Structure of Employment in Rural India

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Abstract

In India, agriculture contributes to 67.9% of employment but it only contributes to 38.34% of rural GDP and about 12% to Indias GDP. It shows that even though structural transformation in GDP taken place rapidly, transformation in employment is very slow especially in rural areas. Keeping this, the paper examined labor market behavior in the 18 selected villages of India, with the following objectives (i) To assess the structure of work status among sample individuals, (ii) To test for segmented labor market theory. The paper uses high frequency data and measured weekly hours spent on both economic and non-economic activities for the year 2010. The paper uses simple regression techniques and estimated modified Mincer equation to determine earnings, followed by application of multinomial regression analysis to know test segmented labor markets. Still labor participation in rural India is very low with only 36.2 hours/week by men and 23.1 hours/week by women. Hours spent in non-farm activities which fetch higher wages are still limited especially among women. To some extent, the labor markets are segmented based on social background and supports segmented labor market theory based on caste, gender and assets. Results revealed that the labor markets are highly segmented based on gender. Still, individuals with land, irrigation facilities, other physical assets and belongs to upper castes are having advantage in rural labor markets. Importance of education in rural labor markets is very limited and only confine to salaried jobs which are very meager, as a result there is high unemployment among educated youth both men and women. However, parents investing heavily in education of their children with hope of getting urban employment. Illiterate women and men loaded with more hours of work in low productive paid-work and also domestic work. Some of the policy prescriptions from the study are (i) enhancing the ownership of assets like land, irrigated area through providing loans which will increase hours worked in economic activities (ii) imbibing savings habit which generally increase labor force participation rate, (iii) enhancing quality education in rural areas beyond the higher-secondary to take advantage of growing employment in salaried jobs and new emerging occupations like repair of mobiles, electric motors computer centres (iv) imparting skill development in both caste occupations and also in modern sectors and (v) balanced development of both urban and rural areas through promotion of small towns.

JEL classification
J22 - Time Allocation and Labor Supply Occupational Choice;
J31 - Wage Level and Structure; Wage Differentials

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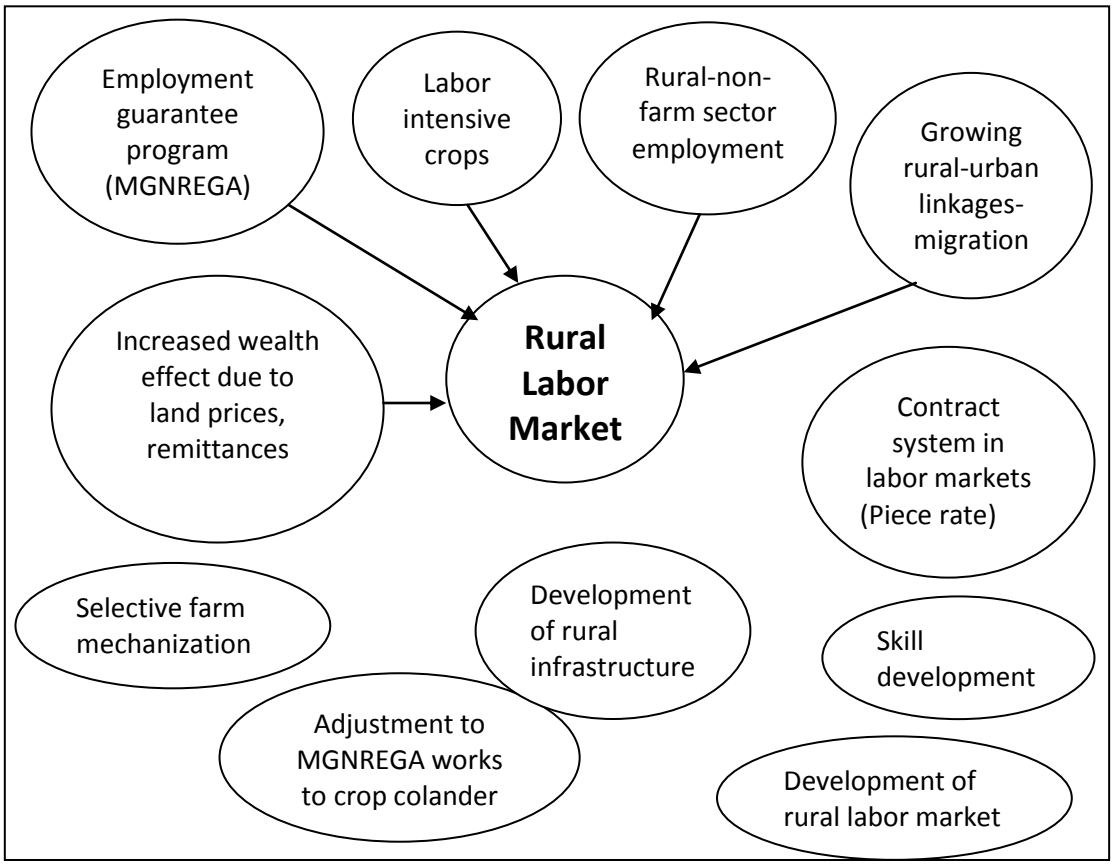
1. Introduction

The rural labor markets are poorly understood component in many developing countries including India. Even though the share of non-farm sector in Gross Domestic Product (GDP) increasing at faster rate, the labor shift from agricultural to non-agricultural sector is at much slower rate and the labor force participation rates are still low for women. Of-late, there is increased dynamism in rural labor markets with increased rural-urban linkages, expansion of non-farm employment, migration and technological change in rural and agricultural sectors, farm mechanization, increase in labor productivity, implementation of employment guarantee act (MGNREGA Act), and increased share of educated labor force. The increased dynamism in labor markets expands income and employment opportunities for rural population within and outside the villages. Young, educated, skilled manpower is migrating to urban areas resulted in a widening gap in wage rates between rural and urban sectors, agricultural and non-agricultural sector employment. As a result, there is persistent poverty in some parts of rural and agricultural sectors which are not benefited from these growing opportunities. About 60% of poor in India are agricultural laborer. There is increased inequality between rural and urban earnings, agricultural and non-agricultural sector employment, educated and uneducated, less resource-endowed and more resource-endowed regions and people etc which are growing concern for policy makers. Authors own work examined the interlinkages between agriculture and labour markets in Andhra Pradesh and India (Reddy and Kumar 2006; Reddy 2010; Reddy 2011; Reddy and Kumar 2011; Reddy and Bantilan (2013); Reddy, 2013; Reddy (2004); Reddy (2006); Reddy (2009a); Reddy (2009b); Reddy (2010b); Reddy (2011a); Reddy et al., (2011)) which shows the slow structural transformation in agriculture and labour markets in India.

Structural transformation in labor markets in India is very slow compared to some of the developing countries including China. There are many studies which hinted that occupational diversification is playing key role in reducing the rural poverty since early 1990s. Growth of the non-farm sector was primarily responsible for the rise in agricultural wages and falling poverty levels (Siciliano, 2012). Hence, any policy study aims to reduce rural poverty need to focus not only on farm sector but also on non-farm sector. The emerging occupations are highly heterogeneous in skills, accessibility, productivity, profitability and labor intensity(Reddy and Kumar, 2006; Nargis and Hossain, 2006; Reardon et al., 2000; Corral and Reardon, 2001; da Silva and del Grossi, 2001; Dejanvry and Sadoulet, 2001; Kung and Lee, 2001). Many studies identify, increased educational levels of labor force, shocks, higher returns and wages as major drivers of occupational diversification in rural areas (Dercon and Krishnan, 1996; Lanjouw, 2001; Lay et al., 2008). There a plenty of studies across the world examined the structural transformation of labor force mostly at macro level in developed

countries (Liedholm et al., 1994; Mead and Liedholm, 1998; Maloney, 2004; Deininger et al., 2007; Carrasco, 1999; Fairlie, 1999; Bruce, 2000; Dunn and Holtz-Eakin, 2000; Mandelman and Montes-Rojas, 2009). Studies of the household-level dynamics of occupational diversification in developing countries remain rare (Reich, et al., 1973; Cain, 1976; Magnusson, 2009; Reddy 2011a). A few are described below. Lam and Schoeni (1993) and Fafchamps and Wahba (2006) highlighted the household and social background will have a positive effect on the persons earnings. Krishna and Shariff (2011) demonstrated that some formerly poor people have escaped poverty; concurrently, some formerly non-poor people have fallen into poverty based on opportunities in employment and income. While examining the Chinese rural economy, Siciliano (2012), highlighted that the reducing the rural–urban income/employment gap in China is a critical objective for both economic growth and equity. Lehmann and Muravyev (2012) highlighted the role of institutions in functioning of labor markets in developing countries. In the recent years there is a raise in wage rates even in rural areas mainly due to the increased rural-urban linkages, increased share of non-farm sector employment, increased labor productivity and wider penetration of largest employment guarantee program (MGNREGA) in to rural areas. There were signs of increased reservation wage rates among workers due to increase income and wealth effects (rise in real estate prices, increased remittances, and social protection programs) as briefly explained in figure 1. But still an intensive examination of the burning labor market issues like labor shortage on the one hand and low labor productivity in agriculture, lower agricultural wages on the other needs to be examined. Keeping this huge gap in literature this paper attempt to examine employment structure.



2. Objectives, Data and Methodology

Employment structure in terms of work hours, wage rates and occupational structure are three important characteristics which reveal about the development of labor markets of a region. Kuznets (1957) is the pioneer in structural transformation in labor markets and studies by Long et al., (2011) and Bdul (2012) are particularly extensive both in terms of countries and of time periods covered to provide evidence of increase in non-farm employment and wage rates as countries develop. Even though there were many studies on structural transformation at macro-level, there were very few studies based on micro-level studies in India. Macro data sets like NSSO will not provide details of economic and non-economic activities and their relation with other household and individual characteristics. It is important to understand labor supply of men and women not only for so called economic activities, but also non-economic activities in evolving policies relating to decision making relating to labor time allocation. Keeping this deficit in the literature, this paper[i] examined the employment status and structure in a sample of households selected from 18 villages located in India by using high frequency data (data collected every 15 day interval for whole year from all individuals from all selected households by residential field investigators) with the following broad objectives

(i) To assess the structure of work status and hours worked per week among sample individuals,

(ii) To test for segmented labor market theory and devaluation theory of labor.

The specific hypotheses of the paper are

(i) Work status and hours worked per week among men and women differs based on human, physical and social group,

(ii) Major occupation of the individuals depends on human, physical, social group and gender.

Taking advantage of high frequency of the data, we test the variation in hours worked per week and wage rates by gender, educational, social and economic status of households. We also test the segmented labor market theory. The segmented labor market theory says that the workers segmented in to two categories of employment one with superior employment characterized by good wages, skilled work, secure employment and another with inferior employment with low wages with unfavorable work environment based on the human and physical capital and social group of households. The literature on segmented labor market theory shows that the mobility from lower hierarchy to higher hierarchy employment is restricted by different socio-economic and cultural factors of the households. If the segmented theory of labor market is true, then there exist significant differences in occupations and wage rates based on social status, religion, assets, gender etc which were not explainable by human and physical capital.

The data used in this paper were obtained from a larger research project entitled "Village Dynamic Studies in South Asia (VDSA), in which ICRISAT research team collected a range of data from households of 18 selected villages from SAT India for the year 2010. The 18 villages in the VDSA studies of ICRISAT were selected from five states (Andhra Pradesh, Maharashtra, Madhya Pradesh, Gujarat and Karnataka), which represent the broad agro-climatic sub-regions in the semi-arid tropics of India. The selected villages were: Aurepalle, Dokur, JC Agraharam and Pamidipadu from Andhra Pradesh; Babrol, KaramdiChingaria, Chatha, Makhiyala from Gujarat; Belladamadugu, Kappanimargi, Markabhinahalli, Tharati from Karnataka; Shirapur, Kalman, Kanzara, Kinkheda from Maharastra; and Papda and Rampur Kalan from Madhya Pradesh. The total sample comprises of 948 male members and 631 female members from the 18 villages.

We have collected the data for each day in the year; hence we have record for all 52 weeks whether a person worked for wages or not, if he worked how many hours worked and at what wage rate? The details include hours spent on paid-work (farm and non-farm, with wage rate), own-farm work, domestic duties (like utensils cleaning, washing clothes, cooking, preparing children for school etc), own-livestock rearing, own-non-farm work (like business, handloom etc), hours with seriously ill and

unemployed-hours. We have run five regression equations with hours worked per week on each activity status (paid-work, own-farm work, own-livestock work, own-non-farm work and all economic activities) as dependent variable to know the influence of the relevant explanatory variables mentioned in table 1. We have also run a modified Mincer equation to know the influence of explanatory variables on log of wage rates. At lost we have also run multinomial logistic regression equation to know the occupational choice among main occupations namely cultivation, non-farm labor, livestock rearing, salaried job, education, domestic duties, business and farm labor.

Table 1. Explanatory variables included in the various regression analyses

Explanatory variable	**Rationale for inclusion**
Land owned (acre)	Indicator for physical capital, source of employment on own farm
Land owned^2	To represent non-linear relation
Irrigated area (acre)	Indicator for land productivity
Irrigated area^2	To represent non-linear relation
Value of owned house ₹	Long run socio-economic status of households
Value of assets owned ₹	Economic status of households
Loans taken ₹	Indicator of household needs
Savings ₹	Indicator of excess of income over expenses
Age (years)	Physical capacity to work
Age^2	To represent non-linear relation
Years of education(years)	Human capital through education
Experience(years)	Human capital through experience
Experience^2	To represent non-linear relation
Height (cm)	Physical capacity to work
Weight (kg)	Physical capacity to work
Height/weight ratio	Indicator of healthy body
Arm circumference (cm)	Physical capacity to work
Caste group	Indicator of social status
Religion group	Indicators of beliefs
Relation to head of hh	Household responsibilities
Marital status	Household responsibilities
Main occupation	Occupational choice
Gender	Gender discrimination

3. Results

3.1 Work status of men and women

The table 2 describes the activities of male and female in the year 2010. Overall, men reported 36.2 hours per week compared to only 23.1 hours per week in economic activities. If we consider both economic and non-economic participation of women increased to 51.2 hours compared to only 45.0 for men. However, men work more hours in paid work (20.8 hours) than women (12.3

hours), consequently men spent less hours in domestic duties (only 6.5 hours) compared to women (26.3 hours). Women average wage rate is only ₹99 per day compared to men wage rate of ₹200 per day, hence, the wage income per year for women is only ₹7920 compared to ₹27000 for men. If we compare imputed wage income (considering even non-monetary activities for both men and women) the gap between men and women income reduced to 77% from 241%, as female average imputed income raised to ₹32967, while male imputed income rose to ₹58400 even if we impute wage rate for women and men at the on-going wage rate respectively. If we impute both men and women wage income for own-days at ₹99, then the imputed wage income for women is ₹32967 and for men is ₹42551 and the gap between men and women further reduced to 29.1%.This indicates in rural areas, if we impute the value of the domestic duties of both men and women equally, the gap in incomes between men and women drastically reduced from 241% to just 29.1%. The above figures demonstrate that the contribution of women is more in non-monetary activities. The less contribution in monetary activities by women is also having adverse impact on intra-household decision making. The average education level of women is just 5th standard and while among men it is 8th standard, which needs to be balanced at higher level for increased participation in monetary activities by women.

Table 2. Average hours/week of female and male

Work type /item	Female	Male	% over female
(I) Hours with economic activities	23.1	36.2	56.7
Paid work	12.3	20.8	69
Own farm	5.2	8.5	62
Own livestock	5.1	6.3	24
Other own	0.5	0.6	33
(II)Hours with non-economic activities	28.1	8.8	-68.7
Domestic duties	26.3	6.5	-75
Seriously ill	0.9	0.6	-33
Unemployed	0.9	1.7	83
Hours with economic and non-economic activities (I+II)	**51.2**	**45.0**	**-12.1**
Wage income (₹/year)	7920	27000	241
Wage rate (₹/8 hours)	99	200	102
Imputed income ₹, if income of non-monetary work days are imputed with on-going wage rates for male and female respectively	32967	58400	77
Imputed income ₹, if income of non-monetary work days of both men and women at the on-going wage rates of female (₹99/8 hours)	32967	42551	29.1
Average level of education	5	8	

Men reported 45 hours/week, of which maximum hours worked as paid worker (46%), followed by own-farm (19%), 14% each for own-domestic and own-livestock work. The reported hours by women are 51.2 of which they spent maximum hours (51% of hours) in domestic-duties, followed by paid-work (24%), about 10% each in own-farm and own-livestock work, while sick and unemployed days

together constitute only 4%. Women's major role in domestic-work coupled with paid-work, own-farm work, domestic-work and own-livestock work resulted in more working hours per week.

Still time allocation to paid work (monetary activities) is much lower in rural India (Table 2). Men spent about 20.8 hours on monetary activities (paid work), women spent only 12.3 hours and, which is about and 57.5% and 53.2% of hours spent on economic activities respectively. This indicates that the remaining 42.5% and 46.8% hours spent on self-employment activities by men and women respectively which is quite significant. Hence increasing productivity in self-employment activities (like own-farm, own-livestock and petty business etc) should be given high priority in rural areas. Another reason for less empowerment of women is they spent more hours in paid farm work compared to men, in which wage rates are low (table 3).

Table 3. Paid hours per week by male and female

Gender	Type of work	Hours/week	Wages (₹/8 hours)	Total paid wage income per year (₹/annum)
Male	Non-farm	15	223	21185
	Farm	5	132	4356
	Total	20	200	25541
Female	Non-farm	5	107	3531
	Farm	7	94	4136
	Total	12	100	7667

Illiterate men work less hours in paid-work and gradually increased as education increases. While the trends is reverse among women, the paid-work hours were higher among illiterate and gradually decreased as educational level increases. It indicates that the employment opportunities in paid-work are higher for educated men, which also an indication for higher returns to education among men compared to women. On the other hand as education level increases, women find it difficult to get employment to commensurate with their higher education in paid-work, hence the educated women end up attending domestic duties. Further their higher social status will not permit them to work either as casual laborer or in public works program like MGNREGA (Table 4). Wage structure indicates that there is no significant increase in wages up to intermediate educational standard, but above that education level there is a steep increase in wage rates for both men and women. The total reported work-hours (include both economic and non-economic activities) are higher for illiterate, as educational level increases the work hours reduced drastically, which indicates the unwillingness of higher-educated to engage in widely available local works like casual laborer or work on own farms among both men and women. There were few employment opportunities for higher-educated persons (both men and women) to commensurate with their educational qualification. It is also true the skill sets of the educated rural youth are not matching the local needs and they also lack entrepreneurial skills required to start new businesses in rural areas. Creating local employment opportunities for educated youth should be given higher priority through policy interventions like recruitment of local educated youth in both public and private employment, imparting skills and vocational training to educated youth which are locally demanded.

Table 4.Work hours per week and wage rates by education level

Gender/ Education level	Economic activities					Non-economic activities				Total hours/week	Wage rates (₹/8 hours)
	Paid work	Own farm	Own livestock	Own non-farm	Total	Domestic duties	sickness	Unemp loyment	Total		
Male											
Illiterate	21.4	9.2	9.7	0.5	40.8	7.1	0.5	2.6	10.2	51.0	152
Primary	21.6	9.3	8.3	0.5	39.7	6.9	0.5	2.0	9.4	49.0	200
Middle	23.0	9.2	8.2	0.5	40.9	7.7	0.5	2.0	10.2	51.0	163
High	20.6	8.2	5.2	0.9	34.9	6.0	0.4	1.7	8.1	43.0	192
Inter	19.4	7.6	3.4	0.8	31.2	5.3	0.4	1.1	6.8	38.0	209
Graduate & above	19.0	7.2	3.8	0.4	30.4	6.5	0.4	0.8	7.7	38.0	345
Total	**20.7**	**8.6**	**6.3**	**0.5**	**36.1**	**6.8**	**0.5**	**1.8**	**9.1**	**45.0**	**200**
Female											
Illiterate	16.2	6.2	6.7	0.6	29.7	24.1	1.1	1.1	26.3	56.0	93
Primary	13.9	6.4	4.6	0.6	25.5	30.7	0.6	1.2	32.5	58.0	90
Middle	10.4	5.7	4.7	0.5	21.3	28.6	1.0	1.0	30.6	52.0	91
High	8.1	4.1	4.1	0.5	16.8	27.0	0.9	0.5	28.4	45.0	83
Inter	7.6	4.0	2.8	0.4	14.8	24.4	0.8	0.0	25.2	40.0	104
Graduate & above	5.0	1.2	2.8	0.6	9.6	19.8	0.6	0.9	21.3	31.0	463
Total	**12.2**	**5.1**	**5.1**	**0.5**	**22.9**	**26.0**	**1.0**	**1.0**	**28.0**	**51.0**	**99**

Unlike, with educational-level, among different landholding classes, there is no significant difference in total reported-hours per week, but there is significant increase in hours worked on own-farm and own-livestock and reduction in the paid-work with the increase in landholding size (Table 5). One interesting thing is that, as landholding size increases, the wage rate for men increased steeply, while there is no significant increase except at higher landholdings among women. This shows that owning large lands improves chances of getting into higher hierarchy (skilled) occupations and industry (non-farm employment) with higher wages. In rural areas, land is an important asset, which will have positive influence on choosing better employment that provides more wages and higher socio-economic status even in non-farm sector.

Table 5. Work hours per week and wage rates by owned-land (physical capital)

Gender /Farm size	Economic activities					Non-economic activities				Total reported hours/week	Wage rates (₹/8 hours)
	Paid work	Own farm	Own livestock	Own-non-farm	Total	Domestic duties	Sickness	Unemp loyment	Total		
Male											
Landless	30.4	1.3	2.7	0.4	34.8	7.2	0.9	1.8	9.9	44.8	186
Small	22.5	7.2	5.8	0.4	35.9	6.7	0.4	1.8	8.9	44.9	189
Medium	18.6	10.4	7.3	0.5	36.8	6.8	0.5	1.4	8.7	45.4	221
Large	12.5	13.8	8.5	0.4	35.2	7.1	0.4	1.8	9.3	44.6	224
Female											
Landless	18.6	1.5	3.6	0.5	24.2	24.7	1.0	1.5	27.2	51.5	93
Small	14.2	4.9	4.4	0.5	24.0	28.4	1.1	1.1	30.6	54.6	98
Medium	10.0	7.3	5.8	0.5	23.6	27.3	0.5	1.0	28.8	52.5	88
Large	6.8	6.8	6.4	0.5	20.5	23.6	0.9	0.5	25.0	45.4	134

In rural areas not only land owned, but land productivity play an important role in employment structure of persons. Having irrigated land is an indication of higher productive land and household income in rural areas. Table 6 depicts hours worked per week by irrigation status. Having irrigated land increases work on own-farm, own livestock and other domestic activities for both men and women with simultaneous decrease in hours spent on paid work for others. It indicates that having higher productive lands (irrigated) increases employment opportunities on their own-farms, own-livestock which generate more hours of work which reduce need to work as paid-laborer. Workers who possess un-irrigated lands reported more hours spent on paid-work. It is also interesting to see

that the wage rates are higher for workers who possess irrigated lands compared to un-irrigated lands, may be due to their higher bargaining power due to higher socio-economic status and higher education and labor productivity.

Table 6. Work hours per week and wage rates by irrigated land status

Gender/ Irrigation status	Economic activities					Non-economic activities				Total reported hours/week	Wage rates (₹/8 hours)
	Paid work	Own farm	Own livestock	Own non-farm	Total	Domestic duties	Sickness	Unemployment	Total		
Male											
Un-irrigated	24.9	5.9	6.3	0.5	37.6	5.9	0.5	1.4	7.8	24.9	5.9
Irrigated	13.7	13.2	6.6	0.9	34.4	7.1	0.9	1.8	9.8	13.7	13.2
Female											
Un-irrigated	15.3	4.2	4.2	0.5	24.2	27.0	0.5	1.1	28.6	15.3	4.2
Irrigated	6.2	7.2	6.7	1.0	21.1	25.4	1.0	0.5	26.9	6.2	7.2

Socially backward castes (scheduled caste and tribes and other backward caste households) are historically underprivileged sections of society, one of the main goals of planning in India is development of these caste groups. Historically scheduled caste and tribes are socio-economically most regressive castes, while forward caste are more forward in education, income and wealth, while other backward caste group is situated in-between. However, there is significant difference between scheduled caste and tribes, with the later group possess more land and mostly dependent on agriculture, while former group mostly depends on casual laborer. Among women, scheduled tribes reported more hours of work per week, followed by scheduled caste, backward caste and the least among forward caste. Among men there is no clear trend. Overall, scheduled tribe and forward caste men and women worked less hours as paid-workers but for higher wage rate, while scheduled caste men and women spent more hours as paid-worker, but with less wage rate (Table 7). Forward caste women spent more hours in domestic duties compared to other caste women. Overall, still, the scheduled caste women and men are working at lower wage rates, at lower wage rates and mostly as casual laborer in rural India.

Table 7. Work hours per week and wage rates by social group

Gender/ Caste group	Economic activities					Non-economic activities				Total reported hours/week	Wage rates (₹/8 hours)
	Paid work	Own farm	Own livestock	Own non-farm	Total	Domestic duties	Sickness	Unemployment	Total		
Male											
BC	21.1	8.3	6.4	0.5	36.3	6.9	0.5	1.8	9.2	45.4	175
ST	17.6	8.6	5.6	0.9	32.7	6.4	0.4	2.6	9.4	42.1	217
SC	26.1	3.9	4.4	0.4	34.8	5.7	0.4	1.7	7.8	42.7	165
FC	18.4	11.6	7.6	0.4	38.0	5.8	0.4	0.4	6.6	44.8	289
Female											
BC	13.4	5.7	5.1	0.5	24.7	24.7	1.0	1.0	26.7	51.4	92
ST	8.2	6.6	7.6	0.5	22.9	29.5	1.1	0.5	31.1	54.1	149
SC	20.7	2.1	2.6	0.5	25.9	23.3	1.0	1.6	25.9	51.8	90
FC	7.2	5.7	3.8	0.5	17.2	29.7	0.5	0.5	30.7	47.8	110

In India, about 80.5% of Indian population is Hindus; the rest belongs to other religions like Muslim and Christianity. It is constitutional obligation to protect interests of these minorities (Muslims, Christians and others) in a secular country like India. Many studies reported that minorities are in disadvantage in labor market, especially Muslim women. Our survey results shows that overall, hours spent in economic activities were less for Muslim women compared to Hindu women (Table 8). Total reported-work-hours per week are higher for Muslim and other religion men compared to Hindu men that too they are working more hours as paid-work then Hindu, as Muslims are having less land to

depend on own-farm work. But as expected, Muslim and other minority religion women worked more hours in domestic duties, compared to Hindu women, while Hindu women worked more hours on own-farm and own-livestock. The low participation of Muslim women in economic activities can be rectified by the distribution of land for undertaking farming activities. Again wage rates for Muslim women and men are less compared to Hindu women and men respectively. The social dimension of wage rates and employment structure shows that minorities and socially backward caste women and men constrained to some extent to participate in gainful economic activities. To some extent the rural labor markets in rural India are segmented based on religion and caste.

Table 8. Work hours per week and wage rates by religion status

Gender/ Religion	Economic activities					Non-economic activities					
	Paid work	Own farm	Own livestock	Own non-farm	Total	Domestic duties	sickness	Unemp loyment	Total	Total reported hours/week	Wage rates (₹/8 hours)
Male											
Muslim	29.7	10.2	4.1	0.2	44.2	6.1	0.5	0.5	7.1	51.2	146
Other minority	26.7	6.1	9.6	0.2	42.6	6.6	0.5	1.0	8.1	50.5	291
Hindu	20.5	8.5	6.2	0.4	35.6	6.7	0.4	1.8	8.9	44.6	199
Female											
Muslim	10.5	3.8	1.0	0.2	15.5	30.5	1.0	1.0	32.5	47.7	92
Other minority	15.2	2.0	4.6	0.2	22.0	42.2	0.7	1.3	44.2	66.0	76
Hindu	12.3	5.6	5.1	0.5	23.5	25.5	1.0	1.0	27.5	51.1	100

Generally, married persons have more responsibility to maintain incomes (mostly men) and run day-to-day household activities (mostly women). The table 9 report hours per week and wage rates by marital status of men and women. Among men, paid-work hours are more among unmarried as they don't have necessary experience and assets/land to be engaged in own-work at young age. As expected, married women spent more hours on own-farm and own-livestock work. Total reported-work-hours in economic activities by unmarried women are much less, as some of them are still going to educational institutions and some other may be preferred to be engaged in domestic work. As in rural areas, social norms discourage participation of young unmarried woman in paid-work outside home. Sending unmarried young women to work is considered as "low social status", diminish prospects of finding good match, hence they prefer domestic work or work on own farms rather than paid-work. But, widow-women spent more hours on paid work, as they don't have male-earning members in the family to meet the households day-to-day cash needs. Wage rate among unmarried women and men is significantly less due to their less experience.

Table 9. Work hours per week and wage rates by marital status

Gender/ Marital status	Economic activities					Non-economic activities					
	Paid work	Own farm	Own livestock	Own non-farm	Total	Domestic duties	Sickness	Unemp loyment	Total	Total reported hours/week	Wage rates ₹/8 hours
Male											
Married	22.1	10.6	7.5	0.5	40.7	7.0	0.5	2.0	9.5	50.3	223
Widow	22.2	5.9	6.4	0.0	34.5	10.4	2.5	2.0	14.9	49.4	148
Unmarried	18.6	4.6	4.2	0.7	28.1	5.6	0.4	1.1	7.1	35.1	154
Female											
Married	12.7	6.1	5.5	0.6	24.9	28.1	1.1	1.1	30.3	55.1	100
Widow	25.1	3.6	4.2	0.0	32.9	23.9	1.2	1.8	26.9	59.7	109
Unmarried	7.2	2.0	2.9	0.7	12.8	18.6	0.7	0.7	20.0	32.6	83

Results of regression equation (hours worked each employment status)

To know the casual relation between hours worked in each employment status (paid work, own-farm, own-livestock, own-non-farm, work hours in total economic activities) in economic activities we have run five regressions as the work status as dependent variable. The results were presented in table 20. Owned land is having negative influence on hours spent on paid work, but positively influence on hours spent on own farm and own livestock work. Irrigated area is having negative influence on hours worked on own-livestock, as the irrigated area increase productivity of land; hence households spent more time on cultivating profitable crops rather than on livestock rearing. Value of residential plot and also value of loan taken, which were in general indicators for attachment for the location (stake in the village) were having positive influence on hours spent on paid work, own farm and on all economic activities. Value of assets owned (other than land) have negative influence on hours spent on paid work, as with more assets people shift to own-employment like rearing of livestock or own business which have positive sign. Years of education have strong negative influence on hours spent on livestock rearing as it is most inferior work. Experience is having negative influence on hours spent on own-other work may be due to the non-profitability of the many self-employment occupations pooled in this category. Among physical capability indicators only arm circumference is having significant positive influence on hours spent on paid work, livestock rearing, and all economic activities, while is has negative influence on hours spent on own-farm and own-other activities. As most of the own-farm and own-other activities don't require manual work, but paid work and own-livestock require more manual work, hence positively influenced by arm circumference. However, height, weight and height/weight ratio don't have any significant influence on work hours.

Scheduled caste members were having positive association with hours spent on paid work. Scheduled tribes were positively associated with hours spent on own non-farm activities, but negatively associated with own-farm and own-livestock. Individuals belongs to other castes were having negative association with livestock rearing compared to forward caste. Muslims were less likely to spend time in own-livestock activities, other minorities were less likely to spent time in own-farm activities compared to Hindus. Married were more likely to spend more time in own-farm activities compared to unmarried who can take up any activity. Cultivators also more likely to spend some hours in own-non-farm activities, but less likely to send time as paid workers. Salaried workers spend more hours in economic activities than farm laborer as they are in regular service. Women are less likely to work on own-farm and also send less hours in economic activities.

Table 10. Determinants of hours spent per year in different work status

Explanatory variables	Regression -I Paid work β	t	Regression-II Own farm β	t	Regression-III Own livestock β	t	Regression-IV Own non-farm β	t	Regression-V All economic activities β	t
Land owned (acre)	-19.32227*	-2.4	11.72093	2.8	12.28752*	3.1	-0.46033	-0.5	4.22586	0.5
Land owned^2	0.20585	1.6	-0.08186	-1.2	-0.12211*	-1.9	0.00445	0.3	0.00633	0.1
Irrigated area (acre)	1.49360	0.1	-4.09605	-0.4	-17.03075*	-2.0	-0.30839	-0.2	-19.94159	-1.1
Irrigated area^2	-0.31800	-0.5	-0.31281	-1.0	0.24178	0.8	0.00410	0.1	-0.38492	-0.6
Value of owned house ₹	0.00177*	2.4	0.00073*	1.9	0.00014	0.4	-0.00004	-0.5	0.00260*	3.4
Value of assets owned ₹	-0.00136*	-2.3	-0.00015	-0.5	0.00081*	2.8	0.00002	0.3	-0.00069	-1.2
Loans taken ₹	0.00305*	3.4	0.00127*	2.7	-0.00068	-1.5	-0.00001	-0.1	0.00363*	4.0
savings ₹	0.00002	0.0	-0.00044	-1.6	-0.00033	-1.3	0.00000	0.0	-0.00074	-1.4
Age (years)	974.85400	1.7	-280.78200	-1.0	-352.42460	-1.3	-261.07610*	-4.2	80.57124	0.1
Age^2	-24.79119	-1.6	7.18784	0.9	9.23341	1.2	6.83559*	4.1	-1.53436	-0.1
Years of education	1.91157	0.3	4.40905	1.2	-9.03621*	-2.7	-0.16040	-0.2	-2.87600	-0.4
Experience (years)	15.39126	0.3	4.16953	0.1	-9.24866	-0.3	-12.62917*	-1.9	-2.31705	0.0
Experience^2	24.91711	1.6	-7.44677	-0.9	-9.42277	-1.3	-6.83600*	-4.1	1.21157	0.1
Height (cm)	1.70560	0.4	-2.66028	-1.1	3.76688	1.6	0.15990	0.3	2.97209	0.6
Weight (kg)	-1.48975	-0.1	5.81028	1.0	-1.28546	-0.2	0.34808	0.3	3.38316	0.3
Height/weight ratio	43.71378	0.3	42.36028	0.5	132.62640	1.5	-13.72437	-0.7	204.97610	1.2
Arm circumference (cm)	22.48936*	2.1	-11.89958*	-2.1	20.25824*	3.8	-4.10316*	-3.5	26.74486*	2.5
Caste group										
BC	127.81170	1.6	-29.28145	-0.7	-78.80707*	-2.0	-2.80762	-0.3	16.91557	0.2
ST	66.95340	0.6	-107.08980*	-1.9	-184.16420*	-3.5	27.55353*	2.4	-196.74710	-1.8
SC	341.15280*	3.1	-82.17840	-1.4	-158.85710*	-2.9	-5.32660	-0.4	94.79062	0.8
FC	(base)		(base)		(base)		(base)		(base)	
Religion group										
Muslim	139.19220	0.9	26.77533	0.3	-182.10060*	-2.4	-5.99362	-0.4	-22.12667	-0.1
Other minority regions	31.93361	0.2	-195.86290*	-1.8	-106.50660	-1.0	2.41596	0.1	-268.02000	-1.3
Hindu	(base)		(base)		(base)		(base)		(base)	
Relation to head of hh										
Head	-96.93465	-1.1	22.28873	0.5	67.93442	1.6	6.91918	0.7	0.20768	0.0
Non-head	(base)		(base)		(base)		(base)		(base)	
Marital status										
Married	-104.78690	-1.2	89.04195*	2.0	-8.01730	-0.2	-0.85671	-0.1	-24.61900	-0.3
Unmarried	(base)		(base)		(base)		(base)		(base)	
Main occupation										
Cultivators	-391.02570*	-5.2	188.11690*	4.9	58.80703	1.6	15.08723*	1.9	-129.01450	-1.7
Nonfarm labor	190.28430	1.6	-165.46990*	-2.7	-121.28910*	-2.1	11.42823	0.9	-85.04643	-0.7
Livestock	-763.05580*	-4.1	-113.43880	-1.2	502.44700*	5.4	5.73723	0.3	-368.31030*	-1.9
Salaried job	703.73150*	5.5	-242.78270*	-3.7	-114.54240	-1.8	0.39335	0.0	346.79970*	2.7
Education	-789.38640*	-5.3	-146.68280*	-1.9	-22.25138	-0.3	17.07445	1.1	-941.24610*	-6.3
Domestic work	106.70450	0.6	-50.41775	-0.5	-97.05603	-1.0	-0.72425	0.0	-41.49352	-0.2
Business	479.98090*	4.2	-157.34750*	-2.7	-141.01260*	-2.5	3.35592	0.3	184.97670	1.6
Farm labor	(base)		(base)		(base)		(base)		(base)	
Gender										
Female	-110.60070	-1.3	-125.12050*	-2.8	-35.11545	-0.8	4.80284	0.5	-266.03380*	-3.0
Male	(base)		(base)		(base)		(base)		(base)	
Constant	-8875.8	-1.7	3219.0	1.2	2238.5	0.9	2593.0*	4.5	-825.1	-0.2
Adjust R2	0.34		0.29		0.21		0.06		0.27	

Note: (i) The mean of paid work 172.5 hours, own farm 47.4 hours, own livestock 34.4 hours, own-non-farm 1.5 hours, all economic activities 255.8 hours. (ii) The significant coefficients at 5% level are marked with *.

A modified Mincer equation was estimated for paid wage earners. In this log of wage rate per day has been taken as dependent variable. Irrigated area, savings, body weight of the worker, other minorities (Christians), salaried job and persons engaged in business were having positive influence on the wage

rates (Table 11). While scheduled caste workers, persons engaged in domestic duties as main occupation, school/college going students and women were having negative influence on the wage rates.

Table 11. Determinants of log of wage rates (modified Mincer equation)

Variable	β	t	Mean
Wage rate (₹/days)			165.1
Land owned (acre)	0.0080129	1.3	5.9
Land owned^2	0.0000963	0.9	109.0
Irrigated area(acre)	0.0427886*	3.0	2.0
Irrigated area^2	-0.0012045*	-2.5	24.3
Value of owned house ₹	0.0000005	0.8	25437.1
Value of assets owned ₹	0.0000001	0.3	32386.7
Loans taken ₹	-0.0000004	-0.5	10165.8
savings ₹	0.0000011*	2.6	20180.4
Age (years)	-0.5266601	-1.2	35.9
Age^2	0.0139019	1.1	1461.6
Years of education	-0.0020054	-0.4	6.1
Experience (years)	-0.0226981	-0.5	16.4
Experience^2	-0.0141305	-1.2	423.9
Height (cm)	-0.0058012	-1.6	159.4
Weight (kg)	0.0282421*	3.3	51.6
Height/weight ratio	0.2341614	1.7	3.2
Arm circumference (cm)	-0.0051617	-0.6	24.0
Caste group			%
1(BC)	-0.0177531	-0.3	54.5
2(ST)	0.0245184	0.3	12.5
3(SC)	-0.2209377*	-2.5	17.1
9(FC)	(base)		16.0
Religion group			
1(Muslim)	-0.0471623	-0.4	2.6
2(others)	0.5552978*	3.3	3.0
9(Hindu)	(base)		94.4
Relation to head of hh			
1(head)	0.0219602	0.3	32.8
0(non-head)	(base)		67.2
Marital status			
1(married)	0.0178633	0.3	72.1
9(unmarried)	(base)		27.9
Main occupation			
1(cultivators)	-0.0152153	-0.3	31.0
3(nonfarm labor)	-0.0236815	-0.3	11.0
5(livestock)	-0.1601719	-1.1	2.5
8(salaried job)	0.2034685*	2.0	8.5
9(education)	-0.2458987*	-2.1	5.3
10(domestic work)	-0.3863613*	-2.5	3.2
13(business)	0.1381025*	1.5	12.4
14(farm labor)	(base)		26.3
Gender			
0(women)	-0.3892887*	-5.6	40.0
1(men)	(base)		60.0
Constant	8.6163540	2.1	
Adjust R2	0.38		

Note: The significant coefficients at 5% level are marked with *.

Table 12 presents the main occupation of individuals based on the maximum number of days spent in a year for men and women. Out of 948 male-members between the age group of 15-65 years in the sample, 29 % are engaged in cultivation, 14 % are engaged in education, 12% are actively engaged in non-farm labor, 10% are engaged in farm labor, 8% each are engaged in salaried job and village petty business, 3% each are engaged in livestock rearing and caste occupation like cleaning cloths, gold smith etc, 1% are engaged in domestic work. This shows that still farming is a major activity in the villages for men, followed by non-farm-labor, farm labor. It is interesting to see that many (14%) are still going to educational institutions, which shows that many male members of the households are educating beyond 15 years and attending for intermediate and higher education institutions. However, out of 631 women of age between 15 and 65 years in the sample, participation in cultivation, attending domestic duties, farm labor, livestock rearing are main occupations. Farm laborer and livestock rearing are mostly illiterate or educated up to primary level only, while education level of cultivators were somewhat higher and spread among all education levels. Although non-farm laborers were mostly concentrated in middle level of education, but they spread up to 10+2 levels. Many of the salaried and business persons are educated even up to graduate and above. Farm laborer and non-farm laborer are mostly landless, while cultivators mostly own land. Again farm labor and non-farm labor are much younger than the cultivators and persons engaged in domestic duties. Salaried and business persons are mostly in middle to old aged. Scheduled castes are mostly working as agricultural laborer and also non-farm laborer, some were in cultivation also. Scheduled tribes were mostly engaged in cultivation, agricultural laborer and livestock rearing. Backward and forward caste households were engaged in cultivation.

Table 12. Distribution of individuals by main occupation and socio-economic status

	Cultivators	Non-farm labor	Livestock rearing	Caste occupation	Salaried job	Education	Domestic Duties	Business	Farm labor	Total
Gender										
Male	40	12	3	3	8	14	1	8	10	100
Female	29	3	11	1	2	10	21	2	21	100
Education										
Illiterate	42	8	10	3	1	0	9	2	25	100
Primary	44	6	6	2	1	0	14	6	21	100
Middle	39	9	9	2	4	2	14	5	16	100
Higher	30	9	6	2	5	19	11	9	10	100
10+2	26	7	1	2	10	32	10	8	5	100
Graduate	15	1	1	1	22	43	7	7	2	100
Landholding										
Medium	45	7	6	1	5	12	10	4	10	100
Large	51	2	8	1	6	14	11	3	3	100
Landless	8	13	6	6	7	10	10	8	31	100
Age group										
below 15	3	4	0	0	0	82	6	0	5	100
15 to 24	17	10	4	2	5	36	10	4	11	100
25 to 60	42	7	8	2	6	1	10	6	18	100
above 60	45	6	7	3	1	0	26	5	7	100
Social group										
BC	37	8	6	3	4	12	8	5	16	100
ST	38	6	10	0	7	11	10	4	14	100
SC	18	15	4	2	8	11	9	5	28	100
FC	35	3	7	0	7	14	20	7	6	100
Total	35	8	7	2	5	12	11	5	15	100

Among men, whose main occupation is business, salaried jobs, farm labor and caste occupations engaged almost fully in paid work, but the wage rates were higher in salaried jobs, business and non-farm labor and lower in farm labor and caste occupations (table 13). Among women, workers engaged in salaried jobs, non-farm labor, business and farm labor as main occupation almost engaged fully in paid work. In general the wage rates and wage income were also higher for these workers in these occupations except some non-farm labor activities which were distress driven.

Table 13. Main occupation of individuals by paid work hours and wage income

	Cultivators	Non-farm labor	Livestock rearing	Caste occupation	Salaried job	Education	Domestic duties	Business	Farm labor	Total
Women										
Work hours/week	10	37(2)	1	25	38(1)	2	4	28(3)	25(4)	12
Wage rate/8 hours	92	77	94	93	177(1)	74	96	113(2)	90	99
Wage income(Rs/annum)	5899	18630	862	15052	43651	1117	2394	20403	14388	7689
Men										
Work days	12	26	9	32(4)	36(2)	4	2	38(1)	32(3)	19
Wage rate	171	191(3)	132	156	363(1)	97	124	255(2)	128	202
Wage income(Rs/annum)	12961	31610	7771	32100	85706	2594	1664	63608	27048	25050

Multinomial regression analysis

Multinomial regression analysis was used to analyse choice of type of employment. The dependent variable was a categorical variable (type of employment) with more than two categories (in this case of six categories) and it has been regressed upon a set of independent variables. As the multinomial model requires that a particular category to be designated as the numerate against which all results should be compared. This implies that parameter estimates for the categories should be interpreted as indicators of the strength of association of a particular explanatory variable with the respective category relative to the same explanatory variable with 'numerate' (comparison) category.

The Model specification
The general form of multinomial logit models is:
$Y_{ij} = \beta_j X_i, + u_{ij}$ (l)
Where Y_{ij} is the ith individual's utility of the jth choice, and X_i is a vector of values of the ith individual on the independent variables. The model estimates a set of regression coefficients for each of the alternatives (except for the choice option that has been defined as reference category), hence the subscript in B_j [Decoster, 2004].

Y (type of employment=) f (physical capital of workers, human capital of workers, socio-economic characteristics, work related variables).

The dependent variable(Y: occupation category) takes six categories namely (i) Cultivators, (ii) Non-farm labor, (iii) Livestock rearing, (iv) Caste occupation, (v) Salaried job, (vi) Education (vii)Domestic duties, (viii) Business and (ix) Farm labor . The independent variables included in employment choice model were same as mentioned in table 2. In the multinomial regression, farm laborer is taken as reference category as this category is most inferior type of employment; most of them try to get out of this type of employment to any other type of employment (Poterba and Summers 1995; Lee, 1983; Boskin, 1974).

Multinomial logistic regression is used when nominal response variable (dependent variable) has more than two categories. Multinomial logit models are multi-equation models. A response variable with k+1 categories will generate k equations. Each of these k equations is a binary logistic regression comparing a group with the reference group. M multinomial logistic regression simultaneously estimates the k logits. Further, it only displays coefficients for the k comparisons. Thus, the coefficients β_i represent the log odds of being in the target groups relative to the reference group. Thus a simplified multinomial logit model has the form:

$$p_j = \frac{\exp(\beta_j X)}{\sum_j \exp(\beta_j x)} \text{ for j= 1,….,k+1}$$

Where exp () stands for the exponential function and x is the vector of independent (or explanatory) variables.

β_{k+1} can be set to 0 (zero vector) as a normalization and thus:

$$P_{k+1} = \frac{1}{\sum_j \exp(\beta_j x)}$$

As a result, the j logit has the form:

$$log \frac{P_j}{P_{k+1}} = \beta_j X \text{ for j= 1,…,k}$$

For example, the 1st equation can be represented as

Log[probability of being in farming/ probability of being farm labor] =-1.00-0.212*[log value of own land(Rs)] +0.007*[log value of own land^2 (Rs)] +0.677*[log irrigated area(acre)] -0.022*[log irrigated area^2] +0.000007*[log owned house(Rs)] -0.000003*[Log owned house^2]-0.000004*[loan taken (Rs)] +0.000014*[savings(Rs)]-35.2*[Age]+0.9099*[Age^2]+0.141*[years of education]-1.16[experience]-0.908*[experience^2]+0.055*[height]-0.075*[weight]-1.27*[height/weight]+0.173*[arm circumference] +0.036*[BC]+2.956*[ST]+0.094*[SC]+0*[FC, reference] +0.55*[Muslim]-5.24*[Other religion] + 0[Hindu(reference)] -0.879*[Head of hh]+0*[not head of hh(reference)] +1.317*[Married] +0*[Unmarried(reference)] ----------drawn from Table 14.

For example, the slope coefficient [for irrigated area in above equation represents change in the log odds of being in cultivation versus farm labor for a person with an increase of one acre of irrigated area. The significance of the parameter estimates can be accessed through standard errors of the parameters.

However, the most common way of interpreting a logit is to convert it (log odd ratios) to an odds ratio using the exp (β) function. The closer the odds ratio is to 1.0, the more the independent variable's categories (ex., irrigated area does not matter in this case in deciding choice between cultivation versus farm labor) are independent of the dependent variable, with 1.0 representing full statistical independence. For Instance if the logit $\beta_i = 0.677$ as in the case of irrigated area in above equation, then the corresponding odds ratio (the exponential function, e^{β}) is 2.0, then we may say that when the independent variable increases one unit ,the odds that the dependent = cultivator increase by a factor of 2.00 compared to farm labor when other variables are controlled.

The overall model fit can be tested by either -2 Log Likelihood or Pseudo-R^2. -2 Log likelihood is a measure of how well the model fits the data. The smaller the value of 2-Logliklihood better is the fit. In step wise methods the change in -2log likelihood tests the null hypothesis that the coefficients of the terms removed from the model are zero. However Cox and Snell R^2 statistics can also tell about goodness of fit of the models as hat of standard R^2 in OLS. Cox and Snell's R –Square is an attempt to imitate the interpretation of multiple R –Square based on the likelihood, but its maximum can be (and usually is) less than 1.0, making it difficult to interpret. Nagelkerke's R-Square is a further modification of the Cox and Snell coefficient to assure that it can vary from 0 to L That is, Nagelkerkes R^2 divides Cox and Snell's R^2 by its maximum in order to achieve a measure that ranges from 0 to L. Therefore Nagelkerkes R^2 will normally be higher than the Cox and Snell measure but will tend to run lower than the corresponding OLS R^2.

The results of multinomial regression analysis were presented in table 14. Among men, probability to be engaged in farming increases with increase in irrigated area, years of education, physical capability like arm circumference, but decreases with irrigated area^2, age, experience. Probability in cultivation is higher for ST and lower for other minority religion (Reddy, 2011; Reddy and Kumar, 2006). Probability to be engaged in non-farm labor increases with irrigated area, age^2, arm circumference, while decreases with owned land, age, experience^2. The social group, religion group and education do not influence choice between non-farm labor and farm labor. Probability to be engaged in own-livestock activity in reference to farm labor did not influenced by any other factor, except arm circumference (increases with arm circumference: physical capability). Probability to be engaged in salaried job increases with irrigated area, years of education, both are indicators for increasing labor productivity in rural areas. In same lines with salaried job, probability to be engaged in business activities increases with irrigated area, years of education. Scheduled tribes are more likely to be engaged, but household heads were less likely to be engaged in petty business activities. Among men,

individuals with lower education are having higher probability to be in domestic work and no work. Probability of engaging in non-farm laborer is higher at middle level of education compared to both lower and higher level of education. Less experienced persons have higher probability to be in "no-work" category, and more probability to be in "caste occupation". In case of physical capital indicators, owning irrigated land having positive influence in choosing farming, caste occupation, salaried job, and negatively influenced the probability to be in the category of "no work". However, having owned land is having significant negative influence on choosing "no-work" category, indicating having land greatly increases the probability to be engaged in work in rural areas. Social status is also having significant influence on choice of occupation. Attending higher educational institutions and participation in domestic duties are less frequent activities among adult men in the rural areas.

Table 14. Determinants of main occupation of men (farm labor as comparison group)

	Cultivation		Nonfarm labor		Livestock		Salaried		Education		Domestic duties		Business	
	1.000000		3.00000		5.00000		8.00000		9.00000		10.00000		13.00000	
Land owned (acre)	-0.212275	-1.7	-0.39550*	-2.6	0.16496	0.1	-0.21421	-1.5	8.96604	0.0	-1.48228	0.0	-0.24270	-1.4
Land owned^2	0.007666	1.4	0.01117	2.0	-0.10444	-0.4	0.00728	1.3	-0.00723	0.0	0.02345	0.0	0.00437	0.6
Irrigated area (acre)	0.677557*	3.5	0.70536*	2.6	13.23765	1.3	0.65398*	2.7	14.39540	0.0	2.36317	0.0	0.78175*	3.3
Irrigated area^2	-0.022050*	-1.9	-0.04368	-1.8	-13.81441	-1.2	-0.02226	-1.7	-0.93739	0.0	-0.07555	0.0	-0.02154	-1.5
Value of owned house ₹	0.000007	0.6	0.00000	-0.2	0.00003	0.5	0.00001	1.1	0.00042	0.0	0.00006	0.0	0.00001	0.5
Value of assets owned ₹	-0.000003	-0.3	0.00001	0.8	-0.00001	-0.3	-0.00001	-0.6	0.00013	0.0	-0.00006	0.0	0.00000	0.0
Loans taken ₹	-0.000004	-0.4	0.00000	-0.3	-0.03576	0.0	-0.00001	-0.7	-0.00004	0.0	-0.00002	0.0	0.00000	-0.2
savings ₹	0.000014	1.1	0.00002	1.2	-0.00016	-0.6	0.00002	1.5	-0.00038	0.0	0.00001	0.0	0.00001	1.0
Age (years)	-35.209250*	-2.4	-28.29435*	-1.9	74.52789	0.7	-16.78462	-0.8	-216.85360	0.0	-32.64714	0.0	0.22964	0.0
Age^2	0.909912*	2.4	0.72496*	1.9	-1.90130	-0.7	0.43839	0.8	4.92504	0.0	0.75961	0.0	0.01600	0.0
Years of education	0.141045*	2.8	0.07191	1.1	0.02429	0.1	0.31767*	4.0	41.56177	0.0	0.98292	0.0	0.32586*	4.8
Experience(years)	-1.166106*	-2.1	-0.86949	-1.6	1.14005	0.5	-0.77061	-1.2	-62.98471	0.0	2.20574	0.0	-0.90873	-1.4
Experience^2	-0.908918*	-2.4	-0.72028*	-1.9	1.91097	0.7	-0.43613	-0.8	-3.17569	0.0	-0.75753	0.0	-0.01251	0.0
Height (cm)	0.055605	1.3	0.01164	0.2	-0.06903	-0.5	0.03126	0.5	3.11215	0.0	-0.66927	0.0	0.06263	1.1
Weight (kg)	-0.075390	-0.6	-0.08350	-0.6	0.12471	0.4	-0.05535	-0.3	12.16069	0.0	1.24885	0.0	-0.10625	-0.7
Height/weight ratio	-1.271213	-0.6	-1.63884	-0.7	5.08227	1.0	-3.80401	-1.2	234.92880	0.0	26.21729	0.0	-3.18344	-1.2
Arm circumference (cm)	0.173469*	2.1	0.31003*	2.8	0.88777*	2.1	-0.01059	-0.1	-9.23704	0.0	-0.20599	0.0	0.13220	1.2
Caste group														
BC	0.036786	0.1	0.38027	0.4	17.25133	0.0	-1.18947	-1.4	53.06722	0.0	3.27339	0.0	0.71400	0.8
ST	2.956844*	2.3	2.27393	1.5	20.23691	0.0	2.12296	1.5	132.12890	0.0	-14.96645	0.0	3.80036*	2.7
SC	0.094928	0.1	0.21336	0.2	17.15375	0.0	-0.73103	-0.7	70.70758	0.0	-8.15010	0.0	-25.42867	0.0
Religion code														
Muslim	0.550469	0.6	0.04588	0.0	1.76071	0.0	-24.38765	0.0	354.67280	0.0	-7.09150	0.0	0.96931	0.8
Other minority	-5.244621*	-1.9	-0.82255	-0.5	-27.61102	0.0	-30.50415	0.0	-159.66900	0.0	12.23177	0.0	0.80506	0.1
Head of household	-0.879146	-1.3	-1.39326	-1.5	-1.25150	-0.4	-1.48402	-1.5	170.67980	0.0	-9.12283	0.0	-1.71427*	-2.0
Married dummy	1.317783	1.8	0.56173	0.7	1.53004	0.6	-0.43390	-0.4	123.64990	0.0	11.67244	0.0	0.43930	0.5
Constant	334.009600*	2.3	276.52790*	1.9	-780.0	0.0	168.0	0.8	85.3	0.0	276.4	0.0	-12.3	0.0
Adjust.R2	0.40													

Note: The significant coefficients at 5% level are marked with *.

Among men, one acre increase in irrigated area increases probability to be engaged in farming increases by 100%, increase in one year of education level increases probability to be engaged in

cultivation by 20% compared to farm labor. One year increase in experience reduces probability to be engaged in cultivation reduces by 70%, one cm increase in arm circumference (physical capability) increases probability in cultivation increases by 20% (table 15). Owning one acre of additional land reduces probability to be engaged in non-farm laborer by 30%. One acre increase in irrigated land, increases probability to be engaged as non-farm laborer increases by 100%. One cm increase in arm circumference increases probability to be engaged in non-farm labor by 40% and increases probability to be engaged in livestock rearing by 140%. One acre increase in irrigated area increases probability to be engaged in salaried job by 90% after controlling for other factors. One year extra education increases probability to be engaged as salaried employee increases by 40%. One acre increase in irrigated area increases probability to be engaged in petty business by 120%. One year extra schooling increases probability to engage in business increases by 40%.

Table 15. Elasticties of Determinants of main occupation of men (farm labor as comparison group)

Explanatory variables	Cultivation	Nonfarm labor	Livestock	Salaried	Education	Domestic duties	Business
Land owned (acre)	0.8	0.7*	1.2	0.8	L	0.2	0.8
Land owned^2	1.0	1.0	0.9	1.0	1.0	1.0	1.0
Irrigated area	2.0	2.0*	L	1.9*	L	10.6	2.2*
Irrigated area^2	1.0*	1.0	0.0	1.0	0.4	0.9	1.0
Value of owned house ₹	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Value of assets owned ₹	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Loans taken ₹	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Savings ₹	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Age	0.01*	0.01*	L	0.0	0.0	0.0	1.3
Age^2	2.5*	2.1*	0.1	1.6	L	2.1	1.0
Years of education	1.2*	1.1	1.0	1.4*	L	2.7	1.4*
Experience	0.3*	0.4	3.1	0.5	0.0	9.1	0.4
Experience^2	0.4*	0.5*	6.8	0.6	0.0	0.5	1.0
Height	1.1	1.0	0.9	1.0	22.5	0.5	1.1
Weight	0.9	0.9	1.1	0.9	L	3.5	0.9
Height/weight ratio	0.3	0.2	L	0.0	L	L	0.0
Arm circumference (cm)	1.2*	1.4*	2.4*	1.0	0.0	0.8	1.1
Caste group							
1(BC)	1.0	1.5	L	0.3	L	26.4	2.0
2(ST)	19.2*	9.7	L	8.4	L	0.0	44.7*
3(SC)	1.1	1.2	L	0.5	L	0.0	0.0
Religion code							
1(Muslim)	1.7	1.0	5.8	0.0	L	0.0	2.6
2(minority religion)	0.01*	0.4	0.0	0.0	0.0	L	2.2
1(head)	0.4	0.2	0.3	0.2	L	0.0	0.2*
1(married)	3.7	1.8	4.6	0.6	L	L	1.6

Note: The significant coefficients at 5% level are marked with *.

Among women, probability to be engaged in cultivation increases with increase in household savings, education and weight in reference to farm labor (Table 16). Probability to be engaged in livestock rearing increase with education of women compared to farm labor. Probability to be engaged in domestic duties increases with value of assets owned (other than residence), household savings,

education level, height, while reduces with value of residential plot compared to farm labor. Probability to be engaged in petty business activities increases with increase in value of assets owned (other than residential plot), household savings, years of education. Probability of Muslim women to be engaged in petty business activities is also higher. Salaried job, attending to higher educational institutions and non-farm labor are less frequent in rural areas among adult women.

Table 16. Determinants of main occupation of women (farm labor as comparison group)

	Cultivation		Nonfarm labor		Livestock		Salaried		Education		Domestic duties		Business	
female	1		3		5		8		9		10		13	
Land owned (acre)	-0.175474	-1.2	-12.69779	0.0	-0.80615	-1.5	79.17183	0.0	-9.56834	0.0	0.54566	1.3	-0.10010	-0.4
Land owned^2	0.008549	1.1	0.23879	0.0	0.02991	1.0	-10.02513	0.0	0.46590	0.0	0.00892	0.6	0.01115	1.0
Irrigated area(acre)	0.340798	1.3	26.32121	0.0	1.58623	1.6	-13.06550	0.0	40.73083	0.0	1.61129	1.7	-0.17117	-0.4
Irrigated area^2	-0.010295	-0.3	-0.77191	0.0	-0.11310	-0.8	4.14519	0.0	-1.82535	0.0	-0.13962	-1.5	-0.01150	-0.2
Value of owned house ₹	-0.000003	-0.4	0.00063	0.0	0.00001	0.4	0.00038	0.0	-0.00083	0.0	-0.00016*	-2.1	-0.00002	-1.1
Value of assets owned ₹	-0.000004	-0.7	-0.00023	0.0	-0.00006	-1.4	0.00020	0.0	0.00129	0.0	0.00011*	2.1	0.00002*	1.5
Loans taken ₹	0.000007	0.7	-0.00476	0.0	-0.00007	-0.9	0.00017	0.0	-0.00750	0.0	0.00000	0.1	0.00000	-0.1
savings ₹	0.000023*	1.9	0.00055	0.0	0.00002	1.2	-0.00011	0.0	0.00109	0.0	0.00004*	2.2	0.00002*	1.8
Years of education (years)	0.112801	1.8	11.10828	0.0	0.44025*	2.6	21.28749	0.0	38.56593	0.0	1.53648*	2.7	0.18905*	1.6
Experience(years)	0.166001	0.3	64.37352	0.0	2.92922	1.4	74.90133	0.0	-35.11764	0.0	-1.45437	-0.6	0.42593	0.3
Experience^2	0.907666	0.8	10.83704	0.0	1.06595	0.8	6.66397	0.0	-8.46635	0.0	0.24053	0.3	0.18849	0.5
Height (cm)	0.001485	0.0	3.96347	0.0	0.09347	0.7	-1.62981	0.0	1.89673	0.0	0.67868*	1.9	-0.04251	-0.3
Weight (kg)	0.240409*	1.9	-27.02696	0.0	0.36492	1.2	-19.91172	0.0	-17.75110	0.0	-1.77237	-1.4	-0.07878	-0.3
Height/weight ratio	2.003994	1.3	-273.61690	0.0	4.24110	1.0	-335.59200	0.0	-225.60430	0.0	-6.61140	-0.7	-3.89538	-0.8
Arm circumference (cm)	-0.102047	-1.2	23.54310	0.0	-0.19854	-0.9	-8.50943	0.0	-8.19844	0.0	1.46527	1.4	-0.02995	-0.2
Caste group														
BC	-0.075965	-0.1	57.19702	0.0	-1.54610	-1.0	-102.65430	0.0	229.68690	0.0	0.35512	0.1	-0.13105	-0.1
ST	-0.194860	-0.2	-48.09712	0.0	-1.77511	-0.8	-43.96701	0.0	315.77600	0.0	-3.48428	-1.0	-23.86774	0.0
SC	1.013039	1.0	259.01120	0.0	1.96046	0.8	106.56460	0.0	486.31380	0.0	-16.27526	0.0	-25.47107	0.0
Religion code														
Muslim	0.112507	0.1	162.10560	.	-49.33218	.	-35.23510	0.0	197.05430	0.0	-45.25581	.	3.29860*	1.9
Other minorities	-26.779420	0.0	-80.72494	0.0	-29.30558	0.0	-132.45900	0.0	139.82750	0.0	-14.38841	0.0	-2.78263	0.0
Head of households	0.458276	0.3	-164.42980	0.0	-5.64178	0.0	-7.75263	0.0	52.40854	0.0	1.11508	0.0	-24.64467	0.0
Married	-0.770675	-1.0	-116.66210	0.0	20.34130	0.0	6.90475	0.0	-4.22458	0.0	3.67412	1.2	-1.62335	-1.1
Constant	-375.4	-0.9	-2692.7	0.0	-441.5	0.0	447.2	0.0	4437.2	.	-171.0	-0.7	-48.2	-0.4
Adjust.R2	0.59													

Note: *indicates significant at 5% level of significance

Among women, probability to engaged in cultivation increase by 30% with one extra kg of weight, probability to be engaged in livestock rearing increases by 60% for every increase in one year education level, probability of engaging in domestic duties increases by 360% for one year extra schooling at mean schooling level (table 17). Probability to be engaged in domestic duties increases by 100% with one cm increase in height. Probability to be engaged in petty business increases by 20% with one year of additional schooling from mean education level.

Table 17. Elasticities of Determinants of main occupation of women (farm labor as comparison group)

Explanatory variables	Cultivation	Nonfarm labor	Livestock	Salaried	Education	Domestic duties	Business
Land owned (acre)	0.8	0.0	0.4	L	0.0	1.7	0.9
Land owned^2	1.0	1.3	1.0	0.0	1.6	1.0	1.0
Irrigated area (acre)	1.4	L	4.9	0.0	L	5.0	0.8
Irrigated area^2	1.0	0.5	0.9	63.1	0.2	0.9	1.0
Value of owned house ₹	1.0	1.0	1.0	1.0	1.0	1.0*	1.0
Value of assets owned ₹	1.0	1.0	1.0	1.0	1.0	1.0*	1.0*
Loans taken ₹	1.0	1.0	1.0	1.0	1.0	1.0	1.0
savings ₹	1.0*	1.0	1.0	1.0	1.0	1.0*	1.0*
Years of education (years)	1.1	L	1.6*	L	L	4.6*	1.2*
Experience(years)	1.2	L	18.7	L	0.0	0.2	1.5
Experience^2	2.5	L	2.9	783.7	0.0	1.3	1.2
Height (cm)	1.0	52.6	1.1	0.2	6.7	2.0*	1.0
Weight (kg)	1.3*	0.0	1.4	0.0	0.0	0.2	0.9
Height/weight ratio	7.4	0.0	69.5	0.0	0.0	0.0	0.0
Arm circumference (cm)	0.9	L	0.8	0.0	0.0	4.3	1.0
Caste group							
BC	0.9	L	0.2	0.0	L	1.4	0.9
ST	0.8	0.0	0.2	0.0	L	0.0	0.0
SC	2.8	L	7.1	L	L	0.0	0.0
Religion code							
Muslim	1.1	L	0.0	0.0	L	0.0	27.1*
Other minorities	0.0	0.0	0.0	0.0	L	0.0	0.1
Head of household	1.6	0.0	0.0	0.0	L	3.0	0.0
Married	0.5	0.0	L	997.0	0.0	39.4	0.2

Note: *indicates significant at 5% level of significance

Conclusions and policy options

The paper examined the labor force participation and occupational structure among 948 men and 631 women of age between 15 and 65 years for the 18 villages of India. The data was collected with high frequency i.e., every 15 day interval for whole year to record hours spent on hours spent on different employment statuses, occupation structure etc. Overall, men reported 36.2 hours per week compared to only 23.1 hours per week in economic activities. If we consider both economic and non-economic activities, participation of women increased to 51.2 hours compared to only 45.0 for men as women spent more hours in attending domestic duties. However, men work more hours in paid work (20.8 hours) than women (12.3 hours). The gap in income earned from monetary activities between men and women is much higher. But, if we impute the value of the domestic duties of both men and women equally, the gap in incomes between men and women drastically reduced from 241% to just 29%. Historically less participation of women in monetary activities is hindering women empowerment in many ways. The low level of education among women needs to be increased to increase women participation in economic activities. Illiterate women loaded with more hours of paid-work as well as domestic work. Labor markets are segmented based on social background to some extent (after discounting for human and physical capital) and supports segmented labor market theory.

It is interesting to see that the hours worked in economic activities increases with ownership of land and assets rather than education in rural India. Level of education and experience have little influence on choice of occupation and quality of employment of individuals both men and women, as still rural employment in rural India is mostly confined to the technologically backward sectors even in non-farm sector and business like petty business, general stores, toddy tapping, repair shops, transport and construction works which require very little skill levels and education levels. However, the quality of work improves significantly for only few higher educated men and women in service sector employment like teachers, nurses, record keeper, health workers; most of the educated youth remain unemployed. Especially most of the educated women engaged in domestic duties due to lack of commensurate employment opportunities in rural areas. Even though in the villages returns to education is low or non-significant, people are investing heavily in educating their children with the expectation of getting urban employment mostly as engineer or doctor or even a software engineer in America etc. Most of the parents persuade their children to go to urban centres as soon as they completed the higher education with expectation of huge remittance money.

Rural society in India is traditionally highly segmented based on caste, gender and traditional occupations, however, they are slowly reducing their influence on labor market outcomes as they are not significant in choice of employment or hours worked, they are replaced by the ownership of land and assets and owning high productive land (like irrigated area) in influencing the labor market outcomes. The driving force behind the changes are imparting quality education and skills beyond higher secondary education both men and women, development of rural non-farm sector through infrastructure development, skill development to meet the local needs and improve labor productivity in emerging sectors like repair of mobile phones, electric motor, computers, drivers, etc which are based on future needs of the country. Imparting higher education among both men and women will defiantly have positive effect on occupational diversification to higher wage earning employment, if it is supported by public investment in rural infrastructure and market development. Higher education also increases the social networks and migration to urban nearby urban areas that will increase dynamism in rural labor markets and increasing returns to education. Demand for some caste occupations like traditional toddy-tapping (making locally made alcohol), cleaning of cloths, etc is increasing in near-by towns which can be captured by rural men and women with middle level of education. Some of the policy prescriptions from the study are (i) enhancing the ownership of assets like land, irrigated area through providing loans which will increase hours worked in economic activities (ii) imbibing savings habit which generally increase labor force participation rate, (iii) enhancing quality education in rural areas beyond the higher-secondary to take advantage of growing employment in service sector and new emerging occupations like repair of mobiles, electric motors computer centres (ii) imparting skill development in both caste occupations and also in modern sectors and (iii) balanced development of both urban and rural areas through promotion of small towns.

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[i] Building on the past studies at consultative Group for International Agricultural Research (CGIAR) and other research organizations, Markets, Institutions and Policies wing of International Crops Research Institute for Semi-Arid Tropics (ICRISAT) is undertaken a long term research project entitled "Study of spatial and temporal dynamics of labor market behavior by using household panel data of ICRISAT in South Asia" by using longitudinal high-frequency panel data of Village Level Studies (VLS) villages.