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Measurement and Analysis

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Underemployment in India: Measurement and Analysis

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Abstract

This paper is about measurement and analysis of underemployment of labour. Here an index of underemployment is defined for a person who belongs to the labour force in usual status but may be employed, unemployed and seeking employment or out of labour force during each half-day of a 7-day reference week. This simple index admits aggregation over similar workers and thus can lead to an underemployment index for a category of workers, like workers of a household, a village, a district, of the age group 15-40 years etc. Using the unit-level dataset of the NSS 66th round: Employment-Unemployment Survey, underemployment index for different categories of workers has been estimated for comparison. In another exercise Tobit regression analysis has been done using the unit-level survey data mentioned above to find out statistically significant covariates of underemployment at the worker level as well as at the household level.

JEL Classification: J01, J64, Z22

Key words: Underemployment, Tobit analysis, India

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1. Introduction

The Report of the Fifth Annual Employment–Unemployment Survey (2015-16) records the overall unemployment rate estimates for persons aged 15 years and above under the usual principal status (ups) for rural and urban India to be 5.1 and 4.9 per cent respectively (Government of India 2016). This report also notes, "... It is pretty well-known that many of the persons who are reported as 'employed' or 'workers' in official publications do not get work for the entire duration of their stay in the labour force. And even those who get some work or the other for the entire duration may be getting work for only a small fraction of the time they are available for work. ... All these constitute *underemployment* which remains a worrying aspect of the employment-unemployment scenario in the country." (Government of India, 2016; page vi) In this context, it is reported that during 2015-16 at the all-India level, in rural areas only 52.7 per cent of persons aged 15 years and above who were available for work for 12 months could get to work throughout the year, the corresponding figure for urban areas being 82.1 per cent.

Such information about the extent of underemployment present in the Indian labour market gains a lot more importance if one notices the facts that during 2015-16 at the all-India level (i) 46.6, 32.8, 17 and 3.7 per cent of workers were estimated to be self-employed, casual labourer, wage/salary earners and contract workers, respectively; and (ii) majority of these workers were employed in the primary sector. More specifically, 46.1, 32 and 21.8 per cent of these persons were estimated to be employed in agriculture, forestry and fishing sector, tertiary sector and secondary sector, respectively. Needless to mention, the overwhelming importance of self-employment and employment in the unorganized sector enhances the chance of a person, who is employed according to usual status, experiencing underemployment.

Given the developmental significance of the phenomenon of underemployment, its measurement for India is in vogue for quite some time now. The Report of the Fifth Annual Employment–Unemployment Survey (2015-16) presents a *qualitative* measure of the extent of underemployment for all-India and the States and Union Territories by gender separately for rural and urban sectors. This is a percentage distribution of workers aged 15 years and above

who reported to be available for work for 12 months but actually worked (according to usual principal and subsidiary status (ps+ss) for 12 months, 6-11 months, 1-5 months or did not get any work at all. Earlier National Sample Survey Organisation/Office (NSSO), in its quinquennial Employment-Unemployment Survey reports, used different *aggregative* measures of underemployment incidence as defined below:

UDE_{NSS1} = Percentage of unemployed/out of labour force persons as per current weekly status (cws) in the total number of employed persons by usual status;

UDE_{NSS2} = Percentage of days out of 7 days an average usual status employed person spent as unemployed/out of labour force; and finally

UDE_{NSS3} = Percentage of days out of 7 days an average employed person by cws spent as unemployed/out of labour force, where a person employed by cws is one who worked at least one day out of the 7 days of the reference week.

Note that these three underemployment measures enumerated above are macro-aggregative measures in nature and indicate different aspects of underemployment suffered by a given population or population subgroup. It is not difficult to see that underlying each of these aggregative measures there is a corresponding micro/person level underemployment measure/concept. At the person level, for example, underemployment results due to factors that may prevent a person from getting fully employed during the time period he/she is in the labour market. It would be worthwhile, if unit/micro-level data are available, to examine the phenomenon of underemployment at the person level, household level or at a more aggregative level and such analysis should help identify significant covariates of underemployment.

Not much academic research has been done on the under utilization of labour – in particular, for the Indian economy. The available literature on underemployment relates to two altogether different kinds of concerns about the phenomenon of underemployment. In developed economies like those of USA and UK, underemployment

relates to short run fluctuations in labour absorption by the economy and thus it is frictional and transitory in nature (Bureau of Labor Statistics, 2017; Leif and Slack, 2003; Bell and Branchflower, 2013). In India and other developing third world countries, on the other hand, underemployment is essentially the result of the unorganized and informal nature of the economy which fails to keep labour engaged on a regular longer term basis (Government of India, 2011; Government of India, 2016).

This paper has two parts. In the first part a person-level measure of underemployment is defined based on information about short run labour force status of a person (as is available from a *person level time disposition* data set collected in NSSO Employment-Unemployment Survey). This person level measure can be aggregated to yield corresponding measure(s) for well-defined person groups such as household, district, social class, religion group, specific age group of persons, state etc. The latter part of the paper presents some illustrative empirical results on underemployment based on the household level unit-record data set of the NSS 66th round Employment-Unemployment survey (July 2009-June 2010). These results are based on the underemployment measure proposed here. Actually, results of two different empirical exercises are presented here. In the first exercise estimates of the underemployment index are obtained for household categories based on state, household type, social class, religion group, separately for the rural and urban sector. The second exercise essentially looks for statistically significant covariates of underemployment using a *Tobit* regression analysis. This analysis is done separately for the household level data and the person level data at three regional levels: all-India rural and urban.

2. A Proposed Measure of Underemployment

Consider the i th household of a given universe of households. Let n_h be the number of household members *in labour force* as per usual activity status (i.e., all members **other than those** having usual primary activity status code 91-99 in block 5.1, column (3) of Schedule 10 of NSSO⁴). For the i th member of such a household,

4. These status codes are as follows: 91: attended educational institutions; 92: attended domestic duties only; 93: attended domestic

$i=1, \dots, n_h$, let l_{ih} be the number of half days the member was *in labour force* and e_{ih} be the number of half days the member was *employed*, as per the short run (half day) activity status code (as given in block 5.3, column (4) of Schedule 10 of NSS 66th Round), out of the 14 half days of the 7-day reference period for which time disposition information is collected. Clearly then, the member was *out of labour force* for $(14-l_{ih})$ half days. Note that $0 \leq e_{ih} \leq l_{ih} \leq 14$. Since $l_{ih} = 0$ for a member who was out of labour force during the entire 7-day reference period, we exclude all such members.

For the i th member of the h th household, the index of underemployment is defined as

$$(1) \rho_{ih} = \frac{l_{ih} - e_{ih}}{l_{ih}}$$

Clearly, $0 \leq \rho_{ih} \leq 1$. $\rho_{ih} = 0$ and $\rho_{ih} = 1$ in the zero unemployment and full unemployment cases, respectively. Given (1), a corresponding household level index of underemployment is obtained by aggregating (1) over all household members who are in labour force, viz.,

$$(2) \rho_h = \frac{\sum_i \rho_{ih} l_{ih}}{\sum_i l_{ih}}$$

Note that ρ_h , being an weighted average of ρ_{ih} 's, is in $[0, 1]$. Finally, (2) may be aggregated over households to get an all-household index of underemployment, viz.,

$$(3) \rho = \frac{\sum_h \rho_h l_h}{\sum_h l_h}$$

duties and was also engaged in free collection of goods, sewing, tailoring, weaving, etc. for household use; 94:rentiers, pensioners, remittance recipients, etc.; 95 not able to work owing to disability; 97: other including beggars, prostitutes, etc.; 98: did not work owing to sickness; 99: children of age 0-4 years.

where $l_h = \sum_i l_{ih}$: total number of half days all members of the h th household were in labour force during the 7-day reference period. Note that if this all-household index is to be estimated from a non-self-weighting sample data set, the relevant estimator will be

$$\hat{\rho} = \frac{\sum_h \rho_h l_h m_h}{\sum_h l_h m_h}$$

where m_h : multiplier for the h th sample household. Note also that ρ and $\hat{\rho}$, being weighted averages of ρ_{ih} 's, will be in $[0, 1]$.

A comprehensive picture of the phenomenon of underemployment may be obtained through an analysis of the person level bivariate data set $(\pi e_{ih}, \pi l_{ih}; i = 1, n_h, h = 1, \dots, H)$ on short run labour force status

of persons, where $\pi e_{ih} = \frac{e_{ih}}{l_{ih}}$: proportion of half days the i th household member was employed out of the total number of half days (s)he was in labour force and $\pi l_{ih} = \frac{l_{ih}}{14}$: proportion of half days out of 14 half days the i th household member was in labour force during the 7-day reference period. Note that one may compile the corresponding household level data set $(\pi e_h, \pi l_h; h = 1, \dots, H)$, where

$$\pi e_h = \frac{\sum_i e_{ih}}{\sum_i l_{ih}} \text{ and } \pi l_h = \frac{\sum_i l_{ih}}{14n_h} . \text{ If desired, this detailed analysis may}$$

be done for specific person groups like, say, females in 15-25 year age group, casual workers, urban educated unemployed (by usual activity status), youths etc. The nature of the required regression analysis is briefly explained below.

For convenience of presentation, let us denote the variables πe and πl by y and x , respectively, and write the regression function as $E(y/x) = g(x)$. Since $y \in [0, 1]$ and $x \in [0, 1]$, $g(x) \in [0, 1]$ for all x , the regression function will be as shown in Figure 1. Note that this regression function may be interpreted as a description of how the probability of getting employment of a person is related to his/her

stay in the labour force in the short run, in an *ex ante* sense and it can be estimated using the technique of nonparametric regression analysis.

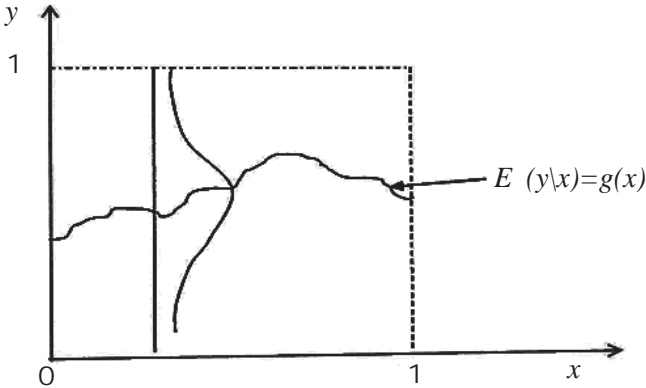


Figure 1 : The underemployment function

Now consider Figure 1. Note that if $E(y/x) = 0$ for all x , all persons were *unemployed* during the entire 7-day reference period, irrespective of how long they were in labour force during that period. Hence in this case the degree of underemployment should be maximum possible. In the other extreme case, $E(y/x) = 1$ for all x ; i.e., all persons were employed on all half days they were in labour force during the 7-day reference period and this is the case of zero un(der)employment. An aggregative index of underemployment may, therefore, be defined as the area of the unit square above the regression line, i.e.,

$$(5) \rho_A = 1 - \int_0^1 E(y/x) f(x) dx,$$

$f(x)$ being the marginal density function of x . Note that, by definition, $\rho_A \in [0,1]$.

Given the regression function defined above, an obvious indicator of the sensitivity of degree of (under)employment to the degree of stay in the labour force would be the elasticity of y w.r.t. x . *A priori*, one

would expect this elasticity to vary along the regression function. A summary measure of this sensitivity could be the *average elasticity* of y w.r.t. x , as defined below

$$\bar{\eta}_{yx} = \frac{\int_0^1 \frac{xdE(y/x)}{E(y/x)dx} E(y/x)f(x)dx}{E(y)} = \frac{\int_0^1 \eta(x)E(y/x)f(x)dx}{E(y)}$$

$\eta(x) = \frac{xdE(y/x)}{E(y/x)dx}$ being the elasticity of y w.r.t. x on the regression function at x .

Given the bivariate data set, the regression function can in principle be estimated *nonparametrically* using the kernel regression technique to get an idea about its shape. To estimate ρ_A , a polynomial regression function of appropriate degree may be fitted then and the area above the fitted function in the unit square is calculated. The corresponding estimate of average elasticity may be estimated directly using nonparametric kernel estimation technique or indirectly by averaging the elasticities estimated along the fitted polynomial regression function. An alternative parametric regression approach for estimating the regression function $g(x)$ may be the following: Since y is a bounded variable, one may consider as regressand the transformed variable $z = \ln \frac{y}{1-y}$ which lies in $(-\infty, \infty)$ and set up the regression equation as $z = h(x)$ where $h(x)$ is an appropriate algebraic specification, given the (z, x) data set. Once $h(x)$ is estimated, the corresponding fitted y values may be obtained as $\hat{y} = 1 - \frac{1}{1 + \exp^{\hat{h}(x)}}$, $\hat{h}(\cdot)$, being the estimated regression function.

3. Empirical Results – Underemployment Index for Selected Household Categories

As mentioned earlier, the proposed underemployment index is used to measure the extent of underemployment for (1) rural and urban sector of major states, separately for male and female and

overall population; (2) all India rural and urban *household type* categories, separately for male, female and overall population; (3) all India rural and urban *social class* categories, separately for male, female and overall population; and (4) all India rural and urban *religion* categories, separately for male, female and overall population. These results are presented in Tables 1 – 4.

Table 1: Index of underemployment for male and female workers in rural and urban sectors across major Indian states

States	Rural			Urban		
	Male	Female	All	Male	Female	All
Jammu & Kashmir	0.04	0.19	0.05	0.05	0.15	0.07
Himachal Pradesh	0.05	0.05	0.05	0.04	0.14	0.06
Punjab	0.06	0.14	0.07	0.07	0.11	0.07
Haryana	0.07	0.05	0.06	0.05	0.04	0.05
Rajasthan	0.03	0.01	0.02	0.04	0.06	0.04
Uttar Pradesh	0.07	0.04	0.06	0.06	0.07	0.06
Bihar	0.06	0.06	0.06	0.07	0.23	0.08
Manipur	0.04	0.05	0.04	0.05	0.05	0.05
Assam	0.06	0.12	0.07	0.05	0.15	0.06
West Bengal	0.07	0.08	0.07	0.07	0.09	0.07
Jharkhand	0.08	0.04	0.07	0.09	0.17	0.10
Orissa	0.09	0.08	0.09	0.06	0.10	0.06
Chattisgarh	0.04	0.03	0.03	0.05	0.02	0.04
Madhya Pradesh	0.07	0.08	0.08	0.06	0.06	0.06
Gujarat	0.06	0.06	0.06	0.04	0.06	0.04
Maharashtra	0.07	0.09	0.08	0.06	0.10	0.07
Andhra Pradesh	0.07	0.08	0.07	0.05	0.10	0.07
Karnataka	0.04	0.05	0.04	0.05	0.07	0.06
Kerala	0.14	0.29	0.19	0.15	0.21	0.17
Tamil Nadu	0.10	0.14	0.12	0.07	0.10	0.07
All India	0.07	0.08	0.07	0.05	0.10	0.07

Notes: 1. Index of underemployment has been calculated using the method suggested in the text.

2. Estimates for 20 states are reported here. For each of these states the sample number workers based on usual principal activity status was 4000 or more.

3. Estimates for all India in the table are based on data for all states and UTs of India.

Source: Estimates based on the unit-record dataset of National Sample Survey 66th round (Employment and Unemployment Survey).

The state-specific estimates of the underemployment index of Table 1 show that value of the index ranges between 1 per cent (rural Rajasthan, female) and 23 per cent (rural Kerala, female and urban Bihar, female). For rural male, the index value is between 3 per cent (Rajasthan) and 14 per cent (Kerala). The corresponding range for rural female is 1 per cent (Rajasthan) and 29 per cent (Kerala). For urban male, the range is between 4 per cent (Himachal Pradesh and Gujarat) and 15 per cent (Kerala). Finally, for urban female the range is between 4 per cent (Haryana) and 23 per cent (Bihar).

Table 2: Index of underemployment for male and female workers of different household type of rural and urban India.

Household type	Male	Female	All
	Rural		
Self-employed in non-agriculture	0.049	0.080	0.054
Agricultural labour	0.094	0.110	0.099
Other labour	0.087	0.120	0.094
Self-employed in agriculture	0.044	0.039	0.043
Others	0.079	0.137	0.090
All	0.067	0.084	0.071
	Urban		
Self-employed	0.042	0.079	0.047
Regular wage/salaried	0.051	0.099	0.059
Casual labour	0.106	0.103	0.105
Others	0.288	0.281	0.287
All	0.060	0.097	0.066

- Notes: 1. Index of underemployment has been calculated using the method suggested in the text.
2. Estimates reported against 'all' household types are based on pooled data for rural/urban India.

Source: Estimates based on the unit-record dataset of National Sample Survey 66th round (Employment and Unemployment Survey).

As Table 2 shows, for rural male the index is lowest (4.4 per cent) for self-employed in agriculture and highest (9.4 per cent) for agricultural labour (thus showing the relative vulnerability of this category of households). For rural female, the index is between 3.9 per cent (self-employed in agriculture) and 13.7 per cent (others). For urban male the index varies between 4.2 per cent (self-employed) and 28.8 per cent (others). Corresponding range for urban female is between 7.9 per cent (self-employed) and 28.1 per cent (others).

Table 3: Index of underemployment for different social groups by gender in rural and urban India.

Social class	Male	Female	All
Rural			
ST	0.067	0.065	0.066
SC	0.086	0.112	0.092
OBC	0.062	0.082	0.067
Others	0.056	0.075	0.059
All	0.067	0.084	0.071
Urban			
ST	0.072	0.078	0.073
SC	0.082	0.096	0.085
OBC	0.061	0.104	0.0699
Others	0.051	0.093	0.057
All	0.060	0.097	0.066

- Notes: 1. Index of underemployment has been calculated using the method suggested in the text.
2. Estimates reported against 'all' household types are based on pooled data for rural/urban India.

Source: Estimates based on the unit-record dataset of National Sample Survey 66th round (Employment and Unemployment Survey).

Table 3 presents the underemployment indices estimated for different social class categories of rural and urban India for male and female workers. For both male and female workers, for rural and urban India alike, the variation of the estimated underemployment index across household social group categories is not large and in almost all cases the index has a higher value for female workers.

Table 4: Index of underemployment for male and female workers by religion type of household in rural and urban India.

Religion category	Rural			Urban		
	Male	Female	All	Male	Female	All
Hindu	0.066	0.083	0.071	0.060	0.097	0.066
Muslim	0.061	0.074	0.062	0.052	0.105	0.058
Christian	0.101	0.143	0.115	0.095	0.092	0.094
Sikh	0.056	0.102	0.060	0.077	0.162	0.088
Jain	0.001	0.000	0.001	0.006	0.011	0.007
Buddhist	0.124	0.118	0.122	0.129	0.110	0.123
Others	0.064	0.028	0.056	0.069	0.021	0.054
All	0.067	0.084	0.071	0.060	0.097	0.066

Notes: 1. Index of underemployment has been calculated using the method suggested in the text.

2. Estimates reported against 'all' household types are based on pooled data for rural/urban India.

Source: Estimates based on the unit-record dataset of National Sample Survey 66th round (Employment and Unemployment Survey).

Finally, we have the variation of the underemployment index across categories of households following different religions. For Buddhist male and female workers of both rural and urban India the extent of underemployment is highest. The index values for male and female Christian workers are also quite large. The estimated index for both male and female Jain workers are mostly close to zero. Hindu and Muslim workers have broadly comparable index values both for male and female categories for rural and urban India.

4. Empirical Results – Tobit Analysis for Underemployment Index

The way underemployment is defined here, it is a manifestation of the inability of a *usual status* worker to find gainful employment in short run. Whether or not a person will experience underemployment and if (s)he does, the intensity of underemployment suffered should depend on relevant attributes/characteristics of the person, of the household (s)he belongs to and other factors that are

likely to affect the condition of the short run labour market that the worker faces. In the present analysis, we attempt to identify a set of statistically significant covariates of the intensity of underemployment at the worker and/or household level separately for rural and urban India. Since the observed value of underemployment index, our dependent variable of interest, can be zero for sample workers/households that did not experience underemployment, we have used Tobit regression analysis in this exercise. Incidentally, in the household level dataset, for 47,273 out of 55,820 rural sample households and 32,599 out of 38,141 urban sample households the estimated underemployment index value was zero. The corresponding numbers of zero observations for the worker level dataset were 90,747 out of 102,640 for rural workers and 53,387 out of 60,803 for urban workers. The possible covariates that we have tried are all from the unit level dataset of the NSS 66th round Employment-Unemployment Survey. This set of covariates that are tried are as follows: worker's attributes/characteristics – gender, age group, marital status, general education, technical education, NREG (National Rural Employment Guarantee) card holding, NREG job seeking; household attributes/characteristics – household size, gender of household head, religion, social class, household type and land holding.

The results of the Tobit regression analysis are reported in Tables 5 – 7. In Table 5, the results based on household level data at three regional levels: all-India, rural, and urban, are presented. Corresponding results based on worker level data at three regional levels: all-India, rural, and urban, are given in Tables 6 and 7, respectively. It may be mentioned that these are final results of the Tobit regression analysis obtained after several trials.

Let us first examine the results of the household level data analysis reported in Table 5. The variables larger household size, larger proportion of working age female members in household, other labour/ casual labour household type and other household type have significant positive effect on household level underemployment at all three regional levels: all-India, rural, and urban. On the other hand, variables such as number of children of age 0-5 years, belonging to Muslim and 'other religion' category have a negative effect on household level underemployment. The effect of the

remaining variables on underemployment is significant for only one of the two sectors.

The results of the analysis of worker level data for all India rural may be summarized as follows: underemployment is likely to be higher for a worker who is a female, not illiterate, has any technical education, does not belong to a self-employed in agriculture/others type household, does not belong to SC or OBC social group, does not have 'big' land holding, possesses NREG job card, and sought but did not get NREG job. On the other hand, age in 40-59 years range, currently married status, belonging to Muslim or 'others' by religion, and ST social group are associated with lower underemployment. For many of these variables interaction effect with 'gender' turns out to be insignificant. Let us try to interpret some of these interaction effects. Consider the variable 'currently married' coefficient of which is estimated to be -0.3909 and it is statistically significant. This means that compared to workers of other marital statuses, a 'currently married' worker has lower underemployment index. Now since the estimated coefficient of the 'currently married'*gender interaction term is 0.0987 and significant, this in turn means that compared to a male 'currently married' worker, a 'currently married' female worker will have a higher under-employment index – perhaps reflecting the gender disadvantage of a female worker.

Finally, let us summarize the results of worker level data analysis for all India urban of Table 7. As these results suggest, under-employment is likely to be higher for an all-India urban worker who is a male, has age below 40 years, has any marital status other than 'currently married', is not illiterate, has some technical education, does not belong to 'self-employed' household type, is Hindu by religion and is not of ST social group category. In this case also interaction effects of 'gender' with the variables age, general education, technical education, gender of household head, and household type turn out to be significant. Needless to mention, these significant interaction effects have interesting interpretations. Take for example the interaction effect between 'other households' household type and gender. The estimated coefficient of 'other households' is 0.7497 and it is significant. This means that compared to a worker belonging to the 'self-employed' type

household an 'other households' worker will have higher under-employment and since the coefficient of the interaction term 'other households *gender' is significant with a value -0.2131, this means a female worker of an 'other households' type household will have lower underemployment compared to her 'male' counterpart.

5. Concluding Observations

The problem of underemployment of labour is prevalent in both developed economies and developing third world economies. However, the problem in these twotypes of economy differs qualitatively. Whereas the phenomenon of underemployment in developing economies is frictional and transitory in nature arising mostly from short run labour market fluctuations, that in a developing third world economy is of a structural nature resulting from the unorganized and informal nature of such an economy. Therefore for a third world country like India underemployment is essentially a developmental issue. Academic research on under-employment as a developmental issue is rare and it is difficult to find out a substantive analysis of underemployment seeking to identify factors leading to underemployment of labour in a developing economy. This is so in spite of the fact that countries do conduct household surveys on employment and unemployment on a regular basis to monitor the employment situation over time and to analyse the data thus collected. However, underemployment is examined only marginally in those analyses.

In this paper we have proposed an underemployment index which is defined at the level of a worker and can be aggregated to give underemployment index for categories of workers. Using this index together with the unit-level data of the NSS 66th round Employment-Unemployment Survey, we have estimated the under-employment of different categories of the worker population to see how underemployment varies/differs across these categories of workers. In another substantive exercise we have tried to identify statistically significant covariates of worker level and household level underemployment index based on a *Tobit* regression analysis of the worker level and household level data sets. These *Tobit* regression results clearly bring out the significant effects of worker level covariates such as gender, education, marital status and

household level covariates like household size, household type, religion, social class and NREGA-related information on the underemployment index of a worker and household of workers.

Table 5: Results of Tobit Regression Model estimation using Household level Underemployment Index as the dependent variable (Rural and urban India)

Explanatory variable	Category	estimated coefficient	
		rural	urban
household size (ref. category: household size 5 or less)	household size 5 or more	0.0813*	0.0720*
number of children of 0 – 5 years age	-	-0.0132**	-0.0186**
proportion of female aged 15 years or above	-	0.2048*	0.1738*
proportion of literate persons of age 7 years or more	-	-	0.0976
household type (ref. category: self-employed in agriculture (for rural) and self-employed in non-agriculture (for urban))	agricultural lab. household	0.5902*	-
	other lab. household (rural)/ casual lab. household (urban)	0.3170*	0.3182*
	self-employed in non-agriculture household	0.3116*	-
	regular wage/ salaried household	-	0.1040*
	other household	0.1009*	0.6853*
religion (ref. category: Hindu)	Muslim	-0.0434*	-0.0693*
	Others	-0.1615*	-0.0638*
caste (ref. category:others/general)	scheduled tribe	-0.1113*	0.0000
	scheduled caste	0.1013*	0.0000
	other backward classes	0.0795*	0.0000
landholding (ref. category: big)	Landless	0.6242*	-
	Marginal	0.6480*	-
	Small	0.4505*	-
	Medium	0.3974*	-

Explanatory variable	Category	estimated coefficient	
		rural	urban
NREG job card holding (ref. category: does not hold)	holds job card	0.1003*	-
NREG work (ref. category: not sought/not applicable/ got job)	sought but did not get job	0.0708*	-
intercept	-	-1.6294*	-0.8658*
sigma		0,6418	0.6091
no. of observations		55,820	38,141
pseudo-R ²	—	0.0619	0.0313

Source: Estimates based on the unit-record dataset of National Sample Survey 66th round (Employment and Unemployment Survey).

Table 6: Results of Tobit Regression Model estimation using Worker level Underemployment Index as the dependent variable (All India rural).

Explanatory variable	Category	estimated coefficient
gender (ref. category: male)	female	0.1361*
age-group (ref. category: 15-39 years/60 years & above)	40-59 years	-0.0745*
marital status (ref. category: never married/divorced/ widowed/separated)	currently married	-0.3909*
marital status * gender interaction	currently married * gender	0.0987*
general education (ref. category: illiterate/ secondary/higher secondary (HS)/ diploma-certificate (DC)/ graduate & above (G+))	literate-below primary or middle	0.0391**
		0.0454*

Explanatory variable	Category	estimated coefficient
general education * gender interaction	secondary * gender	0.0864***
	HS/DC * gender	0.6828*
	G+ * gender	0.6769*
technical education (ref. category: no technical \ education)	technical degree	0.5510**
	diploma or certificate (below graduate level)	0.4421*
	diploma or certificate (above graduate level)	0.3585*
household size * gender interaction	household size > 5 * gender	-0.0571**
gender of household head * gender interaction	female * gender	-0.1813*
household type (ref. category: self-employed in agriculture household/ other household)	agricultural labour household	0.9889*
	other labour household	0.5123*
	self-employed in non-agriculture household	0.5528*
household type * gender interaction	self-employed in non-agriculture * gender	-0.2777*
religion (ref. category: Hindu)	Muslim	-0.0452**
	others	-0.3767*
religion * gender interaction	others * gender	0.1196**
caste (ref. category: others/ general caste)	scheduled tribe	-0.1384*
	scheduled caste	0.1437*
	other backward castes	0.1084*
caste * gender interaction	scheduled caste * gender	0.1233*
	other backward castes * gender	0.1223*
land holding (ref. category: big)	landless	1.2950*
	marginal	1.2503*
	small	0.8790*
	medium	0.7576*
land holding * gender interaction	landless * gender	-0.3177*
	marginal * gender	-0.2752*

Explanatory variable	Category	estimated coefficient
NREG job card holding (ref. category: no job card)	job card possessed	0.1103*
NREG job seeking (ref. category: did not seek / got job)	sought but did not get	0.1252*
intercept	-	-2.4721*
sigma		0.9318
no. of observations		102,640
pseudo-R ²	—	0.0874

Note. *, ** and *** denote significance at 1, 5 and 10 % levels, respectively.

Source: Estimates based on the unit-record dataset of National Sample Survey 66th round (Employment and Unemployment Survey).

Table 7: Results of Tobit Regression Model estimation using Worker level Underemployment Index as the dependent variable (All India urban).

Explanatory variable	Category	estimated coefficient
gender (ref. category: male)	female	-0.0925**
age-group (ref. category: 15-39 years/60 years & above)	40-59 years	-0.1780*
age-group * gender interaction	40-59 years * gender	-0.1213*
	60 years & above * gender	-0.3915*
marital status (ref. category: \ never married/divorced/ widowed/separated)	currently married	-0.4339*
general education (ref. category: illiterate/ literate below primary/ primary/secondary/higher secondary (HS)/diploma – certificate (DC)/graduate & above (G+)	Primary or middle	0.0794*

Explanatory variable	Category	estimated coefficient
General education * gender interaction	primary or middle * gender	0.1428*
	secondary * gender	0.6355*
	HS/ DC * gender	0.5194*
	G+ * gender	0.5563*
technical education (ref. category: no technical education/ technical degree)	DC (below graduate level)	0.3261*
	DC (graduate level & above)	0.3859*
technical education * gender interaction	DC (below graduate level)* gender	-0.1769*
	DC (graduate level & above)* gender	-0.2255*
gender of household head * gender interaction	female * gender	-0.4231*
household type (ref. category: self-employed household)	regular wage/salaried household	0.1495*
	casual labour household	0.4655*
	other households	0.7497*
household type * gender interaction	other household * gender	-0.2131**
religion (ref. category: Hindu)	muslim	-0.1445*
	others	-0.0817*
caste (ref. category: others/ general caste)	scheduled tribe	-0.5065*
	scheduled caste	0.1439*
	other backward castes	0.1170*
intercept	-	-0.8688*
sigma	-	0.8971
no. of observations		60,803
pseudo-R ²	-	0.0541

Note. *, ** and *** denote significance at 1, 5 and 10 % levels, respectively.

Source: Estimates based on the unit-record dataset of National Sample Survey 66th round (Employment and Unemployment Survey).

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