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Sunita
Research Scholar, Department of Economics, Bhagat Phool Singh Mahila Vishwavidyalaya, Sonipat, Haryana, India

Dr. Kiran Lamba
Assistant Professor, Department of Economics, Bhagat Phool Singh Mahila Vishwavidyalaya, Sonipat, Haryana, India

Corresponding Author:
Sunita
Research Scholar, Department of Economics, Bhagat Phool Singh Mahila Vishwavidyalaya, Sonipat, Haryana, India

Exploration of dynamics of participation of females in labour force: Case of rural-Haryana

Sunita and Dr. Kiran Lamba

Abstract
This study is an attempt to examine the association of individual features of females accompanied by household characteristics on participation of females in labour force in rural Haryana. Multistage random sampling has been employed to select twelve villages from twelve blocks of six districts of six administrative divisions of Haryana. Five percent sample of female-population constitutes 799 females of rural-Haryana. Association of factors has been examined after using multinominal logistic regression. Further findings of this study indicate that two factors including decision taking power of females in the ill condition of any family member and household responsibility taken by family members have positive significant association with participation of females in labour force in rural Haryana. The findings of this paper presents that factors constituting decision taking power of females associated with education of children and household responsibility taken by husbands have statistical insignificant association with participation of females in labour force in rural Haryana. Two factors including decision taking power of females in the ill condition and decision for purchasing household appliances have been omitted from the multinominal logistic regression model owing to multicollinearity.

Keywords: Blocks, random-sampling, multinomial, labour-force, administrative-divisions, multicollinearity

Introduction

The epicentre of growth is holistically associated with allocation of resources with no gender bias. Dynamics of generation of employment-opportunity for females are affected by educational status (Dildaar, 2015 [19]; Heath and Jayachandran, 2016) [24], age of female, marital status and age at marriage, family income, household responsibilities taken by husband and family members (Black *et al*., 2017) [9], availability of household appliances like washing machine, internet, newspaper, tap water facility (Das *et al*., 2015 [17]; Desai & Joshi) etc. Decision making power of females in a family is associated with independent status (West, 2006), liberal attitudinal behaviour of families towards females (Alexender & Welzel, 2014) [4]. Liberal attitude of families towards female's-employment varies as per customary beliefs in different religions (Naizer & Ramadan, 2016) [43]. Liberal attitude of families towards female labor force participation determined by education level of head and male members in a family (Gompers & Wang, 2017) [22], sources of income (Mammon and Paxson, 2008 [38]; Sorsa, 2015) [53], geographical spatial associated with access of infrastructural and health facilities (Lahoti & Swaminathan, 2013) [34]. After doing literature review, many determinants have found, comprise income of a family, education level of members of a family (Amador & Napena, 2013 [3]; Stolt 2013) [51], patriarchal values in a society (Hegswisch & Hartmann, 2014) [26], regions and religions (Giuliano, 2014) [23]. Egalitarian element has not been analyzed in different aspects for a woman's life like equality to get education (Forgha, 2016) [21], equality to get wages for same work (Haussman & Brazgolger, 1980; Patel, 2012) [27, 45] and equality to get adequate health services at exact time (Millwski *et al*., 2018) [40]. Investment in human capital is necessary for existence and well-being of human (Patel, 2012; Hosney & Saure, 2014) [45, 25]. Need to recognize the effect of participation of females in labor force on income level of a nation as well as family is essential (Alexender and Welzel, 2014; Saure & Zoabi, 2014) [4].

In many countries, potential of women labor force, contribution of female labor force in GDP of a country is not recognized by the government or societies, due to many setbacks or negative determinants, which impact participation of females in labor force (Lahoti and Swaminathan, 2013; Dildaar, 2015) [34, 19].

In developing and least developed countries gender gap in education is a major concern (Alexender & Welzel, 2014; Hosney & Saure 2014) [4, 25] for participation of females in labor force. Because of skill gap women are employed in the agricultural activities (Giuliano, 2014; Usman & Abdussamad, 2016) [23, 56], works as maid and home-based industries (Teigneir & Cuberes, 2014; Gompers & Wang, 2017) [55, 22]. It is a belief and do find, in illiterate generations, that girls and women do work for household activities (Rendall, 2014; Heath & Jayachandran, 2016) [49, 24] and chief responsibility is to take care of the elders and children (Amador & Napena, 2013; Compton & Pollak, 2013) [3, 15]. The share of women has been increased in the highly insecure jobs like agriculture, manufacturing, self-employment and in domestic services (Khera & Nayak, 2009 [30]; Klesen & Pieters, 2012). Service sector jobs are offered to those, who are highly educated (Hegswisch & Hartmann, 2014) [26]. Economic opportunities in service sector attract highly educated minorities of urban women into the labor force (Bryant *et al*., 2004; Rendall, 2014) [49]. Education of household head put a negative effect on poorly educated women (Lim, 2017) [37]. In that case women do not join job due to childcare and presence of in-laws (Kaya, 2014; Jah, 2014; Ehsaan, 2015) [31, 28, 20]. The basic theory of labor supply model is that an increase in wage rate has a substitution effect and further it does increase incentive to work and supply of labor (Khera and Nayak, 2009, Das *et al*., 2015) [30, 17]. Assets at the time of marriage, ownership on assets as a household head, income from other sources rather than earned income like income from rented house (Blundell *et al*., 2016) [8] income from agriculture (Bardhan, 1979) [10], do also affect participation of females in labor force. In developing countries economic status of women and her family negatively affects participation of females in labor force (Lehman, 2015, Naizer & Ramadan, Avlijas, 2016) [43]. In developed countries families are more liberal towards economic independency of women (Rendall, 2014; Giuliano, 2014; Levy & Zablotsky, 2015) [49, 23].

In the condition of low-income status of the family, women do not get appreciation for joining workforce (Stolt, 2013; Kaya, 2014) [51, 31]. In these situations, patriarchal norms and cultural beliefs takes first place in their decision of joining workforce (Alfarran, 2016; Slotwinski & Stutzer, 2018) [2, 52]. In the situation of strong patriarchal norms, participation of females in labor force is driven by necessity rather than opportunity (Sorsa, 2015, Blundell *et al*. 2016) [53, 8]. Section I describes introduction of this paper. Section II presents formation of hypotheses and review of literature. Section III shows database. Section IV reveals methodology. Section V gives limitations of this paper. Section VI presents conclusion. Section VII highlights perspective for future research work. Section VIII indicates ethical statement.

Hypotheses formation and review of literature

Hypotheses are a tentative premise which does test for possible rejection. Review of literature is an overview of existing literature to get background information on any specific concept (Kawaulich, 2009) [33].

Female labour force and Decision taking power of females

H_{01} = Employed status of females is unaffected by their decision taking power for education status of their children.

H_{02} = Decision taking power of females for the education status of their children is uninfluenced from willingness to work of unemployed females.

H_{03} = Employed status of female is unaffected by decision taking power of females in the ill condition of family members.

H_{04} = Willingness to work of unemployed females is unrelated with decision taking power of females in ill condition of any family member.

Ross (2008) [48] proves that decision making power is promoted by demographic attributes of any region, resources of any family and educational status (Phillips, 2010) [46]. Jobs related with oil industries are not considered for women. In these countries, women's say in family decisions is low, fertility is high and educational attainment is up to primary, not due to Islamic region, but due to lack of resources. The unchallenged patriarchal values are a result of demographic features of these countries. Low level of participation of females has revealed that this status is due to demographic feature of oil producing, less democracy and low level of economic growth (Cakir, 2008) [11]. In rural areas wages and education have not put any positive impact of the participation of females in labor force (Bloom *et al*., 2009) [5]. High income of the families shows positive impact and low income of the families shows negative impact on participation of females in labor force (Masood & Ahmed, 2009) [39]. In Chilli, for "M" shape curve, trend between age and female labor force participation is higher of the women those are related with age bracket of 36 and above. It has found that cultural norms initially retard participation of females in labor force (Contrera & plaza, 2010) [12].

Females in labor force and household responsibilities taken by family members

H_{05} = Employed status of females does not get influence from household responsibilities taken by family members

H_{06} = Unemployed and willing status of females is unaffected by household responsibilities taken by family members

Cynthia (1997) [13] observes social stigmas are weaker for those women, those are related with self-employment. Data has been taken from Household Labor Force Survey. In high educated progressive families, division of household work with male members is observed. In less educated conservative families, liberal beliefs are not found. World Bank Report (2011) [57] shows that, with similar development stage, participation of females in labor force has been declining in some countries. If female labor force participation increases with its pre-assumed levels, total revenues of families do increase by 25 percent. It further up-lift the status of these families from middle class to lower-middle class. In south Asia and Mena region, distribution of household work by family members has not been recognized at global level (Kabeer, 2012; Mupunga, 2013) [29, 41]. Compton & Pollak (2011) [14] reveal the presence of mother and mother-in-law's on the increasing participation of women in labor force in United States of America.

Females in labor force and household responsibilities taken by family members

H_{07} = Employed status of females is unrelated with household responsibilities taken by husbands.

H_{08} = Unemployed and willing status of females is unaffected by household responsibilities taken by husbands

Phillips (2010) [46] highlighted that household activities are not sharable in all religions. After becoming a part of labor force cultural values shifted towards toward liberal values. It has also observed that women residing with husbands shows, less interest to join workforce (Contrera & plaza, 2010) [12] staying in homes for household work. Cynthia (1997) [13] observes social stigmas are weaker for those women, those are related with self-employment. Data has been taken from Household Labor Force Survey. In high educated progressive families, division of household work with male members is observed. In less educated conservative families, liberal beliefs are not found. The younger the child, the more time needed for care. In lower income household, number of children puts negative impact on participation of females in labor force, because of increasing financial pressure and no provision of distribution of household work by husband's and family members (Dagswik, 2012) [16].

The database

Primary data has been collected after using multistage random sampling. Twelve villages of six administrative-divisions of Haryana have been selected for doing primary survey. Primary survey has been conducted on five major features including individual features, household features, economic characteristics, infrastructural features and financial inclusion. This study has been designed for analysis of two major features including individual features and household features of females in rural areas of Haryana. Sample size is 799, which constitutes 5 percent of female population of respective villages. See table 1.

Methodology

Generalized linear model constitutes logit and probit model, multiple linear regression, analysis of variance and linear regression, likliihhod function, log-linear models and inverse polynomials. Multinominal logistic regression is an extension of binary logistic regression. In logistic regression model response variable must have two categories and independent variables can be continuous and categorical. In multinominal logistic regression model, outcome variable must have more than two categories. Logistic regression model refers the probability of outcome variable (Y) due to explanatory variables (X's) when there is only one explanatory variable, logistic regression function is as

$P(Y) = 1/1+e^{-(\beta 0+ \beta 1X1)}$

Here P= probability of Y occurring

e = base of natural logarithm

β0 = Coefficient

β1 =weight coefficient of predictor variable.

X1= explanatory variable

In the case of several explanatory variables, the logistic regression function is as

$P(Y) = 1/1+e^{-(\beta 0+ \beta 1X1+ \beta 2X2+.... \beta 1Xn)}$

Here Y is a binary outcome variable.

Likelihood function expresses probability of observed data in a function. Maximum likelihood function indicates highest value of parameter. Deviance is preferred rather than log-likelihood, it is also based on log - likelihood because it has chi-square distribution. Multinominal logistic regression model uses each category with a baseline category. Baseline category can be last category. Like t statistics the z statistics called Wald statistics. It does use in logistic regression. Z statistics is noted as

Z (Wald) = b/Standard error of b

Z is the ratio of coefficient (b) of specific explanatory variable with standard error of that predictor. Statistics-Wald (z) can be interpreted and considered with caution. In case of large value of b-coefficient, standard error of explanatory variables does get inflated, which will give incorrect results for a specific explanatory variable. The ratio [Pi/1- Pi] is called the odd ratio and log of it called logit, which functions as outcome variable. Odds ratio change as explanatory variable (x) changes and odds does not change as alteration in explanatory variable. Value of odd ratio greater than one show per unit proportional change in predictor variable can increase probability of proportional increment in outcome variable. The ratio [Pi/1- Pi] is called the odd ratio and log of it called logit, which functions as outcome variable.

Model formulation

Model specification has been done after detecting all assumptions of multinominal logistic regression, which constitutes (a) there should be no –multicollinearity, (b) absence of highly influential outliers in the case of continuous variables (c) there should be no over-dispersion i.e. independence of errors (d) linearity of continuous-independent variables with logit of dependent variable.

Model 3 Description and classification of variables associated with individual and household characteristics of females in rural-Haryana See table 2

Model: The multinominal logistic regression for female labor force participation is as:

Employment status = $\alpha + \beta_1 x_1$ (Decision of education of children) + $\beta_2 x_2$ (Decision in the ill condition of any family member) + $\beta_3 x_3$ (Household responsibilities taken by family members) + $\beta_4 x_4$ (Household responsibilities taken by husband) + (ε_i)

Specification of variables used in the model 2: The present chapter is based on situation of female labour force in rural Haryana and determinants of female labor force. These determinants are categorical in nature.

Dependent variable: Female labor force is dependent variable with three categories including employed status of females in rural Haryana, willingness to work of unemployed females and unwillingness to work of unemployed females. Parameter estimates of multinominal logistic regression model of female labor force participation has been given in two sections of table 3 with reference category unemployed and not willing to work. Code 1 has been given to employed status of females, code 2 has been given to willingness to work of unemployed females and code 3 has been given to unemployed and not willing to work. Unemployed and not willing to work has been considered as reference category.

Independent variables

Decision of education of children: Code 1 has been assigned to presence of decision taking power of females for education of their children. Code 2 has been assigned to absence of decision taking power of females for education of their children. Absence of decision taking power of females for education of their children has been considered as reference category.

Decision in the condition of illness of any family member: In this paper, code 1 has been given to presence of decision taking power of females in ill condition of any family member and code 2 has been given to absence of decision taking power of females in ill condition of any family member. Absence of decision taking power of females in ill condition of any family member has been considered as reference category here.

Household responsibilities taken by family members: Household responsibilities taken by family members have been coded with 1 and household responsibilities do not do by family members have been coded with 2. Household responsibilities do not do by family members have been taken as reference category here.

Household responsibilities taken by husband: Household responsibilities taken by husband have been coded with 1 and household responsibilities do not do by husband has been coded with 2. Household responsibilities do not do by husband has been taken as reference category here.

Table 3 indicates parameter estimates of multinominal logistic regression model after testing all assumptions associated with variables including female labor force participation, Decision of education of children, Household responsibilities taken by family members, Household responsibilities taken by husband and Decision in the ill condition of any family member. Dependent variable i.e. female labour force participation has been categorized in the three sub-categories including employed, unemployed and willing to work and unemployed and not willing to work. Unemployed and not willing to work has been considered as the reference category in the model. See table 3

The model explains 78.8% correctly classified cases and is a good fit. The model presents 15% variation in prediction of female labor force participation. It indicates that the predictors have influential role in the prediction of female labor force participation.

Results of multinominal logistic regression have been presented in two parts of table 3. The upper part (first-part) is associated with prediction of employed status of women by four predictors with reference category i.e. unemployed and not willing to work. The second part (lower part) predicts the impact of four predictors on unemployed and willing to work status of women with reference category unemployed and not willing to work.

Findings are explained as

Female labour force and decision taking power of females about education of children

The parameter estimate of multinominal logistic regression model for decision taking power of females for their children with employed status and unemployed status associated with willingness to work has been presented with reference category. In first part of table 3, decision taking power of females for education of their children has been statistically insignificant with employed status of females. Our null hypotheses (H_{01}) is accepted here that is employed status of females is unaffected by their decision taking power towards education status of their children. Second part of table number 3 presents that decision taking power of females for their children has been statistically insignificant with unemployed status of females associated with willing to work. It further highlights acceptance of null hypotheses (H_{02}) that is decision taking power of females of education for their children is uninfluenced by unemployed status of females associated with willing to work.

Female labour force and decision taking power of females in the ill condition of any family member

As per table number 3 that probability of decision in the ill condition of any family member is statistically significant with employed states of females. In the case of decision taking power of females in ill condition of any family member, probability is 2.4 times higher than those who are unemployed and not willing to work. Maintained null hypotheses (H_{03}) have been refuted here that is employed status of female is unaffected by decision taking power of females in the ill condition of family members. Alternative hypotheses (H_{03a}) have been accepted here that is employed status of female is determined by decision taking power of females in the ill condition of family members. Further in second part of table 3 probability of decision in the ill condition of any family member is statistically insignificant with unemployed states of females with willingness to work. It indicates acceptance of null hypotheses (H_{04}) that willingness to work of unemployed females is unrelated with decision taking power of females in ill condition of any family member.

Female labour force and Household responsibilities taken by family members

The first part of the table number 3 explains that household responsibilities taken by family members determines employed status of females and gives significant results. Probability of being employed of females is 6 times higher in the families where household responsibilities are taken by family members than those women who are unemployed and not willing to work. It indicates not acceptance of (H_{05}) that female labour-force does not get influence from household responsibilities taken by family members. Further it shows the acceptance of alternative hypotheses (H_{05a}) that household responsibilities taken by family members positively determine Employed status of females. In the second part of the table 3 parameter estimates of unemployed and willing to work status of females and household responsibilities taken by family members are indeterminate owing to zero value of standard errors. That's why null hypotheses (H_{06}) willingness of unemployed females is unrelated with household responsibilities taken by family members is indeterminate.

Female labour force and Household responsibilities taken by husband

The first part of the table number 3 reveals that parameter estimates of household responsibilities taken by husbands with employed status of females have been found insignificant. It indicates acceptance of (H_{07}) that female labour-force is unrelated with household responsibilities taken by husbands. Further in the second part of the table 3 presents that unemployed and willing to work status of females is not determined by household responsibilities

taken by husbands. It shows acceptance of maintained hypotheses (H_{08}) that is unemployed and willing status of females is unaffected by household responsibilities taken by husbands. See figure 1 for voisual representation of results.

Limitations

Variables causing multicollinearity includes two factors i.e. decision taking power of females in the ill condition and decision for purchasing household appliances has been omitted from the multinominal logistic regression model. Separate analysis of variables causing multicollinearity has not been done in this paper. This paper shows high level of participation of females in labour force in rural Haryana. Analysis of cross sectional data presents 21.52 percent unemployment of female in rural Haryana. Kind of unemployment and wage parity has not been analysed in this paper. The cross sectional data holds all limitations associated with field surveys. Field surveys are impacted by literacy level of respondents, socio-economic situations, geographical conditions and memory of respondents.

Conclusion

The present study is designed to examine the association of individual and household features of females of rural Haryana on participation of females in labour force for the year 2020. Field survey has been conducted after using multistage random-sampling. Cross sectional data contains sample size of 799 females from 12 villages of rural Haryana. Female labour force constitutes employed status of females and willingness to work of unemployed females. Analysis on field survey presents that female labour force participation is 95.11 percent in rural-Haryana. Findings of this study established that Decision taking power of females for education of their children has been statistically insignificant with employed status of females. Employed status of females is unaffected by their decision taking power towards education status of their children. Decision taking power of females of education for their children is uninfluenced by willingness to work of unemployed females. Concrete finding is that employed status of female is determined by decision taking power of females in the ill condition of family members. Willingness to work of unemployed females is unrelated with decision taking power of females in ill condition of any family member. Probability of being employed of females is 6 times higher in the families where household responsibilities are taken by family members than those women who are unemployed and not willing to work. Parameter estimates of household responsibilities taken by husbands with employed status of females have been found insignificant. Willingness to work of unemployed females is unaffected by household responsibilities taken by husbands in rural Haryana. The study opens research areas for researchers to examine the cognitive intelligence accompanied by vocational-education of females, liberal belief system of family members towards female labour force and other factors associated with empowerment of women in rural Haryana.

The perspective for future research

Same study can be done for urban setup of Haryana after analysing literacy status of districts of Haryana. The cross sectional study is confined to analyse the association of individual features accompanied by household characteristics with participation of females in labour force. Other sub-factors can play vital role in female labour force in rural Haryana. Exploration of other factors with the help of principle component analysis and structural equation modelling will be done by me in my future research work.

Ethical statement

Any work has not been done without consideration of ethics associated with research integrity. Citation has been given wherever is due and cited in the reference section.

Table 1: State of female labor force in rural Haryana

Particulars/Serial no.			Not willing to work out of Unemployed	Labor force (employed)+(willingness to work of unemployed females)
District	**Block**	**Village**		
Ambala-(Ambala- division)	Ambala- ii	Devinagar	3 (14.28)	18 (85.71)
	Saha	Nagla	2 (6.25)	30 (93.75)
Panipat (Karnal-division)	Madlauda	Atulaan	10 (8.26)	111 (91.73)
	Samalkha	Dikadla	0	105 (100)
Sonipat (Rohtak-division)	Ganaur	Gumad	6 (6.18)	91 (93.81)
	Rai	Rasoi	6 (10)	54 (90)
Rewari (Gurugram division)	Bawal	Jaliawas	2 (6.66)	28 (93.33)
	Nahar	Shahdhat nagar	2 (3.70)	52 (96.29)
Palwal (Faridabad-division)	Hathin	Mirka	0	44 (100)
	Hodal	Phulwari	8 (6.15)	122 (93.84)
Jind (Hisar-division)	Julana	Sirsakheri	0	40 (100)
	Uchana	Udaipur	0	65 (100)
	Total (Sample size=799)		39 (100)	760 (100)

***Source*:** Field survey.

Table 2: Specification of factors included in the model

Sl.no.	Variables	Categorization and code	Frequencies (Percentage of total sample-size (799))
1	Female labour force	Employed	631 (78.97)
		Willingness to work of unemployed females	129 (16.14)
		Unemployed and not willing to work	39 (5.38)
2	Decision of education of children	Yes (1)	757 (94.74)
		No (2)	42 (5.25)
3	Decision in the condition of illness of any family	Yes (1)	597 (74.71)

	member	No (2)	112 (14.01)
4	Household responsibilities taken by family members	Yes (1)	261 (41.36)
		No (2)	387 (61.33)
5	Household responsibility taken by husband	Yes (1)	134 (70.94)
		No (2)	381 (24.95)

***Source*:** Field survey.

Table 3: Parameter estimates of multinominal logistic regression on participation of females in labour force

Parameter estimates				
Female labour force participation		**B (Std. Error)**	**Wald (Sig.)**	**Exp(B)**
Employed	Intercept	2.602 (1.034)	6.340 (.012)	
	Decision of education of children=[Yes]	-.912 (1.056)	.752 (.386)	.402
	Decision in the ill condition of any family member =[Yes]	.890 (.374)	5.670 (.017)	2.434
	Household responsibility taken by family members=[Yes]	20.277 (.519)	1528.33 (.000)	6401
	Household responsibility taken by husband =[Yes]	19.558 (8977.90)	.000 (.998)	3119
Unemployed and willing to work	Intercept	2.739 (1.033)	7.028 (.008)	
	Decision of education of children=[Yes]	-1.896 (1.055)	3.230 (.072)	.150
	Decision in the ill condition of any family member =[Yes]	.530 (.403)	1.728 (.189)	1.698
	Household responsibility taken by family members=[Yes]	17.528 (.000)	-.	4096
	Household responsibility taken by husband =[Yes]	16.844 (8977.90)	.000 (.999)	2066
Model specific results				
Goodness of fit (-2logliklihood) =Intercept (194.75), Final= 43.25.				
Model chi-square (Degree of freedom) =151.50 (8)				
Significance level=0.05 (p-value)				
Correctly classified cases= 78.8%				
Pseudo R square (Mcfadden)= 15.4				
a. The reference category is: Unemployed and not-willing to work				
b. This parameter is set to zero because it is redundant				

***Source*:** Author's analysis with SPSS-21

Notes: Reference categories are indicated as:

a=Unemployed and not willing to work, b= Decision of education of children [No], c= Household responsibility taken by family members = [No], d= Household responsibility taken by husband [No], e=Decision in the ill condition of any family member.

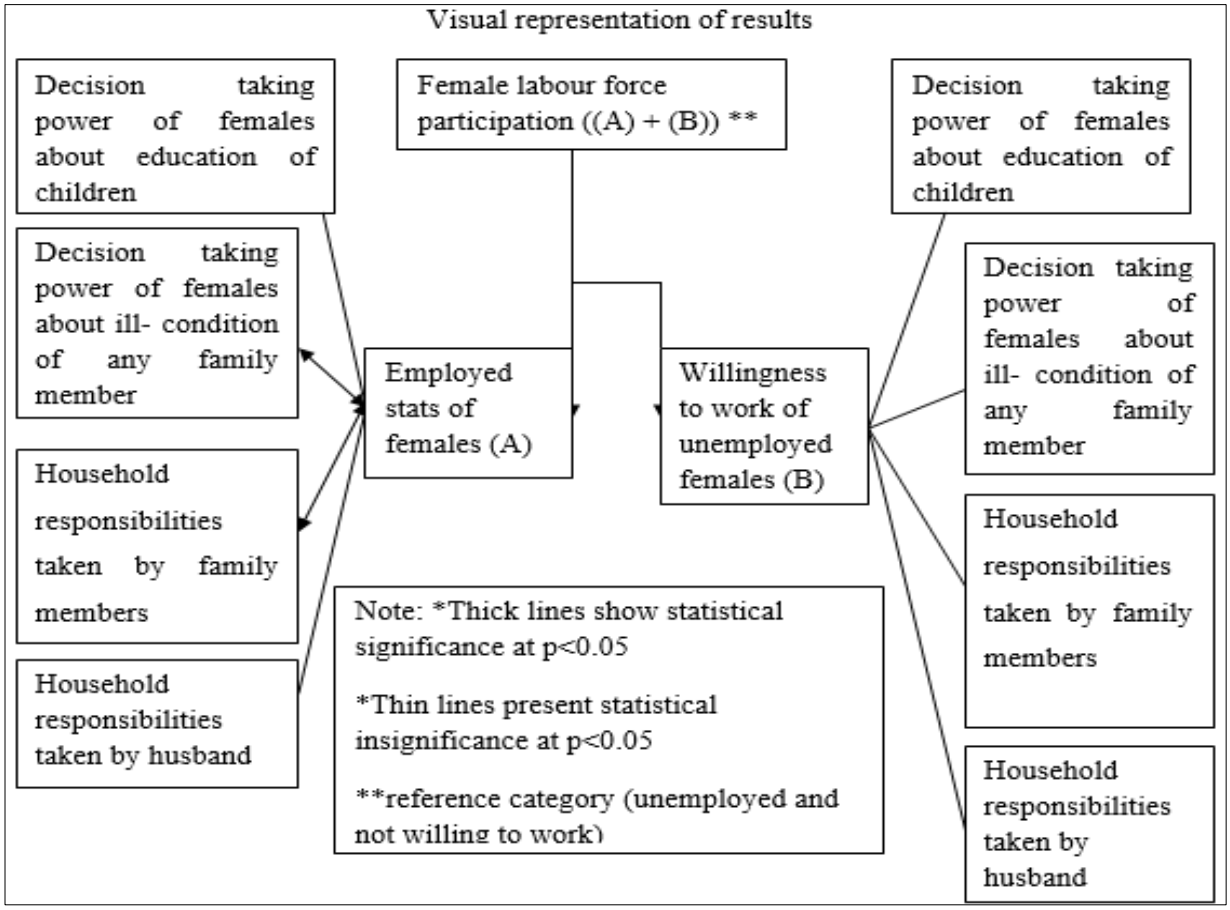

Fig 1: Visual representation of results

Association of individual and household features with participation of females in labour force
Source: Author's analysis

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