International Journal of Science Academic Research
Vol. 02, Issue 09, pp.3028-3035, September, 2021
Available online at http://www.scienceijsar.com

ISSN: 2582-6425

Research Article

MULTI-DIMENSIONAL POVERTY AND ANALYSIS OF FACTORS THAT AFFECT POVERTY: EMPIRICAL EVIDENCE FROM QUANG NGAI PROVINCE, VIETNAM

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Received 27th July 2021; **Accepted** 24th August 2021; **Published online** 20th September 2021

Abstract

The purpose of this study is to identify multi-dimensional poverty and its influencing factors in the province - Quang Ngai, Vietnam. We have applied the Binary Logistic Regression model on the survey data of 500 households in the lowland and mountainous areas of Quang Ngai. The results show that factors affecting multi-dimensional poverty include: Distance from home to the local administrative and commercial centers; Dependency persons in the household; Living area; Qualification; Access to information; Ethnic groups; Borrowing from formal financial institutions; Employment of the head of household; Household size; Scale of agricultural land; and Age of household head.

Keywords: Binary Logistic Regression model; Influencing factors; Lowland and mountainous areas; Multi-dimensional poverty; Quang Ngai Province, Vietnam.

INTRODUCTION

During the past few years, there have been many studies on the factors affecting uni-dimensional poverty. However, these works have not fully paid attention to multi-dimensional poverty. This remains a challenge for researchers and policy makers. This study focuses on (i) Identifying factors influencing multi-dimensional poverty; (ii) Building a Binary Logistic Regression model on this relationship; (iii) Providing policy implications from the research results. To do this research, we conducted a survey of 500 households in Quang Ngai province to form a practical base for the measurement model. Quang Ngai is a coastal central province of Vietnam with a total natural area of 5,131.5 km2 (equal to 1.7% of the country's natural area). There are 13 administrative units, including one city, six lowland districts (Binh Son, Son Tinh, Tu Nghia, Nghia Hanh, Mo Duc, Duc Pho), five mountainous districts (Son Ha, Tra Bong, Ba To, Son Tay, Minh Long - Tra Bong and Tay Tra districts merged into one district in 2020) and one island district (Ly Son). Socio-economic development conditions differ significantly in different regions of the province. Quang Ngai has made great efforts on reducing poverty. In 2020, the rate of multi-dimensional poor households was 6.07%.

THEORETICAL BACKGROUND

Measurement of multi-dimensional poverty

According to the World Bank (2015), uni-dimensional poverty is a situation in which a person or a household has income or expenditure below the minimum standard set by a country or an international organization within a certain time. Accordingly, uni-dimensional poverty is based upon income or expenditure compared to the poverty line.

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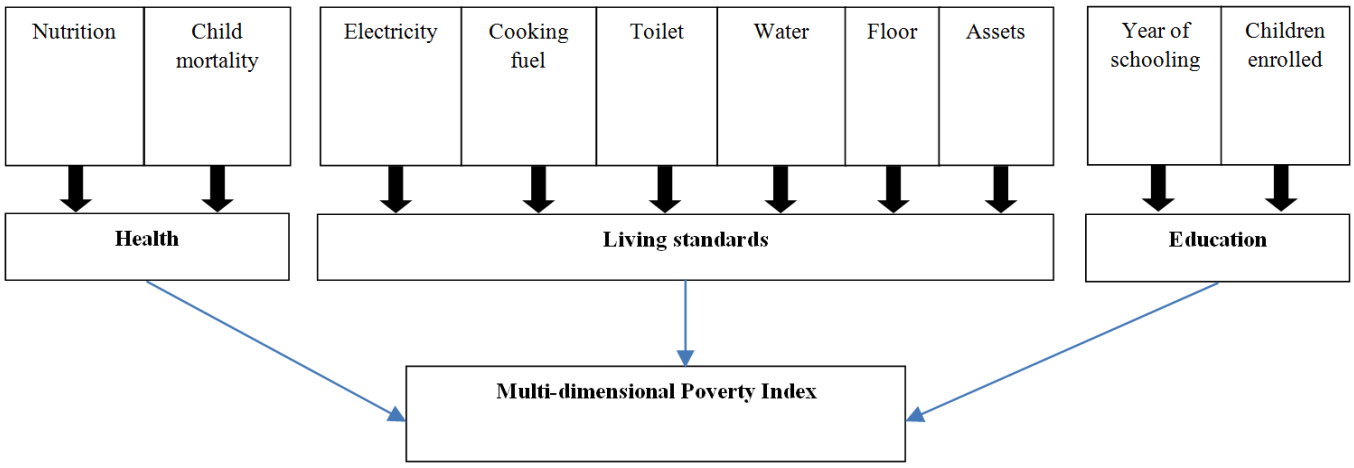
Therefore, uni-dimensional poverty is concerned with the monetary aspect of poverty, therefore, it is also called monetary poverty. The poverty line of the world and Vietnam has changed over the time. It has gradually increased in line with the changes of the costs for the necessities in life. Both Vietnam and the worldcontinue to use uni-dimensional poverty lines to assess the national poverty. However, uni-dimensional poverty does not represent a lack of education, health and quality of life. Therefore, UNDP (2011b) applies an additional measure, the Multi-dimensional poverty index (MPI). According to Alkire & Foster (2011), poverty is measured in terms of person/ household in multi-dimensions and multi-indicators. Based upon this, UNDP (2011a) applies a multi-dimensional poverty measure which includes three dimensions (education, health, and living standards) and ten indicators. Alkire & Robles (2015) applied the United Nations Development Program's (UNDP) multi-dimensional approach for measurement of 101 developing countries.

The multi-dimensional poverty index has three dimensions and ten indicators remaining, after years of evolution. During that time, there have only been changes in the deficiency threshold (Alkire & Kanagaratnam, 2020). Currently, there are two approaches to multi-dimensional poverty measurement in Vietnam: (i) Ministry of Labor, War Invalids and Social Affairs (MOLISA) and (ii) the General Statistics Office (GSO). MOLISA (2015) proposed a 5-dimension approach, including Education; Health; Housing; Living conditions; and Access to information, and ten indicators measuring the level of deficiency in multi-dimensional poverty, including:

1. Households with at least one member aged ranging from 15, born from the year 1986 backwards, who has not graduated from secondary school and is not currently attending school;
2. Households with at least one member aged from five to under 15 who is not currently attending school;

Table 1. Poverty line of the world and Vietnam

1	World poverty line(WB, 2015)		
Years	Poverty line (Income or expenditure level)		
2003	1 USD/ person/day or 360 USD/year		
2008	1.25 USD/ day or 450 USD/year		
2015	1.9 USD/day or 684 USD/year		
2	Vietnam poverty line(VND/person/month)		
Years	Rural Areas	Urban Areas	
2001–2005	100,000	150,000	Decision No 143/2001/QĐ-TTg (The Prime Minister, 2001)
2006–2010	200,000	260,000	Decision No 170/2005/QĐ-TTg (The Prime Minister, 2005)
2011–2015	400,000	500,000	Decision No 9/2011/QĐ-TTg (The Prime Minister, 2011)
2016–2020	700,000	900,000	Decision No 59/2015/QĐ-TTg (The Prime Minister, 2015)



Source: UNDP (2011b)

Fig. 1. Structure of multi-dimensional poverty measures

3. Households with a member who is ill but does not have his/ her health examined (illness is defined as being so seriously ill/ injuredthat he/ she must live in one place and must have a caretaker in bed, or has to quit work/ study, andcan not participate in normal activities);
4. Households with at least one member aged six onwards, who does not have health insurance;
5. Households living in unsolid or temporary houses or flats;
6. Household's average housing area per head of less than $8m^2$;
7. Households that do not have access to hygienic water;
8. Households that do not use hygienic toilets/latrines;
9. Households without any members using telephone and internet subscriptions; and
10. Households that donot have any items of these assets: television, radio, computer; and do not get access to the commune/ village loudspeaker system. The method to identify multi-dimensional poor households is to conduct surveys from the commune level. Then, multi-dimensional poor households are identified, and lists of multi-dimensional poor households for each commune are prepared for the whole country.

General Statistics Office (2015) proposed five dimensions and ten indicators as of MOLISA. The way to identify multi-dimensional poor households is to survey samples which represent the whole country and to estimate multi-dimensional poor households for the whole country. In this study, to be in compliance with the world standards, we chose to classify multi-dimensional poor households according to Alkire & Robles (2015) and applied the multi-dimensional approach of the United Nations Development Program (UNDP) with three dimensions and ten indicators. Accordingly, households fall into multi-dimensional poverty when their total deficiency score is $\geq 1/3$.

Factors affecting poverty

Researches in the world show that there have been three groups of factors affecting poverty since the 1990s, including geographical features, socio-economic characteristics, and characteristics of the households and the head of the household.

- *Geographical features:* Each country has a large geographical space and has certain distinctive characteristics. Factors such as lowland areas, upland areas, rural areas, urban areas, indigenous people, ethnic minority people, and scale of agricultural land owned and used by households have certain impacts on income generation for households in the region. The key factors include Household living area (rural/ urban; lowland/ upland areas), ethnic characteristics (indigenousness/ minority), scale of agricultural land owned and used (Datt & Jolliffe, 1999; Geda *et al*., 2001; Chant, 2003; Shrestha & Eiumnoh, 2000; Schware,2004;Albert *et al*., 2008; Akhtar, 2013; Mukli & Mersini, 2013; Pham Hong Manh, 2014; Maity & Buysse, 2017; Ha Hong Nguyen, 2018).

- *Socio-economic characteristics:* Since each country is at a different level of economic development, there will be differences which affect the livelihoods and income generation of households. The key factors include access to social and market information, employment, and distance from households' houses to the local administrative and commercial centers (Kakwani, 2000; Albert *et al*., 2008; Peters *et al.,* 2008; Mukli & Mersini, 2013; Maity & Buysse, 2017; Asrol & Ahmad, 2018).

- *Characteristics of households and the heads of households:* Each country has its own culture. Therefore, there are

differences in the characteristics of households and the heads of households, which affect the livelihoods and income generation of households. The main factors include: Household size; Number of dependency person in the household; Gender of household head; Age of household head; Professional qualifications of the head of household (Datt & Jolliffe, 1999; Shrestha & Eiumnoh, 2000; Geda *et al.,* 2001; Chant, 2003;Albert *et al*., 2008; Njong, 2010; Chaudhry *et al.,* 2010; Akhtar, 2013; Mukli & Mersini, 2013; Maity & Buysse, 2017; Ha Hong Nguyen, 2018).

Based on the abovementioned related research results, authors proposed the following hypotheses:

H1: The household's ethnic characteristics affecting the possibility of poverty of the household;
H2: Characteristics of the living area (lowland/ upland areas) of the household affecting the possibility of poverty of the household;
H3: Scale of agricultural land of the household affecting the possibility of poverty;
H4: The employment of the head of household affecting the possibility of poverty;
H5: Distance from the household's house to commune center affecting the likelihood of poverty;
H6: Household's ability to get access to information affecting the possibility of poverty;
H7: Household's ability to get access to loans from formal credit institutions affecting the possibility of poverty;
H8: Household size affecting the possibility of poverty;
H9: Number of dependents in the household affecting the possibility of poverty;
H10: The gender of the head of household affecting the possibility of poverty;
H11: Age of household head affecting the possibility of poverty;
H12: The professional qualifications of the head of household affecting the possibility of poverty.

RESEARCH MODELS

A theoretical overview and empirical research are required for further research to expand the theory, provide more empirical evidence, and propose policy implications related to multi-dimensional poverty reduction. Previous studies highlighted the deep understanding of the effects of three groups of factors on the likelihood of poverty and measurement of the relationships using different, and independent quantitative models such as linear regression, analysis of exploratory factors or separate regression models. However, they did not provide a complete basis for a comprehensive analytical framework of the possibility of household poverty. Therefore, this study expands the literature to the above extent by using the Binary Logistic Regression model, evidenced from Quang Ngai as followed:

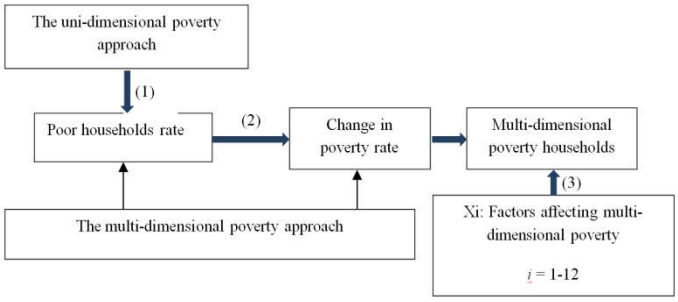


Fig. 2. The multi-dimensional poverty approach

1. Based upon the survey data, identify the proportion of uni-dimensional and non-poor households (following the uni-dimensional poverty approach);
2. Based upon the multi-dimensional poverty approach, identify multi-dimensional poor households;
3. Based upon the identified multi-dimensional poor households, apply the Binary Logistic Regression model to identify factors affecting poverty.

Table 2. Definitions of variables and expectations

	No.	Variables	Symbols	Units	Expectation
Group of factors	**I**	**Dependent variables**			
	1	Types of households	Y	Multi-dimensional poor households = 1; Multi-dimensional non-poor households = 0	
	II	**Independent variables**			
Geographical features	1	Ethnic group	X1	Kinh =1; Ethnic minority = 0	-
	2	Living area	X2	Lowland area = 0; upland area, remote areas = 1	+
	3	Scale of agricultural land	X3	1000 m^2	-
Socio-economic characteristics	4	Occupation of household heads	X4	No job, unemployed = 0; Work on a hire basis/ small scale agricultural = 1; Work on a wage-paid basis/ self-employed = 2	-
	5	Distance from home to the local administrative and commercial centers	X5	Over 6 Km from the center=1; Under 6 Km from the center= 0	+
	6	Access to information	X6	Regular access to information =1; Non regular access to information = 0	-
	7	Loans from formal credit institutions	X7	No loan =0; Loan = 1	-
Characteristics of households and the heads of households	8	Size of households	X8	Number of people living in a household (people)	+
	9	Dependency persons	X9	Person	+
	10	Gender of household heads	X10	Female = 1; male = 0	+
	11	Ages of household heads	X11	Years	-
	12	Qualifications	X12	No qualification = 0; elementary/intermediate = 1; college = 2; university = 3	-

RESEARCH DESIGN

Quantitative model

Form of the research model: Y = f(X1, X2,…,X12)

General form of the linear regression model:

$$Y = B_0 + \sum_{i=1}^{n} B_i X_i + u$$

*X*i: Independent variables; *Y*: dependent variable; *u*: residuals.

According to Agresti (2007), when the dependent variable is a dummy variable (Dummy variable, Y = 1; Y = 0), the appropriate model is the Binary Logistic Regression model. In this study, the dependent variable is a dummy variable, the Binary Logistic Regression model is applied in this study.

Thus, the appropriate model is the Binary Logistic Regression:

$$Ln\left[\frac{\mathrm{P}(Y=1)}{\mathrm{P}(Y=0)}\right] = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + .. + B_{12}X_{12}$$

Of which:

$P(Y=1) = P_0$: The probability of multi-dimensional poor households.

$P(Y = 0) = 1 - P_0$: The probability of multi-dimensional non-poor households.

*X*i: independent variables (*i*: from 1 to 12); *Ln*: Log of base *e* (*e* = 2,714).

Coefficient Odds (O_0):

$$O_0 = \frac{P_0}{1-P_0} = \frac{P(\text{multidimensional poor households})}{P(\text{multidimensional non-poor households})}$$

(Coefficient Odds)

Substitute O_0 into the equation (1):

$$LnO_0 = B_0 + B_1X_1 + .. + B_{12}X_{12}$$

Equation (2) has the form of a Logit function, estimating the regression coefficients by the Maximum Likelihood (ML) method.

Data collection and processing

We conducted a survey of 540 observations in the two regions of Quang Ngai Province, the lowland and the upland areas. 326 observations were distributed in the lowland areas (Quang Ngai City, Ly Son, Binh Son, Son Tinh, Tu Nghia, Nghia Hanh, Mo Duc, Duc Pho) and 214 observations in the upland areas (Tra Bong, Son Ha, Son Tay, Minh Long, Ba To, Tay Tra). All respondents were identified as heads of households, with 270 poor households and 270 non-poor households in the same survey area. The Convenient Stratified Sampling Method was conducted from May 2019 to May 2020. After the processing of the data, 500 observations were relevant and were used for data analysis. All data processing was carried out based on the SPSS 20.0 software. Data was collected through direct interviews with detailed questionnaires to test research models and hypotheses.

RESULTS OF THE RESEARCH

Characteristics of the surveyed people

- *Ethnic groups and geographic region*: Among the 500 surveyed households, the majority is the ethnic minority group (82%) in the multi-dimensional poor group (Fig. 2). Most of the multi-dimensional poor households are in the mountainous areas (71%) – see Fig. 3.

-Employment status of multi-dimensional poor and multi-dimensional non-poor households:

Table 3 shows that the status of not working and unemployment of multi-dimensional poor households is 18.6%, which is higher than that of non-poor households (13.2%). Working on a wage-paid basis and self-employed by the multi-dimensional poor households is 25.5%, which is lower than that of non-poor households (31.2%).

- Distance from home to commune/ city centers:

The Fig. 4 shows that 77.3 % of multi-dimensional poor households live more than 6 km from their community centers, which is much higher than that of non-poor households (27.3%).

Access to information is very different between poor and non-poor households: 68.5% of multi-dimensional poor households do not have access to information, while the rate of multi-dimensional non-poor households who do not have access to information is only 25.9%.

- Gender and qualifications of household head:

In Fig. 6, number of female heads of poor households is higher than those of non-poor households. The rate of the poor household heads who do not have professional qualifications is very high (91.2%), whereas that of the non-poor households who do not have professional qualifications is only 43.9% (Fig. 7).

Regression results

The Wald test shows that variable X10 has Sig. > 0.063; The remaining 11 variables have Sig. ≤ 0.05. The sign of the regression coefficients is consistent with the hypothesis. R2 Nagelkerke = 0.641. Therefore, 64.1% change of the dependent variables is explained by the independent variables of the model. The Omnibus test has Sig. ≤ 0.05, in general, the independent variables are linearly correlated with the dependent ones. Thus, the independent variables have a statistically significant impact on the variable Y "Types of poor households" including: X1, X2, X3, X4, X5, X6, X7, X8, X9, X11, X12.

In Table 5, the order of impact on the possibility of multi-dimensional poverty from the highest to the lowest is as follows: X5 (Distance from homes to the local administrative and commercial centers); X9 (Number of dependents in the household); X2 (Living Area); X12 (Qualification); X6 (Access to information); X1 (Ethnicity); X7 (Loans from official credit institutions); X4 (Employment of household heads); X8 (Household size); X3 (Scale of agricultural land); and X11 (Age of household heads).

Table 3. Employment Status

Employment Status	No job, unemployed	Work on a hire basis/ small scale agricultural work	Work on a wage-paid basis/ self-employed
Multi-dimensional non-poor households	13.2%	55.6%	31.2%
Multi-dimensional poor households	18.6%	55.9%	25.5%

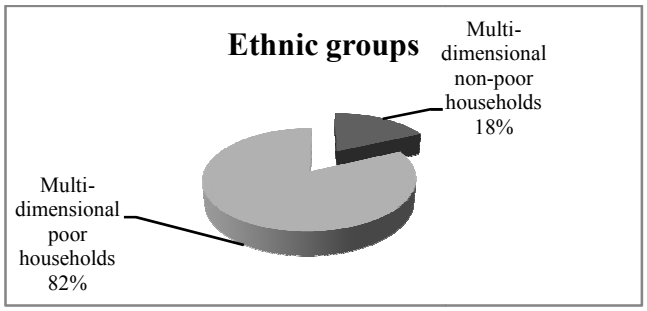


Fig. 2:Proportion of ethnic minorities (%)

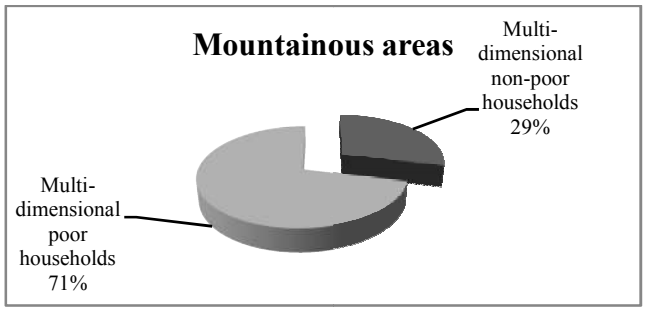


Fig. 3:Poor household rate by geographic area (%)

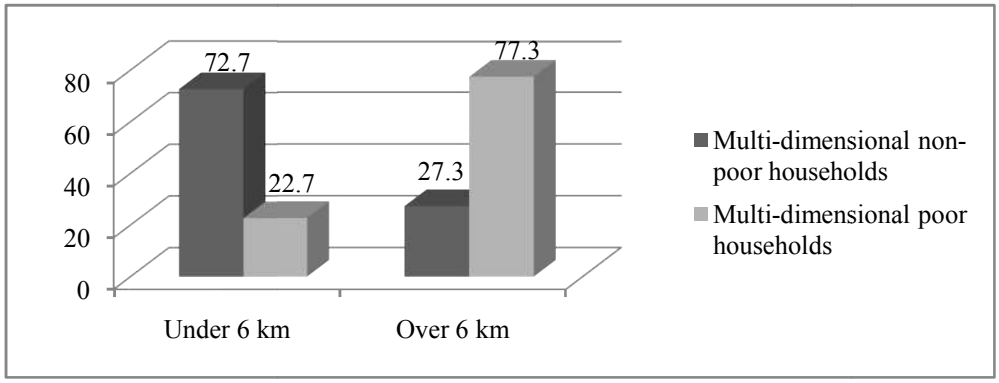


Fig. 4. Distance from home to the local administrative and commercial centers (%)

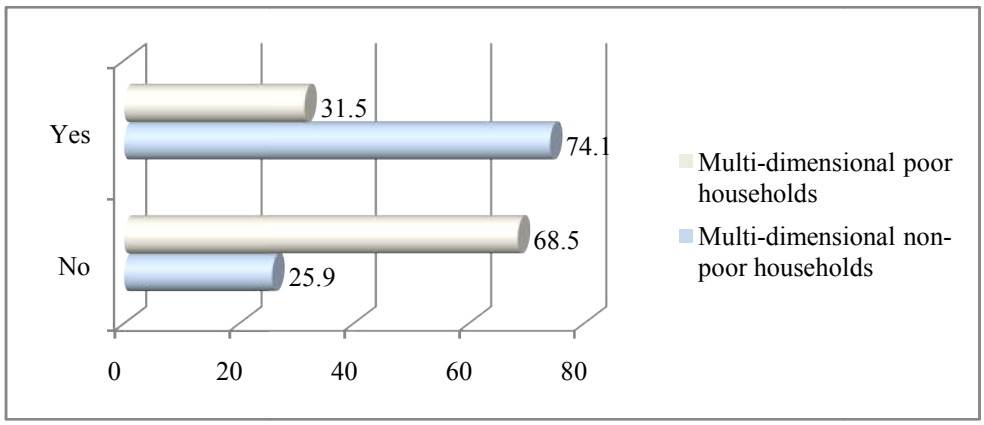
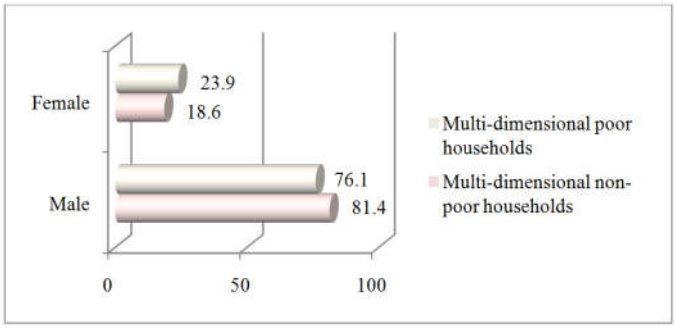
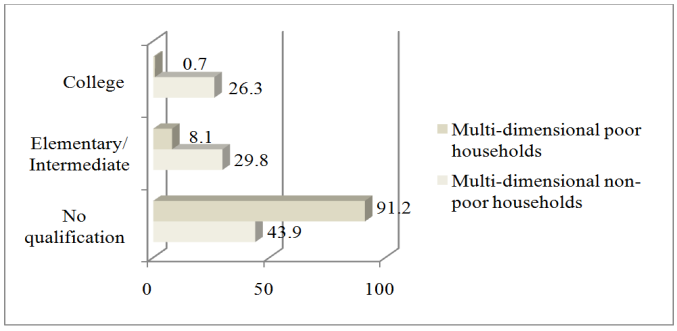


Fig. 5: Access to information (%)





Source: Results of the surveys by the authors (2020)

Fig. 6. Gender of household heads (%)

Fig. 7. Qualifications of household heads (%)

Table 4. Regression coefficient

Variables	B	S.E.	Wald	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
X1	-1.278	0.343	13.869	0.000	0.279	0.142	0.546
X2	0.899	0.323	7.740	0.005	2.456	1.304	4.626
X3	-0.133	0.044	9.137	0.003	0.876	0.804	0.954
X4	-0.473	0.213	4.921	0.027	0.623	0.410	0.946
X5	1.960	0.287	46.696	0.000	7.100	4.047	12.458
X6	-1.529	0.281	29.653	0.000	0.217	0.125	0.376
X7	-0.838	0.286	8.602	0.003	0.432	0.247	0.757
X8	0.280	0.102	7.492	0.006	1.323	1.083	1.616
X9	1.572	0.550	8.154	0.004	4.815	1.637	14.162
X10	0.597	0.321	3.446	0.063	1.816	0.967	3.410
X11	-0.026	0.011	6.235	0.013	0.974	0.954	0.994
X12	-1.583	0.261	36.901	0.000	0.205	0.123	0.342
Constant	1.213	0930	1.702	0.192	3.364		
R^2 Nagelkerke	0.641						
Omnibus Tests (Sig.)	0.000						

Predicted scenario for a change of poor households

Exclude variables which are not statistically significant, the results of the Binary Logistic Regression model are shown in the table below:

Table 5.Degrees of impact of factors affecting multi-dimensional poverty

	Initial Probability P_0 = 10%				
	B	e^B	Pi (%)	Change in probability	Position
X1	-1.278	0.279	3.01	6.99	6
X2	0.899	2.456	21.44	11.44	3
X3	-0.133	0.876	8.87	1.13	10
X4	-0.473	0.623	6.47	3.53	8
X5	1.960	7.100	44.10	34.10	1
X6	-1.529	0.217	2.35	7.65	5
X7	-0.838	0.432	4.58	5.42	7
X8	0.280	1.323	12.82	2.82	9
X9	1.572	4.815	34.85	24.85	2
X11	-0.026	0.974	9.77	0.23	11
X12	-1.583	0.205	2.23	7.77	4

Note: Calculate *P*i in Appendix.

The regression equation of the model:

$$Y = 1.844 - 1.282X1 + 0.84X2 - 0.132X3 - 0.464X4 + 1.921X5 - 1.536X6 - 0.864X7 + 0.266X8 + 1.55X9 - 0.027X11 - 1.529X12 \quad \textbf{(2)}$$

Table 6. Regression coefficient after the insignificant variables have been excluded

	B	S.E.	Wald	Sig.	Exp(B)
X1	-1.282	0.344	13.914	0.000	0.278
X2	0.840	0.321	6.862	0.009	2.317
X3	-0.132	0.044	8.851	0.003	0.876
X4	-0.464	0.212	4.763	0.029	0.629
X5	1.921	0.283	45.946	0.000	6.830
X6	-1.536	0.279	30.342	0.000	0.215
X7	-0.864	0.284	9.264	0.002	0.422
X8	0.266	0.103	6.727	0.009	1.305
X9	1.550	0.546	8.072	0.004	4.714
X11	-0.027	0.010	6.797	0.009	0.973
X12	-1.529	0.254	36.128	0.000	0.217
Constant	1.844	0.865	4.549	0.033	6.323

Scenario 1: *X*i includes the independent variables with the lowest values.

Substituting the Scenario 1 values into equation (2) results in LogOdds. If a household has the following conditions, it has a 100% probability of a "multi-dimensional poverty". "Ethnicity": X1 = 0 (Ethnic minorities); "Living area": X2 = 1 (Mountainous area); "Scale of agricultural land": X3 = 0; "Employment of the head of household": X4 = 0 (Not working, unemployed); "The distance from homes to the local administrative and commercial centers": X5 = 1 (over 6 km far from the center);

Table 7. Forecast scenarios with the impact factors

No	Variables	Regression coefficient (B)	Values of Variables	
			Scenario 1	Scenario 2
1	X1	-1.282	0	1
2	X2	0.84	1	0
3	X3	-0.132	0	30
4	X4	-0.464	0	2
5	X5	1.921	1	0
6	X6	-1.536	0	1
7	X7	-0.864	0	1
8	X8	0.266	8	1
9	X9	1.55	1	0
10	X11	-0.027	85	27
11	X12	-1.529	0	3
12	Constant	1.844		
	LogOdds		5.988	-11.776
	$e^{logOdds}$		398.6166	0.00001
	$1+e^{logOdds}$		399.6166	1.000008
	P(*Y*/*X*i):Probability that Y = 1 occurs is when the independent variable X has a specific value *X*i (%)		100	0

Note: Calculate P(*Y*/*X*i) in Appendix.

"Access to information": X6 = 0 (No access to information); "Loans from formal credit institutions": X7 = 0 (No loans from formal credit institutions; "Household size": X8 = 8 (Person); "Number of dependents in the household": X9 = 1; "Age of the head of household": X11 = 85; "Professional qualifications of the head of household": X12 = 0.

Scenario 2: *X*i includes the independent variables with the best values.

Substituting the Scenario 2 values into equation (2) results in LogOdds.

If a household has the following conditions, it has a 0% probability of a "multi-dimensional poverty".

"Ethnic group": X1 = 1 (Kinh ethnic group); "Living area": X2 = 0 (lowland); "Scale of agricultural land": X3 = 30; "Employment of the head of household": X4 = 2 (wage-paid basis/ self-employment); "The distance from home to the local administrative and commercial centers": X5 = 0 (Less than 6 km far from the center); "Access to information": X6 = 1 (Access to information); "Loans from formal credit institutions": X7 = 1 (Loans from official institutions); "Household size": X8 = 1 (Person); "Number of dependents in the household": X9 = 0; "Age of the head of household": X11 = 27; "Professional qualifications of the head of household": X12 = 3 (University).

DISCUSSION AND POLICY IMPLICATIONS

Firstly, the study has identified three groups of factors affecting multi-dimensional poverty, including: geographical region, socio-economic conditions, characteristics of households and household heads. The group of factors "Geographic region" includes: Ethnic groups; Living areas and Scale of agricultural land of the household. This result aligns with that of Akhtar (2013) on multi-dimensional poverty in the rural areas in Punjab, Pakistan. The group of factors "Socio-economic conditions" includes: Employment of the household head; Distance from home to the local administrative and commercial centers; Access to information and Loans from official credit institutions. This finding is in alignment with results of a study on the case of multi-dimensional poverty in Udalguri district, Bodoland region, India by Maity & Buysse (2017). The group of factors "Characteristics of the household and the head of household" includes: Household size; Number of dependents in the household; Age of household head; Qualifications. This finding is in alignment with results of multi-dimensional poor households in Albani by Mukli & Mersini (2013) and the study of Maity & Buysse (2017) on multi-dimensional poverty in Udalguri district, Bodoland region, India. Secondly, the study has identified the impact level of each factor from the strongest to the weakest: Distance from home to the local administrative and commercial centers; Number of dependents in the household; Living area; Qualification; Access to information; Ethnic groups; Loans from official credit institutions; Employment of the head of household; Household size; Area of agricultural land; Age of household head. Results of this study imply that in order to reduce multi-dimensional poverty, attention should be paid to the followings: (i) Priorities should be given to investment in rural and mountainous infrastructure from the Government funding resources. In addition, social policies should pay more attention to households with high number of dependents; (ii) Rural credit institutions and Agriculture - Forestry Extension organizations should coordinate in providing loans to poor households following their production - business models to make the loans more effective; (iii) Literacy level improving programs and professional training should be continued to deliver to the children of people living in the rural and mountainous areas.

CONCLUSIONS AND LIMITATIONS

This study aims at expanding the theoretical framework and providing evidence in empirical results on multi-dimensional poverty with evidence from Quang Ngai province, Vietnam. The findings highlight the very important role of factors affecting poverty through the Binary Logistic Regression model. There have been certain limitations in this research. Respondents were only from one province - Quang Ngai, which limited the generality of the study. Researches in the future might cover many other provinces and cities in Vietnam, and make comparisons to improve the generality of the findings. Furthermore, this study only looks at 12 factors affecting poverty, meanwhile there are other factors which have not been mentioned in this research.

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APPENDIX

Calculate *P*i:

Assuming the initial probability of a poor household is (P_0), the probability that the household is poor will be *P*i due to the effect of the variable *X*i. According to Agresti (2007), *P*i is defined as follows:

Calculate P(*Y*/*X*i):

Predicted scenario for a change of poor households

According to Agresti (2007), the predictive form of the model:

$$P_i = \frac{P_0 \times e^{B_i}}{1 - P_0\ (1 - e^{B_i})}$$

$$P(Y / Xi) = \frac{e^{LnOdds}}{1+e^{LnOdds}}$$

$$LnOdds = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + .. + B_{10}X_{10}$$

$$P(Y / Xi) = \frac{e^{B0+B1X1+B2X2+B3X3+..+B10X10}}{1+e^{B0+B1X1+B2X2+B3X3+..+B10X10}}$$

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