

Determinants of Livelihood Diversification Strategies in Rural China: A Comparative Analysis

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The main objective of this study is to assess the determinants of livelihood diversification strategies in different regions of rural China. Descriptive statistics, inferential statistics and MNL model are employed to analyze the data, which are obtained from randomly selected 425 households in each western and eastern China. The results indicate that the majority of households diversified their livelihoods into off-farm and non-farm activities. However, we also find several different factors that determine farmer's choice of livelihood strategies at different significance levels in the two study areas. Therefore, development stakeholders should take different ways to expand diversification for the improvement of household income.

Key words: Livelihood Diversification Strategies, Comparative Analysis, Rural China

1. Introduction

Agriculture is an important source of livelihood for the majority of rural people in developing countries, as it can help reduce livelihood vulnerability, overcome poverty and enhance food security. Livelihood strategies is a term that comprises the range and combination of activities and choices that people undertake in order to achieve their livelihood goals (Ellis, 1998). Since the 1990s, livelihood analysis has become the dominant approach to understand how people make a living. However, the merits of livelihood diversification are debatable and vary across households. This is because it is the process by which households construct an increasingly diverse portfolio of activities and livelihood assets in order to survive and to improve their standard of living, rather than an opportunity for improvement (Ellis, 2000).

Since the 1978 economic reform, China has contributed to over 70% of poverty reduction across the world, making it one of the countries with the most people lifted out of poverty. (UN, 2015). Nevertheless, farming remains the main source of income in rural China, which is also plagued with many problems such as low productivity, small fragmented land size, and limited accessibility to various non-farm income sources. Additionally, the poverty features and livelihood systems are significantly different between western and eastern China. It is extremely important to reduce poverty and vulnerability of the poor through diversify their income portfolio. However, the contribution has often been ignored by the policy maker who often focus their activities on agriculture (Xu *et al.*, 2015).

Currently, several studies have been conducted on the factors influencing livelihood diversification strategies in rural China (Wang *et al.*, 2010). However, few quantitative studies to compare different regions have been done, and determinants to diversify livelihood strategies are also not well identified in rural China. Moreover, the factors that condition the farm households reliance on a particular economic activity may vary and are complex, due to some uncertain factors like prices, markets and natural disasters. Thus, a thorough understanding of the factors that influence livelihood options is crucial to improve the response mechanisms related to poverty, food security and livelihood improvement (Babulo, *et al.*, 2008). The objectives of the study therefore are, i) to identify the existing livelihood activities adopted by rural households; ii) to investigate the contribution of livelihood strategies to total annual household income; and iii) to examine the determinants of rural households' decision to choose alternative livelihood strategies in different regions of rural China.

Our guiding premise in exploring the determinants of livelihood diversification strategies in rural China is derived from the fundamental proposition of livelihood approach. It states that the types of livelihood activities and household income are a function of assets and its disposal (Barrett *et al.*, 2005). Based on this proposition and the behavioural responses of a rational economic unit, we hypothesize that each household can pursue relatively heterogeneous livelihood diversification strategies in the two study areas. Livelihood assets, namely human, physical, social, financial and natural assets, may influence

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the farmers' decision to adopt the choice of livelihood strategies. Besides, farm households generate income by distributing their assets through different livelihood activities, and the less a household has access to livelihood assets, the more it depends on income generating activities (Brown *et al.*, 2006).

The paper is organized as follows. The data and methods are introduced in section 2. The results and discussion are presented in section 3, and conclusions are drawn and policy implications are proposed in section 4.

2. Methodology

1) Description of study area

The study was conducted from July to September, 2018 in H county of western region and S county of eastern region.

(1) H county

H is located about 25km southeast from the provincial capital Xining of Qinghai province. It is roughly located between 36°13'N~37°03'N and 101°09'E~101°54'E, which covers a total area of 2,700 km². Moreover, it has a total population of about 460,100, 67.2% of which belong to rural population (2018). The crude population density is about 170 persons/km². Also, the average annual rainfall is 509.8 mm, and the annual average temperature is 5.1°C. The altitude of the area ranges from 2,225 to 4,488 meter above sea level. In 2018, the Gross Regional Product (GRP) of this county was about 15.39 billion yuan (USD 2.26 billion). Meanwhile, the disposable income per capita of rural residents reached 9,824 yuan (USD 1,444.7), with an increase of 9.1% compared to last year. In addition, small scale mixed farming is the main agricultural activity, and barley and canola are the main crops. This area is majorly endowed with yak and Tibetan sheep production.

(2) S county

S is located in the southwestern of Shandong province, which is approximately 168km from the provincial capital city Jinan. Geographically it is located or extends from 35°28'N to 35°48'N latitude and from 117°5'E to 117°35'E longitude. The total population is about 632,900, 50.3% of which live in rural area (2018). The area covers 1,118.96 km² with 75.9% arable land. Thus, population density is about 566 persons/km². Moreover, the annual average temperature is 11-14°C. The highest altitude of this area is about 608 meter. Economically, the GRP was about 20.017 billion yuan (USD 2.944 billion), and the disposable income per capita of rural residents was 12,379 yuan (USD 1,820.4) in 2018. Besides, farming is the major income source, including wheat, maize and watermelon, while the dominant animals are pigs, goats and chicken.

2) Sampling procedure and data collection

The data were collected from a total of 850 randomly selected households in the two study areas using structured interview schedule, with the help of farmers, village heads, doctors, teachers, businessmen and the members of Yinghuo Gongyi (NGO). Specifically, 425 households were selected from 14 villages in H, whereas 425 households were chosen from 12 villages in S using multistage sampling procedure. Simultaneously, key informant interviews, focus group discussions, informal survey and observations were also employed to collect data.

3) Methods of data analysis

In this study, descriptive statistics, inferential statistics and econometric model were employed to analyze the data. The quantitative continuous types of data were analyzed using the mean, standard deviation and one way ANOVA (F-test). On the other hand, quantitative categorical types of data were analyzed using the percentage, frequency and Chi-square test. Meanwhile, the degree of income diversification was measured using Simpson's diversity index (SDI). Afterwards, we used multinomial logistic (MNL) model to estimate and compare the factors influencing livelihood diversification strategies. Before running this model, we used the variance inflation factor (VIF) to detect multicollinearity, and tested for the independence of irrelevant alternatives (IIA) assumption with Hausman test. All analyses were conducted using the STATA version 14.

4) Econometric model specification

Based on the cluster analysis (share of household income), four mutually exclusive livelihood diversification strategies (Lds) as polytomous dependent variable were identified as the following values: Lds=0, farming activities alone (base category); Lds=1, farming plus off-farm activities; Lds=2, farming plus non-farm activities; Lds=3, farming plus non-farm and off-farm activities. Following Wooldridge (2002), MNL model can be specified in term of the probability of occurring outcome j given the explanatory variables as:

$$\text{Prob}(Y_i = j) = \frac{e^{x_i' B_j}}{1 + \sum_{k=0}^m e^{x_i' B_k}} = F_j(X_i, B)$$

$$j = 0, 1, 2, \dots, m; i = 1, 2, 3, \dots, N; \text{ and } B_0 = 0$$

where $\text{Prob}(Y_i = j)$ represents the probability of household i choosing livelihood strategy j out of m strategies, Y_i is the households' choice of livelihood strategies, x_i' stands for the influence factors, B_j is the corresponding parameters to be estimated, X_i is the associated vector of explanatory variables, and F_j is the cumulative density function of the error term assumed to follow logistic distribution. Additionally, the definition and measurement of indicators are described in Table 1.

(3) Non-farm activities

3) Contribution of livelihood strategies to household income

The income portfolio analysis (Table 2) reveals that the total mean annual income is about USD 5,502.6 (37,417.6 yuan) and 6,514.8 (44,300.9 yuan) in H and S, respectively. This briefly indicates that the mean annual income per capita is about USD 1,072.2 and 1,519.7, since the total average family size is 5.132 and 4.287 in H and S, respectively. At the same time, the mean income share of H sample households participating in farming, farming plus off-farm, farming plus non-farm, and farming plus off-farm and non-farm activities, is about 17.09%, 18.88%, 30.09% and 33.94%, while they are 15.64%, 20.66%, 31.56% and 32.14% in S, respectively. Similarly, the mean annual income of H sample households comprises about USD 2,951.5 (53.6%), 902.0 (16.4%) and 1,649.1 (30.0%) of farming, off-farm and non-farm activities, whereas they are about USD 3,603.3 (55.3%), 792.1 (12.2%) and 2,119.4 (32.5%) in S, respectively.

Overall, the largest proportion (USD 3,975.1 and 3,834.6) of mean household income is from farming activities alone in H and S, respectively. Additionally, the result of Simpson's diversity index (SDI) shows that the income diversification level of H (0.735) households is relatively lower than S (0.747). In conclusion, the above findings depict that agriculture still plays a valuable role by contributing a higher share of the total household income in the two counties. Comparing to the farming alone, a significant number of farm households are enforced to pursue diverse income generating activities due to different impediments such as recurrent drought (H), small farm land (S) and lack of infrastructural facilities (H and S). Furthermore, in terms of the total average income share, we find that diversified households are able to earn more income compare to the undiversified or less diversified ones.

4) Determinants of livelihood diversification strategies

The significant independent variables and its reasonable inference are presented as follows (Table 3).

(1) Human capital

Sex of household head (SEX): As the model result indicates, it has a negative and significant ($p < 0.01$) relationship with the livelihood strategies choice into farm plus off-farm activities in H. However, it has the opposite effect on the same activities in S. This result indicates that the households headed by female are less likely to participate in off-farm activities in H. One possible reason is that female headed households in H have more extra household chores that need to be done than S.

Age of household head (AGE): This variable negatively and significantly affects livelihood strategies choice into off-

farm and non-farm income-generating activities at 1% and 5% significance level in both counties. This result opposes the prior expectation that old farmers are more likely to diversify their livelihood options. The potential clarification is that young farmers have more energy and alternative opportunities to earn more income due to relatively better educated.

Education level of household head (EDUCTN): As predicted, it has a positive and significant inspiration on the households' choice of selecting expanded income approaches into off-farm and non-farm activities in H and S counties. The result denotes that household head with high education level has more chance to engage in multiple livelihood activities.

Family size (FAMLSZ): As hypothesized, the estimated coefficient shows that a positively and statistically significant ($p < 0.01$) relationship between family size and households livelihood diversification into farming plus off-farm, farming plus off-farm and non-farm activities in H. This probable justification for positive association is that households with large family members may have more productive labour force.

Dependency ratio (DEPRTO): As expected, dependency ratio is negatively and significantly related to farming plus non-farm, and the combination of three livelihood activities at 1% significance level in H. The possible explanation for this could be attributed to the fact that a larger dependency ratio is unfavorable for a household to generate income.

Agricultural training (TRAIN): Without expectation, it is found to be negatively correlated with farming plus non-farm, and farming plus off-farm and non-farm activities in H. This result denotes that local government should not only offering agricultural training, but also providing entrepreneurial skills.

Extension service (EXTCNT): This variable positively and significantly ($P < 0.01$) influences farmer's livelihood strategies choice into off-farm and non-farm activities in H. Opposite to this, it has a negative and significant effect in S. This result shows that agricultural extension service can enhance farmer's skills, knowledge and abilities to solve their own agricultural difficulties, whereas the service content is relatively singular.

(2) Physical capital

Livestock size in TLU (LIVST): In agreement with prior expectation, it is found to have a negative relationship with farming plus non-farm activities and statistically significant at 5% probability level in H. This means that H sample households holding bigger livestock size have less probable to undertake the diversified income-generating activities in comparison to small number of livestock pursuers. The likely reason is that H households can get required amount of food from livestock.

Table 2. Contribution of each income sources (in USD) by different livelihood strategies

Income Composition	Household income of different livelihood activities (H county)				Total (share in total income)	Household income of different livelihood activities (S county)				Total (share in total income)			
	Lds=0		Lds=2			Lds=1		Lds=3					
	N=124(29.2%)	Mean(SD)	N=86(20.2%)	Mean(SD)		N=94(22.1%)	Mean(SD)	N=112(26.4%)	Mean(SD)				
		N=141(33.2%)	Mean(SD)	N=74(17.4%)	(%)								
Crop	3175.8(1357.2)	2183.5(992.5)	2193.7(971.8)	1548.9(889.5)	2364.6(1229.1)	43.0	3771.3(1979.3)	3311.5(1319.0)	3781.7(1515.3)	3336.3(1517.1)	3560.1(1594.6)	54.6	
Livestock	799.3(2132.9)	347.3(889.5)	609.3(1922.5)	661.6(1714.4)	586.9(1691.6)	10.7	63.4(121.0)	36.7(86.9)	40.9(104.0)	33.5(76.6)	43.2(99.0)	0.7	
Farming subtotal	3975.1(1863.8)	2530.8(1038.2)	2803.0(2043.0)	2210.5(1811.5)	2951.5(797.5)	53.6	3834.6(1987.6)	3348.2(1319.3)	3822.6(1501.1)	3369.7(1526.2)	3603.3(1595.9)	55.3	
Daily wage labor	17.6(80.8)	1664.7(1206.0)	15.4(67.8)	1315.6(993.5)	789.6(1118.8)	14.3	28.2(140.2)	1554.0(1227.2)	49.4(124.2)	1132.8(1122.2)	673.2(1063.2)	10.3	
Rent & sell	24.2(118.7)	200.1(320.2)	146.2(850.4)	53.7(134.6)	112.4(437.8)	2.0	31.3(113.9)	244.9(407.8)	92.1(201.9)	92.1(262.7)	118.9(282.0)	1.8	
Off-farm subtotal	41.7(158.4)	1864.8(1181.7)	161.6(850.4)	1369.2(1042.1)	902.0(1214.2)	16.4	59.4(214.9)	1798.8(1335.5)	141.5(250.3)	1225.0(1152.3)	719.2(1154.3)	12.2	
Petty trading	10.7(53.6)	29.2(107.2)	646.4(1781.4)	596.2(1946.07)	247.4(1174.1)	4.5	25.0(115.4)	76.2(560.1)	961.9(2800.7)	875.9(3975.6)	502.8(2445.7)	7.7	
Migration	17.8(89.13)	43.8(126.4)	3510.6(1457.3)	3857.3(1784.0)	1401.7(2027.1)	25.5	109.5(763.7)	99.8(219.1)	3099.7(1574.4)	2808.7(1666.6)	1585.5(1884.6)	24.3	
Non-farm subtotal	28.5(102.2)	73.0(165.0)	4157.0(1683.2)	4453.5(1860.9)	1649.1(2327.8)	30.0	134.5(795.2)	175.9(592.5)	4165.0(2884.6)	3684.6(3730.8)	2119.4(3055.7)	32.5	
Overall mean	4045.3(2027.1)	4468.6(1349.3)	7121.6(2797.1)	8033.2(1885.5)	5502.6(2569.0)	100	4028.6(2550.5)	5323.0(1970.8)	8129.1(3035.3)	8279.3(3717.9)	6514.8(3367.1)	100	
Mean income share	17.09%	18.88%	30.09%	33.94%	-		15.64%	20.66%	31.56%	32.14%	-		
Income per capita	848.8	846.8	1434.4	1418.8	1072.2		971.0	1271.0	1822.3	1921.8	1519.7		
Simpson's diversity index			0.735					0.747					

Note: values in parentheses are standard deviation. 1 USD = 6.8 CNY (during survey period). SDE: No diversification (SDI <= 0.01); Low level (0.01 - 0.25); Medium level (0.26 - 0.50); High level (0.51 - 0.75); Very high level (SDI >= 0.75). Source: Survey result, 2018.

Table 3. Multinomial logit regression estimation of rural households' choice of livelihood strategies

Variables	Household livelihood strategy choices (H county)						Household livelihood strategy choices (S county)					
	Lds=1		Lds=2		Lds=3		Lds=1		Lds=2		Lds=3	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
SEX	-2.005***	0.520	0.215	0.899	0.056	1.154	1.143**	0.507	0.794	0.547	0.458	0.584
AGE	-0.051***	0.019	-0.066***	0.023	-0.074***	0.026	-0.043**	0.020	-0.057***	0.021	-0.046**	0.023
EDUCTN	0.189***	0.048	0.246***	0.061	0.282***	0.069	0.076	0.060	0.194***	0.072	0.252***	0.079
FAMLSZ	0.348***	0.120	0.118	0.146	0.490***	0.157	0.017	0.177	0.238	0.180	0.130	0.191
DEPRTO	-0.825	0.851	-3.143***	1.054	-3.500***	1.219	0.414	0.842	-0.684	0.884	-0.240	0.937
LAND	-0.111***	0.032	-0.169***	0.042	-0.124***	0.043	-0.128*	0.071	-0.063	0.074	-0.179**	0.080
LIVST	-0.021	0.017	-0.032**	0.015	-0.018	0.012	-0.026	0.235	-0.228	0.277	-0.497	0.366
TRAIN	-0.176	0.364	-0.811*	0.450	-2.146***	0.579	0.606	0.393	0.525	0.408	0.309	0.438
EXTCNT	1.815***	0.381	2.096***	0.449	1.470***	0.478	-0.789**	0.401	-0.716*	0.412	-0.308	0.444
CREDIT	-1.156***	0.452	-0.139	0.505	-0.510	0.577	0.731	0.799	0.589	0.799	0.929	0.621
LEADER	3.107**	1.452	4.865***	1.451	5.343***	1.458	-0.513	0.467	0.989**	0.429	0.707	0.454
IRRIGA	-1.923***	0.687	-0.722	0.719	-2.107*	1.158	1.577***	0.357	2.378***	0.430	4.532***	1.043
REMITA	0.333	0.410	1.598***	0.441	1.423**	0.468	0.933**	0.416	1.186***	0.422	1.086**	0.443
Cons	2.412*	1.280	1.934	1.729	0.183	2.006	0.262	1.429	-1.925	1.567	-3.918**	1.916
Number of observations	425						425					
LR chi2 (39)	337.63						221.53					
Prob > chi2	0.0000						0.0000					
Pseudo R2	0.2936						0.1893					

Note: Cons: Coef. and S.E. stands for Constant, Coefficient and Standard Error, respectively. Lds=0, farming activities alone as reference category. ***, **, * indicates significant at 1, 5 and 10% probability levels respectively. Source: Survey result, 2018.

(3) Social capital

Leadership (LEADER): As expected, this variable positively and significantly inspires the livelihood strategies into off-farm and non-farm activities in H, while it is only found to have positive relationship and statistically significant at 5% probability level with farming plus non-farm activities in S. This is because household heads' sharing in leadership make them obtain more informative knowledge and experiences.

(4) Financial capital

Access to credit (CREDIT): Contrary to prior expectation, it is found only to have a negative and significant ($p < 0.05$) relationship with farming plus off-farm activities in H. The probable reason is that although the formal credit institutions are available, in reality majority of farmers are not user of credit due to lack of collateral and fear of ability to repay debt.

Remittance (REMITA): It positively and significantly ($p < 0.01$) motivates the livelihood strategies choice into non-farm activities as well as the combination of off-farm and non-farm activities in H. In addition, this variable positively and statistically influences household's into off-farm and non-farm livelihood activities at different significance levels in S. The probable explanation is that economic support can strengthen economic potential.

(5) Natural capital

Land size (LAND): As projected, the estimated coefficient for land size is found to be negatively correlated with off-farm and non-farm activities at different significance levels in H and S counties. This result shows that farmers with larger cultivated land are less involved in diverse livelihood activities and thereby intensifying their annual cash income.

Irrigation water (IRRIGA): Similarly, this variable is found to have a negative and significant impact on households' participation in farming plus off-farm, and farming plus off-farm and non-farm activities in H. However, it has the diametrically opposite effect in S. The justified cause is that the surplus income gained from irrigation helps them improve their livelihoods in S.

4. Conclusion

Agriculture is still an important economic strategy for rural households in the two study areas. However, the statistical analysis indicated that the majority (70.8% and 77.9%) of households are engaged in diverse livelihood strategies away from purely crop and livestock production in H and S, respectively.

The income portfolio analysis showed that most (53.6% and 55.3%) of rural household income are obtained from farming activities. In addition, we also found low resources endowments are the main characteristics of poor households,

and the contribution (46.4% and 44.7%) made by off-farm and non-farm activities to household income is prominent for farm households in H and S, respectively.

Furthermore, the results of econometric analysis demonstrated that among thirteen assumed explanatory variables, nine (six), nine (six), ten (five) variables are significant in H(S), respectively. Specifically, sex⁻, age⁻, education⁺, family size⁺, dependency ratio⁻, land⁻, livestock⁻, training⁻, extension⁺, credit⁻, leadership⁺, irrigation⁻, and remittance⁺ are found to be significant in H, whereas sex⁺, age⁻, education⁺, land⁻, extension⁻, leadership⁺, irrigation⁺, and remittance⁺ are statistically significant determinants up to 10% probability level in S. This result depicts that different livelihood strategies are affected by different asset-based factors between the two counties.

Hence, the development stakeholders should enhance poor rural household's sustainable livelihood ability, and attempt to suit the needs of different livelihood groups to help them participate in income generating activities in different ways.

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