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## Determinants of Rural Non-Farm Employment in Neyshabur: Application of Multilevel Multinomial Logit Model

Samaneh Iravani<sup>1</sup>, Mahmoud Daneshvar Kakhki<sup>2\*</sup>

Mohammad Ghorbani<sup>3</sup>, Alireza Karbasi<sup>4</sup>

<sup>1</sup> Ph.D Student

Department of Agricultural Economics, Ferdowsi University of Mashhad  
Azadi square, Mashhad, Razavi Province, Iran

<sup>2</sup> Professor in agricultural economics

Department of Agricultural Economics, Ferdowsi University of Mashhad  
Azadi square, Mashhad, Razavi Province, Iran

\* Corresponding author: daneshvar@um.ac.ir

<sup>3</sup> Professor in agricultural economics

Department of Agricultural Economics, Ferdowsi University of Mashhad  
Azadi square, Mashhad, Razavi Province, Iran

<sup>4</sup> Professor in agricultural economics

Department of Agricultural Economics, Ferdowsi University of Mashhad  
Azadi square, Mashhad, Razavi Province, Iran

Email address: karbasi@um.ac.ir

### Abstract

Today, nonfarm activities become an essential part of the livelihood strategies of rural households, especially in developing countries. The reason why rural households move to the non-farm sector is crucial for planning integrated rural development. In rural areas of Iran, due to factors such as drought and water scarcity, many households have moved to non-farm sectors or migrated to urban areas. The present paper aims at investigating the structure of rural employment and determinants of participation in non-farm activities in Neyshabur rural areas, Iran. We collected data by 380 completed questionnaires from rural households between September 2017 to February 2018 and the two-level multinomial logit model was adopted to investigate the determinants of employment. The structure of rural household's employment shows that 40.5% of the households are employed in farm activities only, 32.6% participated in non-farm activities only, and 26.8% in both sectors. The results of the two-level multinomial logit model show that 24% of the total variance of employment is attributed to geographical factors and household residential places. Also, the number of employed people in the household and distance from urban centers have positive and significant effects on the probability of participation in non-farm activities compared to the farm activities. Policy suggestion for this study is the strengthening and expanding existing industrial parks. Besides, due to higher education and the lower age of the non-farm workers, vocational training to the rural youth for starting innovative businesses can also be an effective policy.

**Keywords:** Non-farm employment, Two-level multinomial logit, Rural household,

Neyshabur county.

## Introduction

In many developed and developing countries, agriculture is no longer the only source of employment and income for rural households and the non-farm activities are also of great importance (Babatunde & Qaim, 2009; Vasco & Tamayo, 2017). The rural labor market has undergone a structural transformation with the embracement of non-farm instead of farm activities. Thus, not only is the non-farm sector not an extra part, but it is also a driving force for the development of the rural areas (Reddy et al., 2014). Non-farm activities account for about 50% of rural employment in the developing countries in Asia and Africa (World Bank, 1978; Reardon, 2001). In a study in Chile, Berdegue et al. (2001) showed that non-farm sources account for 41% of income and 39% of employment among rural households. Van de Walle and Cratty (2003), Hoang et al. (2005), and Minto et al. (2006) reported the development of non-farm employment in Vietnam. Wiggins and Hazell (2011) also found that 30% of full-time rural employment in Asia and Latin America, 20% in East Asia and North Africa, and 10% in Africa is related to the rural non-farm employment.

In general, the rural non-farm sector (RNFS) means activities outside agriculture (including cropping, livestock, fishing, hunting, forestry, and wage employment in agriculture). Therefore, the rural non-farm employment (RNFE) may be defined as comprising of all those non-agricultural activities which generate income to rural households (including income in-kind and remittances), either through waged work or in self-employment. In some contexts, rural non-farm activities are also important sources of local economic growth (e.g. tourism, mining, timber processing, etc) (Davis, 2003; World Bank, 1978, Chadha, 1993; Lanjouw, 1998, Reardon, 2001).

In the opinion of policymakers and planners of rural development, it is important to find out why anyone is engaged in non-farm employment in the rural economy and whether this is a growing or deteriorating way of livelihood. Researchers have identified pull and push factors for the issue. The push factors include lack of farmland, low crop yield, low income or labor productivity, population growth, lack of access to the financial market and agricultural input markets, and reduced basic natural resources; and pull factors include higher yields and lower risks of non-farm activities, and a higher return on investment in the non-farm sector (Reardon., 1997, Reardon et al., 1998; Davis & Pearce, 2000; Davis & Cristoiu, 2002). Frequently, push factors are commonly associated with the poor and push factors with non-poor rural households (Shehu & Siddique, 2014). In a study on 1053 farming households in Bulgaria, Hungary, Poland, Romania and Slovenia, Fritsch (2011) showed that not only do these households have a high potential for non-farm employment, but also due to the small farmlands, most of them are pushed toward diversifying their incomes, and only a few of the farming households have turned to a livelihood diversification through pull factors. Meanwhile, Nagler and Naudé (2017) studied six countries in sub-Saharan Africa to show that rural households are engaged in non-farm activities for both pull and push factors. In addition, various studies in Honduras (Isgut, 2004), Albania (Meyer et al., 2008), African countries of Sudan, Kenya and Senegal, Ghana and Nigeria (Ebaidalla, 2014; Sarah, 2012; Dary & Kuunibe, 2012; Idowu et al., 2011; Mbah & Igbokwe, 2015; Khan et al, 2019), India (Misra, 2014; Mech et al., 2017; Das, 2017), Ethiopia (Bezabih et al., 2010), Thailand (Lohmann & Liefner, 2014), and Central Amazon (Torres et al., 2018) showed that several factors can be effective in the probability of participation in rural non-farm activities including individual characteristics (e.g. gender, age, education, skills, ethnicity, and religion), household characteristics (household size, wealth, means of transport, access to immigration opportunities, access to credit, farming assets (number of animals, area of farm land, access to agricultural input markets, and agricultural labor), access to infrastructure, distance from urban centers, industrial or farming place and population. In any

case, it is important to distinguish between the push factors of poverty and the pull factors of demand for choosing proper policies by policymakers. Davis and Pearce (2000) argued that in the former case, policymakers need to appropriately develop social networks and to apply policies to reduce pressure on urban centers due to the rapid growth of urbanization, while in the latter, policymakers may seek to improve the business environment to support the development of non-farm employment. Also, using the multilevel logit model, Giannakis et al (2018) worked on off-farm employment for the effect of both farm-level and regional-level factors in Cyprus. He found that farm households located in rural areas are 70% less likely to become involved in off-farm activities than households located in urban areas. In off-farm employment, farm structural factors are significant determinants. A one-hectare increase in the farm size lowers the chance of off-farm labor participation by 50%. In crop farming holdings, operators are 4.2 times more likely to work off-farm than operators of mixed-farming and livestock holdings. For the analysis of off-farm employment, the result shows the importance of adopting a multilevel and integrated approach.

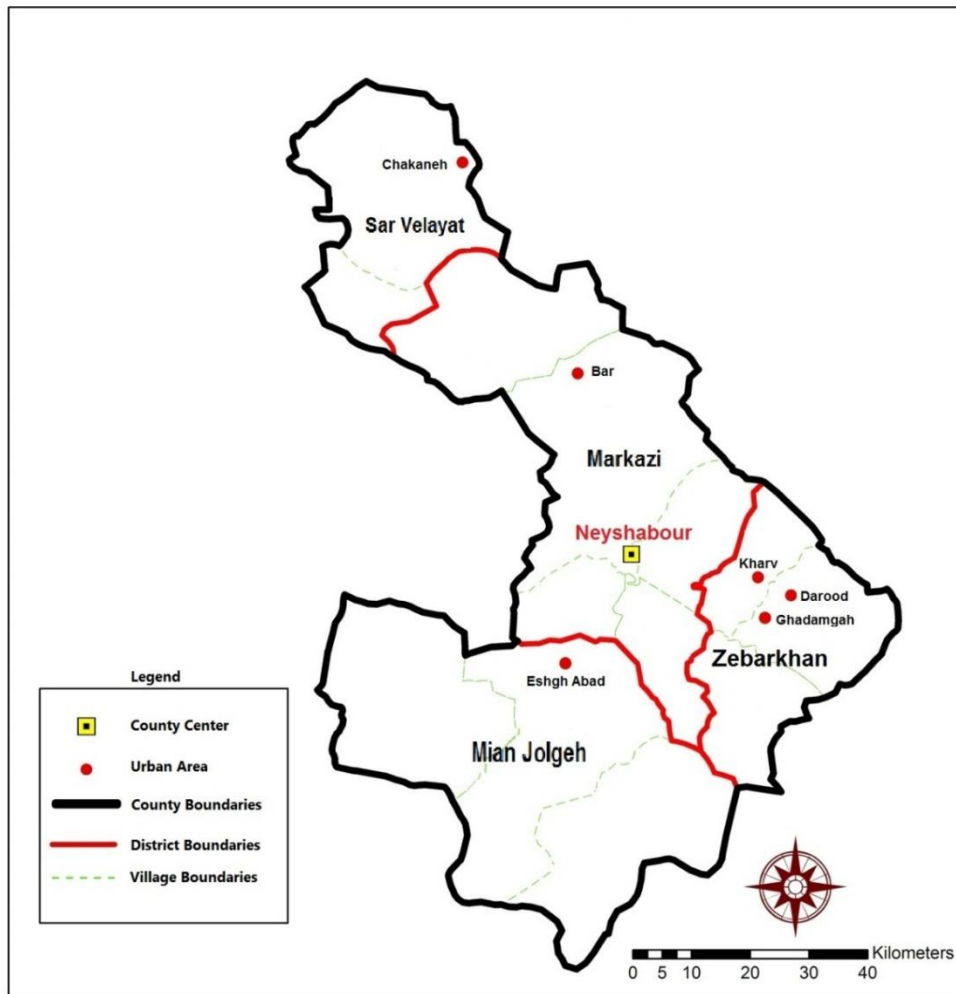
Given this necessity, the present study examines the employment structure of rural households and the determinants of participation in non-farm activities in Neyshabur. Accordingly, this study seeks to answer the following three questions:

- What is the possibility for a rural household to be engaged in each employment group (farm, non-farm, or both)?
- Does the probability of participation in any of the employment groups change with the change of village?
- What is the relationship between the individual and household characteristics, farming assets, and village infrastructure with the probability of engagement in each employment group?

Neyshabur is the second-most populous county in Khorasan Razavi province in Iran. The population of this county was about 451 thousand people in 2016. Also, it is the second industrial county of Khorasan Razavi province due to the existence of four large industrial towns after Mashhad city. In addition, it ranks first in the province in terms of production and cultivation area of most agricultural and horticultural products. In other words, it possesses a favorable agricultural situation in the province. However, due to the increase in population and a high share of the rural population (34.9% compared to 26.9% in the province and 25.9% in the country) and decrease in basic agricultural production resources, especially water resources in recent years, there has been the limited expansion of activities and agricultural occupations in this county, which has led to accelerated migration of villagers (based on the population and housing census of 2011, 40.3% of immigrants to Neyshabur city was from the surrounding villages). Meanwhile, in recent years, the Iranian government has considered a policy of limiting the area under cultivation in the agricultural sector to reduce the pressure on groundwater resources and a policy of inclusive employment in rural areas. Therefore, the expansion of non-farm activities in this county can be considered as a solution.

## **Data collection**

Data was collected through 380 questionnaires distributed among the rural households in Zebarkhan, Central, Sar-Velayat, and Mian-Jolgeh districts (figure1). Based on the population in these areas, the corresponding 80, 182, 35, and 83 questionnaires were completed by the subjects. We collected data between September 2017 and February 2018. Households were chosen through a multistage stratified sampling method, in such a way that after determining the district, villages were selected randomly within the district, and at the next stage, households were selected randomly in the villages.



*Fig. 1. Distribution of surveyed rural households by district in Neyshabour*

## Methodology

To investigate the determinants of non-farm employment in rural households, the study adopted a multilevel multinomial logit model. We considered this model because, despite the strong farm sector in the region, many households have turned to the non-farm sector. Therefore, determining the factors that have caused the participation of rural households in the non-farm sector compared to the farm sector is of great importance for development planners.

The multilevel multinomial logit model is a mixed generalized linear model (McCullagh & Nelder, 1989), with linear predictors. According to Wright and Sparks (1994), Skrondal and Rabe-Hesketh (2003), Hedeker (2003), and Grilli and Rampichini (2007), the two-level multinomial logit model with a random intercept can be explicated as follows:

$$\eta_{ij}^{(m)} = \alpha_{00}^{(m)} + \beta_1^{(m)} x_{ij} + \xi_{0j}^{(m)} + \delta_{ij}^{(m)} \quad (1)$$

And combining with the multinomial logit, we obtain:

$$P(Y_{ij} = m | x_{ij}, \xi_j, \delta_{ij}) = \frac{\exp\{\eta_{ij}^{(m)}\}}{1 + \sum_{l=2}^M \exp\{\eta_{ij}^{(l)}\}} \tag{2}$$

where,  $m = 1, 2, \dots, M$  denotes the dependent variable category (employment),  $j = 1, 2, \dots, J$  denotes the clusters (village), and  $i = 1, 2, \dots, n_j$  denotes the subject (household) of the  $j$ -th cluster (villages).  $\xi_j^{(m)}$  and  $\delta_{ij}^{(m)}$  are vectors of random errors at the subject and cluster level, respectively. The dependent variable  $Y_{ij}$  (conditional to random effects) has a multinomial distribution that takes values in the set of categories  $\{1, 2, \dots, M\}$ , in which  $m = 1$  is the reference category and its conditional probability ( $Y_{ij}=1$ ) is obtained according to Eq. (3).

$$1 / (1 + \sum_{l=2}^M \exp[\eta_{ij}^{(l)}]) \tag{3}$$

The intended statistic at the multilevel models is the intraclass correlation coefficient (ICC) which can be calculated for the multilevel multinomial logit model by Eq. (4) (Grilli & Rampichini, 2003):

$$ICC^{(m)} = \frac{\text{Var}(\xi_j^{(m)})}{\text{Var}(\xi_j^{(m)}) + \frac{\pi^2}{3}} \tag{4}$$

Also, in order to select the best among the multilevel models, the deviance or -2log likelihood (-2LL) index is used, where lower indexes are preferred.

In this research, the hierarchical structure of the two-level multinomial logit model is displayed in figure 2:

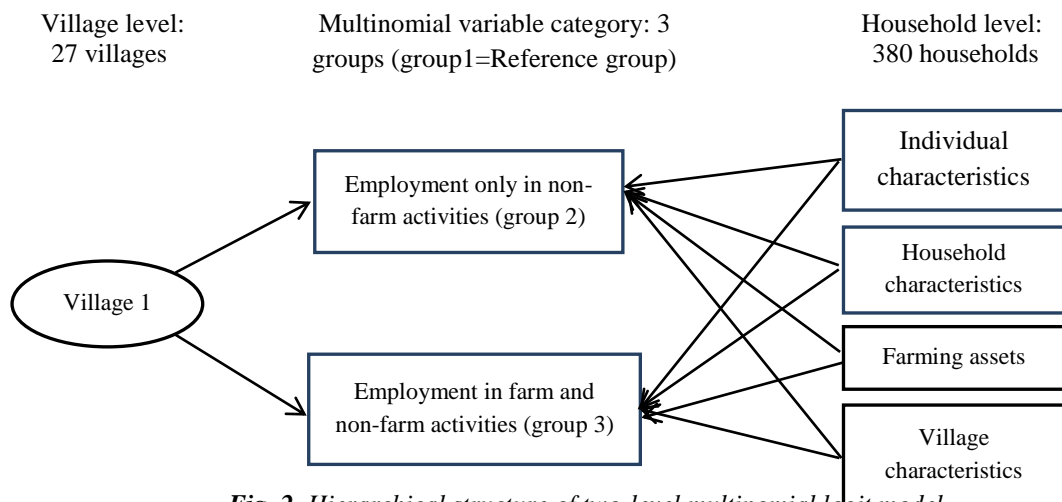


Fig. 2. Hierarchical structure of two-level multinomial logit model

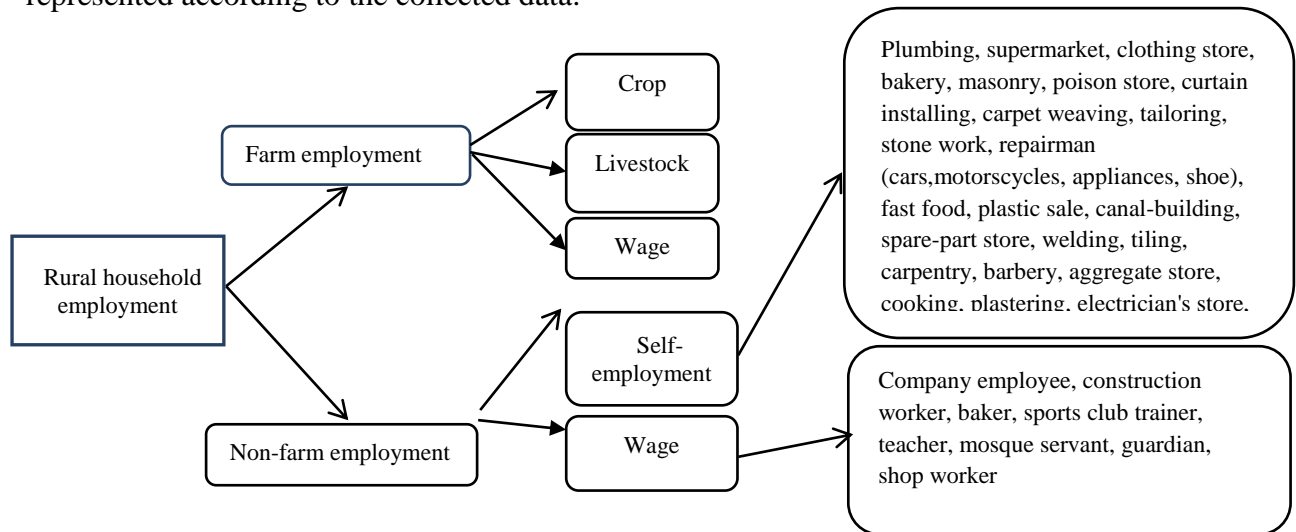
The dependent variable is the employment of rural households in farm and non-farm activities, which is a multinomial variable with three categories. The first group is employment only in farm activities, which is considered a reference group in the calculations. The second group is the employment only in non-farm activities and the third group is employment in both activities (farm and non-farm activities). The probability of employment in these occupational groups is regarded as a function of individual characteristics, household characteristics, farming assets and village (regional) characteristics.

Individual characteristics of the head of household include age, gender, and education. Household characteristics include household size, the financial value of the vehicle, access to loans, and the number of employed people in the household. Farming assets involve farmland size, livestock keeping, the value of agricultural assets (water + machinery) and farmland owning. Finally, village characteristics comprise the distance from urban centers and population.

We utilized the `gsem` command of Stata15 software to calculate a two-level multinomial logit model.

## Results and discussion

As can be seen in figure 3, the structure of rural household employment in Neyshabur is represented according to the collected data.



*Fig. 3. Employment structure of rural households in Neyshabur county*

According to Figure 2, it is observed that rural households in the agricultural sector have been employed in three groups of agricultural and horticultural production, livestock breeding and agricultural wage working, so that out of 380 households surveyed, 34.7% have activities in the agricultural sector, 32.6% have activities in the horticulture sector, 35% have activities in the livestock sector and 9.5% have activities in the agricultural wage sector (more than 100% are due to the simultaneous employment of households in one or more agricultural activities). The main agricultural products include wheat, barley, vegetables and summer crops (tomatoes, cucumbers and eggplants), sugar beet and cotton, and the main horticultural products also include plums, cherries, grapes and saffron. Also, raising and keeping sheep and dairy cows is the most important activity of the livestock sector in the study area.

Non-farm activities are divided into two groups: self-employment and wage-earning. The main activities of the first group are formed in the service sector so that the most important non-farm self-employment activities include building and shop activities. This is also true for non-farm wage jobs, which means that construction workers are among the major non-farm wage earners in the study area, along with corporate workers (wage workers in industrial regions). According to the sample, 33.1% of households are engaged in non-farm self-employment activity and 26.3% have non-farm wage activity.

The households are categorized into only one of the farm- or non-farm employment sectors, considering that 154 households (40.5%) are employed in the only-farm sector. A

total of 124 (32.6%) were engaged in the only non-farm and 102 (26.8%) in both sectors (Table 1).

**Tab. 1.** Number and employment share of households from farm and non-farm employment

Employment groups	Households (number)	Percentage (%)	Cumulative (%)
1=Employment only in farm activities	154	40.53	40.53
2=Employment only in non-farm activities	124	32.63	73.16
3=Employment in both activities	102	26.84	100

Source: Research findings

The results of the individual, household and agricultural characteristics of the sample by the three groups of rural employment (employment only in farm activities (group1), employment only in non-farm activities (group 2) and both (group 3) are presented in Table 2.

**Tab. 2.** Individual, household and agricultural characteristics by employment groups

Dependent variable groups/ variables		Group 1 (Reference group) (employment only in farm activities)		Group 2 (employment only in non-farm activities)		Group 3 (employment in farm and non-farm activities)	
		Mean	SD	Mean	SD	Mean	SD
Variables	Age (years)	44.87	12.95	37.52	9.89	40.91	11.82
	Education (years)	6.14	3.77	8.75	3.68	8.53	4.29
Characteristics of households	Household Size (individuals)	3.58	1.19	3.40	1.11	3.78	1.16
	workers(individuals)	1.01	0.11	1.10	0.33	1.21	0.43
	credit (Million Tomans)	4.93	12.70	5.39	8.86	7.55	13.12
	Household asset (Million Tomans)	5.96	10.17	9.90	24.79	9.78	11.39



s	Characteristic agricultural	farm land size (ha)	1.68	2.66	0	0	0.90	1.18
		Agricultural assets (Million Tomans)	50.90	73.01	0.87	6.56	37.48	66.84
cs	Village Characteristic	population (people)	1094.65	651.32	1547.74	873.23	1408.35	756.76
		distance from urban centers (kilometers)	28.45	31.84	20.19	25.21	26.98	29.55

Source: Research findings

1 Tomans= 0.00025 USA\$

Consulting Table (2), only non-farm employment households had the lowest average age of household head (37.52 years) and the highest educational level (8.75 years) compared to the other two groups. The household size in this group was 3.40 people - that was lower than the other two groups-, and the average value of the household asset (9.90 Million Tomans) was higher than the two groups. In the group of households employed in both farm and non-farm sectors, the number of household workers (1.21 individuals) and the loans received (7.55 Million Tomans) were higher than the other two groups. Meanwhile, the average farmland size (1.68 ha) and the value of agricultural assets (50.90 Million Tomans) were higher in the only farm employment households than the other two groups. It should be noted that in the studied sample, 94 percent of households in group 1 and 91 percent in group 2 and 99 percent in group 3 have male-headed. Also, about 70 percent of households in groups 1 and 3 own farmlands. As much as 49 and 57 percent of households in these groups keep at least one kind of livestock.

As displayed in Table 2, only non-farm employment households did not have any land for farming or any livestock and other agricultural assets such as irrigation water or machinery. In the meantime, households with farming facilities such as land and livestock were employed in the farm sector. In Sar-Velayat and Mian-Jolgeh districts, villagers use both of rivers and aqueducts for irrigation, and in recent years the drought has led to a decrease in access to water. Therefore, the lack of farmland and especially available irrigation water (push factors) seem to be important factors in the tendency of households to non-farm activities.

Different scenarios for estimating the probability of engagement in rural non-farm activities via the two-level multinomial logit model is given in Table 3 with the results shown in Table 4.

**Tab. 3.** Various scenarios for building the model

Model 1 (Null model)	Model 2	Model 3	Model 4
Null model without explanatory variables and only by taking random effects of the village into account	Model 1 + First level variables (household characteristics)	Model 2+ First level variables (agricultural characteristics )	Model 3+ Village level variables

The results of the fluctuations of employment levels described by the level 2 (village) units	The results of the relationship between the variables of level 1 (households) and employment	The results show that if the are included agricultural characteristics, the model will get better	The results show that if the level 2 variables (village) are added, the model will get better
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**Tab. 4.** Results of estimating two-level multinomial logit model for rural employment groups (group1=Reference group)

	Model 1		Model 2		Model 3		Model 4	
<b>Fixed effects</b>								
Intercept in group 2	-0.23(0.23)		-2.06(1.43)		-0.91(2.78)		-1.85(2.91)	
Intercept in group 3	0.43(0.24)***		-6.77(1.76)*		-8.26(2.05)*		-8.94(2.09)*	
Variables	Group 2		Group 3		Group 2		Group 3	
Sex	1.43(0.67)**		0.85(1.17)		-0.65(2.83)		-8.34(2.06)*	
Age	-0.05(0.02)*		-0.02(0.02)		-0.01(0.04)		-0.01(0.02)	
Education	0.18(0.05)*		0.20(0.05)*		0.22(0.12)***		0.23(0.06)*	
Household Size	-0.10(0.14)		0.05(0.15)		0.06(0.42)		0.12(0.16)	
Number of workers	3.93(0.98)*		4.24(0.97)*		2.91(1.53)**		4.99(1.18)*	
credit	0.04(0.02)**		0.03(0.01)***		0.01(0.07)		-0.01(0.02)	
household wealth	0.02(0.01)		0.008(0.01)		0.05(0.05)		0.02(0.02)	
farmland size					-204.3(35846)		-0.41(0.14)*	
livestock keeping					-28.73(67250)		0.13(0.36)	
Farm land ownership					-10.68(30903)		0.67(0.40)	
Agricultural assets					-0.05(0.02)*		-0.005(0.003)***	
Village population							-0.05(0.02)**	
Distance from urban centers							0.0005(0.0005)	
							0.001(0.0003)*	
							0.04(0.03)	
							0.02(0.007)*	
<b>variance of random error term</b>								
	0.99(0.42)**		1.08(0.49)		0.58(0.39)		0.01(0.17)	
<b>Goodness of fit model</b>								

-2LL	789.5	693.62	314.92	298.74
LR test	-	95.89(p<0.000)	378.71(p<0.0000)	16.46(p<0.002)

Source: Research findings. The numbers in brackets are standard deviations.

\*, \*\*, \*\*\* are significant at the levels of 1%, 5% and 10%, respectively.

To select the best among the estimated models, the variance of the random error term and the deviance index (-2LL) were taken into account. If the addition of new variables reduces the variance of random error, the variables can suitably explain the model. Therefore, considering the value and significance of the deviance index and the reduction of the random error term, model 4, the model that includes individual, households, agriculture, and village variables, is the best.

To answer the first question, the probability of each rural household engaged in every occupational group, we used the fixed effects of the model (1) in Table (4). Considering the mean of the variables, without taking into account the explanatory variables, these probabilities are calculated as follows:

$$p = \frac{1}{1 + \sum e^{\alpha_{ij}}} = \frac{1}{1 + e^{-0.23} + e^{-0.43}} = \frac{1}{1 + 0.794 + 0.650} = 0.409 \quad \text{Employment only in farm activities}$$

$$p = \frac{1}{1 + \sum e^{\alpha_{ij}}} = \frac{e^{-0.23}}{1 + e^{-0.23} + e^{-0.43}} = \frac{0.794}{1 + 0.794 + 0.650} = 0.324 \quad \text{Employment only in non-farm activities}$$

$$p = \frac{1}{1 + \sum e^{\alpha_{ij}}} = \frac{e^{-0.43}}{1 + e^{-0.23} + e^{-0.43}} = \frac{0.650}{1 + 0.794 + 0.650} = 0.266 \quad \text{Employment in farm and non-farm activities}$$

Therefore, the probability of participation in the farm activities for a rural individual is 41%, without taking into account the household characteristics. Similarly, the probability of employment in the non-farm sector and both sectors is 32% and 27%, respectively.

To answer the second question of the research, the value of ICC statistic was calculated based on Eq. (4). In addition to verifying hierarchical structure in the data, this statistic shows that 24% of the total variance of the dependent variable (employment in different occupational groups) is related to the second level, i.e., villages. Therefore, 86% of the variance is explained by the variables of the first level (individual and household characteristics).

$$ICC = \frac{0.99}{0.99 + 3.29} = 0.24$$

Therefore, the findings highlight the important spatial characteristics, i.e., village features on rural households' decision to participate in non-farm employment. Lohman and Liefner (2014) state that location features such as proximity to urban centers raise participation in non-farm wage employment in rural areas in Thailand. Giannakis et al. (2018) found the importance of location in the participation of farm household off-farm. As a result, farm

households located in rural areas are 70% less likely to be engaged in these activities than households located in urban areas.

To evaluate the effect of explanatory variables on the probability of engagement in the occupational groups, the coefficients presented in model 4 are considered. Since the coefficients of the variables presented are log odd values, only their significance and the direction are examined. As evident in the table, the variables of the number of workers, and the value of agricultural assets in the second group (employment only in non-farm activities) and the variables of the household heads' education, number of workers, farmland size, the population of the village and distance from urban centers in the third group (employment in farm and non-farm activities) had a significant effect on the log odds. Meanwhile, the direction of effectiveness on these variables (positive or negative) is as expected.

To better interpret the results, the relative risk ratio (RRR) is calculated and presented in Table 5.

**Tab. 5.** Values of Relative Risk Ratio (Group 1= Reference group)

Variable	Group 2 compared to group 1	Group 3 compared to group 1
Intercept	0.15	0.0001
Sex	1.26	2.09
Age	0.98	0.97
education	1.19	1.18
Household Size	0.91	1.002
workers	30.94	288.17
Credit	1.01	0.98
Household wealth	1.05	1.02
Farmland size	$1.4 \cdot 10^{-101}$	0.61
Land ownership	0.000003	1.78
Livestock hold	$1.51 \cdot 10^{-13}$	1.36
Agricultural assets	0.95	0.99
Village Population	1.0005	1.001
Distance from urban centers	1.04	1.02

Source: Research findings

Considering the RRR values for variables that were statistically significant in group 2, it is observed that with an increase of 1 individual in the number of household workers, assuming other variables unchanged, it is expected that the relative risk of employment in the non-farm sector increased 31 units compared to the farm sector. Also, compared to the farm sector, with a 1-unit increase in the agricultural assets, the relative risk of employment in the non-farm sector is expected to decrease 0.95 units.

With reference to group 3, it is also observed that with a 1-unit increase in household head's education, the relative risk of employment in this group is expected to increase by 1.18 units relative to the employment only in the farm sector, assuming other variables constant. Furthermore, with 1 unit increase in the number of workers in the household, the relative risk of employment in group 3 is expected to increase 288 units compared to the reference group. Farmland size is among the significant variables in this group. The relative risk ratio of this variable indicates that with the increase of one unit in the size of farmland, the relative risk of employment in group 3 reduces by 0.61 units. The village population and distance from urban centers also had a positive effect on the relative probability (log odd) for group 3. An increase of 1 unit in the village population and the distance from urban centers leads to 1 and 1.02 units of increase in the relative risk of employment in both farm and non-farm sectors, respectively.

The marginal effects for the reference group (group 1) are also calculated and presented in Table 6.

**Tab. 6.** Marginal effects in reference group (Group 1)

Variable	dy/dx	Standard errors	P-value
Sex	-0.170	0.241	0.480
Age	0.007	0.004	0.144
education	-0.042	0.014	0.003
Household Size	0.001	0.037	0.975
workers	-1.412	0.335	0.000
Credit	0.004	0.004	0.302
Household wealth	-0.006	0.004	0.148
Farmland size	0.122	0.035	0.001
Land ownership	-0.143	0.092	0.118
Livestock keeping	-0.077	0.086	0.368
Agricultural assets	0.001	0.0008	0.116
Village Population	-0.0002	0.0007	0.000

Distance from urban centers	-0.004	0.001	0.005
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Source: Research findings

According to Table 6, household heads' education, number of household workers, village population and distance from urban centers have significant and negative effects on the probability of employment in group 1 (employment only in farm sector). For example, increasing 1 percent in household heads' education reduces the probability of employment in this sector by 0.04 percent. The variables of farmland size increase the probability of employment in this sector. So, increasing 1 percent in the farmland size, the probability of employment only in the farm sector increase by 0.12 percent.

More workers in households, villages with a large population, and proximity to urban centers increase the probability of employment in the non-farm sector based on the results of the econometric estimates. Also, access to more agricultural assets such as irrigation water reduces the possibility of employment only in the non-farm sector. In other words, households prefer to work in the agriculture sector when they have access to irrigation water.

## Conclusion

The present study examines the determinants of employment in the non-farm sector in rural areas of Neyshabur county in Iran. For this purpose, a multilevel multinomial logit model has been adopted to investigate factors related to the household level and regional level (village features). Improved technology and commercialization of agriculture, along with urbanization and globalization have led to the growth of the rural non-farm sector as a whole (Pal & Biswas, 2011). Thus, push and pull factors such as wages and higher returns than the agricultural sector, reduced farm income risk, relieving the pressure on basic natural resources. They also provide the necessary liquidity to invest in agricultural inputs. Additionally, developing and distributing agricultural products provide an incentive for rural households to participate in non-farm activities (Haggblade, Hazel, & Reardon, 2010; Reardon et al., 1998; Yúnez-Naude & Taylor, 2001). In addition to the incentives to enter this sector, which are the same factors of push and pull, the capacities of the household level and the regional level are important too. In other words, if there are capacities at the household and regional level, the incentives are met and the household participates in the non-farm activities (Reardon et al, 2007).

Investigation of the rural employment structure of Neyshabur county shows that push factors such as lack of farmland and low agricultural assets (especially irrigation water) play an important role in the engagement of rural households in non-farm employment. Hence, from among 380 studied households, 32.6% were employed only in the non-farm sector, and they were households who had no farmlands or livestock. To put it differently, they did not have any facilities for farm activities. However, farm households that also worked in the non-farm sector accounted for 26.8% of households. In this group, 55.8% were active in the light livestock sector too (sheep and goat) and had no farmlands. Fritsch (2011) in Europe, Kune and Mberengwa (2012) and Van Den Berg and Kumbi (2006) in Ethiopia, Vatta and Sidhu (2007) in Punjab, India, Matsumoto et al (2006) in East Africa showed in their studies that employment of rural households in the non-farm sector has been affected by push factors.

However, econometric estimates in the study show that farmland ownership did not have a significant effect on employment in any of the occupational groups while the lack of access to irrigation water has increased probability employment in only the non-farm sector.

Another point to be made is that the structure of non-farm employment shows that 33% of non-farm activities are in the form of self-employment, especially in the service sector which requires a smaller investment. Of the 26% of non-farm wage employment, the share of corporate and construction workers was higher than in other sectors like education. As can be seen, most non-farm businesses are formed in low-return activities. In fact, in non-farm activities, due to low skill levels and lack of sufficient work tools, the level of returns is lower than farm activities in these areas, although these people may have more assets.

Considering the results of the two-level multinomial logit model, it can be observed that the geographical factors and the residential place are effective in the probability of the engagement of rural households in the non-farm sector; thus, based on the intraclass correlation statistic, 24% of the total variance of employment in different groups (farm, non-farm, and so on) belongs to villages. Among the village characteristics, the population of the village and distance from urban centers had a positive effect on the relative probability of being employed in both farm and non-farm sectors compared to the farm sector alone. The findings are in line with those of Reardon et al (2007), Isgut (2004), and Lohmann and Liefner (2014) that regional capacities (village characteristics) affect employment in the non-farm sector.

We found that without considering independent variables, the probability of the engagement of a rural household in the farm sector is 41%, in the non-farm sector it is 32%, and in both, 27%, which is similar with the share of households employed in the three occupational groups.

Among the individual, household and agricultural characteristics of rural households, the household head's education and the number of workers had a positive and significant effect in relative probability in farm and non-farm employment sector. Meanwhile, these variables reduced the relative probability of employment only in the farm sector and having agricultural assets reduced the probability in the only non-farm sector. The results of this part of the study correspond to the studies of Ebaidalla (2014), Misra (2014), Sara (2012), and Fritsch (2011).

As mentioned, push factors play an important role in the tendency of rural households in the non-farm sector. Also, the village population, household head's education, access to urban centers, and the number of workers affect employment in both the farm and non-farm sectors.

Accordingly, rural development policymakers and planners in this region should consider the development of non-farm activities along with the development of the agricultural sector. Among non-farm activities, the processing of agricultural products should be given special attention.

As rural employment policy has been in place for the past two years, it is recommended that projects be considered in this area, firstly targeting households without farmland and with low agricultural assets. Secondly, farm occupations should be a priority in the payment of facilities related to this policy such as greenhouse development because of the paucity of water and land, the development of livestock and poultry sectors, and the processing of agricultural products, especially vegetables and horticultural products.

According to these results, state policy should support the expansion of the rural non-farm sector as a means of combating poverty. This sector, which has often been neglected by policymakers, can effectively attract the growing rural labor forces by creating jobs for poor and landless villagers. Therefore, it is suggested that policymakers prioritize households without farmland in order to expand non-farm and farm activities in the study area. A policy

option for stimulating the rural non-farm sector is the provision of credit at reasonable interest rates to the rural poor. Complementary services, such as targeted training programs and linkages to urban markets can further enhance efforts to expand the sector.

In addition, facing important challenges like climate change, environmental degradation, biodiversity reduction, and migration increased investment in rural areas is essential if agriculture is to fulfill its vital function of contributing to economic development, poverty reduction and food security of the Neyshabur county.

Rural development is of great significance for the future of the Neyshabur county. We must reduce migration, create new jobs, and focus on sustainability and the principles and goals of environmental protection and nature conservation. Increased investments could help raise incomes, Increase production, and improve the resilience of the rural area. Community resilience is central to reshaping the role and functions of rural areas; and development has increasingly come about via the capacity of communities to be resilient in the face of challenges.

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