6844.96	**1**	**3**	5197.64	5049.08	5222.93
4	8450.75	2829.16	8506.05		**4**	6251.46	5309.24	6446.06
5	13431.37	**15299.78**	**13373.55**		**5**	12409.32	8039.09	13452.09
Sector					**Sector**			
Rural	7828.22	6217.74	7834.29		**Rural**	5670.38	5041.51	5786.94
Urban	11244.76	**13191.66**	**11179.21**		**Urban**	9124.57	6643.96	9568.67
Social Group					**Social Group**			
Scheduled Tribe	4857.65	8808.04	4790.96	**2**	**Scheduled Tribe**	4077.17	3022.88	4362.86
Scheduled Caste	6212.31	5269.63	6226.91		**Scheduled Caste**	4673.24	4062.38	4789.48
OBC	8618.05	**21449.03**	**8494.07**		**OBC**	6778.05	5987.19	6936.40
Others	11238.24	8397.06	11280.70		**Others**	8915.38	7180.16	9147.26

Source: Author's Calculation using NSS Data. Sample size is restricted to those who had expenses greater than zero. OOP expenses are net of reimbursement.

A descriptive analysis of out of pocket expenditures presents lower expenditures in 2014. In 2004, expenditures were higher in urban areas and those in the highest income quintile among the insured vis-à-vis not insured individuals. In 2014, expenditures among the insured are lower across all categories.

A gendered analysis presents OOP expenses to be higher for men than women, both under insured and not insured category. Further, a pooled OLS is carried at the household level data.

Table 7: Out of pocket Expenditure and Insurance Status, pooled OLS Regression at the Household Level

	(1)
Variables	**Pooled OLS, Log OOP**
year = 1(2014)	-0.209***
	(0.0116)
Sector = 2, Urban	-0.0936***
	(0.0122)
Religion = 2, Islam	-0.163***
	(0.0173)
Religion = 3, Christianity	0.0744**

	(0.0320)
Religion = 4, Sikhism	0.0856
	(0.0548)
Religion = 5, Jainism	0.250**
	(0.110)
Religion = 6, Buddhism	-0.0506
	(0.0642)
Religion = 7, Zoroastrianism	0.315
	(0.294)
Religion = 9, others	0.156**
	(0.0711)
Social group = 2, Scheduled Castes	0.199***
	(0.0244)
Social group = 3, OBC	0.422***
	(0.0226)
Social group = 9, Others	0.576***
	(0.0230)
Govt. Insured HH = 1	-0.175***
	(0.0544)
5 quintiles of HHexp = 2	0.266***
	(0.0189)
5 quintiles of HHexp = 3	0.435***
	(0.0202)
5 quintiles of HHexp = 4	0.661***
	(0.0191)
5 quintiles of HHexp = 5	1.087***
	(0.0198)
1.gvinshh#2.HHexp5	0.0179
	(0.0741)
1.gvinshh#3.HHexp5	0.0359
	(0.0792)
1.gvinshh#4.HHexp5	-0.0915
	(0.0734)
1.gvinshh#5.HHexp5	-0.272***
	(0.0729)
Constant	7.107***
	(0.0413)
Observations	71,562
R-squared	0.120

Source: Author's Calculation using NSS Data. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.
Note: Model is run with State Fixed effects, coefficients are not reported.

Households with government insurance have lower out of pocket expenditures by 17.5 percent and the variable is significant. A cursory interpretation can seem to represent a positive effect of the Government insurance schemes. However, a further analysis of interacting government insurance with income quintiles brings out that the reduction in out of pocket expenditures is for the highest income quintiles. Compared to the lowest income quintile, households in the highest income quintile with insurance have lower out of pocket expenditures by 27.2 percent. Those in the fourth income quintile have lower OOP by 9 percent.

Across the sector, OOP expenses have been lower in urban areas by 9.3 percent and higher for other castes in the social group vis-à-vis those belonging to Scheduled Tribes.

This result points towards potential success of the CGHS, ESIS insurance schemes of the government which are offered to formal sector employees having a certain threshold income level (Rs 21,000 in case of ESIS). It may be an indicator of success of only the elite comprehensive schemes like CGHS, ESIS, and armed forces insurance schemes (sometimes known as social insurance schemes). Since expenditures of lower income quintiles, among those insured, do not reflect a decline, success of the insurance scheme for the poor i.e. RSBY is contentious.

The analysis of health care demand (i.e. access to hospitalization) and health care expenditures together point towards the limited effect of insurance schemes. Those with government insurance schemes are indeed accessing government hospitals more. However, interaction of government insurance with household expenditure quintiles brings out that among the insured, expenditures for lower income quintiles have been increasing. Since OOP of government insurance holders in higher income quintiles are lower, who are expected to be enrolled in the premium schemes like CGHS, ESIS it can be inferred that the "schemes for the poor households is poor".

5. Conclusion

This paper made an attempt to present the pre-Covid health scenario in India. Data analysis using NSS unit level data studying the health seeking behaviour, morbidity patterns, expenditures on utilization of healthcare services and the changes over the years shows an improvement in health profile with decline in the proportion of ailing persons reporting being ill. An increase in utilization of government care facilities is observed, however, private care still dominates. Southern states have better utilization of healthcare accompanied with higher coverage under insurance programmes as compared to northern states. However, the pattern of better health indicators, higher utilization and coverage; is also accompanied by the corresponding rise in the household savings and income as a source of finance for managing healthcare expenses.

The healthcare system with a mix of both routes (low cost health care and demand side financing) has improved since 2004. There is increasing bias for investment in demand side financing structure as presented by the plenty of insurance schemes introduced in the past decade. However, to tread on the path of universal health coverage, the programmes must have blanket coverage, so as to bring it all under its purview. Outpatient services are not represented in practically most of the schemes which leaves individuals with partial protection.

Econometric analysis reveals that presence of insurance is found to increase the access to hospitals but is not significant in reducing the out of pocket expenditures of households. The financial protection aspect of insurance schemes has been limited.

With these results, the demand side financing model of the Government must be relooked. Government insurance has to be accompanied with an increase in the set up of primary care units. In 2014, lack of proper medical facilities was more of an issue than financial constraint in accessing hospitalization. Supply side impediments cannot be ignored and revival of the public health care system is required. The insurance model can be a supplementary mode to assist, wherever an adequate health care service network is not developed.

A model of statutory health insurance, similar to that of Germany, gives a way forward if the demand side financing structure is to be pursued. Providing insurance coverage to only a few would only aggravate the situation of high costs of healthcare, as increased demand for private care services under insurance schemes would raise the prices of services. Also, with insurance it is recommended that standard treatment protocols should be introduced.

Reviving public healthcare especially primary care is required. The disparity between rural and urban areas in terms of health indicators are to be reduced and consequently, cutting down on programmes like NHM must be reviewed.

The United Kingdom's Health Protection Scheme has been lauded; for it entails components of easy access, efficiency and reduced costs to patients. Covering the entire population, releasing standard protocols and eliminating partial coverage under insurance have been the fundamental elements of HPS. Following this, the National Commission of Macroeconomics and Health had made an attempt by designing a standard health package with estimated costs.

India can follow the UK's example and develop a mechanism to bring about the healthcare delivery through co-ordination between the primary, secondary and tertiary care. A health care model which aims to provide health coverage only to the poor fails to be on the path of UHC. Improving the publicly owned health infrastructure would provide the crucial backdrop to aim for UHC.

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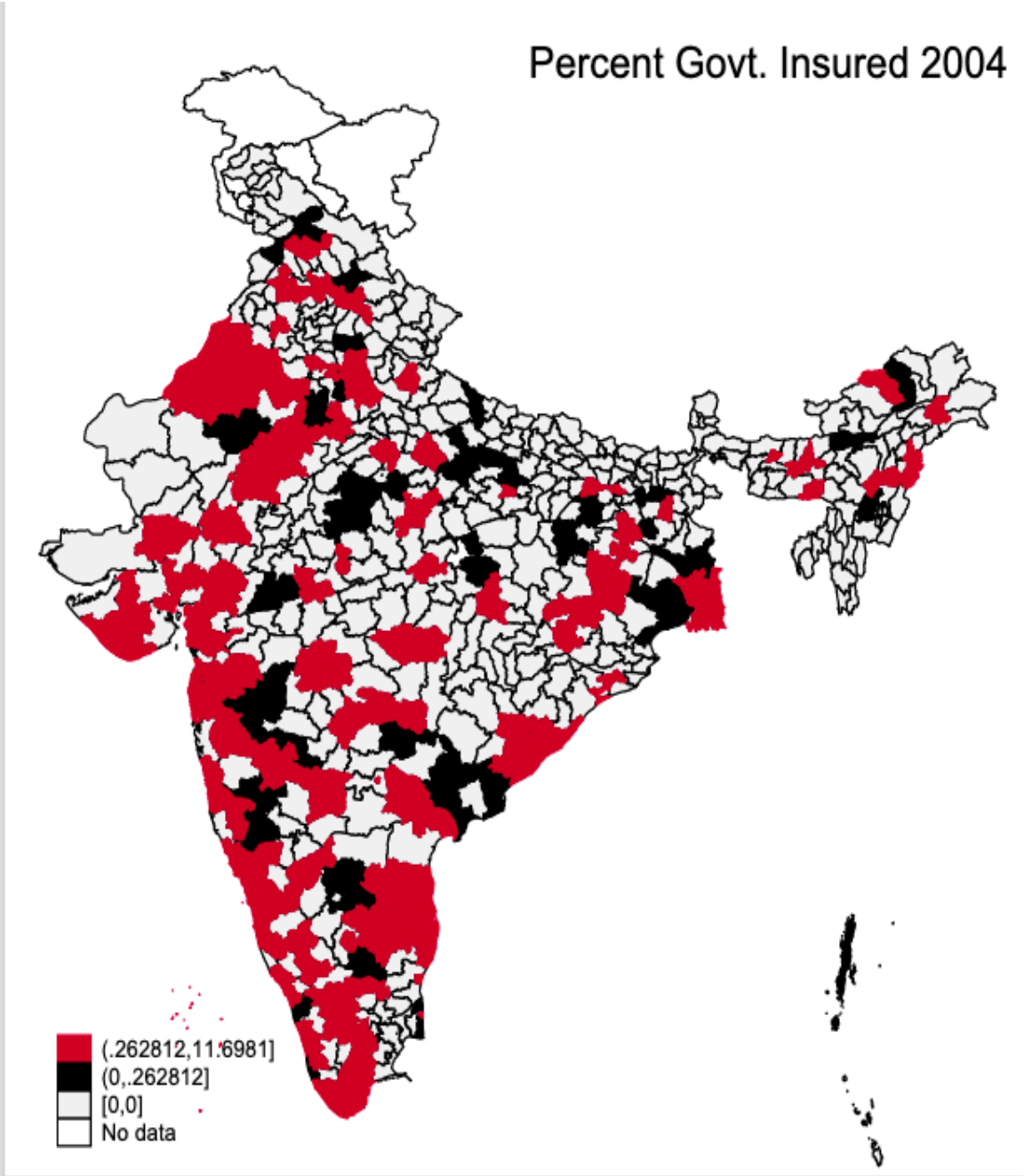
Notes:

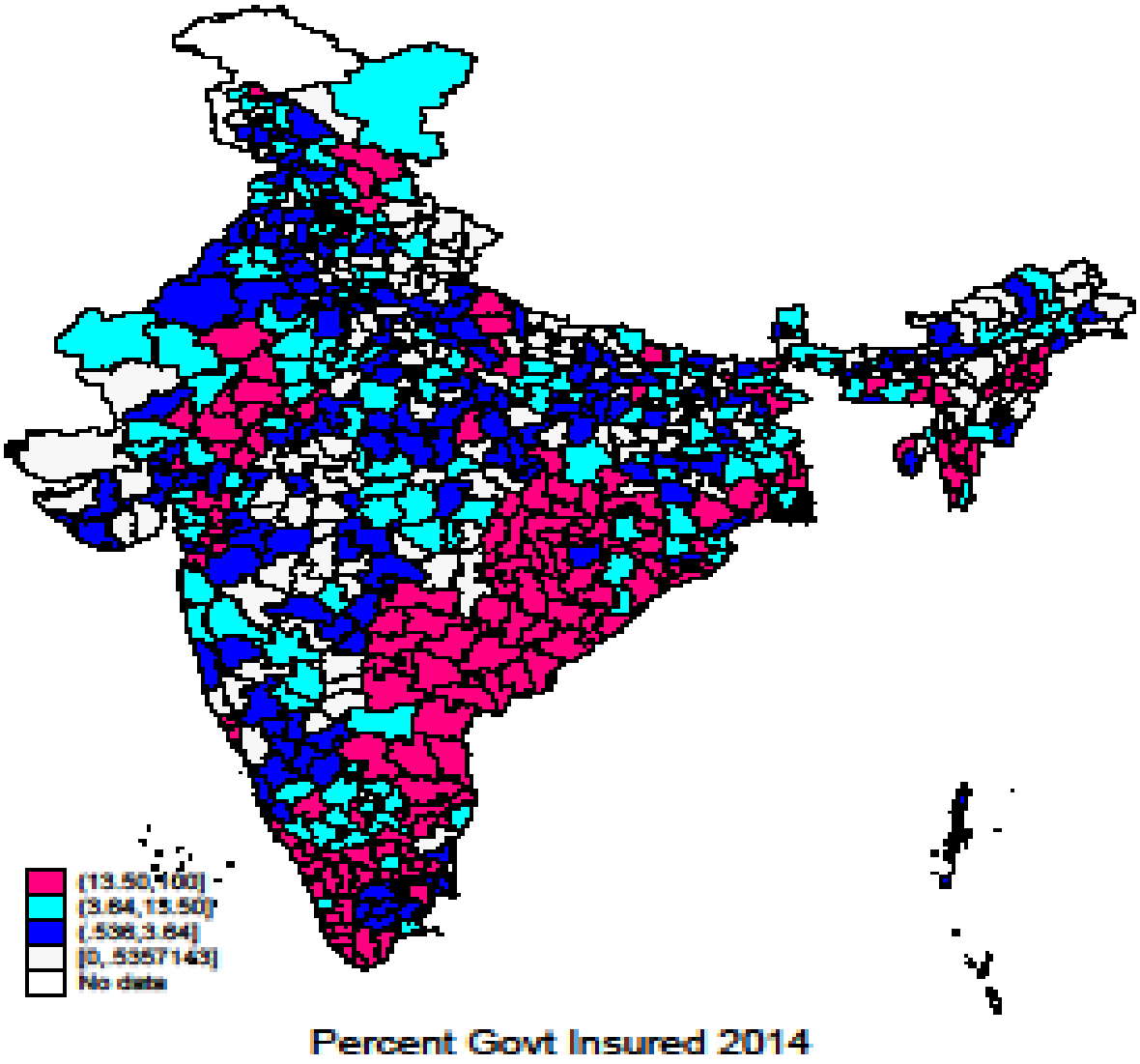
[1]Data accessed from:
http://data.worldbank.org/indicator/SH.XPD.PCAP?end=2014&start=2004&view=chart
Total health expenditure is the sum of public and private health expenditures as a ratio of total population. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation.

[2]Source: National Health Accounts 2013-14

[3]"Healthcare access in India is affected with 70:70 paradoxes; 70 per cent of healthcare expenses in India are incurred by people from their pockets, of which 70 per cent is spent on medicines alone, leads to impoverishment and indebtedness." Golechha (2015)

[4]Health Insurance Enrolment by Districts is presented in the following maps.


Percent Govt. Insured 2004
(.262812,11.6981]
(0,.262812]
[0,0]
No data



[5]Out of pocket expenditures are calculated net of insurance reimbursement.

[6]For logit model, marginal effect is used to explain the relationship of independent variables (predictors) to the predicted probability, while other variables are kept at a specific (usually mean) value.

Theoretical Probability Models for the Distribution of Household Land Ownership Holding

P. D. Joshi[1]

Abstract

This paper examines the suitability of two probability models viz., Mixed Displaced Lognormal Distribution (MDLND) and Mixed Displaced Gamma Distribution (MDGD) for describing the size Distribution of household ownership holding. It has been shown that Mixed Displaced Gamma Distribution (MDGD) fits the observed distribution of household land ownership holding. It is of paramount importance for policy implications from the point of land reform measures viz., imposition of ceiling and redistribution of land among the landless as the landless population in the rural sector form the core of poverty problem.

Key words: Model, Lognormal, Gamma, Maximum Likelihood, Estimators.
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1. Introduction

In the Indian rural scenario, the size distribution of household land holdings provide a scope for the study of the changes, if any, in the distribution of land ownership, measurement of inequality in respect of distribution of land, the consequences of inequality in distribution of land and its effect on landless peasants. The theoretical model describing the observed distribution suitably is, therefore, of paramount use for policy implications from the point of land reform measures viz., imposition of ceiling, and redistribution of land among the landless. This is important from the point of rural poverty as the landless population form the core of the problem.

A number of statistical distributions have been tried for size distribution of household land ownership holding based on a very uneven character calling for skew distributions. Important among them includes lognormal distribution by Krishnamurthy (1959) and Gamma distribution by Mukherjee (1969). No statistical tests were employed for judging the suitability of the model. The model does not fit to the data as the observed and the expected frequency differs significantly. Moreover, no efforts have been made in the model for incorporating wide differences in the proportion of landless households because of rise of landless peasants in the society asking for its consideration over a period.

Bhattacharya and Krishnaji (1981) utilised Decreasing Failure Rate (DFR), Gamma and Log Gamma distribute for NSS 17^{th} round (1961-62) landholding data coalesced to five size classes to examine the relative superiority of lognormal (LN) distribution, decreasing failure rate Gamma (DFRG) distribution and Log Gamma distributions (LGD). In doing so, they have not taken in to account the households with "no land". Moreover, these theoretical models have range from zero to infinity. However, they have derived the associated measures of inequality in different states by making use of reliability theory.

In a paper published in Sarvekshana, Joshi (1995) has presented measures of inequality in distribution of land ownership holdings. under the assumption of mixed households i.e. households with no land and households with different sizes of land ownership for the rural areas of different states and all India utilising NSS 37^{th} round data for the period January-December 1982 employing theoretical models viz., Mixed Displaced Lognormal Distribution (MDLND) and Mixed Displaced Gamma Distribution (MDGD). In doing so, mathematical form of these two models was included as supplement in that paper. Estimation of parameters involved in the model and the suitability of the model based on statistical test of significance were not included. The purpose of this paper is to present the same. For completeness, mathematical forms of these two models are given below.

In the observed distribution of households by the size class of ownership holdings, there will be a lower bound say tau (τ) to the range of values of the variable X. Therefore, the theoretical model to be considered for graduating the size distribution of ownership holding should start with threshold (τ) and not from zero as in the case of size distribution of consumption expenditure, Joshi (1979) so that the variable X is displaced one. Moreover, it should be a mixture of distribution. Following models

have therefore, been proposed for examining their suitability using NSS data of 37th round (1982-83) without coalescing size classes.

From Feller (1971), we know that every probability distribution is a convex combination of a discrete and a continuous distribution by Jordan decomposition theorem. Therefore,

$$F(Z) = \theta F_d(Z) + (1-\theta)F_c(Z), \qquad 0 \le \theta \le 1 \qquad (1)$$

where, 'Z' is 'area owned' and θ is the proportion of households with no land.

2. Models

Model-1: Mixed Displaced Lognormal Distribution (MDLND)

Joshi (1979) has established the suitability of Displaced Lognormal Distribution (DLND) in graduating the size distribution of consumer expenditure. Accordingly, if Z for non-zero values follow Lognormal distribution having displacement 'τ', then

$$f_c(Z) = \Lambda\left(Z\middle|\tau,\mu,\sigma^2\right) = 0; \qquad Z \le \tau$$

$$f_c(Z) = \Lambda\left(Z\middle|\tau,\mu,\sigma^2\right) = \left(Z-\tau,\mu,\sigma^2\right); \qquad Z > \tau$$

The corresponding probability density function for mixed population is given by,

$$f(Z) = \theta \qquad for \qquad Z \le \tau < \theta$$

$$f(Z) = (1-\theta)\frac{1}{\sigma\sqrt{2\pi}(Z-\tau)}\exp\frac{\left[-\{\log(Z-\tau)-\mu\}^2\right]}{2\sigma^2} \qquad for \qquad Z > \tau$$

where, θ is the proportion of households with no land. Thus, for

(i) τ=0, Mixed Lognormal Distribution (MLD) results.

(ii) θ =0, Displaced Lognormal Distribution (DLD) results.

(iii) τ=0, θ =0, Two parameter Lognormal Distribution (TPLD) results.

Estimation of Parameters

For mixed distribution, the parameter 'θ' is estimated as proportion of household with no land. Thus, $E(\theta) = \frac{N_0}{N}$, where, N_0 is number of households having no land and N is the total number of households. In connection with the estimation of threshold 'ς' the approaches are (a) determination on priori ground and determination from actual data under first approach, if the value of threshold is determined on a priori ground, then the variate $Y = (Z-\tau)$ may be taken into consideration in place of Z. Now the variate Y possesses all the features of mixed two-parameter lognormal distribution and its parameter can be estimated as given in Annex.

Under the second approach, for 'τ' not known in advance and needs to be estimated from the given data, an estimation procedure different from the one used in the case of mixed two parameter lognormal distribution needs to be adopted.

For estimation of other two parameters involved in the model, Aitcheson and Brown (1969) have pointed out five methods viz., the maximum likelihood method, the method of moments, the method of quintiles, graphical and the mixed method. Though theoretically speaking, the maximum likelihood method is more efficient but

it is cumbersome. The method of moments has therefore, been preferred here for estimation of parameters 'μ' and 'σ'.

It has been shown in Annex (Mathematical Supplement) that the moment of order 'r' for Log normal distribution about origin '0' is given by

$$E\left(Z^r\right) = \mu_r^{'} = \exp\left[r\mu + \left(r^2 \frac{\sigma^2}{2} \right) \right]; \qquad r = 1,2,3,\ldots$$

Here, Mixed Displaced Log Normal Distribution.

The r^{th} **moment about origin** is given as

$$\mu_r^{'} = \tau + (1-\theta)\exp\left[r\mu + (1/2)r^2\sigma^2 \right];\ r = 1,2,3,\ldots$$

$$\mu_1^{'} = \tau + (1-\theta)\exp\left[\mu + (1/2)\sigma^2 \right] = Mean$$

$$\mu_2^{'} = \tau + (1-\theta)\exp\left[2\mu + (1/2)4\sigma^2 \right]$$

$$\mu_3^{'} = \tau + (1-\theta)\exp\left[3\mu + (1/2)9\sigma^2 \right]$$

$$\mu_4^{'} = \tau + (1-\theta)\exp\left[4\mu + (1/2)16\sigma^2 \right]$$

Moments about Mean (Central Moments)

$$\mu_2 = \mu_2^{'} - \left(\mu_1^{'}\right)^2 = Variance$$

$$\mu_3 = \mu_3^{'} - 3\mu_2^{'}\mu_1^{'} + 2\left(\mu_1^{'}\right)^3$$

$$\mu_4 = \mu_4^{'} - 4\mu_3^{'}\mu_1^{'} + 6\mu_2^{'}\left(\mu_1^{'}\right)^2 - 3\left(\mu_1^{'}\right)^4$$

$$Mean(Z) = \tau + (1-\theta)\exp\left[\mu + (1/2)\sigma^2 \right]$$

$$Mode(Z) = \tau + (1-\theta)\exp\left(\mu - \sigma^2 \right)$$

$$Variance(Z) = (1-\theta)\alpha^2\left\{ \eta^2 + 1 - (1-\theta) \right\}$$

$$Here, \quad \alpha = \exp\left(\mu + \frac{\sigma^2}{2} \right) \qquad and \qquad \eta^2 = \exp\left(\sigma^2 - 1\right)$$

$$m_1 = \exp\left[\mu + \frac{\left(1+\eta^2\right)}{2} \right]$$

$$m_2 = \exp\left[(2\mu)\left(1+\eta^2\right)\eta^2 \right]$$

$$m_3 = \exp\left[(3\mu)\left(1+\eta^2\right)^{3/2}\left(\eta^6 + 3\eta^4\right) \right]$$

So that,

$$Skewness = \frac{m_3}{\left(m_2\right)^{3/2}}$$

$$E(\mu) = \left(\frac{1}{2} \right)\left[\log m_2 - \log\left\{ \eta^2\left(1+\eta^2\right) \right\} \right]$$

$$E\left(\sigma^2\right) = \left(1+\eta^2\right)$$

$$E(\tau) = m_1^{'} - \exp\left[(\mu)\left(1+\eta^2\right)^{1/2} \right]$$

Solving these equations, estimated value of parameters applied to size distribution of land ownership holding given in Annex has been obtained as under.

Table 1: Estimated Value of Parameters of Displaced Log Normal Distribution

Tau	**(1-θ)**	$E(\mu)$	$E(\sigma)$	**Est. Mean=Exp(μ+ σ^2)**	**Ob. Mean**
0.002	0.8279	0.5511	σ=1.0821	0.5511	0.5514

Model 2: Mixed Displaced Gamma Distribution

If *Z* displaced to ς for nonzero values follow Gamma Distribution, the probability density function is given by,

$$f(Z) = \theta, \quad when \;\; Z \le \varsigma$$

$$f(Z) = (1-\theta)\lambda^{\alpha}\left(\frac{(Z-\varsigma)^{\alpha-1}}{\Gamma(\alpha)}\right)\exp\left(-(Z-\varsigma)\lambda\right) \; when \quad Z > \varsigma$$

Clearly, for

(i) $\varsigma = 0$, Med Gamma Distribution M (MGD) results.

(ii) $\theta = 0$, Distribution Gamma Distribution (DGD) results.

(iii) $\varsigma = 0$ and $\theta = 0$, two parameter Gamma Distribution (GD) results.

Estimation of Parameters:

In connection with the values of threshold ς, we assume ς on a priori ground so that the variate $Y = (Z - \varsigma)$ may be taken into consideration in place of *Z* and the estimation of parameters α and λ may be followed on the lines of usual estimation procedures. Thus we estimate, $E(\theta) = \frac{N_0}{N}$, where, ' N_0 ' is the number of households with 'no land' and *N* is the total number of households Parameters 'α' may be derived by making use of (a) method of moments or (b) by Maximum Likelihood Method based on the parameters 'α' and 'λ' of two parameter Gamma Distribution.

(a) Method of Moments

Employing the moments of order '*r*' for Gamma distribution presented in Annex-mathematical supplement, the **moments of order '*r*' about origin** 'ς', under Mixed Displaced Gamma Distribution (MDGD), is given by,

$$E(Z-\varsigma)^r = MG\left(\mu_r^{'}\right) = (1-\theta)G\left(\mu_r^{'}\right); \qquad r = 1,2,3,\ldots$$

Obviously, $Mean_{MDGD}(X) = \left(1 - E(\theta)\right)\frac{\alpha}{\lambda}\left(Mean_{GD}\right)$

$$(Mean - \tau) = (1-\theta)\frac{\alpha}{\lambda}$$

$$E(Z-\varsigma) = MG\left(\mu_1^{'}\right) = (1-\theta)G\left(\mu_1^{'}\right) = Mean$$

$$E(Z-\varsigma)^2 = MG\left(\mu_2^{'}\right) = (1-\theta)G\left(\mu_2^{'}\right)$$

$$MG\left(\mu_2^{'}\right) = (1-\theta)\left[\alpha(\alpha+1)\lambda^2\right]$$

Method of Moments about Mean

$$MG(\mu_1) = 0 \quad (always)$$

$$MG(\mu_2) = MG(\mu_2^{'}) - \left(MG(\mu_1^{'})\right)^2 = Variance$$
$$MG(\mu_2) = (1-\theta)\alpha(\alpha+1)\lambda^2 - \left((1-\theta)\alpha\lambda\right)^2$$

(b) Maximum Likelihood Method

Employing the method of maximum likelihood for two-parameter Gamma distribution presented in Annex, the estimators for three-parameter Gamma distribution are derived as under. For a random variable $Z \sim f(z,\theta)$, where, $\theta = (\alpha, \lambda, \tau)$, the likelihood function of three parameter Gamma distribution for the observed sample values $\underline{Z} = \left(Z_1, Z_2, ..., Z_n\right)$ is given by

$$L(\underline{z},\theta) = L(\alpha,\beta,\tau|\underline{z}) = \prod_{i=1}^{n} f(z_i,\theta)$$

$$L(\alpha,\beta,\tau|\underline{z}) = \prod_{i=1}^{n} \lambda^{\alpha} \frac{(z_i-\tau)^{\alpha-1}}{\Gamma(\alpha)} \exp\left(-\frac{(z_i-\tau)}{\lambda}\right) \qquad when\ z > \tau$$

$$L(\alpha,\beta,\tau|z) = \frac{\lambda^{n\alpha}}{(\Gamma\alpha)^n} \prod_{i=1}^{n} (z_i-\tau)^{\alpha-1} \exp\left(-\frac{\sum_i^n (z_i-\tau)}{\lambda}\right)$$

Taking log on both sides of the above equation, then the log likelihood function is given by

$$LogL = n\alpha\, Log(\lambda) - nLog(\Gamma\alpha) + (\alpha-1)\sum_{i=1}^{n} Log(z_i-\tau) - \sum_{i=}^{n} \frac{(z_i-\tau)}{\lambda}$$

Maximum likelihood estimates of α, λ and τ are obtained by setting the first partial derivatives of above equation to zero with respectively to α, λ and τ, respectively, these simultaneous equations are,

$$\frac{\partial}{\partial\alpha} LogL = 0,\ \frac{\partial}{\partial\lambda} LogL = 0 \text{ and } \frac{\partial}{\partial\tau} LogL = 0$$

If $\frac{\partial}{\partial\lambda} LogL = 0$, then result is $\frac{n\alpha}{\lambda} + \frac{1}{n\lambda^2}\sum_{i=1}^{n}(z_i-\tau)$

If $\frac{\partial}{\partial\alpha} LogL = 0$, then the result is $nLog(\lambda) - n\frac{d}{d\alpha} Log(\Gamma\alpha) + \sum_{i=1}^{n} Log(z_i-\tau)$

Substituting λ in above expression we have

$$Log(\alpha) - \frac{d}{d\alpha} Log(\Gamma\alpha) = Log\left[\sum_{i=1}^{n} \frac{(z_i-\tau)}{n}\right] - \sum_{i=1}^{n} \frac{\lambda}{n}$$

$$\frac{\partial}{\partial\alpha} LogL(\alpha,\beta,\tau|z) = nLog(\lambda) - n\frac{d}{d\alpha} Log(\Gamma\alpha) + \sum_{i=1}^{n} Log(z_i-\tau) = 0$$

$$\frac{\partial}{\partial\lambda} LogL(\alpha,\beta,\tau|z) = \frac{n\alpha}{\lambda} + \frac{1}{n\lambda^2}\sum_{i=1}^{n}(z_i - \tau) = 0$$

If $\frac{\alpha}{\lambda} = \bar{z} - \tau$,

$$\frac{\partial}{\partial\alpha} LogL(\alpha,\beta,\tau|z) = -(\alpha-1)\sum_{i=1}^{n}\frac{1}{(z_i-\tau)} + \sum_{i=1}^{n}\frac{1}{\lambda}$$ which reduces to

$$\sum_{i=1}^{n}\frac{1}{(z_i-\tau)} = \frac{n}{\lambda}(\alpha-1)$$

Thus, we can proceed for estimating approximate α,λ and τ. Solving above equations, estimated value of parameters applied to size distribution of land ownership holding given in Annex is as under.

Putting, $A = Log(\bar{z}) - \frac{1}{n}\sum_{i=1}^{n} Log(z_i)$, approximate estimated value of α based on selected approximate estimators given in Annex i.e. Thom, Greenwood and Durend-1, Greenwood and Durend-2 and also with Pearson and Hartley Tables (1972), has been computed for the value of *V* given by,

$$V = Log(\bar{z}) - Mean(Log(z_i))$$

Where, $\bar{z}$ is the computed overall mean and z_i is the class specific mean.

For Mixed Gamma Distribution,

$$V = \left(\frac{\nu}{(1-\theta)}\right)\left(\frac{\theta}{(1-\theta)}\right) Log(\bar{z}) - Log(1-\theta)$$

We set mean $\bar{z} = \frac{\alpha}{\lambda}$ and regard the gamma distribution with parameters $E(\alpha)$, $E(\lambda)$ an approximation. Obviously,

$$\bar{z} = (1 - E(\theta))E(\bar{z}) = (1 - E(\theta))E(\alpha/\lambda)$$

Now, $\bar{z} = \frac{E(\bar{z})}{(1-\theta)}$.

Table 2: Approximate Estimated Value of α Based on Selected Estimators for Observed Distribution given in Annex

Biometrika Tables	Thom	Greenwood and Durend-1	Greenwood and Durend -2
0.4494	0.4571	0.4534	0.4536

Table 3: Estimated Value of Parameters of Mixed Displaced Gamma Distribution

Ob. Mean	*Tau*	(1-θ)	Log (AM)	Log (GM)	*A*	$E(\alpha)$	$E(\lambda)$	Est. Mean	Ob. Mean
0.5514	0.002	0.8279	-0.5953	-1.1453	0.550	0.453	1.004	0.5494	0.5514

3. Application and Suitability of Proposed Models

We apply the estimated value of parameters for graduating the size distribution of land ownership holdings given in Annex. It relates to National Sample survey data of 37th round for the state of West Bengal. Following table presents observed and estimated percentage distribution of households by size class of land ownership holdings for Mixed Displaced Lognormal distribution (MDLND) and Mixed Displaced Gamma distribution taking land owned for homestead only 'ς' equal to 0.002 hectares.

For judging the suitability of suggested models, the values of following non-parametric tests T_1, T_2, T_3, T_4 and T_5 have been computed.

(i) $T_1 = Max|F_0 - F_e|$

(ii) $T_2 = \frac{1}{N}\sum|f_0 - f_e|$

(iii) $T_3 = \frac{1}{k}\sum\frac{|f_0 - f_e|}{f_0}$

(iv) $T_4 = \frac{1}{N}SQRT\sum\frac{(f_0 - f_e)^2}{f_0}$

(v) $T_5 = \frac{1}{N}\sum\frac{(f_0 - f_e)^2}{f_e}$

where, F_0 and F_e stand for observed and expected cumulative frequencies, f_0 and f_e stand for observed and expected frequencies, *k* is the number of classes in the frequency distribution and *N* is the total number of households.

The first test statistics T_1 is the Kolmogorov–Smirnov test statistic and T_2, T_3, T_4 are those of Lahiri and Ganguli (1951). T_5 is the Pearson's mean Square contingency coefficient. The results are presented in following table along with the fitted distributions.

Table 4: Observed and Estimated Percentage Distribution of Household Land Ownership Holdings in West Bengal, NSS 37th round (January- December 1982)

Size Class (Hectares)	Observed		Estimated	
	Number of Households	Percent of Households	Percentage of Households	
			MDLND	MD GD
Landless	13280	17.21	17.21	17.21
<0.20	27523	35.66	23.52	36.14
0.20-0.40	8773	11.37	20.18	11.59
0.40-0.50	3435	4.45	6.67	4.04
0.50-1.01	9960	12.90	17.75	13.02
1.01-2.02	8876	11.50	9.82	10.33
2.02-3.03	3124	4.05	2.68	4.07
3.03-4.04	1152	1.49	1.01	1.70
4.04-6.07	841	1.09	0.75	1.10
6.07-8.09	124	0.16	0.32	0.23
8.09-10.12	33	0.04	0.04	0.05
.>10.12	59	0.08	0.05	0.02
All classes	77180	100	100	100
			$\mathbf{T_1}$ = 12.14	0.70
			$\mathbf{T_2}$=0.3208	0.0278
			$\mathbf{T_3}$=0.3736	0.1537
			$\mathbf{T_4}$= 0.5083	0.2910
			$\mathbf{T_5}$=0.1364	0.0041

The findings confirm the suitability of Mixed Displaced Gamma Distribution (MDGD) in graduating the size distribution of household land ownership holdings.

The theoretical model describing the observed distribution suitably is, therefore, of paramount use for policy implications from the point of land reform measures viz., imposition of ceiling and redistribution of land among the landless. This is important from the point of rural poverty as the landless population form the core of the problem.

Annex

Size Distribution of Household Land Ownership Holding

Size of Land (Hectares)	No. of Households	Area Owned	Av. Size of Land
	(N_i)	(X_i)	(X_i/N_i)
< 0.002	13280	0	
0.002-0.20	27523	1476	0.0536
0.20-0.40	8773	2534	0.2888
0.40-0.50	3435	1507	0.4387
50-1.00	9960	7391	0.7421
1.00-2.02	8876	12243	1.3793
2.02-5.05	3124	7575	2.4248
3.03-4.04	1152	4015	3.4852
4.04-5.05	587	2632	4.4838
5.05-6.07	254	1396	5.4980
6.07-8.09	124	829	6.6855
8.09-10.12	33	304	9.2121
10.12-12.14	51	551	10.8039
12.14-20.24	8	103	12.8750
.>20.25			
All size	**77180**	**42556**	**0.5514**

Mathematical Supplement:

Normal Distribution

A random variable *Z* is said to follow a normal distribution with mean μ and variance σ^2, if its probability density function is

$$f_Z(z;\mu,\sigma) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left\{-\frac{1}{2\sigma^2}(z-\mu)^2\right\}; -\infty < z < \infty, -\infty < \mu < \infty, \sigma > 0$$

The variate *Z* is said to be distributed normally with mean μ and variance σ^2 and is denoted as $Z \sim N(\mu, \sigma^2)$. If μ= 0 and σ = 1, then

$$f_Z(z) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}z^2}$$

Here, *Z* is said to be standardized normal variate and is denoted as $Z \sim N(0, 1)$.

Log Normal Distribution

Lognormal distribution has its support on the interval $(0, \infty)$, and hence overcomes the criticism against use of Normal distribution as a model for failure time distribution. This model is particularly suitable for failure processes that are result of several small

multiplicative errors. The two-parameter lognormal distribution of a continuous random variable has the following pdf:

$$f(z;\mu,\sigma^2)=\frac{1}{z\sigma\sqrt{2\pi}}\exp\left[-\frac{1}{2\sigma^2}(\log z-\mu)^2\right];\ -\infty<\mu<\infty,\sigma>0,0<z<\infty$$
$$=\Lambda\left(Z\middle|\mu,\sigma^2\right)$$

Displaced Log Normal Distribution

It is a probability distribution of displaced variable $Z=Z-\tau$, i.e. $\log(Z-\tau)$ is distributed as normal with mean μ and variance σ^2. Thus, if '*Z*' is displaced, then the probability density function (*p.d.f.*) of three parameter displaced lognormal distribution (DLND) is given by,

$$f(z)=\frac{1}{(Z-\tau)\sigma\sqrt{2\pi}}\exp\left[-\frac{1}{2}\left(\frac{\log(Z-\tau)-\mu}{\sigma}\right)^2\right]=\Lambda\left((Z-\tau)\middle|\mu,\sigma^2\right);\ Z>\tau$$

Mixed Displaced Lognormal Distribution

From Feller (1971), we know that every probability distribution is a convex combination of a discrete and a continuous distribution. Therefore

$$F(Z)=\theta F_d(Z)+(1-\theta)F_c(Z),\qquad 0\le\theta\le 1$$

Here, subscript *d* and *c* denote the discrete and continuous variables. Accordingly, if *Z* for non-zero values follow Lognormal distribution having displacement 'τ', then

$$f_c(Z)=\Lambda\left(Z\middle|\tau,\mu,\sigma^2\right)=0;\qquad Z\le\tau$$
$$f_c(Z)=\Lambda\left(Z\middle|\tau,\mu,\sigma^2\right)=\left(Z-\tau,\mu,\sigma^2\right);\qquad Z>\tau$$

The corresponding probability density function for mixed displaced lognormal distribution is given by,

$$f(Z)=\theta\qquad for\qquad Z\le\tau<\theta$$
$$f(Z)=(1-\theta)\frac{1}{\sigma\sqrt{2\pi}(Z-\tau)}\exp\frac{\left[-\{\log(Z-\tau)-\mu\}^2\right]}{2\sigma^2}\ for\qquad Z>\tau$$

Moments of order '*r*' about origin i.e. $\mu_r^{'}$ can be derived by Expectation method. In general, for each integer *r*, the r^{th} moment of *X* is $\mu_r^{'}=E(X^r)=\int X^r f(x)dx$.

The r^{th} central moment of *X*,

$$\mu_r=E[X-\mu]^r$$

where, $\mu=\mu_1^{'}=E(X)$ and the variance of the random variable *X* is the second central moment, i.e.

$$V(X)=\mu_2=E[X-\mu]^2=\mu_2^{'}-\left(\mu_1^{'}\right)^2=E\left(X^2\right)-[E(X)]^2$$

The third central moment,

$$\mu_3=[Z-\mu]^3=E\left(Z^3\right)-3E(Z)E\left(Z^2\right)+2[E(Z)]^3=\mu_3^{'}-3\mu_2^{'}\mu_1^{'}+2\left(\mu_1^{'}\right)^3$$

Skewness is defined as $\gamma_1 = \frac{\mu_3}{(\mu_2)^{3/2}}$, Mean, Variance, Skewness, Kurtosis can be worked out for lognormal distribution. The r^{th} moment for the lognormal distribution is equal to $\exp(r\mu + r^2\sigma^2/2)$ which can be derived as under. We have, if x is lognormal, then $Y = \text{Log}X$ is normal

$$\mu_r^{'} = E[y^r] = \int y^r \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(y-\mu)^2}{2\sigma^2}\right) dy$$

Now,

$$ry - \frac{(y-\mu)^2}{2\sigma^2} = \frac{\left(-2r\sigma^2 y + y^2 - 2\mu y + \mu^2\right)}{2\sigma^2}$$

$$= \left[y^2 - 2\left(\mu + r\sigma^2\right)y + \left(\mu + r\sigma^2\right)^2 + \mu^2 - \left(\mu + r\sigma^2\right)^2\right]$$

$$= y - \frac{\left(\mu + r\sigma^2\right)^2}{2\sigma^2} + r\frac{\left(2\mu + r\sigma^2\right)}{2}$$

Latter term under integral is Normal distribution of y with mean $\mu_1^{'} = \mu + r\frac{\sigma^2}{2}$ and variance σ^2,

$$E\left(x^r\right) = \exp\left(r\frac{\left(2\mu + r\sigma^2\right)}{2}\right) = r\mu + r^2\frac{\sigma^2}{2}$$

Putting $r = 1,2,3,4$, we get $\mu_1^{'}, \mu_2^{'}, \mu_3^{'}, \mu_4^{'}$. If $\alpha = \mu + \frac{\sigma^2}{2}$ and $\eta^2 = \sigma^2 - 1$

$$mean = \mu_1^{'} = \alpha = \mu + \frac{\sigma^2}{2}, \mu_2^{'} = 2\mu + 4\frac{\sigma^2}{2}, \mu_3^{'} = 3\mu + 9\frac{\sigma^2}{2}$$

$$\mu_2 = \mu_2^{'} - \left(\mu_1^{'}\right)^2 = \left(2\mu + 2\sigma^2\right) - \left(\mu + \frac{\sigma^2}{2}\right)^2 = \left(\mu + \frac{\sigma^2}{2}\right)^2 + \sigma^2 - \left(\mu + \frac{\sigma^2}{2}\right)^2$$

$$= \left(\mu + \frac{\sigma^2}{2}\right)^2\left[\sigma^2 - 1\right] = \alpha^2\left(\sigma^2 - 1\right) = \alpha^2\eta^2$$

$$\mu_3 = \mu_3^{'} - 3\mu_2^{'}\mu_1^{'} + 2\left(\mu_1^{'}\right)^3$$

$$\mu_4 = \mu_4^{'} - 4\mu_3^{'}\mu_1^{'} + 6\mu_2^{'}\left(\mu_1^{'}\right)^2 - 3\left(\mu_1^{'}\right)^4$$

$$Mean(X) = \mu_1^{'} = \exp\left(\mu + \frac{\sigma^2}{2}\right)$$

$$Variance(X) = \mu_2^{'} = \left(\mu + \frac{\sigma^2}{2}\right)^2\eta^2, \text{ where, } \alpha = \left(\mu + \frac{\sigma^2}{2}\right), \eta^2 = e^{\sigma^2} - 1$$

$$\mu_2^{'} = \exp\left(2\mu + \frac{2\sigma^2}{2}\right) - \exp\left(2\mu + \sigma^2\right)$$

$$\mu_2 = \exp(2\mu) + \left(\eta^2 + 1\right)^{3/2}\eta^6 + 3\eta^4$$

Further,

$$\mu_3 = \exp(3\mu) + (\eta^2 + 1)\eta^2$$

Thus, $Mean(X) = E(X) = \mu_1^{'} = \alpha = \exp(\mu) + \frac{\sigma^2}{2} = \exp(\mu)\exp\left(\frac{1+\eta^2}{2}\right)$

$$E(X^2) = S^2 = \exp(\sigma^2 - 1)\exp\left(2\mu + \frac{\sigma^2}{2}\right)$$

$$Variance(X) = V = \mu_2 = \exp(2\mu + 2\sigma^2) - \exp\left(\mu + \frac{\sigma^2}{2}\right)^2$$

$$Skewness = \frac{(\mu_3)^2}{(\mu_2)^3} = \exp(\sigma^2 + 2)\sqrt{\exp(\sigma^2 - 1)} = \exp(\sigma^2 - 1 + 3)\sqrt{\exp(\sigma^2 - 1)}$$

$$= (\eta^2 + 3)\sqrt{(\eta^2)} = \eta^3 + 3\eta$$

Parameters μ and σ of the lognormal distribution can be obtained by solving above equations. Again:

$$\frac{V}{(Mean)^2} = \exp(\sigma^2) - 1 = \eta^2$$

$$1 + \eta^2 = \exp(\sigma^2) = 1 + \frac{V}{(Mean)^2}$$

$$\sigma^2 = Log\left[1 + \frac{V}{(Mean)^2}\right] = \mu_2^{'} - (\mu_1^{'})^2$$

$$E(\sigma) = \left[Log\left(1 + \frac{V}{(Mean)^2}\right)\right]^{1/2}$$

$$2Log(Mean) = 2\mu + \sigma^2$$

$$\mu = Log(Mean) - \frac{1}{2}Log\left[1 + \frac{V}{(Mean)^2}\right]$$

$$E(\mu) = Log\left[\frac{Mean}{\sqrt{Log\left(1 + \frac{V}{(Mean)^2}\right)}}\right] = Log\left[\frac{(mean)^2}{\mu_2^{'}}\right] = Log\left[\frac{(mean)^2}{E(x^2)}\right]$$

Gamma Distribution

The distribution with probability density function (*p.d.f*), $f(x|\alpha, \lambda)$ is called Gamma Distribution with parameter α, λ and is denoted by $\Gamma(\alpha, \lambda)$.

$$f(z) = \frac{\lambda^\alpha}{\Gamma(\alpha)} Z^{\alpha-1} e^{-\lambda Z}; \quad \alpha, \lambda > 0,\ 0 < Z < \infty$$

Symbolically, it is denoted by Z~G(α, λ).

Displaced Gamma Distribution

If 'Z' is displaced, then the probability density function (p.d.f.) of displaced Gamma distribution (DGD) is given by,

$$f(Z) = \frac{\lambda^{\alpha}}{\Gamma(\alpha)}(Z-\varsigma)^{\alpha-1}\exp(-(Z-\varsigma)\lambda); \qquad when\ Z > \varsigma$$

Mixed Displaced Gamma distribution

The probability density function for mixed displaced Gamma distribution is given by,

$$f(Z) = (1-\theta)\frac{\lambda^{\alpha}}{\Gamma(\alpha)}(Z-\varsigma)^{\alpha-1}\exp(-(Z-\varsigma)\lambda) \qquad when\ Z > \varsigma$$

If $Z = 0$, then the function is $f(Z) = \theta$.

Moments and Moment Generating Function

For each integer '*r*', the r^{th} moment about origin of *Z*, $\mu_r^{'} = E(X^r)$.

The r^{th} central moment of *X* is denoted by $\mu_r = E[X-\mu]^r$.

If taking, *r*=1, this is a mean or first raw moment of given distribution and if r=2, this is second raw moment of given distribution,

$$\mu_1^{'} = E(z) = \int_{-\infty}^{+\infty} zf(z)dz \text{ and } \mu_2^{'} = E(z^2) = \int_{-\infty}^{+\infty} z^2 f(z)dz$$

The variance of the random variable *Z* is the second central moment (μ_2). Thus,

$$V(X) = \mu_2 = E[X-\mu]^2 = \mu_2^{'} - \left(\mu_1^{'}\right)^2 = E\left(X^2\right) - \left[E(X)\right]^2$$

The third central moment,

$$\mu_3 = \left[Z-\mu\right]^3 = E\left(Z^3\right) - 3E(Z)E\left(Z^2\right) + 2[E(Z)]^3 = \mu_3^{'} - 3\mu_2^{'}\mu_1^{'} + 2\left(\mu_1^{'}\right)^3$$

Using the values of μ_1, μ_2, μ_3 and μ_4, β_1 and β_2 can be easily obtained as follows:

$$\beta_1 = \frac{\mu_3^2}{\mu_2^3},\ \beta_2 = \frac{\mu_4}{\mu_2^2},\ \gamma_1 = \sqrt{\beta_1} \text{ and } Skewness = \frac{\mu_3}{\left(\mu_2\right)^{3/2}}$$

Parameters involved in the model can be estimated by (a) method of moments (b) method of maximum likelihood.

(a) Method of moments

The moments can be generated using moment generating function defined as

$$M_z(t) = E\left(e^{tz}\right) = \frac{1}{\Gamma(\alpha)}\int_{-\infty}^{\infty} e^{tz} f(z)dz$$

Putting y=Z(1/ λ)-t

Z=y/{(1/λ)-t} and rearranging

Z=({λ/(1-λt)}y,

dZ={λ/(1-λt)}dy

$$M_z(t) = \frac{\lambda^{\alpha}}{\Gamma(\alpha)}\int_0^{\infty} y^{\alpha-1}e^{-y}\frac{\lambda}{(1-\lambda t)^{\alpha-1}}\frac{\lambda}{(1-\lambda t)}dy$$

$$= \frac{\lambda^{\alpha}}{\Gamma(\alpha)} \frac{\lambda}{(1-\lambda t)^{\alpha}} \int_0^{\infty} y^{\alpha-1} e^{-y} dy = \frac{1}{(1-\lambda t)^{\alpha}} = (1-\lambda t)^{-\alpha}$$

The r[th] derivative of $M_z(t) = (1-\lambda t)^{-\alpha}$ evaluated at *t*=0 i.e. $M_z^r(0)$ is the moment of order r, i.e. $E[Z^r]$

$$M_z^{'}(t) = \alpha\lambda(1-\lambda t)^{-\alpha}$$

At t=0, then $Mean = \mu_1^{'} = \alpha\lambda$

At t=0, then $Mean = \mu_2^{'} = \alpha(\alpha+1)\lambda^2$

$$Variance = \mu_2 = \alpha(\alpha+1)\lambda^2 - (\alpha\lambda)^2 = \alpha\lambda^2$$

$$M_z^{''}(t) = \mu_3^{'} = \alpha(\alpha+1)(\alpha+2)\lambda^3(1-\lambda t)^{-(\alpha+3)}$$

At t=0, $M_z^{''}(t) = \mu_3^{'} = \alpha(\alpha+1)(\alpha+2)\lambda^3$

Thus, $\frac{Variance}{Mean} = \frac{\alpha\lambda^2}{\alpha\lambda} = \lambda(est.)$

$$\alpha(est.) = \frac{Mean}{\lambda(est.)}$$

(b) Maximum Likelihood Estimators

It consists of maximising the log likelihood for Gamma distribution by differentiating with respect to two parameters and equating to zero resulting in two equations for estimation of two-parameters α and β. accordingly, the likelihood function is given by

$$L(\alpha,\lambda|z) = \left(\frac{\lambda^{\alpha}}{\Gamma(\alpha)}\right)^n \prod_{i=1}^{n} (z_1, z_2, ..., z_n)^{(\alpha-1)} e^{-\lambda\sum_{i=1}^{n}(z_1, z_2, ..., z_n)}$$

The log likelihood function is given by,

$$LogL = n\alpha Log(\lambda) - nLog(\Gamma\alpha) + (\alpha-1)Log\sum_{i=1}^{n} Log(z_i) - \lambda\sum_{i=1}^{n}(z_i)$$

To determine the parameters that maximises the likelihood, we have two equations

$$\frac{\partial}{\partial\alpha} LogL = nLog(\lambda) - \frac{\partial}{\partial\alpha} Log(\Gamma\alpha) + \sum_{i=1}^{n} Log(z_i) = 0$$

$$\frac{\partial}{\partial\lambda} LogL = n\frac{\alpha}{\lambda} - \sum_{i=1}^{n}(z_i) = 0$$

Or $\bar{z} = \frac{\alpha}{\lambda}$ *or* $\lambda = \frac{\alpha}{\bar{z}}$

The derivative of the logarithm of the gamma function i.e. $\frac{d}{d\alpha}(Log\Gamma(\alpha)) = \Psi(\alpha)$ is the digamma function which can be solved numerically.

Substituting for $Log(\lambda) = Log\left(\frac{\alpha}{\bar{z}}\right)$, we have

$$Log(\alpha) - Log(\bar{z}) - \Psi(\alpha) - \left(\frac{1}{n}\right)\sum_{i=1}^{n} Log(z_i)$$

$$Log(\alpha) - \Psi(\alpha) = Log\left(\bar{z}\right) - \frac{1}{n}\sum_{i=1}^{n} Log\left(z_i\right)$$

Several scholars have derived iterative maximum likelihood estimators for parameters involved in p.d.f. of Gamma distribution using log likelihood function. Method is cumbersome and requires tables of digamma function. Algorithm based several iterations for estimation of parameters using software or writing of algorithm for programme is required which is not practical without a computer. However, the equation is implicit in α. but may be solved using Davis Tables (1933) which provides $\Psi(\alpha) = functions$ and Tables of $\alpha - \Psi(\alpha)$ computed by Masuyama and Kuroiwa (1951).

To solve this problem, we define

$$A = Log\left(\bar{z}\right) - \left(\frac{1}{n}\right)\sum_{i=1}^{n} Log\left(z_i\right)$$

$$= Log(overall\ mean) - Log(Geometric\ Mean)$$

And using A, simple approximation to the maximum likelihood estimators proposed by Thom (1958), Greenwood and Durand (1960) and Biometrica Tables of Pearson and Hartley (1972) can be obtained as under.

Thom HCS (1958) proposed

$$E(\alpha) = \frac{\left[1 + \sqrt{1 + \frac{4A}{3}}\right]}{4A},$$

Greenwood and Durand (1960) proposed

$$E(\alpha) = \frac{1}{A}\left[0.5000876 + 0.1648852A - 0.544274A^2\right]$$

Or $$E(\alpha) = \frac{8.898919 + 9.059950A + 0.9775373A \times A}{A(17.79728 + 11.968477A + A \times A)}$$

For the purpose of this paper the parameter (α) of Gamma distribution has been estimated using above estimators and Biometrika tables of Pearson and Hartley (1972) which involves the value '*V*'= Log overall mean (x)- overall means of Log (*x*).

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A Subjective Approach of Firm's Performance: A Multinomial Analysis

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Abstract

This paper deals with the subjective prognosis of a firm's performance. The NSSO data categorised the firms as expanding, stagnant and contracting. Using a multinomial regression separately for OAE and for Establishment firms we have related this prognosis on a number of firm specific parameters. The analysis shows certain differences between the types of enterprises. It is inferred that these units are severely plagued by a number of problems that seriously bog down their prospects. In order to mitigate their problems, the firms try to diversify their activities. Also Government help is crucially helping these small firms.

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1. Introduction

In the standard analysis of a firms performance, there is a general reliance on efficiency analysis. Most of these analyses are based on the organised sector where the production relations and input-output choice can be defined precisely. Recently there has been an attempt to extend this analysis to the unorganised sector. Here the preference is on non-parametric approach (Raj 2011; Bairagya, 2013; Kathuria and Sen 2013, 2016; Sengupta and Seth 2017).

However, efficiency is often constructed from the technical data of inputs and outputs and may have certain problems when applied to the unorganised sector[3] . It is then necessary to look into some subjective evaluation to gauge the performances of this sector. The subjective evaluation is often controversial and contradictory. It is difficult to rely on any one of such versions. However, fortunately for us the NSSO have given a subjective prognosis of the firms in their unit level data. They have categorised firms as expanding, contracting and stagnant. We have made use of NSSO prescribed prognosis in our current analysis. We feel that such an analysis will give us information about the condition of the firms.

2. Description of data

We used 73rd round NSSO data as noted earlier. Some of the features of the data are presented in the tables below:

The following Table (Table 1) shows that most of the firms (manufacturing) are stagnant. The stagnancy is seen more in rural areas than in urban areas. On the other hand, there are comparatively more expanding firms in urban areas than in rural areas. The Percentage of contracting firms is more or less the same in both rural and urban areas.

Table 1: Percent of Firms According to Status.

	Rural	**Urban**
Expanding	33%	36%
Stagnant	54%	50%
Contracting	13%	14%
Total	100%	100%

Source: *Authors' calculation from NSSO 73rd Round data.*

From the following table (Table 2) we can see that among the OAE firms 54% is stagnant but for Establishment firms the figure is 44%. So, stagnancy is more prevalent in case of OAE firms. On the other hand, 47% of the Establishment firms are expanding whereas 32% of OAE firms are expanding. Again, about 14% of OAE firms are contracting but about 10 % of the Establishment firms are contracting. This shows the relative position of OAE firms in our country.

[3]See Sengupta and Seth (2017) for further discussion in this respect.

Table 2: Percent of Firms According to Status and Enterprise Type

	OAE	ESTA
Expanding	32%	47%
Stagnant	54%	44%
Contracting	14%	10%
Total	100%	100%

Source: *Authors' calculation from NSSO 73rd Round data.*

From Table 3 we see that expanding firms are facing the most severe problem of non-recovering of financial dues. For them, the second biggest problem is the non-availability or high cost of credit. For the other two types of firms, viz. for Stagnant and for contracting the biggest problem is shrinking or falling demand. For all kinds of firms labour related problems are absent.

Table 3: Percent of Firms According to Nature of the Problem Faced.

	Erratic Power Supply/ Power Cuts	Shortage of Raw Materials	Shrinkage /Fall of Demand	Non-Availability /high Cost of Credit	Non-Recovery of Financial dues	Non-Availability of Labour as and when Needed	Non-Availability of Skilled Labour as and when Needed	Labour Disputes and Related Problems	Others
Expanding	14%	4%	16%	20%	25%	3%	3%	0%	15%
Stagnant	7%	5%	36%	16%	16%	1%	1%	0%	17%
Contracting	3%	4%	62%	7%	7%	1%	1%	0%	16%

Source: *Authors' calculation from NSSO 73rd Round data.*

In the table below (Table 4) we present the percent of firms according to government assistance received. Here we see that for all status of firms most important assistance comes in the form of financial loans. The second most important assistance is the subsidy.

Table 4: Percent of Firms According to Different kinds of Government Assistance Received

	Financial Loan	Subsidy	Machinery/ Equipment	Skill Development	Marketing	Raw Material	Others
Expanding	72.9%	15.0%	1.1%	3.5%	0.3%	0.6%	6.6%
Stagnant	69.5%	17.0%	5.0%	1.3%	0.1%	0.6%	6.5%
Contracting	73.3%	17.5%	1.2%	1.2%	0.0%	0.2%	6.6%

Source: *Authors' calculation from NSSO 73rd Round data.*

3. Objective

We have found that the firms in the informal sector face different problems. These lead to different consequences in their behaviour. Some firms are Expanding, some are contracting, and some others are Stagnant. There are few firms which operate less than 3 months. These are non-comparable with others.

Now we want to examine the effect of constraints on their behavioural choice. This we do by multinomial logistic regression analysis.

4. Methodology

Multinomial logistic regression analysis is applicable when there are more than two discrete outcomes. Here the dependent variable is categorical. This dependent variable is regressed with a set of independent variables. The independent variables may be real valued, binary valued or categorical. Here the model predicts probabilities of different actualisation for a set of independent variables.

Let us now see how that can be done.

Let a multinomial variable (Y_i) take different discrete values which may be indexed as j=1,2,3,...,J. Further, let

$$\phi_{ij} = \Pr\{Y_i = j\} \tag{1}$$

Represent, for probability that the i^{th} response falls in the j^{th} category.

Let us assume that the response categories are mutually exclusive and exhaustive. We have $\sum_{j=1}^{J} \phi_{ij} = 1$ for each i, i.e., the probabilities add up to one for each individual, and we have these probability streams for different parameters j=1,2,3,...,J.

For the case of grouped data, an auxiliary random variable counter for responses in the various categories is introduced. Let n_i be the number of cases in the i^{th} group and let Y_{ij} be the number of responses from the i^{th} group that fall on the j^{th} category, with observed values Y_{ij}.

For individual data $n_i = 1$ and Y_{ij} becomes an indicator (or dummy) variable that takes the value *1* if the i^{th} response falls in the j^{th} category and *0* otherwise, and $\sum_j Y_{ij} = 1$ since one and only one of the indicators Y_{ij} can be 'on' in this case.

The probability distribution of the counts y_{ij} given the total n_i is given by the *multinomial* distribution,

$$\Pr(Y_{i1} = y_{i1}, Y_{i2} = y_{i2}, ..., Y_{iJ} = y_{iJ}) = \binom{n_i}{y_{i1}, y_{i2}, ..., y_{iJ}} \phi_{i1}^{y_{i1}}, \phi_{i2}^{y_{i2}}, ..., \phi_{iJ}^{y_{iJ}} \tag{2}$$

The simplest approach to multinomial data is to nominate one of the response categories as a baseline or reference cell, calculate log-odds for all other categories relative to the baseline, and then let the log-odds be a linear function of the predictors.

For example, if we pick the *last* category (*J*) as a baseline and calculate the odds that a member of group *i* falls in category *j* as opposed to the baseline as $\phi_{ij} \mid \phi_{iJ}$.

In the multinomial logit model, we assume that the log-odds of each response follow a linear model,

$$\theta_{ij} = log \frac{\phi_{ij}}{\phi_{iJ}} = A_j + x_i' B_j \tag{3}$$

Where A_j is a constant and B_j is a vector of regression coefficients, for j= 1,2,...,J-1. This model is analogous to a logistic regression model, except that the probability distribution of the response is multinomial instead of binomial and we have j-1 equations instead of one. The multinomial logit equations contrast each of categories $j = 1, 2, 3, \dots, J-1$ with category J, whereas the single logistic regression equation is contrast between successes and failures. If $J = 2$, the multinomial logit model reduces to the usual logistic regression model.

5. Results of the Regression

We run multinomial logit regression separately for OAE and for Establishment (ESTA) firms considering the fact that the very set up of these two categories is different. Our main enquiry is the factor responsible for the evaluative performances of enterprises expanding or contracting vis-à-vis stagnant. Thus, the dependent variable is status of enterprise (status of entp). The independent variables are dummy variables- about the firms having mixed activities, facing any problem, having contracts facing any power shortage problem, facing raw material shortage problem, facing falling demand problem and facing labour problem.

These variables are chosen keeping in view the nature of the activities of the firms, its various activities involving production and the problems that they face in their day-to-day production activities. The first variable depends on the nature of activity of the firm. A firm may be engaged not only in a single activity but combination of a whole battery of activities. For example, restaurants, hostels, petrol pumps, selling some car parts may all be combined in an outlet that is placed on a state or national highway. Similarly, for many local rural and semi urban areas grocery shops may sell vegetables, medicines, sweets, and various other items. Such firms are referred to as mixed firms. A small firm may engage in a mixture of activities in order to reduce the uncertainty involved in any single activity. This is an important factor determining whether the firm is expanding, contracting or stagnant.

The second factor is whether it has contracts with other firms. In many cases firms enter a putting out system. Such systems were prevalent in 17th century Western Europe[4] where the merchants gave raw materials to the producers and/or collected their produce for sale in the market. The merchants provided working capital as well as raw materials. They also bought all the output. In some cases even the specification of the design is given by the merchants. For example, Moxham (2016) showed that in the case of India, the British East India Company merchants provided the designs to be depicted on the cloth to the Indian producers. These designs were built according to the tastes of the British people. The producers worked in their home or in workshops. In some cases, they used to lease out their work to others. Such a system is still prevalent in the area of small scale informal production sphere of modern India. In many cases the firms get raw materials through their contract. In some other

[4]However such a system was prevalent in many parts of the world even before that. Existence of such a system in ancient India can be culled from various sources (Baishya 1997)

cases, they sell their entire output (finished or semi-finished) to the merchants. This variable thus captures the dependency of the small firms on the other firms. There is a debate on how far such contracts are profitable. Some opined that such contracts are beneficial to the producers. They ensure a steady supply of good raw materials at a low cost. They also cushion the market and relieve the firm of demand problems. However, a contrary opinion argues that putting out system places a strong constraint on the prospect of the firms. It does not allow the firms to act efficiently and independently even when such opportunity may arise. They are seen to favour the lazy firms by invoking the problem of the "Adverse Selection". We wish to test how far this logic carries to the present NSSO data.

The other set of variables are the problem variables. They are directly in conflict with the prospect of the firms. We hope them to be negatively related for an expanding and positively for contracting and stagnant firms.

As noted earlier we have considered the stagnant firms as the base. In the multinomial exercises the regression is relative to the base. The coefficients must be interpreted carefully keeping this relativity in mind. Hence it is better to consider the odd-ratios (Table A1 to A2). As is known, odds ratio are generated by exponentiation the coefficients. They give us relative probabilities. In order to assess the odds ratio, it is necessary to compare them across the alternative possibilities.

First consider the OAE firms (Table A1). For the variable mixed dummy, we find that firms' relative probability of being expanding is 57% higher for the firms using mixed operations than others. However, there is also a 57% probability that they are stagnant. Thus, there are no unambiguous results here.

The result is unambiguous for problems faced. There is an 86% less chance of an expanding firm to face any problem. This is more than twice the similar figure for stagnant firms. A similar result is obtained for labour problem dummy. Also contracting with other firms leads to a lesser probability of being expanding and more probability of being stagnant. Similar is the case of raw material availability and demand fall problems. Power dummy gives no ambiguous results. Government assistance increases the probability of being expanded and reduces the problem of contracting.

The picture is almost the same for Established firms (Table A2). Effect of mixed activity and power dummy is not ambiguous. Problem faced decreases the possibility of expanding and increases the possibility of contracting. Labour problem, raw material availability and demand shortage all have a booster effect on contracting and negative on expanding. Again, contracts have no positive effects. Government assistance helps the expansion and lack of this leads to contraction.

We then consider the marginal effects (Table A1 –A6). These results match with the findings of odds ratio. We see that for both OAE and Establishment firms a mixture of activity has no unambiguous results at the margin. There is an increase in probability

of expanding but also stagnancy though a decrease in the probability of contracting. Same is the case with power dummies. Again, the marginal effects of problems faced are negative for expansion but positive for contracting and stagnant. So is the case of labour problems. In fact, problems have a very large effect of withholding expansion and boosting stagnation and contraction. Contracts with other firms have a negative marginal effect on our data. Raw material availability and demand fall problems seriously hamper the prospects of the firms (OAE and ESTA) at the margin. Government assistance bolsters expansion.

As for policy suggestions it is clear that government help is crucial in mitigating the problems of the firms. However, the government should play its role not only in providing loans but also in monitoring and endowing the small units. Stress on quality control, provision of market access, building up of small industrial clusters, dissipation of knowledge through skill could help the firms in tiding the problems they are facing. In many cases government action is already present. The need perhaps is to boost it further.

6. Conclusion

The paper sets out to find out certain features of the informal sector that are evidenced by the NSSO data. The paper first attempts to find out some of the salient features of the informal sector units. It has charted the preponderance of some features among the firms operating in this sector. The analysis shows certain differences between the Own Account Enterprises (OAE) and the Establishments. It also brings out the various types of input-output relationships exhibited by these firms (in terms of labour employment, capital invested and so on). In the end, we have tried to relate the conditions of these firms (expanding, contract or stagnant) to a set of subjective variables. It is inferred that these units are severely plagued by a number of problems that seriously bog down their prospects. In order to reduce this negative impact, they try to diversify their activities. However, such diversifications are not always successful. Also subcontracting is of no help here. However, Government help seems to be very useful for both the OAEs and establishments.

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Appendix:

Table A1: Relative Probability for OAE
(Odds ratio)

Iteration 0: log likelihood = -32616.541
Iteration 1: log likelihood = -30423.723
Iteration 2: log likelihood = -29936.689
Iteration 3: log likelihood = -29932.153
Iteration 4: log likelihood = -29932.151
Multinomial Logistic Regression Number of Observation = 33,600
LR $chi^2(16)$= 5368.78
Prob> chi^2= 0.0000
Log Likelihood=-29932.151 Pseudo R^2=0.0823

status_of_entp					**[95% Conf.**	
Expanding	**RRR**	**Std. Err.**	**Z**	**P>|z|**	**Interval]**	
mix_dum	1.562325	0.104343	6.68	0	1.370636	1.780823
probface_dum	0.861769	0.033890	-3.78	0	0.797841	0.930819
asstrecv_dum	1.205312	0.163909	1.37	0.17	0.923305	1.573452
cotract_dum	0.966588	0.048041	-0.68	0.49	0.876871	1.065485
power_dum	1.075297	0.071346	1.09	0.27	0.944172	1.224633
rawmat_dum	0.714936	0.065733	-3.65	0	0.597043	0.856109
ddfall_dum	0.340153	0.019188	-19.12	0	0.304550	0.379919
labprob_dum	0.562378	0.042060	-7.70	0	0.485699	0.651164
_cons	0.678968	0.010505	-25.02	0	0.658687	0.699873
Stagnant (Base Outcome)						
Contracting						
mix_dum	1.552560	0.137448	4.97	0	1.305244	1.846738
probface_dum	2.403628	0.147721	14.27	0	2.130859	2.711314
asstrecv_dum	0.455218	0.115321	-3.11	0.002	0.277066	0.747921
cotract_dum	1.265262	0.076587	3.89	0	1.123716	1.424637
power_dum	1.118130	0.104486	1.19	0.232	0.931001	1.342872
rawmat_dum	1.754998	0.176845	5.58	0	1.440469	2.138204
ddfall_dum	3.564908	0.207892	21.80	0	3.179870	3.996568
labprob_dum	1.832656	0.146163	7.60	0	1.567450	2.142734
_cons	0.090016	0.003005	-72.12	0	0.084314	0.0961027

Note: Cons estimates baseline relative risk for each outcome.
Source: *Authors' calculation from NSSO 73rd round data.*

Table A2: Relative probability for ESTA
(Odds Ratio)

Iteration 0: log likelihood = -26613.667
Iteration 1: log likelihood = -25148.440
Iteration 2: log likelihood = -24602.759
Iteration 3: log likelihood = -24587.094
Iteration 4: log likelihood = -24587.078
Iteration 5: log likelihood = -24587.078
Multinomial Logistic Regression
Number of Observation=27,288
LR $chi^2(16)$=4053.18
Prob> chi^2=0.0000
Log Likelihood=-24587.078 Pseudo R^2=0.0761

Status_of_entp						
Expanding	**RRR**	**Std. Err.**	**Z**	**P>|Z|**	**[95% Conf. Interval]**	
mix_dum	1.483435	0.088054	6.64	0	1.320513	1.666459
probface_dum	0.830391	0.029057	-5.31	0	0.775349	0.889339
asstrecv_dum	1.439719	0.128996	4.07	0	1.207846	1.716105
cotract_dum	0.870707	0.035622	-3.38	0.001	0.803615	0.943399
power_dum	1.039518	0.054395	0.74	0.459	0.938190	1.151789
rawmat_dum	0.947538	0.081446	-0.63	0.531	0.800629	1.121405
ddfall_dum	0.315304	0.018007	-20.21	0	0.281915	0.352647
labprob_dum	0.753421	0.055579	-3.84	0	0.651996	0.870624
_cons	1.170819	0.021027	8.78	0	1.130323	1.212766
Stagnant (Base Outcome)						
Contracting						
mix_dum	1.465839	0.127603	4.39	0	1.235913	1.738539
probface_dum	3.348461	0.216073	18.73	0	2.950653	3.799902
asstrecv_dum	0.992256	0.135570	-0.06	0.955	0.759147	1.296946
cotract_dum	1.381211	0.077298	5.77	0	1.237723	1.541334
power_dum	0.828394	0.068752	-2.27	0.023	0.704031	0.974726
rawmat_dum	1.079274	0.133937	0.61	0.539	0.846250	1.376464
ddfall_dum	2.942382	0.168495	18.85	0	2.629997	3.291872
labprob_dum	1.574081	0.143380	4.98	0	1.316718	1.881748
_cons	0.078690	0.003669	-54.52	0	0.071818	0.086220

Note: _cons estimates baseline relative risk for each outcome.
Source: *Authors' calculation from NSSO 73rd round data.*

Table A3: Predicted Probability of being Expanding at each Level of Variables for OAE Firms

Average Marginal effects
Number of Obs=33,600
Model VCE: OIM

Expression: Pr(status_of_entp==expanding), predict(outcome(1))
dy/dx w.r.t.: 1.mix_dum 1.probface_dum 1.asstrecv_dum 1.cotract_dum 1.power_dum 1.rawmat_dum 1.ddfall_dum 1.labprob_dum

	dy/dx	Delta-method Std. Err.	z	P>|z|	[95% Conf. Interval]	
1.mix_dum	0.077680	0.013877	5.60	0	0.050482	0.104878
1.probface_dum	-0.057838	0.007737	-7.48	0	-0.073002	-0.042674
1.asstrecv_dum	0.057919	0.029369	1.97	0.049	0.000356	0.115483
1.cotract_dum	-0.014058	0.009522	-1.48	0.14	-0.032722	0.004605
1.power_dum	0.011277	0.013021	0.87	0.386	-0.014244	0.036797
1.rawmat_dum	-0.080501	0.015034	-5.35	0	-0.109966	-0.051035
1.ddfall_dum	-0.227449	0.006978	-32.59	0	-0.241127	-0.213772
1.labprob_dum	-0.121445	0.011094	-10.95	0	-0.143188	-0.099702

Note: dy/dx for factor levels is the discrete change from the base level.
Source: *Authors' calculation from NSSO 73rd round data*

Table A4: Predicted Probability of being Contracting at each Level of Variables for OAE Firms

Average Marginal Effects
Number of Observation=33,600
Model VCE: OIM
Expression: Pr(status_of_entp==contracting), predict (outcome (3))
dy/dx w.r.t. : 1.mix_dum 1.probface_dum 1.asstrecv_dum 1.cotract_dum 1.power_dum 1.rawmat_dum 1.ddfall_dum 1.labprob_dum

	dy/dx	Delta-method Std. Err.	z	P>|z|	[95% Conf. Interval]	
1.mix_dum	0.032656	0.009959	3.28	0.001	0.013136	0.052177
1.probface_dum	0.096711	0.006286	15.39	0	0.084392	0.109031
1.asstrecv_dum	-0.069371	0.015588	-4.45	0	-0.099923	-0.038819
1.cotract_dum	0.026932	0.006827	3.94	0	0.013551	0.040312
1.power_dum	0.009641	0.009752	0.99	0.323	-0.009472	0.028755
1.rawmat_dum	0.079057	0.013430	5.89	0	0.052735	0.105379
1.ddfall_dum	0.212698	0.009698	21.93	0	0.193689	0.231706
1.labprob_dum	0.092180	0.010919	8.44	0	0.070779	0.113581

Note: dy/dx for factor levels is the discrete change from the base level.
Source: *Authors' calculation from NSSO 73rd round data*

Table A5: Predicted Probability of being Expanding at each level of Variables for ESTA Firms

Average Marginal effects
Number of Obs= 27,288
Model VCE: OIM

Expression: Pr(status_of_entp==expanding), predict(outcome(1))
dy/dx w.r.t.: 1.mix_dum 1.probface_dum 1.asstrecv_dum 1.cotract_dum 1.power_dum 1.rawmat_dum 1.ddfall_dum 1.labprob_dum

	dy/dx	Delta-method Std. Err.	z	P>|z|	[95% Conf. Interval]	
1.mix_dum	0.074356	0.012786	5.82	0	0.049295	0.099416
1.probface_dum	-0.087389	0.007904	-11.06	0	-0.102880	-0.071897
1.asstrecv_dum	0.084215	0.019588	4.30	0	0.045824	0.122606
1.cotract_dum	-0.044026	0.008821	-4.99	0	-0.061316	-0.026737
1.power_dum	0.015484	0.011497	1.35	0.178	-0.007051	0.038019
1.rawmat_dum	-0.015123	0.018509	-0.82	0.414	-0.051399	0.021154
1.ddfall_dum	-0.288308	0.008868	-32.51	0	-0.305689	-0.270926
1.labprob_dum	-0.081577	0.015018	-5.43	0	-0.111014	-0.052143

Note: dy/dx for factor levels is the discrete change from the base level.
Source: *Authors' calculation from NSSO 73rd round data.*

Table A6: Predicted Probability of being Stagnant at each Level of Variables for ESTA Firms

Average Marginal Effects
Number of Obs=27,288
Model VCE: OIM

Expression: Pr(status_of_entp==contracting), predict(outcome(3))
dy/dx w.r.t.: 1.mix_dum 1.probface_dum 1.asstrecv_dum 1.cotract_dum 1.power_dum 1.rawmat_dum 1.ddfall_dum 1.labprob_dum

	dy/dx	Delta-method Std. Err.	z	P>|z|	[95% Conf. Interval]	
1.mix_dum	0.019499	0.008085	2.41	0.016	0.003653	0.035345
1.probface_dum	0.109017	0.004912	22.19	0	0.099389	0.118645
1.asstrecv_dum	-0.014327	0.010534	-1.36	0.174	-0.034973	0.006319
1.cotract_dum	0.036952	0.005658	6.53	0	0.025864	0.048041
1.power_dum	-0.017591	0.006498	-2.71	0.007	-0.030326	-0.004855
1.rawmat_dum	0.009050	0.011138	0.81	0.416	-0.012769	0.030889
1.ddfall_dum	0.186371	0.008757	21.28	0	0.169207	0.203535
1.labprob_dum	0.058470	0.010034	5.83	0	0.038804	0.078136

Note: dy/dx for factor levels is the discrete change from the base level.
Source: *Authors' calculation from NSSO 73rd round data*

PART-II

Highlights of Report Released by National Statistical Office (NSO)

(The 'Highlights' are reproduced from related report prepared by Survey Design and Research Division (SDRD) of NSO. For details, the reader may refer to the related Main Report.)

HIGHLIGHTS

Periodic Labour Force Survey (PLFS) 2018-2019

This Report is based on the Periodic Labour Force Survey (PLFS) conducted by National Statistical Office (NSO) from July 2018 to June 2019. The survey was spread over 12,720 FSUs (6,983 villages and 5, 737 urban blocks) covering 1, 01, 579 households (55, 812 in rural areas and 45, 767 in urban areas) and enumerating 4, 20, 757 persons (2, 39, 817 in rural areas and 1, 80, 940 in urban areas). Estimates of the labour force indicators are presented in this Report based on the *usual status (ps+ss)* approach and *current weekly status* approach adopted in the survey for classification of the population by activity statuses. The reference period for usual status (ps+ss) approach is 1 year and for *current weekly status* approach, it is 1 week. A rotational panel sampling design was used in urban areas. In this rotational panel scheme each selected household in urban areas is visited four times–in the beginning with first visit schedule and thrice periodically later with revisit schedule. There was no revisit in the rural samples. The estimates of household and population, labour force, workforce and unemployment presented here are based on data collected in the Schedules of first visit in both rural and urban areas.

Some of the key results at the all-India level for the period July 2018 - June 2019 emerging from PLFS are highlighted below.

A. Household and Population

- During 2018-2019, about 51.7 per cent of rural households had major source of income from *self-employment.* The share of rural households with major source of income from *casual labour* during 2018-2019 was 25.1 per cent and that of *regular wage/salary earning* was 13.1 per cent.
- In urban areas, about 31.8 per cent of the households had major source of income from *self-employment* during 2018-2019. The share of urban households with major source of income from *regular wage/salary earning* was 42.8 per cent and that of *casual labour was* nearly 11.0 per cent.

- In India, literacy rate (*among persons of age 7 years and above*) during 2018-2019 was 78.1 per cent.

- Literacy rate in both rural and urban areas was higher among males than females: in rural areas, literacy rate was 81.9 per cent among males compared to 65.7 per cent among females and in urban areas; literacy rate was 91.9 per cent among males compared to 82.6 per cent among females.

B. Labour Force in usual status (ps+ss)

- About 55.1 per cent of the rural males, 19.7 per cent of the rural females, 56.7 per cent of the urban males and 16.1 per cent of the urban females were in the labour force.

- Among persons of age 15-29 years, LFPR in India was 38.1 per cent: it was 37.8 per cent in rural areas and 38.7 per cent in urban areas.

- Among persons of age 15 years and above, LFPR in India was 50.2 per cent: it was 51.5 per cent in rural areas and 47.5 per cent in urban areas.

C. Workforce

C.1 *Worker Population Ratio (WPR) in usual status (ps+ss)*

- The Worker Population Ratio (WPR) was about 35.3 per cent at the all-India level. It was about 35.8 per cent in rural areas and 34.1 per cent in urban areas.

- The WPR was 52.1 per cent for rural males, 19.0 per cent for rural females, 52.7 per cent for urban males and 14.5 per cent for urban females.

- Among persons of age 15-29 years, WPR in India was 31.5 per cent: it was 31.7 per cent in rural areas and 30.9 per cent in urban areas.

- Among persons of age 15 years and above, WPR in India was 47.3 per cent: it was 48.9 per cent in rural areas and 43.9 per cent in urban areas.

C.2 *Status in employment among workers in usual status (ps+ss)*

- Share of *self-employed* among workers in India was about 57.4 per cent among rural males, 59.6 per cent among rural females, 38.7 per cent among urban males and 34.5 per cent among urban females.

- Among workers, about 14.2 per cent among rural males, 11.0 per cent among rural females, 47.2 per cent among urban males and 54.7 per cent among urban females were *regular wage/ salaried employees*.

- The proportion of *casual labour* among workers in India was about 28.3 per cent among rural males, 29.3 per cent among rural females, 14.2 per cent among urban males and 10.3 per cent among urban females.

C.3 *Industry of work of the workers in usual status (ps+ss)*

- In rural areas, during 2018-2019, about 53.2 per cent of the male workers and 71.1 per cent of the female workers were engaged in the agricultural sector. The proportions of male and female workers in rural areas engaged in 'construction' sector were 15.4 per cent and 6.0 per cent respectively. The proportions of male and female workers in rural areas engaged in 'manufacturing' sector were 7.3 per cent and 9.0 per cent respectively.
- In urban India, during 2018-2019, among male workers, the industry sector, 'trade, hotel and restaurant' sector engaged about 25.2 per cent while 'manufacturing' and 'other services' sectors accounted for about 21.9 per cent and 22.3 per cent, respectively.
- Among female workers in the urban, 'other services' sector (other than *'trade, hotel & restaurant' and 'transport, storage & communications'***)** shared the highest proportion of workers (45.6 per cent), followed by 'manufacturing' (24.5 per cent) and 'trade, hotel and restaurant' (13.8 per cent).

C.4 *Occupation of the workers in usual status (ps+ss)*

- In rural areas, 10.2 per cent of the male workers and 8.9 per cent of the female workers were engaged in the following occupation divisions: *Division 1: Legislators, senior officials and managers, Division 2: Professionals* and *Division 3: Technicians and associate professionals*.

- In urban areas, 32.0 per cent of the male workers and 35.3 per cent of the female workers were engaged in the following occupation divisions: *Division 1: Legislators, senior officials and managers, Division 2: Professionals* and *Division 3: Technicians and associate professionals*.

C.5 *Informal sector and conditions of employment of the workers in usual status (ps+ss)*

- In India, 68.4 per cent of the workers in *non-agriculture* sector were engaged in informal sector. The share of informal sector among male workers was 71.5 per cent and among female workers was nearly 54.1 per cent in *non-agriculture*.

- In India, among regular wage/salaried employees in the *non-agriculture sector*, 69.5 per cent had no written job contract: 70.3 per cent among males and 66.5 per cent among females.

- In India, among regular wage/salaried employees in the *non-agriculture sector*, 53.8 per cent were not eligible for paid leave: 54.7 per cent among males and 50.6 per cent among females.

- In India, among regular wage/salaried employees in the *non-agriculture sector*, 51.9 per cent were not eligible for any social security benefit: 51.2 per cent among males and 54.4 per cent among females.

D. Earnings from employment, hours worked and hours available for additional work

The estimates on earnings from employment of the workers, hours worked and hours available for additional work are derived on the basis of data collected in the first visit schedule in rural areas (since in rural areas there was no revisit) and on the basis of data collected in the first visit schedule as well as revisit schedules in urban areas for each of the survey periods July – September 2018, October- December 2018, January – March 2019 and April – June 2019.

Information on earnings from employment was collected for all the three categories of workers, viz., self-employed persons, regular wage/salaried employees and casual labour. For regular wage/salaried persons in current weekly status information on earnings was collected for preceding calendar month, for self-employed persons in current weekly status (CWS) information on earnings was collected for the last 30 days and for casual labour information on earnings was collected for each day of the reference week.

D.1 *Earnings from employment*

- In rural areas, among regular wage/salaried employees in current weekly status (CWS), earnings during the preceding calendar month ranged from Rs 13.2 thousand to Rs. 13.8 thousand among males and it was around Rs. 8.0 thousand to Rs. 9.4 thousand among females during July–September 2018, October-December 2018, January – March 2019 and April–June 2019.

- In urban areas, among regular wage/salaried employees in current weekly status (CWS), earnings during the preceding calendar month ranged from Rs. 18.9 thousand to Rs. 19.5 thousand among males and from Rs. 14.4 thousand to 15.7 thousand among females during July–September 2018, October- December 2018, January – March 2019 and April–June 2019.

- In rural areas, average wage earnings per day by casual labour engaged in works other than public works ranged between Rs. 277 to Rs. 297 among males and

nearly Rs. 170 to Rs. 199 among females during July – September 2018, October-December 2018, January – March 2019 and April – June 2019. In urban areas, average wage earnings per day by casual labour engaged in works other than public works ranged between Rs. 342 to Rs. 368 among males and nearly Rs. 205 to Rs. 244 among females during this period.

- In rural areas average gross earnings during the last 30 days from self-employment work by the self-employed workers in CWS ranged between Rs. 9.1 thousand to Rs. 9.6 thousand among males which was nearly Rs. 3.8 thousand to Rs. 4.4 thousand among females during July – September 2018, October-December 2018, January – March 2019 and April – June 2019. In urban areas, average gross earnings from self-employment work during the last 30 days ranged between Rs. 16 thousand to Rs. 18 thousand among males and it ranged between Rs. 6.2 thousand to Rs. 6.9 thousand among females during this period.

D.2 ***Hours actually worked during the reference week by the workers in current weekly status (CWS)***

- In rural areas, in a week, a worker in CWS actually worked on an average nearly 45 hours during July 2018 to June 2019 and in urban areas they worked for 50 hours, in a week, during this period.

D.3 ***Hours available for additional work by the workers in current weekly status (CWS)***

- In rural areas, percentage of the workers in CWS who reported that they were available for additional work ranged from 2.8 per cent to 3.5 per cent during July – September 2018, October- December 2018, January – March 2019 and April – June 2019.
- In rural areas, during July – September 2018, October- December 2018, January – March 2019 and April – June 2019 hours available for additional work in a week for workers in CWS who reported that they were available for additional work, ranged from 10.3 to 12.6 hours.
- In urban areas, percentage of the workers in CWS who reported that they were available for additional work ranged from 1.6 per cent to 2.5 per cent during July – September 2018, October- December 2018, January – March 2019 and April – June 2019.
- In urban areas, during July–September 2018, October- December 2018, January–March 2019 and April–June 2019 hours available for additional work in a week for workers in CWS who reported that they were available for additional work, ranged from 10.3 to 11.4 hours.

E. Unemployment Rate in usual status (ps+ss)

- Unemployment rate in India was 5.8 per cent. It was 5.6 per cent among males and 3.5 per cent among females in rural areas, while the rates were 7.1 per cent among males and 9.9 per cent among females in urban areas.

- For *educated (highest level of education secondary and above) persons of age 15 years and above*, unemployment rate in India was 11.0 per cent: 11.2 per cent in rural areas and 10.8 per cent in urban areas.

- The unemployment rate among the rural male youth (persons of age 15-29 years) was 16.6 per cent while the unemployment rate among the rural female youth was 13.8 per cent during 2018-19. The unemployment rate among the urban male youth was 18.7 per cent in 2017-18 while the unemployment rate for urban female youth was 25.7 per cent during this period.

Periodic Labour Force Survey (PLFS) 2019-2020

Survey Period

July 2019 to June 2020

Survey Coverage

Surveyed

12,569 First Stage Units (FSUs)	Rural: 6,913 villages Urban: 5,656 urban blocks
1,00,480 Households	55,291 in rural areas 45,189 in urban areas
4,18,297 Persons	2,40,231 in rural areas 1,78,066 in urban areas

The survey covered the whole of the Indian Union *except* the villages in Andaman and Nicobar Islands which remained extremely difficult to access throughout the year.

Approaches for presenting Labour Force Indicators

Approaches followed for presenting Labour Force Indicators

usual status (ps+ss) Reference period : 1 year	current weekly status(CWS) Reference period : 1 week

Some of the key results at the all-India level for the period July 2019 - June 2020 emerging from PLFS are highlighted below.

Households and Population

Percentage of households with major source of income (household type)

rural households (%)

household type

Self-Employment	Regular wage/salary earning	Casual Labour	Others	All
53.2	12.9	24.8	9.1	100.0

urban households (%)

household type

Self-Employment	Regular wage/salary earning	Casual Labour	Others	All
30.7	43.1	11.5	14.7	100.0

Literacy rate for persons of age 7 years and above

Literacy Rate for persons of age 7 years and above in India: 78.4%

rural	urban
male: 82.2% female: 66.3%	male: 91.8% female:83.0%

Labour Force in usual status (ps+ss)

LFPR for persons of all ages

Labour Force Participation Rate (LFPR) in usual status (ps+ss) in India: 40.1%

rural	**urban**
male: 56.3%	male: 57.8%
female: 24.7%	female:18.5%

LFPR for persons of age 15-29 years

Labour Force Participation Rate (LFPR) in usual status (ps+ss) for persons of age 15-29 years in India: 40.9%

rural:	**urban:**
41.3%	40.0%

LFPR for persons of age 15 years and above

Labour Force Participation Rate (LFPR) in usual status (ps+ss) for persons of age 15 years and above in India: 53.5%

rural:	**urban:**
55.5%	49.3%

Workforce

WPR in usual status for persons of all ages

Worker Population Ratio (WPR) in usual status (ps+ss) in India: 38.2%

rural	**urban**
male: 53.8%	male: 54.1%
female: 24.0%	female:16.8%

WPR in usual status for persons of age 15-29 years

Worker Population Ratio (WPR) in usual status (ps+ss) for persons of age 15-29 years in India: 34.7%

rural:	**urban:**
35.9%	32.1%

WPR in usual stat for persons age 15 year and above

Worker Population Ratio (WPR) in usual status (ps+ss) for persons of age 15 years and above in India: 50.9%

rural:	**urban:**
53.3%	45.8%

Status in employment among workers in usual status (ps+ss)

Share (%) of self-employed among workers in usual status (ps+ss)

rural male: 58.4	rural female: 63.0	urban male: 38.7	urban female: 34.6

Share (%) of regular wage/ salaried employees among workers in usual status (ps+ss)

rural male: 13.8	rural female: 9.5	urban male: 47.2	urban female: 54.2

Share (%) of casual labour among workers in usual status(ps+ss)

rural male: 27.8	rural female: 27.5	urban male: 14.1	urban female: 11.1

Industry of work (NIC - 2008) of the workers in usual

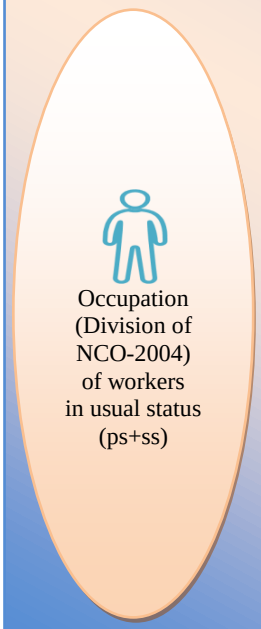
Some industry of activity with share (%) of workers in usual status (ps+ss) in rural areas

Agriculture Sector	rural male: 55.4	rural female: 75.7	rural person:61.5
Construction Sector	rural male: 15.0	rural female: 5.6	rural person:12.2
Trade, hotel and restaurant Sector	rural male: 9.2	rural female: 3.7	rural person:7.6
Manufacturing Sector	rural male: 7.3	rural female: 7.3	rural person:7.3

Industry of work (NIC - 2008) of the workers in usual status (ps+ss)

Some industry of activity with share (%) of workers in usual status (ps+ss) in urban areas

Trade, hotel and restaurant Sector	urban male: 28.9	urban female: 22.3	urban person: 27.4
Manufacturing Sector	urban male: 20.3	urban female: 22.4	urban person: 20.8
Construction Sector	urban male: 12.0	urban female: 4.9	urban person: 10.3
Transport, storage & communications	urban male: 12.1	urban female: 3.6	urban person: 10.2



Some Occupation Divisions with share (%) of workers in usual status (ps+ss) in rural areas

Division 1: Legislators, senior officials and managers	rural male: 6.3	rural female: 4.0
Division 2: Professionals	rural male: 2.0	rural female: 1.7
Division 3: Technicians and associate professionals	rural male: 2.1	rural female: 2.9

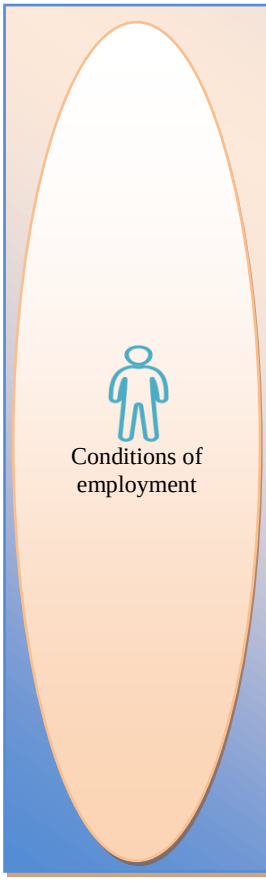
Some Occupation Divisions with share (%) of workers in usual status (ps+ss) in urban areas

Division 1: Legislators, senior officials and managers	urban male: 17.8	urban female: 11.7
Division 2: Professionals	urban male: 8.8	urban female: 13.7
Division 3: Technicians and associate professionals	urban male: 6.1	urban female: 11.7

Informal Sector

Percentage of workers in usual status (ps+ss) engaged in informal non-agriculture sector in India:

male:	female :	person:
72.9	56.5	69.5



Conditions of Employment

Percentage of regular wage/salaried employees in the non-agriculture sector who had no job contract in India

male:	female :	person:
68.1	65.0	67.3

Percentage of regular wage/salaried employees in the non-agriculture sector who were not eligible for paid leave in India

male:	female :	person:
53.1	49.8	52.3

Percentage of regular wage/salaried employees in the non-agriculture sector who were not eligible for any social security in India

male:	female :	person:
53.6	56.0	54.2

Earnings from employment, hours worked and hours available for additional work

Earnings from employment, hours worked and hours available for additional work

Estimates derived based on

- data collected in first visit schedule in rural areas; and
- data collected in first visit and revisit schedule in urban areas during for each of the survey periods July–September 2019, October- December 2019, January – March 2020 and April – June 2020

Information on earnings collected for

- self-employed persons in current weekly status (CWS) for last 30 days
- regular wage/salaried persons in current weekly status (CWS) for last calendar month
- casual labour during each day of reference week

Range of earnings from employment of regular wage/salaried employees in CWS

Range of earning for regular wage/salaried employees in CWS during preceding calendar month in the quarters July – September 2019, October- December 2019, January – March 2020 and April – June 2020

rural	
male	₹13.9 thousand - ₹ 14.3thousand
female	₹8.5 thousand - ₹ 12.1 thousand
urban	
male	₹19.2 thousand - ₹21.6 thousand
female	₹15.3 thousand - ₹17.3 thousand

Range of earnings from employment by casual labour engaged in work other than public works

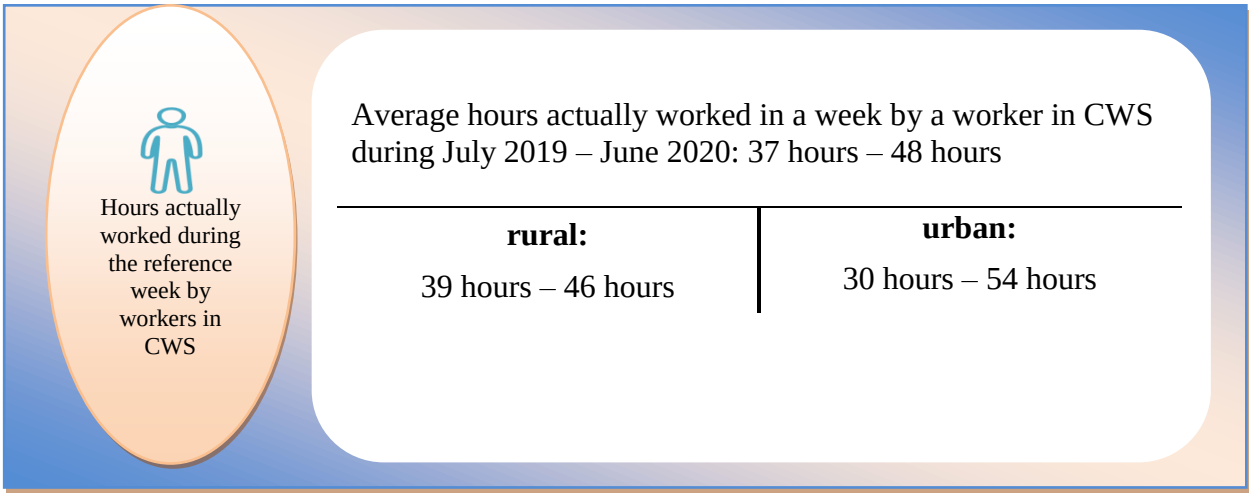
Average wage earning per day by casual labour engaged in work other than public works during the reference week of the quarters July – September 2019, October- December 2019, January – March 2020 and April – June 2020

rural male	₹297 - ₹315
female	₹185 - ₹209
urban male	₹375 - ₹391
female	₹243 - ₹265

Range of Earnings from employment of self-employed workers in CWS

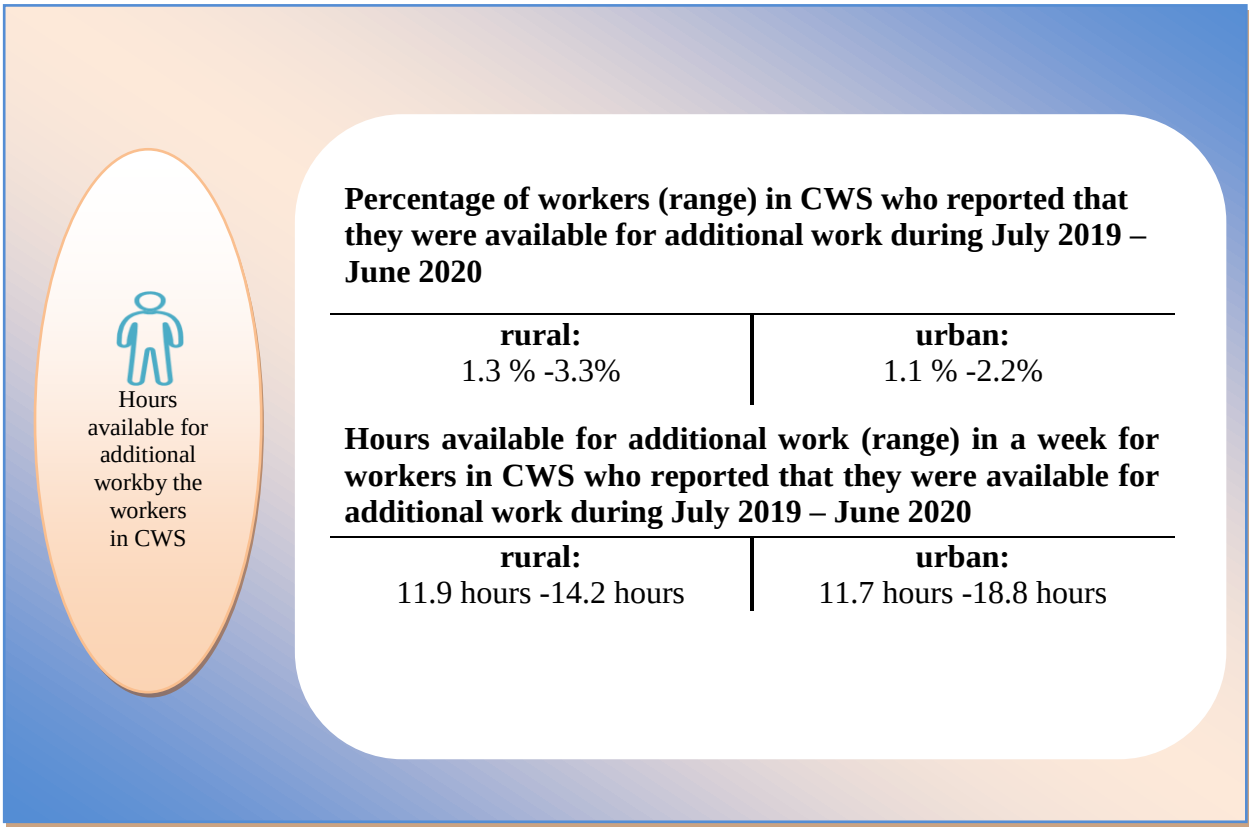
Average gross earnings during last 30 days from self-employment work by self-employed workers in CWS in the quarters July–September 2019, October-December 2019, January–March 2020 and April – June 2020

rural male	₹9.2 thousand - ₹10.1 thousand
female	₹4.6 thousand - ₹5.0 thousand
urban male	₹14.5 thousand - ₹17.8 thousand
female	₹6.9 thousand - ₹7.7 thousand



Average hours actually worked in a week by a worker in CWS during July 2019 – June 2020: 37 hours – 48 hours

rural:	**urban:**
39 hours – 46 hours	30 hours – 54 hours



Percentage of workers (range) in CWS who reported that they were available for additional work during July 2019 – June 2020

rural:	**urban:**
1.3 % -3.3%	1.1 % -2.2%

Hours available for additional work (range) in a week for workers in CWS who reported that they were available for additional work during July 2019 – June 2020

rural:	**urban:**
11.9 hours -14.2 hours	11.7 hours -18.8 hours

Unemployment Rate in usual status (ps+ss)

Unemployment Rate (UR) in usual status for persons of all ages

Unemployment Rate in usual status (ps+ss) for persons of all ages in India: 4.8%

rural	urban
male: 4.5%	male: 6.4%
female: 2.6%	female: 8.9%

Unemployment Rate (UR) in usual status for educated persons of all age 15 years and above

Unemployment Rate in usual status (ps+ss) for UR for educated (highest level of education secondary and above) persons of age 15 years and above in India:10.1%

rural	urban
9.9%	10.3%

Unemployment Rate (UR) in usual status for persons of age 15 -29 years

Unemployment Rate in usual status (ps+ss) for youth persons of age 15 -29 years in India: 15.0%

rural	urban
male: 13.8%	male: 18.2%
female:10.3%	female:24.9%

खण्ड–III हिंदी

सर्वेक्षण

राष्ट्रीय सांख्यिकी कार्यालय की पत्रिका

भाग- PDOS 57 XXXVI-VII सं० (3-4 एवं 1-2)
संयुक्त अंक संख्या 110वां & 111वां
मार्च & सितम्बर, 2021

राष्ट्रीय सांख्यिकी कार्यालय
सांख्यिकी और कार्यक्रम कार्यान्वयन मंत्रालय
भारत सरकार
नई दिल्ली

सम्पादकीयसचिवालय – सर्वेक्षणसमन्वयप्रभाग,राष्ट्रीय सांख्यिकी कार्यालय,सांख्यिकी एवं कार्यक्रम कार्यान्वयन मंत्रालय, संख्यिकी भवन,महर्षि वाल्मीकि मार्ग,नईदिल्ली-110032

1. श्रीमतीप्रवीन होरो सिंह, अपर महानिदेशक,एनएसओ (एस.सी.डी)
2. सुश्री नौशीदा एन.ए.,निदेशक, एनएसओ (एस.सी.डी)
3. श्री चेतन यंगजोर, उपनिदेशक, एनएसओ (एस.सी.डी)
4. श्री राम प्रकाश, वरिष्ठ सांख्यिकी अधिकारी, एनएसओ (एस.सी.डी)

सर्वेक्षण
भाग- PDOS 57 XXXVI-VII सं॰ (3-4 एवं 1-2)

मुख्य बातें

आवधिक श्रमबल सवेक्षण (पी एल एफ एस) 2018-2019

यह रिपोर्ट राष्ट्रीय सांख्यिकीय कार्यालय (एनएसओं) दवारा जुलाई 2018 से जून 2019 के दौरान किए गए आवधिक श्रमबल सर्बेक्षण (पीएलएफएस) पर आधारित हैं । यह सर्बेक्षण 12,720 एफएसयु (6,983 ग्रामीण और 5,737 नगरीय खंडो) में फैला हुआ था, एवं 1,01,579 परिवारों (55,812 ग्रामीण क्षेत्रों और 45,767 नगरीय क्षेत्रों में) को इसमें समाविष्ट किया गया, और 4,20,757 वयक्तियों (2,39,817 ग्रामीण क्षेत्रों और 1,80,940 नगरीय क्षेत्रों) गणना की गई । यह रिपोर्ट में श्रमबल संकेतक का प्राक्कलन क्रियाशील स्थितियों दवारा जनसंख्या के वर्गीकरण के लिए सर्बेक्षण में अपनाए गए वर्तमान साप्ताहिक स्थिति एवं सामान्य स्थिति (पीएस+एसएस) पर आधारित हैं । सामान्य स्थिति (पीएस+एसएस) के लिए सन्दर्भ अबधि 1 वर्ष हैं, और वर्तमान साप्ताहिक स्थिति के लिए 1 सप्ताह हैं । नगरीय क्षेत्र में क्रमावर्तित पैनल प्रतिदर्श अभिकल्प का उपयोग किया गया । इस क्रमावर्तित पैनल स्किम में नगरीय क्षेत्र में चयनित प्रत्येक परिवारों को चार बार निरीक्षण किया गया - एक प्रथम अनुसूची निरीक्षण और अन्य तीन अनुसूची के पुनः निरीक्षण किया गया । ग्रामीण अनुसूचियों का पुनः निरीक्षण नहीं हुआ । यहाँ प्रस्तुत परिवार और जनसंख्या, श्रमबल, कार्यबल और बेरोजगारी का प्राक्कलन नगरीय एवं ग्रामीण दोनों क्षेत्रों में अनुसूचियों के प्रथम निरीक्षण में एकत्रित डाटा पर आधारित हैं ।

अखिल भारतीय स्तर पर जुलाई 2018 - जून 2019 की अबधि के लिए पीएलएफएस से प्राप्त कुछ मुख्य परिणाम निम्नलिखित हैं ।

(क) परिवार एवं जनसंख्या

- 2018-19 के दौरान करीब 51.7 प्रतिशत ग्रामीण परिवारों के आय का प्रमुख स्त्रोत स्व.नियोजन था । 25.1 प्रतिशत ग्रामीण परिवारों का आय के प्रमुख स्त्रोत आकस्मिक मजदूरी था, और 13.1 प्रतिशत ग्रामीण परिवारों का आय के प्रमुख स्त्रोत नियमित मजदूरी/वेतन था ।
- 2018-19 के दौरान करीब 31.8 प्रतिशत नगरीय परिवारों के आय का प्रमुख स्त्रोत स्व.नियोजन था। 11.0 प्रतिशत नगरीय परिवारों का आय के प्रमुख स्त्रोत आकस्मिक मजदूरी था और 42.8 प्रतिशत ग्रामीण परिवारों का आय के प्रमुख स्त्रोत नियमित मजदूरी/वेतन था ।
- भारत में साक्षरता दर (7 वर्ष और उससे अधिक उम्र के व्यक्तियों में) 2018-19 के दौरान 78.1 प्रतिशत था ।
- ग्रामीण और नगरीय दोनों क्षेत्रों में साक्षरता दर पुरूषों में महिलाओं से अधिक था : ग्रामीण क्षेत्रों में पुरूषों में साक्षरता दर 81.9 प्रतिशत और महिलाओं में साक्षरता दर

65.7 प्रतिशत था और नगरीय क्षेत्रों में साक्षरता दर महिलाओं की 82.6 प्रतिशत की तुलना में पुरूषों में 91.9 प्रतिशत था।

(ख) श्रमबल सामान्य स्थिति (पीएस+एसएस) में

- करीब 55.1 प्रतिशत ग्रामीण पुरूषों, 19.7 प्रतिशत ग्रामीण महिलाओं, 56.7 प्रतिशत नगरीय पुरूषों और 16.1 प्रतिशत नगरीय श्रमबल में थे।
- भारत के 15-29 वर्ष उम्र के व्यक्तियों में एलएफपीआर 38.1 प्रतिशत था : यह 37.8 प्रतिशत ग्रामीण क्षेत्रों में और 38.7 प्रतिशत नगरीय क्षेत्रों में था।
- भारत के 15 वर्ष एवं उससे अधिक उम्र के व्यक्तियों में एलएफपीआर 50.2 प्रतिशत था : यह ग्रामीण क्षेत्रों में 51.5 प्रतिशत और नगरीय क्षेत्रों में 47.5 प्रतिशत था।

(ग) कार्यबल

ग .1 कामगार जनसंख्या अनुपात (डब्ल्यूपीआर) सामान्य स्थिति (पीएस+एसएस) में

- कामगार जनसंख्या अनुपात (डब्ल्यूपीआर) अखिल भारतीय स्तर पर करीब 35.3 प्रतिशत था। यह करीब 35.8 प्रतिशत ग्रामीण क्षेत्रों में और 34.1 प्रतिशत नगरीय क्षेत्रों में था।
- डब्ल्यूपीआर ग्रामीण पुरूषों के लिए 52.1 प्रतिशत था, ग्रामीण महिलाओं के लिए 19.0 प्रतिशत, नगरीय पुरूषों के लिए 52.7 प्रतिशत और नगरीय महिलाओं के लिए 14.5 प्रतिशत था।
- 15-29 वर्ष उम्र के व्यक्तियों में भारत में डब्ल्यूपीआर 31.5 प्रतिशत था: यह ग्रामीण क्षेत्रों में 31.7 प्रतिशत और नगरीय क्षेत्रों में 30.9 प्रतिशत था।
- 15 वर्ष एवं उससे अधिक उम्र के व्यक्तियों में भारत में डब्ल्यूपीआर 47.3 प्रतिशत था: यह ग्रामीण क्षेत्रों में 48.9 प्रतिशत और नगरीय क्षेत्रों में 43.9 प्रतिशत था।

ग .2 सामान्य स्थिति (पीएस+एसएस) में कामगारों के बीच रोजगार स्थिति

- कामगारों के बीच स्व-रोजगार का शेयर ग्रामीण पुरूषों में करीब 57.4 प्रतिशत, ग्रामीण महिलाओं में 59.6 प्रतिशत, नगरीय पुरूषों में 38.7 प्रतिशत और नगरीय महिलाओं में 34.5 प्रतिशत था।
- कामगारों के बीच ग्रामीण पुरूषों में करीब 14.2 प्रतिशत, ग्रामीण महिलाओं में 11.0 प्रतिशत, नगरीय पुरूषों में 47.2 प्रतिशत और नगरीय महिलाओं में 54.7 प्रतिशत नियमित मजदूरी/वेतन पानेवाल कर्मी थे।
- कामगारों के बीच आकस्मिक मजदूरों का अनुपात ग्रामीण पुरूषों में करीब 28.3 प्रतिशत, ग्रामीण महिलाओं में 29.3 प्रतिशत, नगरीय पुरूषों में 14.2 प्रतिशत और नगरीय महिलाओं में 10.3 प्रतिशत था।

ग.3 सामान्य स्थिति (पीएस+एसएस) में कामगारों का कार्य उद्योग

- ग्रामीण क्षेत्रों में, 2018-19 के दौरान पुरुष कामगारों का 53.2 प्रतिशत और महिला कामगारों का 71.1 प्रतिशत कृषि क्षेत्र में प्रयुक्त था । ग्रामीण क्षेत्र में 'निर्माण' सेक्टर में प्रयुक्त पुरुष एवं महिला कामगारों का अनुपात क्रमशः 15.4 प्रतिशत और 6.0 प्रतिशत था । 'विनिर्माण' क्षेत्र में प्रयुक्त पुरुष एवं महिला कामगारों का अनुपात क्रमशः 7.3 प्रतिशत और 9.0 प्रतिशत था ।
- नगरीय भारत में, 2018-19 के दौरान पुरुष कामगारों के बीच 'ट्रेड, होटल और रेस्टुरेन्ट सेक्टर' में करीब 25.2 प्रतिशत प्रयुक्त थे, जबकि 'विनिर्माण' और 'अन्य सेवाओं' सेक्टर में क्रमशः करीब 21.9 प्रतिशत और 22.3 प्रतिशत प्रयुक्त थे ।
- नगरीय क्षेत्रों में महिला कर्मियों के बीच 'अन्य सेवाऐ' सेक्टर (ट्रेड, होटल एवं रेस्टुरेन्ट और ट्रांसपोर्ट एवं कम्युनिकेशन सेक्टर के अलावा) कामगारों के अधिकतम अनुपात (45.6 प्रतिशत) शेयर किया, इसके उपरांत 'विनिर्माण' (24.5 प्रतिशत) और 'ट्रेड, होटल और रेस्टुरेन्ट' (13.8 प्रतिशत) शेयर किया ।

ग.4 सामान्य स्थिति (पीएस+एसएस) में कामगारों का उपजीविका

- ग्रामीण क्षेत्रों में 10.2 प्रतिशत पुरुष कामगार और 8.9 प्रतिशत महिला कामगार निम्नलिखित उपजीविका प्रभागों में प्रयुक्त थे: प्रभाग 1: विधिकारों, वरीय कर्मचारियों एवं प्रबंधकों, प्रभाग 2 : पेशेवरों एवं प्रभाग 3: टेक्नेशियन एवं सहयोगी पेशेवरों।
- नगरीय क्षेत्रों में 32.0 प्रतिशत पुरुष कामगार और 35.3 प्रतिशत महिला कामगार निम्नलिखित उपजीविका प्रभागों में प्रयुक्त थे: प्रभाग 1: विधिकारों, वरीय कर्मचारियों एवं प्रबंधकों, प्रभाग 2: पेशेवरों एवं प्रभाग 3: टेक्नेशियन एवं सहयोगी पेशेवरों।

ग.5 अनौपचारिक सेक्टर और सामान्य स्थिति (पीएस+एसएस) में कामगारों के रोजगार की अवस्था

- भारत में 68.4 प्रतिशत कामगार गैर-कृषि सेक्टर में अनौपचारिक क्षेत्र में लगे हुए थे । पुरुष कामगारों के बीच अनौपचारिक क्षेत्र का शेयर करीब 71.5 प्रतिशत और महिला कामगारों के बीच अनौपचारिक क्षेत्र का शेयर 54.1 प्रतिशत था गैर-कृषि और सेक्टर में ।
- भारत में, गैर-कृषि क्षेत्र में नियमित मजदूरी/वेतन भोगी कर्मचारियों के बीच 69.5 प्रतिशत के पास कोई लिखित नौकरी संविदा नहीं था : 70.3 प्रतिशत पुरूषों में और 66.5 प्रतिशत महिलाओं में ।

- भारत में, गैर-कृषि क्षेत्र में नियमित मजदूरी/वेतन भोगी कर्मचारियों के बीच 53.8 प्रतिशत वेतन युक्त अबकाश के योग्य नहीं थे: 54.7 प्रतिशत पुरूषों में और 50.6 प्रतिशत महिलाओं में।
- भारत में, गैर-कृषि क्षेत्र में नियमित मजदूरी/वेतन भोगी कर्मचारियों के बीच 51.9 प्रतिशत किसी सामाजिक सुरक्षा हितलाभ के पात्र नहीं थे: पुरूषों में 51.2 प्रतिशत एवं महिलाओं में 54.4 प्रतिशत।

(घ) कामगारों के आय, कितने घंटे काम किया एवं अतिरिक्त कार्यों के लिए उपलब्ध घंटे

कामगारों के आय कितने घंटे काम किया एवं अतिरिक्त कार्यों के लिए उपलब्ध घंटे ग्रामीण क्षेत्रों में किए गए अनुसूची के पहले दौरे पर इकट्ठे किए गए आंकड़ों पर आधारित हैं। नगरीय क्षेत्रों में अनुसूची के पहले दौरे पर और पुनः दौरे पर इकट्ठे किए गए आंकड़ों पर आधारित हैं जो जुलाई - सितम्बर 2018, अक्टूबर - दिसंबर 2018, जनवरी - मार्च 2019 एवं अप्रैल - जून 2019 अवधियों के लिए थे।

रोजगार से आय पर सुचना सभी तीन वर्गों के कामगारों के लिए इकट्ठी की गयी, जैसे स्व-कार्यरत व्यक्ति, नियमित मजदूरी/वेतन भोगी कर्मचारी एवं आकस्मिक श्रमिक। वर्तमान साप्ताहिक स्थिति (सीडब्ल्यूएस) में नियमित मजदूरी/वतनभोगी व्यक्तियों के लिए आय पर सुचना पूर्ववर्ती केलेण्डर माह के लिए इकट्ठी की गयी, वर्तमान साप्ताहिक स्थिति (सीडब्ल्यूएस) में स्व-रोजगार व्यक्तियों के लिए आय पर सुचना पिछले 30 दिनों के लिए इकट्ठी की गयी एवं आकस्मिक श्रमिक के लिए आय पर सुचना संदर्भ हफ्ते के प्रतिदिन के लिए इकट्ठी की गयी।

घ.1 कामगारों के आय

- ग्रामीण क्षेत्रों में, वर्तमान साप्ताहिक स्थिति (सीडब्ल्यूएस) में नियमित मजदूरी/वेतनभोगी कर्मचारियों के बीच, पूर्ववर्ती केलेण्डर माह के दौरान हुई आय की रेंज पुरूषों में रुपये 13.2 हजार से रुपये 13.8 हजार के बीच की रही एवं महिलाओं के बीच यह रुपये 8.0 हजार स रुपये 9.4 हजार के बीच की रही सर्वेक्षण अवधि के जुलाई - सितम्बर 2018, अक्टूबर - दिसंबर 2018, जनवरी - मार्च 2019 एवं अप्रैल - जून 2019 के बीच में।
- नगरीय क्षेत्रों में, वर्तमान साप्ताहिक स्थिति (सीडब्ल्यूएस) में नियमित मजदूरी/वेतनभोगी कर्मचारियों के बीच, पूर्ववर्ती केलेण्डर माह के दौरान हुई आय की रेंज पुरूषों में रुपये 18.9 हजार से 19.5 हजार की थी एवं महिलाओं के बीच रुपये 14.4 हजार से 15.7 हजार तक थी सर्वेक्षण अवधि के जुलाई - सितम्बर 2018, अक्टूबर - दिसंबर 2018, जनवरी - मार्च 2019 एवं अप्रैल - जून 2019 के बीच में।
- ग्रामीण क्षेत्रों म, आकस्मिक श्रमिक की औसतन प्रतिदिन की आय जो कि सर्वजनिक कार्यों के अतिरिक्त अन्य कार्यों में कार्यरत थे, पुरूषों में रु. 277 से रु. 297 एवं महिलाओं के बीच करीब रु.170 से रु. 199 थी सर्वेक्षण अवधि के जुलाई - सितम्बर 2018, अक्टूबर - दिसंबर

2018, जनवरी - मार्च 2019 एवं अप्रैल - जून 2019 के बीच में। नगरीय क्षेत्रों में, आकस्मिक श्रमिक की औसतन प्रतिदिन की आय जो कि सर्वजनिक कार्यों के अतिरिक्त अन्य कार्यों में कार्यरत थे, पुरूषों में रु. 342 से रु. 368 थी एवं महिलाओं में करीब रु. 205 से रु. 244 की थी।

- ग्रामीण क्षेत्रों में पिछले 30 दिनों के दौरान औसतन सकल आय सीडब्ल्यूएस में स्व-कार्यरत कामगारों दवारा किए गए स्व-कार्यरत कार्य से आय की रेंज, पुरूषों में रु. 9.1 हजार से रु. 9.6 हजार के बीच थी जो कि महिलाओं में करीब रु. 3.8 हजार से रु. 4.4 हजार के बीच थी सर्वेक्षण अवधि के जुलाई - सितम्बर 2018, अक्टूबर - दिसंबर 2018, जनवरी - मार्च 2019 एवं अप्रैल - जून 2019 के बीच में। पिछले 30 दिनों के दौरान नगरीय क्षेत्रों में स्व-रोजगार के कार्य की सकल औसतन आय की रेंज, पुरूषों में रु. 16 हजार से रु. 18 हजार के बीच थी एवं महिलाओं में यह रु. 6.2 हजार से रु. 6.9 हजार तक थी इस अवधि के दौरान।

घ.2 वर्तमान साप्ताहिक स्तर (सीडब्ल्यूएस) में संदर्भ हफ्ते के दौरान कामगारों के दवारा कितने घंटे कार्य किया गया

- ग्रामीण क्षेत्रों में, एक हफ्ते में सीडब्ल्यूएस में एक कामगार ने औसतन करीब सर्वेक्षण अवधि के जलाई 2018 से जून 2019 के दौरान 45 घंटे कार्य किया एवं नगरीय क्षेत्रों में, एक सप्ताह में इस अवधि के दौरान, 50 घंटे कार्य किया।

घ.3 वर्तमान साप्ताहिक स्तर (सीडब्ल्यूएस) में कामगारों का अतिरिक्त कार्यों के लिए उपलब्ध समय

- ग्रामीण क्षेत्रों में, सीडब्ल्यूएस में अतिरिक्त कार्य की उपलब्धता दर्ज करवाने वाले कामगारों की प्रतिशत की रेंज 2.8 प्रतिशत से 3.5 प्रतिशत के बीच थी जुलाई - सितम्बर 2018, अक्टूबर - दिसंबर 2018, जनवरी - मार्च 2019 एवं अप्रैल - जून 2019 के बीच में।
- ग्रामीण क्षेत्रों में, जुलाई - सितम्बर 2018, अक्टूबर - दिसंबर 2018, जनवरी - मार्च 2019 एवं अप्रैल - जून 2019 के बीच में सीडब्ल्यूएस में जिन कामगारों ने अतिरिक्त कार्य की उपलब्धता दर्ज करवायी थी उस में एक हफ्ते में अतिरिक्त कार्य की लिए उपलब्ध समय की रेंज 10.3 घंटे से 12.6 घंटे के बीच थी।
- नगरीय क्षेत्रों में, सीडब्ल्यूएस में अतिरिक्त कार्य की उपलब्धता दर्ज करवाने वाले कामगारों की प्रतिशत की रेंज 1.6 प्रतिशत से 2.5 प्रतिशत के बीच थी जुलाई - सितम्बर 2018, अक्टूबर - दिसंबर 2018, जनवरी - मार्च 2019 एवं अप्रैल - जून 2019 के बीच में।
- नगरीय क्षेत्रों में जुलाई - सितम्बर 2018, अक्टूबर - दिसंबर 2018, जनवरी - मार्च 2019 एवं अप्रैल - जून 2019 के बीच में सीडब्ल्यूएस में जिन कामगारों ने अतिरिक्त कार्य की उपलब्धता दर्ज करवायी थी उस में एक हफ्ते में अतिरिक्त कार्य की लिए उपलब्ध समय की रेंज 10.3 घंटे से 11.4 घंटे के बीच थी।

(ङ) सामान्य स्थिति (पीएस+एसएस) में बेरोजगार दर

- भारत में बरोजगार दर 5.8 प्रतिशत था | ग्रामीण क्षेत्रों में पुरूषों में बरोजगार दर 5.6 प्रतिशत था एवं महिलाओं में 3.5 प्रतिशत जबकि नगरीय क्षेत्रों में यही दर पुरूषों में 7.1 प्रतिशत एवं महिलाओं के बीच 9.9 प्रतिशत था।
- भारत में 15 बर्षो और उससे उपर के उम्र के शिक्षित (माध्यमिक एवं उसके उच्चतर का अधिकतम शिक्षा का स्तर) व्यक्तियों में बरोजगार दर 11.0 प्रतिशत था : ग्रामीण क्षेत्रों 11.2 प्रतिशत एवं नगरीय क्षेत्रों में 10.8 प्रतिशत था।
- 2018-19 के दौरान बरोजगार दर ग्रामीण युवा पुरुष (15-29 वर्ष) में 16.6 प्रतिशत था जबकि यह बेरोजगार दर ग्रामीण युवा महिला में 13.8 प्रतिशत था। 2018-19 के दौरान बरोजगार दर नगरीय युवा पुरुष में 18.7 प्रतिशत था एवं यही बरोजगार दर नगरीय युवा महिला के लिए 25.7 प्रतिशत था।

आवधिक श्रमबल सर्वेक्षण (पी एल एफ एस) 2019-2020

सर्वेक्षण अवधि

जुलाई 2019 से जून 2020

सर्वेक्षण कवरेज

सर्वेक्षण किया गया

12,569 फर्स्ट स्टेजउनिट्स (एफएसयु)	ग्रामीण: 6,913 गांवों नगरीय: 5,656 नगरीय खंडो
1,00,480 परिवारों	55,291 ग्रामीणक्षेत्रों में 45,189 नगरीयक्षेत्रों में
4,18,297 वयक्तियों	2,40,231 ग्रामीणक्षेत्रों में 1,78,066 नगरीयक्षेत्रों में

इस सर्वेक्षण में पूरे भारतीय संघ कोशामिल किया गया अंडमान और निकोबार द्वीप समूह के उन गाँवों को छोड़कर जिन तक पहुँचपाना पूरे वर्ष तक बेहद कठिन था|

श्रम बल संकेतक पेश करने के आधार

श्रम बल संकेत पेश करने के लिए अपनाया गया आधार

सामान्य स्थिति (पीएस+एस एस) सन्दर्भ अबधि:1 वर्ष	वर्तमान साप्ताहिक स्थिति (सी डब्ल्यू एस) सन्दर्भ अबधि: 1 सप्ताह

अखिल भारतीय स्तर पर जुलाई 2019 - जून 2020 की अबधि के लिए पी एल एफ एस से प्राप्त कुछ मुख्य परिणाम निम्नलिखित हैं।

परिवार एवं जनसंख्या

परिवारों के आय का प्रमुख स्त्रोत का प्रतिशत (परिवारों के प्रकार)

ग्रामीण परिवारों (%)

परिवारों के प्रकार

स्व.नियोजन	नियमित मजदूरी/वेतन	आकस्मिक मजदूरी	अन्य	सब
53.2	12.9	24.8	9.1	100.0

नगरीय परिवारों (%)

परिवारों के प्रकार

स्व.नियोजन	नियमित मजदूरी/वेतन	आकस्मिक मजदूरी	अन्य	सब
30.7	43.1	11.5	14.7	100.0

साक्षरता दर 7 वर्ष और उससे अधिक उम्र के व्यक्तियों में

भारत में साक्षरता दर 7 वर्ष और उससे अधिक उम्र के व्यक्तियों में: 78.4%

ग्रामीण	नगरीय
पुरूषों में: 82.2% महिलाओं में: 66.3%	पुरूषों में: 91.8% महिलाओं में:83.0%

श्रम बल सामान्य स्थिति (पी एस+एस एस) में

एल एफ पी आर सभी उम्र के व्यक्तियों पर

भारत में लेबर फोर्स पार्टिसपैशन रेट(एल एफ पी आर) सामान्य स्थिति (पी एस+एस एस) में: 40.1%

ग्रामीण	नगरीय
पुरूषों में: 56.3%	पुरूषों में: 57.8%
महिलाओं में: 24.7%	महिलाओं में:18.5%

एल एफ पी आर 15-29 वर्ष उम्र के व्यक्तियों में

भारत के 15-29 वर्ष उम्र के व्यक्तियों में सामान्य स्थिति (पी एस+एस एस) में एल एफ पी आर: 40.9%

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
41.3%	40.0%

एल एफ पी आर 15 वर्ष एवं उससे अधिक उम्र के व्यक्तियों में

भारतके 15 वर्ष एवं उससे अधिक उम्र के व्यक्तियों में सामान्य स्थिति (पी एस+एस एस) में एल एफ पी आर: 53.5%

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
55.5%	49.3%

कार्य बल

डब्ल्यू पी आर सभी उम्र के व्यक्तियों पर

कामगार जनसंख्या अनुपात (डब्ल्यू पी आर) सामान्य स्थिति में (पी एस+एस एस) में: 38.2%

ग्रामीण	नगरीय
पुरूषों में: 53.8%	पुरूषों में: 54.1%
महिलाओं में: 24.0%	महिलाओं में:16.8%

डब्ल्यू पी आर 15-29 वर्ष उम्र के व्यक्तियों में

15-29 वर्ष उम्र के व्यक्तियों में भारत में डब्ल्यू पीआर सामान्य स्थिति (पी एस+एस एस) में: 34.7%

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
35.9%	32.1%

डब्ल्यू पी 15 वर्ष उ उससे अधि उम्र के व्यक्ति में

15 वर्ष एवं उससे अधिक उम्र के व्यक्तियों में भारत में डब्ल्यू पी आर सामान्य स्थिति (पी एस+एस एस) में: 50.9%

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
53.3%	45.8%

सामान्य स्थिति (पीएस+एसएस) मेंकामगारोंकेबीच रोजगार स्थिति

सामान्य स्थिति (पी एस+एस एस) में कामगारों के बीचस्व-रोजगार का शेयर (%)

ग्रामीण	ग्रामीण	नगरीय	नगरीय
पुरूषों में:58.4	महिलाओं में:63.0	पुरूषों में:38.7	महिलाओं में:34.6

सामान्य स्थिति (पी एस+एस एस) में कामगारों के बीच नियमित मजदूरी/वेतन भोगी कर्मचारियों काशेयर (%)

ग्रामीण	ग्रामीण	नगरीय	नगरीय
पुरूषों में:13.8	महिलाओं में: 9.5	पुरूषों में: 47.2	महिलाओं में: 54.2

सामान्य स्थिति (पी एस+एस एस) में कामगारों के बीच आकस्मिक मजदूरों काशेयर(%)

ग्रामीण	ग्रामीण	नगरीय	नगरीय
पुरूषोंमें:27.8	महिलाओंमें:27.5	पुरूषोंमें:14.1	महिलाओंमें:11.1

सामान्य स्थिति (पी स+एस एस) में कामगारों का कार्य उद्योग

सामान्य स्थिति (पी एस+एस एस) में कुछ कार्य उद्योग (एन आई सी -2008) में कामगारों का शेयर (%) ग्रामीण क्षेत्रों में

कृषि क्षेत्र में	ग्रामीण पुरूषों में: 55.4	ग्रामीण महिलाओंमें: 75.7	ग्रामीण व्यक्तियोंमें:61.5
'निर्माण' सेक्टर में	ग्रामीण पुरूषों में: 15.0	ग्रामीण महिलाओंमें: 5.6	ग्रामीण व्यक्तियोंमें: 12.2
ट्रेड, होटल और रेस्टुरेन्ट सेक्टर में	ग्रामीण पुरूषों में: 9.2	ग्रामीण महिलाओंमें: 3.7	ग्रामीण व्यक्तियोंमें: 7.6
'विनिर्माण' क्षेत्र में	ग्रामीण पुरूषों में: 7.3	ग्रामीण महिलाओंमें: 7.3	ग्रामीण व्यक्तियोंमें:7.3

सामान्य स्थिति (पीएस+एस एस) में कामगारों कार्य उद्योग

सामान्य स्थिति (पीएस+एसएस) में कुछ कार्य उद्योग (एन आई सी -2008) में कामगारों का शेयर (%) नगरीय क्षेत्रों में

ट्रेड, होटल और रेस्टुरेन्ट सेक्टरमें	नगरीय पुरूषों में: 28.9	नगरीय महिलाओं में: 22.3	नगरीय व्यक्तियों में: 27.4
'विनिर्माण' क्षेत्र में	नगरीय पुरूषों में: 20.3	नगरीय महिलाओं में: 22.4	नगरीय व्यक्तियों में: 20.8
'निर्माण' सेक्टर में	नगरीय पुरूषों में: 12.0	नगरीय महिलाओं में: 4.9	नगरीय व्यक्तियों में: 10.3
ट्रैन्स्पर्टेशन, स्टॉरिज एण्ड कम्यूनिकेशन	नगरीय पुरूषों में: 12.1	नगरीय महिलाओं में: 3.6	नगरीय व्यक्तियों में: 10.2

सामान्य स्थिति (पीएस+एसएस) में कामगारों का उपजीविका (एनसीओ2004के प्रभाग)

सामान्य स्थिति (पी एस+एस एस) में कुछ उपजीविका (एन सी ओ 2004 के प्रभाग) में कामगारों का शेयर (%)

ग्रामीण क्षेत्रों में

प्रभाग 1: विधिकारों, वरीय कर्मचारियों एवं प्रबंधकों	ग्रामीण पुरूषों में: 6.3	ग्रामीण महिलाओं में: 4.0
प्रभाग 2 : पेशेवरों	ग्रामीण पुरूषों में: 2.0	ग्रामीण महिलाओं में: 1.7
प्रभाग 3: टेक्नेशियन एवं सहयोगी पेशेवरों	ग्रामीण पुरूषों में: 2.0	ग्रामीण महिलाओं में: 2.9

सामान्य स्थिति (पी एस+एस एस) में कामगारों का उपजीविका (एन सी ओ 2004 के प्रभाग)

सामान्य स्थिति (पी एस+एस एस) में कुछ उपजीविका (एन सी ओ 2004 के प्रभाग) में कामगारों का शेयर (%)

नगरीय क्षेत्रों में

प्रभाग 1: विधिकारों, वरीय कर्मचारियों एवं प्रबंधकों	नगरीय पुरूषों में: 17.8	नगरीय महिलाओं में: 11.7
प्रभाग 2 : पेशेवरों	नगरीय पुरूषों में: 8.8	नगरीय महिलाओं में: 13.7
प्रभाग 3: टेक्नेशियन एवं सहयोगी पेशेवरों	नगरीय पुरूषों में: 6.1	नगरीय महिलाओं में: 11.7

अनौपचारिक क्षेत्र

गैर-कृषि अनौपचारिक क्षेत्र# में सामान्य स्थिति (पी एस+एस एस) में कामगारों का शेयर (%)

भारत में गैर-कृषि अनौपचारिक क्षेत्र में नियुक्त सामान्य स्थिति (पी एस+एस एस) में कामगारों का प्रतिशत (%):

पुरुष कामगारों में: 72.9	महिला कामगारों में: 56.5	व्यक्ति कामगारों में: 69.5

कामगारों के आय, कितने घंटे काम किया एवं अतिरिक्त कार्यों के उपलब्ध घंटे

कामगारों के आय, कितने घंटे काम किया एवं अतिरिक्त कार्यों के लिए उपलब्ध घंटे

एस्टीमटेस आधारित है

- ग्रामीण क्षेत्रों में कि एगएअनु सूची के पहले दौरे पर इकट्ठे किए गए आंकड़ों; और
- नगरीय क्षेत्रों में अनुसूची के पहले दौरे पर और पुनः दौरे पर इकट्ठे किए गए आंकड़ों जो जुलाई – सितम्बर 2019, अक्टूबर – दिसंबर 2019, जनवरी - मार्च 2020 एवं अप्रैल - जून 2020 अवधियों के लिए थे

रोजगार से आय पर सुचना इकट्ठी की गयी

- वर्तमान साप्ताहिक स्थिति (सी डब्ल्यू एस) में स्व-रोजगार व्यक्तियों के लिए आय पर सुचना पिछले 30 दिनों के लिए
- वर्तमान साप्ताहिक स्थिति (सी डब्ल्यू एस) में नियमित मजदूरी/वतनभोगी व्यक्तियों के लिए आय पर सुचना पूर्ववर्ती केलेण्डर माह के लिए
- आकस्मिक श्रमिक के लिए आय पर सुचना संदर्भ हफ्ते के प्रतिदिन के लिए

वर्तमान साप्ताहिक स्थिति (सी डब्ल्यू ए स) में नियमित मजदूरी/वेतन भोगी कर्मचारियों के बीच आयकीरेंज

वर्तमान साप्ताहिक स्थिति (सी डब्ल्यू ए स) में नियमित मजदूरी/वेतन भोगी कर्मचारियों के बीच,पूर्ववर्ती केलेण्डर माह के दौरान हुई आय की रेंज सर्वेक्षण अवधि के जुलाई – सितम्बर 2019, अक्टूबर – दिसंबर 2019, जनवरी - मार्च 2020 एवं अप्रैल - जून 2020 के बीच में

ग्रामीण	
पुरूषों में	₹13.9 हजार - ₹ 14.3 हजार
महिलाओं में	₹8.5 हजार - ₹ 12.1 हजार
नगरीय	
पुरूषों में	₹19.2 हजार - ₹21.6 हजार
महिलाओं में	₹15.3 हजार - ₹17.3 हजार

आकस्मिकश्रमिक(पब्लिक वर्क्स के अलावा अन्य कार्यमें) कीऔसतनप्रतिदिनआयकीरेंज

आकस्मिक श्रमिक (पब्लिक वर्क्स के अलावा अन्य कार्य में) की औसतन प्रतिदिन की आय सर्वेक्षण अवधि के जुलाई - सितम्बर 2019, अक्टूबर - दिसंबर 2019, जनवरी - मार्च 2020 एवं अप्रैल - जून 2020 के बीच में

ग्रामीण	
पुरूषों में	₹297 - ₹315
महिलाओं में	₹185 - ₹209
नगरीय	
पुरूषों में	₹375 - ₹391
महिलाओं में	₹243 - ₹265

सीडब्ल्यूएसमें स्व-कार्यरत कामगारों दवारा किए गए स्व-कार्यरत कार्य से औसन कुल आय की रेंज

सी डब्ल्यू एस में स्व-कार्यरत कामगारों दवारा किए गए स्व-कार्यरत कार्य से औसतन कुल आय की रेंज सर्वेक्षण अवधि के जुलाई - सितम्बर 2019, अक्टूबर - दिसंबर 2019, जनवरी - मार्च 2020 एवंअप्रैल - जून 2020 के बीच में

ग्रामीण	
पुरूषों में	₹9.2 हजार - ₹10.1 हजार
महिलाओं में	₹4.6 हजार - ₹5.0 हजार
नगरीय	
पुरूषों में	₹14.5 हजार - ₹17.8 हजार
महिलाओं में	₹6.9 हजार - ₹7.7 हजार

सी डब्ल्यू एस में कामगार द्वारा औसतन साप्ताहिक कितने घंटे कार्य किया गया

वर्तमान साप्ताहिक स्थिति (सी डब्ल्यू एस) में सर्वेक्षण अवधि जुलाई 2019 से जून 2020 के दौरान कामगार द्वारा औसतन साप्ताहिक काम किया गया: 37 घंटे – 48 घंटे

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
39 घंटे - 46 घंटे	30 घंटे - 54 घंटे

सी डब्ल्यू एस में कामगारों का अतिरिक्त कार्यों के लिए उपलब्ध समय

वर्तमान साप्ताहिक स्थिति (सी डब्ल्यू एस) में अतिरिक्त कार्य की उपलब्धता दर्ज करवाने वाले कामगारों की प्रतिशत की रेंज सर्वेक्षण अवधि जुलाई 2019 से जून 2020 के दौरान

ग्रामीणक्षेत्रोंमें:	नगरीयक्षेत्रोंमें:
1.3 % -3.3%	1.1 % -2.2%

सी डब्ल्यू एस में जिन कामगारों ने अतिरिक्त कार्य की उपलब्धता दर्ज करवायी थी उसमें एक हफ्ते में अतिरिक्त कार्य की लिए उपलब्ध समय की रेंज सर्वेक्षण अवधि जुलाई 2019 से जून 2020 के दौरान

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
11.9 घंटे -14.2 घंटे	11.7 घंटे -18.8 घंटे

बेरोजगार दर सामान्य स्थिति (पी एस+एस एस) में

बरोजगार दर सभी उम्र के व्यक्तियों पर

भारत में सामान्य स्थिति (पी एस+एस एस) में बरोजगार दर: 4.8%

ग्रामीण	नगरीय
पुरूषों में: 4.5%	पुरूषों में: 6.4%
महिलाओं में: 2.6%	महिलाओं में: 8.9%

बरोजगार दर 15 वर्षो और उससे उपर के उम्र के शिक्षित व्यक्तियों में

भारत में 15 वर्षोऔरउससेउपरकेउम्रकेशिक्षित (माध्यमिक एवं उसके उच्चतर का अधिकतम शिक्षा का स्तर) व्यक्तियों में सामान्य स्थिति (पी एस+एस एस) में बरोजगार दर:10.1%

ग्रामीण क्षेत्रों में	नगरीय क्षेत्रों में
9.9%	10.3%

बरोजगार दर युवा (15-29 वर्ष उम्र के) व्यक्तियों में

भारत में बरोजगार दर युवा (15-29 वर्ष उम्र के) व्यक्तियों में:15.0%

ग्रामीण	नगरीय
पुरूषों में: 13.8%	पुरूषों में: 18.2%
महिलाओं में:10.3%	महिलाओं में:24.9%

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PART-II: HIGHLIGHTS OF SOME OF THE REPORTS RELEASED BY NSO

(B) 108th ISSUE

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