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NDIC FELLOWS PROGRAMME

Labour utilisation and Time-related underemployment: Evidence from labour market experiments in India

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Overview and Measurement Challenge

Unemployment rates, traditionally adopted as a measure of economic health, are inadequate in reflecting labour market distress. To better interpret the state of employment, underemployment indicators such as growth in real wages (Dreze, 2023), skill mismatch, and the willingness and availability to work need to be presented along with unemployment rates. Underemployment may be a better indicator at capturing labour market slack over and beyond unemployment rates. Labour (under)utilisation gives us a broader sense of labour market performance by taking into account the unemployed, underemployed, or potential labour force (ILO, 2016). A recent Union Government document reports India's overall underemployment score is moderate to low at 62.28, with a lower score for females than males (Samaddar, 2024).

Underemployment is usually measured as time-related underemployment, which means fewer than threshold hours worked in a reference period.[1] However, increased working hours do not necessarily point to adequate employment (Samaddar, 2024). It is important to characterise underemployment beyond the intersectional criterion of less than threshold hours of work in the reference period and willingness and availability to work more. However, potential challenges may emerge in estimating the true state of underemployment given *who* is being asked. Underemployment estimates are subject to reporting errors in the same way as employment statistics (Abraham et al. 2023; Bardasi et al., 2011; Kapur et al., 2021). Surveys on household asset ownership and other labour market outcomes like income and time-use data show different estimates for self versus proxy reporting that is dependent on the respondent's identity (Ambler et al., 2021; Deere et al., 2012; Fisher et al., 2010; Kilic et al., 2022; Sharma et al., 2024). Typically, household surveys ask the household head/single most knowledgeable member of the household about the employment status of other household members. This may lead to biased estimates on labour force reporting due to information differential or social norms around work (Dillion and Mensah, 2023).

Figure 1: India Working Survey (IWS) 2020, Karnataka and Rajasthan.[2]

- IWS uses survey experiments to understand how social identities—gender, caste and religion, affect labour market outcomes.
- 3,646 households and 5,951 individuals were interviewed.
- In every household, one adult male and adult female were randomly selected.[3] Final sample of spousal pairs consists of 2,674 observations (1337 husbands and 1337 wives).
- Predominantly rural
- Collaborative project between Azim Premji University, IIM Bangalore, University of Western Australia
- Funded by IWWAGE, Azim Premji University, IIMB and UNU-WIDER

1 It comprises all employed people who are willing and available to work for additional hours and are employed for less than the threshold relating to working time. It is a slack variable that captures labour underutilization (19thICLS, 2013). For a detailed reading, refer to: https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@dgreports/@stat/documents/publication/wcms_220535.pdf

2 The IWS followed stratified multi-stage sampling and intended to survey a state representative sample of approximately 4,000 households across Karnataka and Rajasthan. However, due to Covid-19, only 3,646 households could be interviewed. The sample is highly rural (85%) and consists of 3,371 women and 2,580 men. Of the 5,951 respondents, 63% (3,750) belonged to a husband-wife pair. Due to non-participation by either respondent, we dropped 1,076 observations.

3 Enumerators of matching genders were ascribed to the participating male and female informants. The interviews were conducted as privately as possible.

Table 1: IWS questionnaire, 2020

Following questions asked to the respondent if *employed.*	Following questions asked to the respondent about the spouse if the spouse is *reported* to be *employed* by the respondent.
Would you have wanted to do more work for pay or profit in the last week?	Do you think your spouse would have wanted to do more work for pay or profit in the last week?
Did you have the time to do more work in the last week for pay or profit (in addition to the work you were already doing)?	Do you think your spouse would have had the time to do more work in the last week for pay or profit (in addition to the work they were already doing)?
How many hours in the week would you have had time to do more work?	—

In this article, we focus on the determinants of time-related underemployment and their measurement challenges using the India Working Survey, which is a collaboration of researchers across Azim Premji University, IIM Bangalore and the University of Western Australia. Our goal is two-fold. First, we estimate the determinants of underemployment at the *intensive margin* (exact number of hours underemployed) and at the extensive margins (incidence of underemployment for employed individuals). Second, we estimate self-proxy differences in reporting an individual's willingness to work given that they work less (more) than the ascribed threshold weekly hours.[4]

Method

In the IWS dataset, we identify two levels of underemployment: time-related and augmented time-related. We consider both employed individuals who worked fewer than 40 hours per week[5] and were willing and available to work for more hours, as well as individuals who worked more than 40 hours per week and were willing and available to work for more hours. While the former is the internationally accepted definition of time-related underemployment, the latter is a broader indicator of time-related underemployment, indicative of the nature of demand for paid work in the characteristic labour market. Table 2 (on Page 5) shows the distribution of weekly participation in employment for less/more than the threshold along with the individual's reported willingness and availability to work.

Cell 2 is the pure time-related underemployment recording of individuals who work less than weekly threshold hours and are willing and available to work more. Cell 3 points to the employment status where individuals are fully employed for the weekly threshold hours and do not want to work more. Cells 1 and 4 show some form of labour market distress where individuals are either working less/more than the weekly threshold hours and unwilling/willing and unavailable/ available to work more. Cells 1 and 4 are some measure of an *augmented time-related underemployment* which does not flow strictly from the definition of time-related underemployment but measures some kind of labour market slack. This may be because of lack of quality jobs which is indicative of underemployment since the individual's willingness and work availability does not match their minimum weekly threshold hours of employment.

We model the above time-related underemployment (both pure and augmented) and employment distress for our experimental sample using separate logistic regressions.

We obtain an estimate of underemployment controlling for individual and household characteristics by running a logistic regression for our employed subsample. We stratify the subsample into individuals who work less/more than the weekly threshold (40 hours). We then predict the likeli-

4 Extensive margin in this context refers to the incidence of time-related underemployment whereas intensive margin refers to the exact number of hours underemployed.

5 In the absence of an internationally accepted definition of weekly threshold hours cutoff to estimate 'part-time work', nationally determined hourly thresholds vary across countries. As a simplification exercise, we use the ILO-defined 40-hour weekly threshold to estimate time-related underemployment below and above the cut off (Samaddar, 2024). We further refer to the 40-hour work week as the threshold and allude to working hours above or below this threshold.

hood that an individual is underemployed given that they work for less/more than the threshold.

$$logit = Li = \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_K X_K \qquad (1)$$

$X_{i=1\ldots k}$ represents the set of regressors including gender, education status, social group, household asset terciles and other covariates. Since the logit function gives us the odds-ratio, we use marginal effects to interpret the average marginal effects of predicting underemployment on the covariates.

At the intensive margin, we estimate the following equation using OLS estimation to explain the determinants of time-related underemployment measured as hours available to work in a week. This equation is estimated for all individuals employed for at least one hour in the reference period.

$$y_i = \alpha + \beta X_i + \varphi_e + \theta_{it} + \varepsilon_i \qquad (2)$$

y_i denotes the additional hours an individual is willing and available to work in the reference week. X_i denotes individual and household covariates; φ_e represents enumerator fixed effects; θ_{it} is the district fixed effects; and ϵ is the random error term.

Our experimental design enables us to estimate the effect of proxy reporting on our pooled sample where each observation appears twice, both as self-reported and proxy reported. To address the self-proxy question in reporting underemployment, we estimate the impact of proxy reporting on an individual's willingness and availability to work given that the individual is working less/more than 40 hours per week. We use the estimates from the following OLS equation to model self-proxy differences in reporting, controlling for individual and household characteristics for our pooled sample, separately for women and men.

$$y_i = \alpha + \beta P_i + \Upsilon X_i + \varphi_e + \theta_{it} + \varepsilon_i \quad (3)$$

Equation 3 shows the pooled linear probability model where y_i is the probability of an individual's willingness and availability to work on a conditional sample of individuals working less/more than 40 hours per week. β gives us the difference between self- and proxy-reported time-related underemployment when individuals work less than a weekly threshold and an augmented state of time-related underemployment when individuals work more than 40 hours per week. P_i denotes whether the observation comes from self- or proxy-reported status.

To avoid the problem of omitted variable bias, the fixed effects model enables us to control for time-invariant observed and unobservable characteristics by estimating the following equation separately for women and men:

$$y_i = \alpha + \beta P_i + \varphi_e + \lambda_i + \varepsilon_i \qquad (4)$$

Equation 4 is the same as Equation 3 with λ_i estimating individual fixed effects. Controlling for λ_i, our coefficient β becomes the causal impact of proxy reporting.

Results

1. About 23% of employed women and 39% of employed men in our sample are time-related underemployed. They work less than the weekly threshold and are willing and available to do more work.

Moreover, there are significant reporting differences between individuals and their (spousal) proxies when reporting time-related underemployment. Proxies (irrespective of gender) under-report an individual's willingness and availability to work. The labour utilisation statistic (LU2) is sensitive to the weekly threshold values for time-related underemployment

2. When people work less than 40 hours a week and report underemployment, they are engaged as unpaid family helpers in their weekly employment status. This is as per expectations since men and women working as contributing family workers may have additional availability and willingness to be more gainfully employed.

However, for individuals working more than 40 hours per week, these patterns differ. Among men who report underemployment and are working more than the threshold, the majority are engaged in self-employment, whereas the majority of the women are employed in casual wage work. This

Table 2: Descriptive labour force statistics for self and proxy reporting by gender

	Women			Men		
	Self	Proxy	Difference	Self	Proxy	Difference
WPR(%)	**63.2**	**57.9**	**5.7*** **	**79.7**	**78.7**	**-1.8**
Unemployment (%)	**9.0**	**6.0**	**3**	**3.5**	**2.8**	**0.7**
Employed subsample						
Hours worked	**33.4**	**32.2**	**1.2**	**43.2**	**42.1**	**1.1**
Willing and available to do more work (%)	**22.7**	**18.4**	**4.3****	**29.0**	**21.6**	**7.4*****
Additional hours available to work in a week	**5.7**	**-**		**9.1**	**-**	
Time-related underemployment(%)	**22.5**	**20.2**	**2.3**	**39.1**	**32.9**	**6.3***
Labour utilisation (LU2) (%)(conditional)	**15.4**	**12.5**	**2.8***	**16.2**	**13.5**	**2.7***
Labour utilisation (LU2) (%)(unconditional)	**28.2**	**23.9**	**4.3****	**31.3**	**24.8**	**6.4*****

Source: Author's computation based on IWS (2020)

Notes:

1. WPR is the worker participation rate and the percentage of all employed people in our population. Individuals' willingness and availability to work are tabulated for all individuals reporting at least one hour of employment in the weekly status. It includes all individuals who are employed and report willingness and availability to do more work irrespective of hours worked in the reference week (both augmented time-related underemployment).
2. Time-related underemployment shows the distribution of individuals working below the weekly threshold and willing and available to do more work, as a percentage of the employed population.
3. LU2 conditional is the sum total of the proportion of individuals who are time-related underemployed (employed for less than 40 hours per week, available and willing to work) or unemployed as a proportion of the labour force participation rate.
4. LU2 unconditional is the sum total of the proportion of individuals willing and available to work irrespective of their weekly hours worked or unemployed as a percentage of the labour force participation rate.
5. *, **, *** indicate significance at 10% 5% and 1% level. Robust standard errors are in parentheses.

points towards the inadequate nature of self-employment and wage work for informal workers who work more than 40 hours per week, probably at multiple jobs, but are willing to work more in these sectors (or others). Identification of sectors is important to address the issue of rural demand for jobs, especially in the casual wage sector because it may affect women's work status disproportionately.

3. Estimates of underemployment

At the extensive margin, we predict the likelihood of underemployment for individuals employed for at least one hour in the reference week (augmented time-related underemployed). Therefore, we predict an individual's willingness and availability to work, controlling for individual and household covariates irrespective of the number of hours worked in the reference week. Figure 2 (on Page 6) shows the average marginal effects for women, asset terciles and own activity status on the predicted underemployment. We find that women are significantly less likely to be time-related underemployed than men. Individuals in the higher asset tercile as well as those engaged in self-employment predict significantly less underemployment (compared to the base employment category of unpaid helpers). Once we estimate underemployment by stratifying on the basis of the weekly hours threshold, we find that individuals who are time-related underemployed and working less than 40 hours per week drive the above results (Figure 2, right panel). This means that it is primarily in this sub-population that women, individuals in the highest asset tercile, and those belonging to agricultural households negatively and significantly

Table 3: Activity-wise distribution of underemployment by gender (spousal pairs)

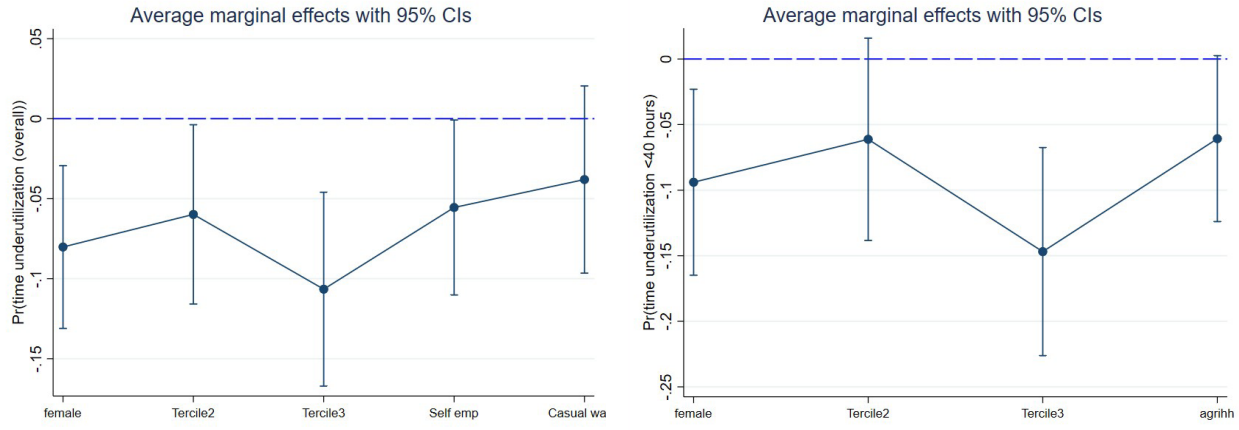
Activity distribution (%)	Women	Men
Underemployment (working less than 40 hours per week)		
Self employed	9.9	35.4
Contributing Family Worker (Unpaid helper)	76.0	36.1
Casual wage work/salaried	14.1	28.5
Underemployment (working more than 40 hours per week		
Self employed	24.4	55.6
Contributing Family Worker (Unpaid helper)	36.6	14.4
Casual wage work/salaried	39.0	30.0

Source: Author's computation based on IWS (2020)

predict time-related underemployment. It is also worthwhile to mention the mild significance of the respondent's education level (not shown in figure) as obtaining secondary education or higher increases the likelihood of being underemployed. Those who have a secondary education and above are more likely to be underemployed (compared to those who are illiterate) in this sub-stratification of weekly hours worked. Belonging to an agricultural household unlocks a web of interlinking production and non-production activities which involves working status for most of the individuals (especially women) in these households.

4. At the intensive margin only gender significantly explains the variation in additional hours an individual was available to work in a week. On average, men were available to work for nine extra hours in a week beyond their usual employment while women were available to work for five extra hours. Controlling for individual and household correlates, we find that women are significantly available to work fewer additional hours a week. These results are driven by women working less than the weekly threshold. Therefore, while at the extensive margin, both women working less and more than 40 hours per week are significantly

Figure 2: Average marginal effects of various explanatory variables on predictive augmented underemployment (left panel) and pure time-related underemployment (right panel), spousal pairs



Source: Author's computation based on IWS (2020)

Notes:

1. Y axis shows the predicted likelihood of underemployment; X-axis shows marginal effects with respect to gender, asset class (tercile 2 and 3), employment status (self-employment, casual wage)(left panel) and nature of household (agricultural household)(right panel).
2. A house is considered to be an agricultural household if it owns land and has at least one self-employed member in the agricultural sector.

less likely to be underemployed; at the intensive margin, women are significantly less likely to be available to work for fewer hours if they are employed for less than 40 hours per week.

5. Self vs. Proxy estimates of underemployment

Table 4 shows the coefficient of proxy reporting on underemployment for both less (more) than the threshold weekly hours. In both cases, proxies under-report their spouse's underemployment. This figure for overall underemployment matches with Table 2 after controlling for individual and household correlates as well as omitted variables.

For both men and women, underemployment is significantly under-reported by proxies even after controlling for omitted variables. Hence, at an overall level, the causal effect of proxy reporting (irrespective of gender) is negative. Once we slice it by hours worked, we notice that husbands are under-reporting wives' underemployment when wives work less than 40 hours per week. However, once we control for omitted variables, there is no causal under-reporting of women's underemployment by husbands. The same is true for wives reporting on husbands' underemployment. Therefore, for spousal pairs working under 40 hours a week, there is no significant causal under-reporting by proxies. Therefore, if individuals are working less than a specified threshold hours as reported by self and their proxies, underemployment is correctly identified by the proxy informants. However, when individuals are working over the weekly threshold as reported by themselves and the proxies, wives significantly under-report husband's underemployment. Therefore, when men work more than the threshold hours and are willing and available to work more, wives do not concur that they are thus underemployed. This points towards the asymmetry in reported underemployment for men working more than the threshold. This may also be indicative of social norms which significantly under-reports husbands underemployment beyond the threshold working hours but not of wives.

Table 4: Coefficient of proxy reporting for underemployment, by gender (spousal pairs)

	Women			Men		
	1	2	3	1	2	3
Overall hours						
Proxy	-0.06***	-0.07***	-0.04**	-0.07***	-0.06***	-0.07***
	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
N	1373	1371	1373	1764	1762	1764
Employed for less than 40 hours per week						
Proxy	-0.07***	-0.07***	-0.02	-0.07**	-0.06*	-0.06*
	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04
N	926	924	926	823	822	823
Employed for more than 40 hours per week						
Proxy	-0.05	-0.06*	-0.04	-0.07***	-0.06**	-0.07***
	-0.04	-0.04	-0.05	-0.03	-0.03	-0.03
N	447	447	447	941	940	941
Controls	No	Yes	Yes	No	Yes	Yes
Enumerator FE	No	Yes	Yes	No	Yes	Yes
Individual FE	No	No	Yes	No	No	Yes

Source: Author's computation based on IWS (2020)

Notes:1. Dependent variable is 1 if reports/reported as willing and available to do more work in the reference week, 0 otherwise. 2. Proxy is the independent variable which takes value 1 if proxy reported and 0 if self-reported. 3. Individual and household controls include respondent and proxy education, age and age-squared, respondent's major activity status in the year, household social group, landowning status, household size, age and education difference between respondent and proxy. 4. The reported number of observations (N) belong to a pooled sample where the individual appears twice: once with self-reported underemployment status and then proxy-reported underemployment status. Hence, the number of observations is double the number of individuals. 5. *, **, *** indicate significance at 10% 5% and 1% level. Robust standard errors in parentheses.

Research Design Lessons

Measuring underemployment is complex as it deals with not just insufficient hours (visible underemployment) but also insufficient compensation or skills (invisible underemployment)(19th ICLS, 2013). In this article, we try to establish that the definition of time-related underemployment which takes all 3 factors into account[6] might be insufficient to capture the nature of employment for individuals who work a sufficient number of hours in a week but still want to work more. This is particularly common in a country like India where the precarious and informal nature of employment makes individuals want to work more, over and above sufficient weekly hours of employment. Broadly, this may be viewed as a demand for being gainfully employed which regular labour force statistics fail to address. The sectoral distribution of activity status switches for individuals who wanted and were available to do more work but employed less (more) than the threshold of 40 hours per week. This is important from a policy perspective because it directly points towards sectoral distress within time-related underemployment (Table 3). The PLFS asks individuals about the additional hours they would have wanted to work for each of the 7 days of the week[7]. It remains to be seen how many of these individuals were employed for a sufficient number of hours in a week, yet wanted to do more work. This is a better indicator of labour market health as opposed to unemployment rates, and it significantly affects labour utilisation rates.

There is evidence in the literature to show that respondent identity matters in estimating labour force statistics. As is clear, men's underemployment status is exposed to systematic under-reporting by women especially if they are working for more than the weekly hours threshold. This is because long hours of weekly employment may give the impression of being gainfully employed but the nature of employment is inadequate due to which individuals would want to work more. Hence, underemployment is sensitive to the gender of proxy informants and provides additional insights into how (under)employment is viewed. In our design, we interviewed a spousal pair for self-proxy statistics as information asymmetry is assumed to be minimised in intimate partner relationships. However, even after this we find systematic under-reporting of men's underemployment beyond certain threshold hours. Even though expensive to implement, labour force statistics should be interpreted with caution.

Scale-up/Policy Influence/Ongoing Research/Open Questions

Given that the Indian economy is seeing the highest increase in new labour market entrants, efforts should be made to report more sensitive labour market indicators. Given how not working is not an option for over 90% of the country's population, the nature of (under)employment becomes indicative markers of the nature of the job market. More and more focus should be on labour utilisation over and above the binary status of employed-unemployed. Labour markets in developing countries are sensitive to measurement errors, especially respondent identity. Gender norms play a big role in systematically reporting (under)employment status. Thus, labour force surveys should be designed in a way that is sensitive to exploring the demand for jobs, especially in certain sectors, as well as highlighting the cognitive or normative challenges in factoring the nature of the informant. Survey designs must ask probing questions about availability to work not only based on a time estimate ('Did you have time to do additional work?') but also sensitive to employment conditions that may influence women's work participation decisions.

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