

Estimating the labour supply and labour demand for female labour in rural India

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Abstract

This paper attempts to estimate the female labour supply and demand in rural India by utilising the NSSO - 61st round data and controlling for other covariates. The decision to participate in the labour market for a female relies not only on her own willingness to work but also on various other factors like family support, education, children, distance to workplace, status of the family etc. Recent emphasis on female labour supply in the labour market has received greater attention and this paper is an attempt to do the same.

Keywords: female labour supply, female labour demand

Introduction

In this paper we make an attempt to estimate supply and demand equation for females in rural India by making use of the NSS data -61st round (2004-05). There is a vast body of literature which says that whether or not a female will supply labour in the market does not only depend on her own decision but it takes into account various other factors like support from family, distance to workplace, status of the family, consent of the spouse etc while labour demand is affected by factors like average land holding, rainfall, education level of females, rice cultivation, area irrigated etc.

Literature review

Other studies that try to estimate the demand and supply equations for hired agricultural labour in India are Bardhan (1984) and Kanwar (2004) ^[1]. Bardhan estimates simultaneous demand and supply equations for hired male labourers at village level in West Bengal. He instruments the village wage rate by village developmental indicators, unemployment rate and seasonal dummies. Kanwar (2004) estimates village level seasonal labour demand and supply equations for hired agricultural labour simultaneously.

In their paper Purnamita Dasgupta and Bishwanath Goldar ^[2] present econometric evidence of what may be called “forced employment” or “need-based participation in workforce” for females from BPL families in rural areas. Results show that if the female wage rate earned by BPL households in rural

areas rises or if the male members of these households get more employment opportunities then more and more women of BPL families may withdraw from the labour force.

Data source

The data is taken from National Sample Survey -61st round (2004-05). This survey was spread across 7999 villages and 4602 urban blocks that covered 124680 households which can further be subdivided into 79306 households in the rural areas and 45374 households in the urban areas which cover a total of 602833 people (398025 in the rural areas and 204808 in the urban areas).

In this data set the data is available at both the household level and the individual level. At the household level we have calculated variables like wage rate, monthly per capita expenditure etc while at the district level we have calculated variables like the proportion of landless households, percentage of rural areas under rice cultivation etc.

The control variables used in the regression relate to agriculture like irrigation, inequality in land holdings, rainfall, agro-climatic endowments, and land allocation to various crops. The agro-climatic variables are derived from a classification of the country into 20 agro-ecological zones (AEZ). Other control variables relate to infrastructure like roads, electrification and banking. And a few more control variables relate to education and urbanisation.

Table 1: Variable names and explanation

Variable Name	Explanation
lnfemp	represents the log of female employment
lnfwr	represents the log of female labour wage rate
avg_land	represents the average land holding
gini	represents the gini coefficient for landholding inequality
landless_pct	represents the proportion of landless households in a district
area_irr	represents the percentage cultivated area irrigated
rain_june_sept	represents the rainfall received in months of june to September in cms
comm_bank_pct	represents the percentage of villages having commercial banks
road_pct	represents the percentage villages accessible by paved roads
elec_pct	represents the percentage of villages electrified
child	represents a child above the age of 5 years,
mpce	represents the monthly per-capita expenditure
urban_pct	represents percentage population in a district living in urban areas
low_caste	represents percentage of sc/st/obc households

female_ped	represents the proportion of females who have received primary education
female_sed	represents the proportion of females who have received secondary education
cultivated_irr	represents the area cultivated in a district (in hectares)
rice_p	represents the percentage area under production of rice
wheat_p	represents the percentage area under production of wheat, and all this for rural area
paez2, paez 3 and so on till paez19	represents the proportion of area in a district under AEZ 2 (agro-ecological zone)

Table 1 gives the variable names and their explanation.

We estimate the equations for female labour supply and labour demand and they are as follows:

$$\text{Infemp} = B_0 + B_1 \text{lnavgland} + B_2 \text{Infer} + B_3 \text{gini} + B_4 \text{sqlandless} + B_5 \text{lnareairr} + B_6 \text{rain_june_sept} + B_7 \text{rice_p} +$$

$$B_8 \text{comm_bank_pcnt} + B_9 \text{road_pcnt} + B_{10} \text{elec_pcnt} + B_{11} \text{lnmemp} + B_{12} \text{female_ped} + B_{13} \text{female_sed} + B_{14} \text{married_women} + B_{15} \text{squrban} + B_{16} \text{child} + B_{17} \text{mpce} + B_{18} \text{sqind} + B_{19} \text{low_caste} + U_1$$

Table 2: Regression results for female Labour Supply and Labour Demand

Variables	1 Female labour supply	2 Female labour demand
lnavgland	0.004 (0.07)	0.86** (0.41)
Infer	0.02 (0.051)	0.34 (0.30)
gini	-0.87** (0.37)	13.63**** (2.21)
sqlandless	1.72* (0.990)	21.53**** (5.80)
lnareairr	-0.04 (21.99)	-0.70**** (0.19)
rain_june_sept	0.006 (43.57)	0.009 (0.00)
rice_p	-0.36** (0.15)	0.57 (0.90)
comm_bank_pcnt	-0.59** (0.30)	6.00**** (1.78)
road_pcnt	0.81**** (0.20)	-1.12 (1.22)
elec_pcnt	0.29* (0.19)	1.41 (1.14)
lnmemp	0.63**** (0.08)	1.53**** (0.49)
female_ped	-0.74 (0.64)	0.77 (3.75)
female_sed	0.27 (0.89)	-4.35 (5.21)
married_women	-0.91*** (0.31)	-3.37* (1.86)
squrban	-0.69 (0.48)	1.36 (2.84)
child	-1.66 (1.46)	-11.85 (8.56)
mpce	-0.005 (0.00)	-0.007** (0.00)
sqind	4.25 (2.65)	-23.52 (15.53)
low_caste	1.23**** (0.17)	-1.08 (1.02)
Constant	-0.50 (0.72)	-10.42** (4.24)
Observations	414	414

Standard errors in parentheses

****p=0.000, ***p<0.01, **p<0.05, *p<0.10, ^a – significant at 20%

From column 1 in table 2, we can see gini, lnareairr, rice_p, comm_bank_pcnt, female_ped, married_women, squrban, child and mpce are negatively related to female labour supply. And as we can see from the p-value of these variables None of these have a p-value less than 0.05, except for rice_p, road_pcnt, lnemp, married_women and low_caste.

If we take a look at the coefficients and the standard errors, then variables that are significant are road_pcnt, lnemp and low_caste at 5% level of significance.

For female labour demand we estimate the following equation:

$$\text{sqwr} = B_0 + B_1 \text{lnavg} + B_2 \text{Infer} + B_3 \text{gini} + B_4 \text{sqlandless} + B_5 \text{lnareairr} + B_6 \text{rain_june_sept} + B_7 \text{rice_p} + B_8 \text{comm_bank_pcnt} + B_9 \text{road_pcnt} + B_{10} \text{elec_pcnt} + B_{11} \text{lnmemp} + B_{12} \text{female_ped} + B_{13} \text{female_sed} + B_{14} \text{married_women} + B_{15} \text{squrban} + B_{16} \text{child} + B_{17} \text{mpce} + B_{18} \text{sqind} + B_{19} \text{low_caste} + U_2$$

From column 2 in table 2, we see that lnareairr, road_pcnt,

female_sed, married_women, child, mpce, sqind and low_caste are all negatively related to wage rate. Looking at the variables lnavgland, gini, sqlandless, comm_bank_pcnt and lnemp we find that they are significant at 5% level of significance.

Next we try to estimate 3SLS results (Table 3) for labour demand and labour supply because it requires stricter assumptions and gives more efficient estimates, and the results are as follows

Table 3: Regression results for female Labour Supply and Labour Demand

Variables			
lnfemp		lnfwr	
lnfwr	0.22*** (0.07)	lnfemp	-0.07 (0.20)
avg_land	-0.03**** (0.00)	avg_land	0.00*** (0.00)
gini	-1.48**** (0.43)	gini	3.83**** (0.56)
landless_pcnt	-0.02 (0.57)	landless_pcnt	1.71*** (0.65)
female_ped	-0.08 (0.70)	paez2	-3.47*** (1.31)
female_sed	0.12 (0.94)	paez3	-2.51* (1.36)
married_women	-0.49 (0.34)	paez4	-3.95*** (1.31)
urban_pcnt	-0.19 (0.26)	paez5	-2.84** (1.30)
child	-0.78 (1.63)	paez6	-2.46* (1.30)
mpce	0.09 (0.06)	paez7	-2.78** (1.32)
industry	0.14 (1.49)	paez8	-2.79** (1.30)
low_caste	1.15**** (0.20)	paez9	-4.07*** (1.31)
constant	0.91** (0.42)	paez10	-3.06** (1.30)
		paez11	-2.76** (1.29)
		paez12	-2.72** (1.29)
		paez13	-3.19** (1.31)
		paez14	-3.86*** (1.37)
		paez15	-2.88** (1.40)
		paez16	-0.98 (1.37)
		paez17	omitted
		paez18	-3.18** (1.30)
		paez19	-2.19* (1.32)
		area_irr	0.12 (0.08)
		rain_june_sept	-0.00 (0.00)
		rice_p	0.28 (0.27)
		comm_bank_pcnt	0.15 (0.48)
		road_pcnt	-0.49 (0.32)
		elec_pcnt	0.51* (0.27)
		lnmemp	0.49*** (0.17)
		constant	1.38 (1.37)

Standard errors in parentheses

****p=0.000, ***p<0.01, **p<0.05, *p<0.10, ^a – significant at 20%

In the above regression endogenous variables are $\ln femp$ and $\ln fwr$ i.e. log of female labour supply and log of female labour wage rate. Exogenous variables in the above regression are avg_land , $gini$, $landless_pcnt$, $female_ped$, $female_sed$, $married_women$, $urban_pcnt$, $child$, $mpce$, $industry$, low_caste , $paez2 - paez19$, $area_irr$, $rain_june_sept$, $rice_p$, $comm_bank_pcnt$, $road_pcnt$, $elec_pcnt$ and $\ln memp$. From the regression results for female labour supply we saw that $gini$, $\ln areairr$, $rice_p$, $comm_bank_pcnt$, $female_ped$, $married_women$, $squrban$, $child$ and $mpce$ were negatively related to female labour supply.

And now if we look at the 3SLS results for female labour supply we see that avg_land , $gini$, $landless_pcnt$, $female_ped$, $married_women$, $urban_pcnt$ and $child$ have a negative relation with female labour supply. Looking at the significance of the variables we find that only $\ln fwr$ and low_caste are statistically significant at 5% level of significance. Looking at the estimates for " $\ln fwr$ " implies that a 1% increase in wage is likely to increase labour supplied by 22%.

Labour supplied is positively related to wage variable which indicates the fact that as wage rises females will supply more labour and is statistically significant too. Average land holding is negatively related to labour supply, which can be explained by the fact that if a household has higher land holdings then they might be well-off and hence females might not go out for work, but is statistically insignificant. Gini coefficient is negatively related to labour supply but is statistically insignificant, implying that higher the inequality in land distribution higher the female labour supply.

Female primary education, although insignificant, is negatively related to labour supply. But female secondary education is positively related to labour supply, although insignificant. Married women are less likely to supply labour, and if a woman has a child to take care of then also she is less likely to supply labour. A woman belonging to a lower caste is more likely to supply labour.

From the regression estimates for female labour demand we saw that $\ln areairr$, $road_pcnt$, $female_sed$, $married_women$, $child$, $mpce$, $sqind$ and low_caste were negatively related to female labour demand. One difference is that earlier we took square root of wage rate and now we take log of wage rate.

Now if we look at the 3SLS results for female labour demand we see that $\ln femp$, $paez2 - paez19$, $rain_june_sept$ and $road_pcnt$ have a negative relation with wage rate. Looking at the statistical significance of the variables we find that $gini$ and $\ln memp$ are statistically significant at 5% level of significance. Labour demand is negatively related to wage variable which can be explained by the negatively sloped demand curve i.e. as wage rises labour demand falls, although it is statistically insignificant.

Rain exhibits a negative relation with the wage rate which is the opposite of what is expected, but is statistically insignificant. Rice cultivation shows a positive relation to labour demand because rice growing regions have a higher demand for female labour because of greater demand for females in tasks like transplanting and weeding. Access to paved roads does not seem to increase labour demand.

This paper attempts to estimate the female labour supply and labour demand equation. An analysis like this would definitely help to lift up women not only in terms of their earnings but also in terms of status and will help them to achieve self sufficiency.

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