Statistical Analysis to Identify the Factors Affecting Employment Creation by Rural Micro Enterprises in Bangladesh

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Abstract : This study is designed to identify the factors affecting employment creation by rural micro enterprises in Bangladesh. The study intends to fit logistic regression model to identify these factors. It also measures weather the progress of entrepreneurs and that of enterprises can contribute to create employment. Before fitting the logistic model the study attempts to provide bivariate presentation of different factors and employment status of micro enterprises and it also applies chi-square test to assess the significant association of each of the factors with employment creation. In this study, a sample of 180 rural micro enterprises has been selected using two stage sampling design. At first, twenty villages have been selected following PPS sampling method. Then, nine micro enterprises have been selected from each of the selected villages by systematic sampling. The study findings reveal that the amount of current investment, the business nature of manufacturing, service, manufacturing with trading or service with trading and non-poor status of the entrepreneurs have been found significant for employment creation through rural micro enterprises. The findings also show that progress of enterprises rather than that of entrepreneurs can play significant role in employment creation.

Keywords: *MSME ● Employment ● Entrepreneur ● Rural*

1. Introduction

In the reality of diminishing scope of agriculture in rural Bangladesh the rural non-agriculture sectors bring momentum in rural economy. Therefore, expansion of employment opportunities in non-agriculture sector in the rural economy is essential in this regard. Rural micro enterprises are important parts of the non-agricultural sectors, which play major role in providing means of livelihood to the marginalized rural people and often create employment opportunities for many in the non-agricultural sectors. Literatures revealed the issue of creating employment opportunities through micro enterprises in many aspects.

Rotar et al. (2019) in their study examined the role of small and medium enterprises (SMEs) employment to the total European Union employment. They also decomposed SME employment into two sectors: SME service sector employment and SME industry sector employment. The study used panel data models during the 2005–2016 periods. The study findings showed that there is a positive relationship between SME service sector employment and overall economy employment, and also there is a positive relationship between GDP per capita and total employment.

A relevant study (Al-Haddad et al., 2019) conducted in Pakistan identified the contributions of Small and Medium Enterprises (SMEs) to the economy in terms of employment generation and economic growth. The study results discovered that SMEs play an important role in

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employment generation in terms of positive relationship between SMEs and reduction of unemployment and increase in income level.

Another study (Pașnicu, 2018) entitled "Supporting SMEs in creating jobs" investigates the dynamics of staff in Romanian SMEs by size classes and activities of the national economy. It performed statistical analysis followed by a SWOT analysis of policies and tools to support SMEs in creating jobs both with direct and indirect actions. The study revealed that about 3 million employees representing 72% of the total employees were employed in the Romanian SMEs in 2015. They were operating in various sectors such as industry, construction, trade etc.

Amoah and Amoah (2018) conducted a study to assess the roles that Micro, Small and Medium Enterprises (MSMEs) are playing with respect to generate employment in Ghana. The study revealed that the MSMEs provided employment of about 82 percent to the working population in Ghana. Out of total employment provided by MSMEs, about 81 percent was for permanent employment while 86 percent was for temporary employment. The study findings also revealed that the micro enterprises employed larger percentage of the working population than the small and medium enterprises.

Katua (2014) conducted a study that aims to explore the definition of micro, small and medium enterprises across selected countries. It further explores the roles of these enterprises in economic development and employment generation and the challenges faced by this sector. According to this study the share of micro enterprises in total employment is 57 % in Greece and 48 % in Italy. In South Africa micro and very small businesses offered more than 55 per cent of total employment and 22 per cent of GDP in 2003. It also stated "The average European business provides employment for four people, including the owner/manager. SMEs account for roughly two thirds (66%) of employment within the EU, with micro enterprises accounting for 34%, small enterprises accounting for 19% and medium sized enterprises accounting for 13%. Ninety three percent (93 %) of all European enterprises have less than 10 employees."

According to Sarker and Gazi (2013) micro enterprises are very much important for development of entrepreneurs, help human development, poverty reduction and employment generation both in rural and urban areas. Their study also revealed that development of micro enterprises needs two split strategies— poverty reduction and employment creation.

An empirical study on micro enterprises in Bangladesh was done by Ahmed (2010). Along with some other important aspects of micro enterprises, the study explores the employment creation by them. Regarding the employment creation by micro enterprises, the study finds that the surveyed micro enterprises have employed 2.33 regular employees on average. There are 21 micro enterprises that have employed over 5 employees. It is also observed that the surveyed micro enterprises sometimes have some irregular employees.

Harvie (2003) in his study mentioned that micro enterprises account for more than 60 percent of all regional enterprises and up to 50 percent of paid employment. He also indicated that by producing basic goods and services for rapidly increasing populations these enterprises provide income and create employment opportunities for notable proportions of workers in both rural and urban areas.

Relevant past studies mainly focused on the linkage of employment creation with micro enterprises in many aspects but they did not however intend to find out the significant factors for employment creation through these enterprises, especially in the context of Bangladesh. The linkage between employment creation and micro enterprises did not necessarily tell us which factors have the actual impact on employment creation. But, it is important to determine which characteristics of the enterprises and that of the entrepreneurs are really responsible for employment creation so that emphasize can be given on that factors in policy making. Identifying such characteristics can obviously accelerate the scope of creating employment in rural areas of Bangladesh. Hence the scope of the present study has been formed.

The objective of this study is to identify the factors which have significant role for employment creation by rural micro enterprises in Bangladesh. The study also intends to measure weather the progress of entrepreneurs and that of enterprises can contribute to create employment.

2. Materials and Methods

2.1 Sampling design

A two stage sampling design has been used in this study. Villages have been considered as Primary Sampling Units (PSUs) while the Secondary Sampling Units (SSUs) comprise of micro enterprises within the villages.

At the first stage, 20 PSUs (villages) have been selected from the list of all villages in Bangladesh following standard systematic probability proportional to size (PPS) sampling method after arranging them geographically. To apply PPS method, village wise household list has been used which is available in community reports of Population and Housing Census 2011 (BBS, 2012). In each of the selected villages, all the micro enterprises have been listed by listing operation and the listed enterprises have been arranged geographically. However, while listing, the micro enterprises operated irregularly or seasonally or started within last one year preceding the

survey have been excluded from the study. Then from the list, 9 micro enterprises have been selected by systematic fashion. Thus the sample of 20×9=180 micro enterprises has been selected for the study. The study area comprises of all villages of the country. Using a structured questionnaire, primary data have been collected from the selected micro enterprises during the period 1st September 2013 to 30th November 2013.

2.2 Description of variables

Different characteristics of micro enterprises as well as the entrepreneurs may promote them to create employment through employing some ones as regular wage employees. Among the factors that are related to the characteristics of micro enterprises or the entrepreneurs, ten factors have been considered for the study as explanatory variables. The factors related to the characteristics of the entrepreneurs are: educational attainment, previous experience, receiving any technical support/ training, and poverty status. On the other hand, the factors associated with the characteristics of micro enterprises are: nature of business, nature of starting micro enterprise, time since started micro enterprise, amount of current investment, access to electricity, and administrative division where the micro enterprise placed.

To describe the dependent variable, the term 'employment creation' has been operationally defined to have some regular employees. Thus, according to this operational definition, it is considered that the enterprises with regular employees have created employment while those do not have such employees have not created employment.

Therefore, the response variable Y is defined as:

$$Y = \begin{cases} 1, \text{if a micro enterprise has some regular employees} \\ 0, \text{if a micro enterprise does not have any regular employee} \end{cases}$$

2.3 Statistical Analyses

Bivariate analysis and logistic regression model have been used to find the significant predictors of having regular employee of the rural micro enterprises. In addition, separate scores for entrepreneurs and for micro enterprises have been constructed using Principal Component Analysis (PCA) and another logistic regression model has been fitted to investigate whether entrepreneur's and enterprise's scores have significant impact on having regular employee. The logistic regression model and the process of constructing the scores using Principal Component Analysis (PCA) are described below.

Logistic regression model: Suppose that Y is a binary response variable and $X_1, X_2, \ldots, X_k$ are k explanatory variables. The response variable Y is defined such that

$$Y = \begin{cases} 1, \text{if the outcome is a success} \\ 0, \text{if the outcome is a failure} \end{cases}$$

That is, Y is a Bernoulli random variable. In logistic regression (Cox, 1970), the probability of success (P) for the random variable Y is written as:

$$P = \frac{\exp\left(\beta_0 + \sum_{j=1}^{k} \beta_j X_j\right)}{1 + \exp\left(\beta_0 + \sum_{j=1}^{k} \beta_j X_j\right)};$$

where $\beta_0, \beta_1, \ldots, \beta_k$ are unknown parameters.

Hence, the probability of failure (1-P) is

$$1 - P = \frac{1}{1 + \exp\left(\beta_0 + \sum_{j=1}^{k} \beta_j X_j\right)}$$

Therefore, the odds in favor of occurrence of an event (i.e., $Y = 1$) can be written as:

$$\text{Odds} = \frac{P}{1-P} = \exp\left(\beta_0 + \sum_{j=1}^{k} \beta_j X_j\right)$$

and the log-odds is $\log\dfrac{P}{1-P} = \beta_0 + \sum_{j=1}^{k} \beta_j X_j = \text{logit}(P)$.

The log-odds is called the logit which is not only linear in the explanatory variables but also linear in the parameters and this model is called a binary logistic regression model or a binary logit model. The jth regression coefficient (β_j) of the logistic model is interpreted as the change in the log-odds associated with a one-unit increase in the jth explanatory variable. Consequently, the odds ratio (e^{β_j}) is the multiplier by which the odds change for every one-unit increase in X_j.

Construction of scores using PCA: As stated earlier, the study intends to measure the contribution of overall progress of the entrepreneurs and that of the enterprises in creating employment in rural micro enterprises.

To assess the level of progress of the entrepreneurs as well as of the enterprises, separate scores for entrepreneurs and for micro enterprises have been constructed. This study has adopted an approach of constructing the scores by using Principal Component Analysis (PCA).

Principal component analysis can determine the weight as a factor score for each of the characteristics of the entrepreneurs as well as of the enterprises. Scoring factors of the first principal component have been used for constructing the scores of each entrepreneur or enterprises.

Derived from PCA, the formula for constructing scores is described below.

Let us define

$$X_{ij} = \begin{cases} 1; \text{ if the } i^{th} \text{ entrepreneur or enterprise possesses } j^{th} \text{ type of characteristic} \\ 0; \text{ if the } i^{th} \text{ entrepreneur or enterprise does not possess that characteristic} \end{cases}$$

where $i = 1, 2, . . ., n$ and $j = 1, 2, . . ., k$.

Then the score derived from PCA for i^{th} entrepreneur or enterprise is given by

$$A_i = \sum_{j=1}^{k} f_j \left(\frac{X_{ij} - \overline{X}_j}{\sigma_j} \right); \ i = 1, 2, . . ., n$$

where f_j = Scoring factor for j^{th} characteristic

$\overline{X}_j$ = Mean of the jth characteristic

σ_j = Standard deviation of the jth characteristic

Among others, Howe et al. (2008), Filmer and Pritchett (2001) used this technique in their studies in accordance with their own objectives.

To apply this technique, all variables are dichotomized as 0 and 1where the category '1' indicates improved level of progress while the category '0' indicates absence of that level, so that higher score indicates higher level of progress. Accordingly, the variables labeled as 0 and 1 are shown in Table 1.

Clearly, the first four variables have been used for constructing entrepreneur's score, while other six variables have been used for score of enterprise. After constructing the scores they have been divided into three categories on the basis of the quantiles and labeled as low, medium, and high. Then, another logistic regression model has been fitted taking these two scores (categorized) as covariates.

3. Results and Discussion

3.1 Bivariate presentation of different factors with employment status

Table 2 shows the bivariate relationship of the employment status of micro enterprises with different characteristics. Overall 71 (39.4%) of the total 180 micro enterprises have regular employees.

Table 2 reveals that poverty status of the entrepreneur has a significant relationship with the employment status of the micro enterprise. About 48% of the non-poor entrepreneurs have regular employees for their micro enterprises as compared with 12% poor entrepreneurs. Nature of business of micro enterprise is also significantly associated with the employment status. The micro enterprises with manufacturing and trading are more likely (about 85%) to have regular employee.

A significant relationship is found between the employment status and current investment of the micro enterprises. Higher investment implies a greater proportion of regular employees. Access to electricity of micro enterprise also has a statistically significant relationship with the employment status.

Table 1: Description of the dichotomous variables

Variables	category '0'	category '1'
Education of the entrepreneur	Illiterate	Literate
Previous experience of the entrepreneur as employee/assistant in another micro enterprise (in years)	Has previous experience	Has no previous experience
The entrepreneur received any technical support/ training for the business	Not received	Received
Poverty status of the entrepreneur (using lower poverty line)	Poor	Non-poor
Nature of business of micro enterprise	Does not possess multiple nature of business	Possesses multiple nature of business
Nature of starting micro enterprise	Business not inherited from ancestors	Business inherited from ancestors
Time since started micro enterprise (in years)	Not started long time ago (Less than or equal to mean value)	Started long time ago (Greater than mean value)
Amount of current investment (in Taka)	Has no larger investment (Less than or equal to mean value)	Has larger investment (Greater than mean value)
The micro enterprise has access to electricity	Has no access	Has access
Administrative division where the micro enterprise placed	Other than Dhaka	Dhaka

Table 2: Bivariate relationship of different characteristics with employment status

Variables	Micro enterprise has regular employee		Chi-square (*p*-value)
	Yes *n* (%)	No *n* (%)	
Education of the entrepreneur			
Never been to school	19 (38.8)	30 (61.2)	0.348
Primary or less	14 (35.9)	25 (64.1)	(0.840)
Above primary	38 (41.3)	54 (58.7)	
Previous experience of the entrepreneur as employee/assistant in another micro enterprise (in years)			
No Experience	22 (33.3)	44 (66.7)	5.951
<3	9 (28.1)	23 (71.9)	(0.203)
3–5	7 (43.8)	9 (56.2)	
5–10	21 (50.0)	21 (50.0)	
10+	12 (50.0)	12 (50.0)	
The entrepreneur received any technical support/training for the business			
Not received	55 (40.4)	81 (59.6)	0.231
Received	16 (36.4)	28 (63.6)	(0.630)
Poverty status of the entrepreneur (using lower poverty line)			
Poor	5 (12.2)	36 (87.8)	16.505
Non-poor	66 (47.5)	73 (52.5)	(<0.001)
Nature of business of micro enterprise			
Trading	14 (18.7)	61 (81.3)	36.659
Manufacturing	17 (45.9)	20 (54.1)	(<0.001)
Service	11 (44.0)	14 (56.0)	
Service and Trading	7 (41.2)	10 (58.8)	
Manufacturing and Trading	22 (84.6)	4 (15.4)	
Nature of starting micro enterprise			
Self-started business	50 (37.6)	83 (62.4)	0.730
Business inherited from ancestors	21 (44.7)	26 (55.3)	(0.393)
Time since started micro enterprise (in years)			
1–5	27 (47.4)	30 (52.6)	2.944
5–10	10 (30.3)	23 (69.7)	(0.567)
10–15	16 (39.0)	25 (61.0)	
15–25	12 (38.7)	19 (61.3)	
25+	6 (33.3)	12 (66.7)	
Amount of current investment (in Taka)			
<100,000	28 (27.7)	73 (72.3)	13.312
100,000–200,000	25 (53.2)	22 (46.8)	(0.001)
200,000–300,000	18 (56.2)	14 (43.8)	
The micro enterprise has access to electricity			
Has no access	12 (26.7)	33 (73.3)	4.101
Has access	59 (43.7)	76 (56.3)	(0.043)
Administrative division where the micro enterprise placed			
Other than Dhaka	56 (38.9)	88 (61.1)	0.093
Dhaka	15 (41.7)	21 (58.3)	(0.760)
Total	71 (39.4)	109 (60.6)	

3.2 Results from logistic regression models

As evident from Table 3, the likeliness of employment creation by micro enterprises significantly depends on the nature of business and it also depends on current investment and the poverty status of the entrepreneurs. The micro enterprises having the business nature of manufacturing, service, manufacturing with trading or service with trading are very likely to create regular employment in comparison with those having the business nature of trading.

It is noticeable that among the business natures, the micro enterprises with the nature of manufacturing and

trading are much more likely to employ some ones as it is evident from higher value of odds ratio in this case. It may be due to that the micro enterprises with trading and manufacturing often need some employees for operating business, as it is also revealed from higher number of employees in micro enterprises that provide only trading or only manufacturing according to Table 2.

Again, the larger is the amount of current investment in micro enterprises the more the likeliness of creating employment by them as it is expected in real. The results also indicate that non-poor entrepreneurs are very likely to have regular employees in their micro enterprises. That is the micro enterprises whose owners are free from poverty are very likely to create employment which is also anticipated. That is, regarding investment in micro enterprises and economic status of the entrepreneurs, the findings support the reality. Concerning other independent variables however, no sufficient evidence has been found that can prove any significant effect of them on employment creation.

Table 3: Results of logistic regression model using entrepreneur's characteristics and enterprise's characteristics as covariates

Variables	Coefficient	Odds ratio (95% CI)	*p*-value
Education of the entrepreneur			
No education (Reference)			
Primary or less	-0.892	0.410 (0.118 – 1.426)	0.161
Above primary	-0.982	0.374 (0.126 – 1.112)	0.077
Previous experience of the entrepreneur as employee/assistant in another micro enterprise (in years)	0.064	1.066 (0.970 – 1.171)	0.186
The entrepreneur received any technical support/training for the business			
Not received (Reference)			
Received	-0.247	0.781 (0.294 – 2.074)	0.620
Poverty status of the entrepreneur (using lower poverty line)			
Poor (Reference)	2.001	7.394 (2.206 – 24.778)	0.001
Non-poor			
Nature of business of micro enterprise			
Trading (Reference)			
Manufacturing	1.922	6.837 (2.268 – 20.609)	0.001
Service	2.557	12.901 (3.477 – 47.866)	<0.001
Service and Trading	1.570	4.807 (1.244 – 18.570)	0.023
Manufacturing and Trading	3.660	38.847 (8.428 –179.048)	<0.001
Nature of starting micro enterprise			
Self-started business (Reference)			
Business inherited from ancestors	0.115	1.122 (0.431 – 2.926)	0.813
Time since started micro enterprise (in years)	-0.021	0.979 (0.932 – 1.028)	0.394
Amount of current investment (in Taka)			
<100,000 (Reference)			
100,000–200,000	1.290	3.635 (1.234 – 10.705)	0.019
200,000–300,000	1.424	4.156 (1.306 – 13.222)	0.016
The micro enterprise has access to electricity			
Has no access (Reference)			
Has access	0.857	2.357 (0.836 – 6.648)	0.105
Administrative division where the micro enterprise placed			
Other than Dhaka (Reference)			
Dhaka	-0.325	0.723 (0.262 – 1.992)	0.530

CI represents confidence interval.

Table 4: Results of logistic regression model using entrepreneur's score and enterprise's score as covariates

Variables	Coefficient	Odds ratio (95% CI)	*p*-value
Entrepreneur's score			
Low (Reference)			
Medium	0.386	1.471 (0.703 – 3.080)	0.306
High	0.029	1.029 (0.402 – 2.633)	0.952
Enterprise's score			
Low (Reference)			
Medium	0.902	2.464 (1.102 – 5.509)	0.028
High	1.617	5.039 (2.062 – 12.312)	<0.001

CI represents confidence interval.

Table 4 shows the results from the logistic regression model where the entrepreneur's score and enterprise's score computed by principal component analysis are used as explanatory variables. The enterprise's score is found as a significant predictor of having regular employee. If enterprises have a medium level of score, the odds of having regular employee is about 2.5 times than those who have a low level of score. The odds of having regular employee is 5 times of the enterprises with a high level of score than the enterprises with a low level of score. The findings indicate that the greater the score of the enterprises implies the more likely to have regular employee.

4. Conclusion and Recommendations

The study findings lead to conclude that business nature of manufacturing, service, manufacturing with trading or service with trading, larger amount of current investment and non-poor status of the entrepreneurs significantly increase the likeliness of employment creation by rural micro enterprises. Regarding the progress of entrepreneurs and that of enterprises, the findings reveal that the progress of enterprises can significantly contribute to create employment through rural micro enterprises.

Therefore to increase the scope of employment, it is important to take initiatives that simultaneously increase the investment and improve the business up to the level that can help alleviate poverty of the entrepreneurs. In addition, to increase employment opportunity in rural areas policymakers should come forward with financial and other support for all types of rural micro enterprises particularly for those having the nature of manufacturing and trading. Also, policy makers should give emphasizes to progress and enrich rural micro enterprises in terms of different relevant indicators.

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