Guan, Ming

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Income diversification of Chinese rural households after they rent out land

Ming Guan[1*]

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*Corresponding author: Ming Guan, School of Business, Family Issues Center, Xuchang University, Road Bayi 88, Xuchang, China
E-mail: gming0604@163.com

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Abstract: Economic reforms in China have created opportunities for rural households pursue different types of livelihood strategies to source income from a combination of income-earning activities. A number of rural households rent out their land and choose income diversification strategies. It is speculated that these strategies might be closely interrelated, but proper statistical tests are lacking. Using China Family Panel Studies data, we identify influencing determinants of income diversification activities of Chinese rural households. This paper first examines the factors that determine the participation of farm households in one business activity, using three separate logit regressions. Seemingly unrelated bivariate probit regression (SURBP) is used to examine the factors that determine the participation of farm households in two income activities, and investigates whether the participation in them influences one another. This paper uses a multivariate probit model (MVP) to reflect the fact that in practice, Chinese rural households simultaneously consider the use of various business activities. Using data from a large-scale household survey, results from bivariate probit regression suggest that business activities are influenced one another insignificantly. The results from MVP indicate that simultaneous business activities take poor effect. Finally, some feasible policies are suggested.

Subjects: Rural Development; Business, Management and Accounting; Industry & Industrial Studies

Keywords: Chinese rural households; business activities; logit regression; seemingly unrelated bivariate probit regression; multivariate probit regression; income diversification

Ming Guan

ABOUT THE AUTHOR

Ming Guan is a lecturer at the School of Business, as well as the director of Family Issues Center, Xuchang University. His main research interest is migration, agricultural issues, housing issues, and health issues. He creates a research institute at Xuchang University. He has launched an international journal titled Migration and Residential Mobility with Inderscience publisher. His teaching interests focus on Management, Management Information System, Enterprise Strategic Management, and Organizational Behavioral Science. He mentors about 200 undergraduates to publish academic and policy papers.

PUBLIC INTEREST STATEMENT

This paper presents an empirical analysis of the impacts of residential conditions and life environment on the livelihood strategies among Chinese rural households. Income diversification is always used to increase income by Chinese rural households. Due to low return from land, many rural households in China rent out land and are engaged in other economic activities. This study explores the number of combining activities a household could operate at the same time. Especially, the influencing determinants of income diversification activities of Chinese rural households are identified and assessed. Simultaneous equation models are constructed to compare one income activity, two income activities, and three income activities to reflect performance of simultaneous business activities.

1. Introduction

Since 1978, nonfarm employment opportunities have affected the structure of rural household incomes in China. This economic phenomenon is driven by structural upgrading of tertiary industry and accompany with abandoning crop production and carrying out multiple livelihoods. Results reported about determinants of income diversification are few in academic circles. Current studies reflect important roles of household characteristics, locational characteristics, and indoor facilities. For example, a study in rural Ghana indicate that household characteristics, location, and infrastructure all play a role in explaining the adoption of income strategies by households (Senadza, 2014). But, the similar study has not reported in China.

Currently, many households in rural China have diversified income portfolios. They do not earn income solely from farm sources but rather at least one off-farm activity. This is because income maximization is important for rural households to cope with rising prices. The diversification of livelihood strategies in China experience different stages. Wang, Zhang, and Liu (2010) summarize diverse limiting factors behind the diversification process of livelihood strategies. Before 1978, "planned economy," "production team organization," strict "household registration system," and the scarcity of livelihood assets were the main factors restricting the diversification of livelihood strategies. From 1978 to 1993, the reform and open policy provided opportunities for local people to diversify their livelihood strategies, but livelihood strategies based on crop production still took an important role in their life. From 2000 to 2007, national policies brought assistance to help local farmers diversify their agricultural activities.

Since land tenure reform, rural households in China autonomously and independently can make their own choices to rent out land or go to live diversification. Land rental market development and off-farm employment have important implications for agricultural production in rural China. Zhan, Wu, Zhang, and Zhou (2012) suggest that China's grain production benefit from the economies of scale. But, most farms with a little scale of grain production and earning lower income from grain. Zhang, Li, and Song (2014) find that geographical and locational characteristics influence land abandonment greatly. Similarly, scenario in rural Ethiopia reports among the farmers who lease out land, those who live in the highland areas, where land is scarce and unequal, are more likely to engage in informal rental land markets (Teklu & Lemi, 2004). On the one hand, the emergence of off-farm employment has significant and positive impacts on stimulating household to rent out cultivated land (Huang, Gao, & Rozelle, 2012). On the other hand, concerning the technical efficiency in rice production, Feng (2008) showed that households that rented land achieved higher technical efficiency than households that did not rent land. Recent evidence indicates that rapid economic growth in rural China has been attributed to growth of the rural nonagricultural sector.

Here, four reasons are summarized for Chinese rural households rent out land and carry out nonfarm activities. First, farm-level diversification, especially involving nonfarm employment, brings a monetary premium to low-income rural families and an income discount to high-income rural households in China (Zhao & Barry, 2014). The second factor is the declining number of farms engaged in grain production in China in recent years. Zhan et al. (2012) identify the key factors that influence a farm to quit from, or stay in, grain production, including family size, the share of farming labor out of total family labor, arable land per capita, the proportion of land used for grain production, the share of family income from grains. It is also found that the level of grain prices and the sunk cost in farming, chiefly in grain production, also affect the likelihood that a household will stay or exit from grain production. Further, farmers in more economically developed regions are more likely to quit from grain production. Thirdly, following the sequence of radical rural reforms commencing in 1978, many peasant households in China have been actively diversifying away from time-honored grain production. Xia and Simmons (2004) provide robust evidence that households that move from grain enhance significantly several indicators of their economic well-being. While, Huang, Wang, and Rozelle (2013) show that China's agricultural subsidy programs issued in 2004 play a limited part in income growth of Chinese rural households. Finally, the rural households in China are rationally economic man. For example, as to the Grain for Green program, a most

ambitious forestry projects in China, Guo, Li, Hou, Lu, and Nan (2014) indicate that the economic benefit and non-monetary values stimulate households' willingness to participate, and households' attitudes have significant effects on their willingness.

A prior study confirmed that there was a negative relationship between land renting and migration in rural China (Feng & Heerink, 2008). If household characteristics, locational characteristics, indoor facilities, and geographical characteristics were used as explanatory variables, it is an interesting matter to explore whether income diversification might be closely interrelated. In truth, although rural households pursue different types of livelihood strategies, some households are able to source income from a combination of income-earning activities.

Clearly, the prior studies suggest that there are a number of factors that affect farmers' operation of a combination of income earning activities. However, studies that specifically examine why farmers take income diversification activities, such as business activities in individual and private economic sector, are scarce. This present study contributes to our understanding as to why Chinese rural households take income diversification activities after they rent out land.

The rest of the paper proceeds as follows. Section 2 discusses the methodological issues of income diversification, including the data, main variables, the pattern of income diversification, and statistical methods. Section 3 outlines the econometric estimation method and presents the empirical findings. Section 4 summarizes the findings and concludes with policy implications.

2. Material and methods

2.1. Hypothesis

A hypothesis in this study is that household characteristics, locational characteristics, indoor facilities, and geographical characteristics may influence the farmers' decision to adopt unique income strategy and income diversification strategies.

2.2. Data

The data are adopted from China Family Panel Studies (CFPS). The CFPS is a nationally representative, annual longitudinal survey of Chinese communities, families, and individuals launched in 2010 by the Institute of Social Science Survey of Peking University, China. The CFPS is designed to cover family-level cross sectional data which reflect the economic activities of rural households. Based on interviewees above 16 years old and households renting out land, the 862 targeted rural households were left from the CFPS data-set.

The surveyed provinces consist of Tianjin, Hebei, Shanxi, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shangdong, Henan, Hubei, Hunan, Guangdong, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shanxi, and Gansu. Geographical characteristics of the villages surveyed includes hilly and mountain area (30.16%), high mountain (8.82%), continental plateau (3.60%), plain (54.64%), grasslands (0.46%), fishing village (1.39%), and others (0.93%). In the case of house type, they live in flat apartment (1.16%), single-story house (52.55%), quadrangle (3.48), townhouses (0.12%), small building (28.31%), and others (14.39%). Among the total sample, most families use well water/spring water (52.09%) and tap water (46.17%) to take cook. Most households use firewood (37.70%), coal gas, liquefied gas, natural gas (30.16%), and electricity (24.13%) as cook fuels. Regarding rubbish dumping, 28.07% households dump rubbish into public trash can, 29.70% households dump rubbish into neighboring brook, 14.73% households dump rubbish into house surrounding, 10.56% households dump rubbish into soil pit, 5.22% households dump rubbish into everywhere, 8.12% households enjoy the mode collected by designated workers.

2.3. Main variables

Dependent variables for the model are income strategies that take on a value of one if a representative rural household opts to adopt, and zero if otherwise. Household characteristics, locational

Table 1. Variable definition and sample means

Variable	Description	Mean	Standard deviation
	Dependent variables		
Renting out house	1 if rent out house, 0 otherwise	0.043	0.203
Engaging in private sector	1 if engage in individual and private economic sector, 0 = otherwise	0.124	0.330
Lending out money	1 if lend out money to other, 0 otherwise	0.171	0.376
	Independent variables		
	Household characteristics		
Familysize	Population number in family	3.683	1.855
Livearea	Housing construction area (m^2)	64.409	175.684
Total_asset	Family net property (yuan)	282,779.5	834,129.1
	Locational characteristics		
Distancebus	Distance from family to bus stop (meter)	1,147.09	1,508.472
Timebus	Time waiting for bus (minutes)	27.156	23.152
Distanceschool	Distance to high school (meter)	15,670.65	19,147.67
Timecbd	Time to nearest CBD (minutes)	26.683	23.994
	Indoor facilities		
Firewood	1 if household use firewood, 0 otherwise	0.377	0.485
Rubbishdump	1 if dump rubbish everywhere, 0 otherwise	0.052	0.223
	Geographical characteristics		
Hily	1 if live on the hilly and mountain area, 0 otherwise	0.302	0.459
Mountain	1 if live on the high mountain, 0 otherwise	0.088	0.284
Plateau	1 if live on the continental plateau, 0 otherwise	0.036	0.186

characteristics, indoor facilities, and geographical characteristics are independent variables presented in Table 1.

2.4. Income portfolios

As noted earlier, a representative rural household typically pursues a variety of income strategies. The pursuit of these strategies leads to various income portfolios for the household. Using the three labor income sources, namely renting out house, engaging in individual and private economic sector, and lending out money to other persons, seven distinct mutually exclusive and exhaustive income strategies (portfolios) are generated as follows:

(1) S1: renting out house only;
(2) S2: engaging in individual and private economic sector only;
(3) S3: lending out money to other persons only;
(4) S4: renting out house and engaging in individual and private economic sector only;
(5) S5: renting out house and lending out money to other persons only;
(6) S6: lending out money to other persons, and engaging in individual & private economic sector only;
(7) S7: renting out house, engaging in individual and private economic sector, and lending out money to other persons.

Hence, individual effect of one income strategy and simultaneous effects of multiple income strategies can be assessed.

2.5. Statistical methods

A representative rural household gives up "digging" soil, he can choose one, two, and three types of income strategies. The dependent variable is the possibility of the farmer adopting a specialized income strategy, which is the dummy variable. Thus, logit model is used to identify factors associated with the representative rural household's decision of one specific strategy. When representative rural household adopt two concurrent industries, seemingly unrelated bivariate probit regression (SURBP) will be used to examine whether the dependent variables are inter-correlated. When representative rural household adopt three industries simultaneously, MVP will be used to examine factors and relationship between the dependent variables.

For the binary dependent variable of two or three simultaneous choices, we used the Stata program "biprobit" or "mvprobit" to estimate MVP model. The program "biprobit" or "mvprobit," discussed by Cappellari and Jenkins (2003), runs in the statistical package Stata and estimates MVP by simulated maximum likelihood. Here, renting out house, engaging in private sector, and/or lending out money are jointly estimated.

The correlation coefficient rho can be explained as a correlation between the unobservable explanatory variables of the different equations in the bivariate and multivariate probit model (MVP). When *rho* is zero, it means that the outcome variable in the first equation is uncorrelated with the error term of the second equation of the model. However, if *rho* is not zero, the outcome variable and error term of the other equation is correlated and therefore endogenous. In the absence of endogeneity we can run a univariate model and expect unbiased and consistent results.

Because Stata statistical software has user developed modules that can deal with the complexity of MVP. The models were estimated by using the procedures in Stata.

3. Results

3.1. Estimated logit regression results

Table 2 illustrates the estimated results of separate three logit regression models for decision to choose unique income strategy. The estimated results of models confirm the hypothesis that household characteristics, locational characteristics, indoor facilities, and geographical characteristics are significantly determinant factors that have influenced on decision to choose unique income strategy.

In the current study, the models' overall explanatory powers are good with a pseudo-R^2 are bigger than zero. Considering renting out house, coefficient of *Distancebus* and *Distanceschool* are found to be small and negative, while coefficient of *livearea* is found to be significantly small and positive. In terms of engaging in private sector, coefficients of *TimeCBD* and firewood are found to be negative, while coefficient of *hily* is found to be significantly positive. In the lending out money column, coefficient of plateau is found to be significantly positive.

Most of the coefficients are not statistically significant at 1% levels (shown in Table 2). The coefficient of the government subsidy policy positively influences the farmer's decision to adopt the co-cultivation agriculture technique at 5% level. This indicates that an increase in government support has a significant impact on the probability of the farmer's adoption of the multi-cropping practice. The effect of farmer education level in his/her decision-making process is significant at 1% level. The farmer who has an elementary school degree (or higher) is more likely to adopt the new practice (at 5% level).

The household debt payment responsibility is positive and significant at 10% level on the probability of employing co-cultivation practice. This relationship indicates the advantage of the multi-cropping system to the farmer. Those farmers who have carried debt for the past three years have higher probability to adopt the mixed cropping practice. On the other hand, the effect of variations in technical assistance and scientific information provided by the local agricultural extension services and outreach on the probability of adopting mixed cropping practice is negatively significant at 1% level.

Table 2. Logit regression results of business activities of Chinese rural households (robust)

	Renting out house	Engaging in private sector	Lending out money
Familysize	−0.177 (0.135)	0.022 (0.078)	0.114* (0.061)
Livearea	0.002** (0.001)	−0.000 (0.001)	0.001 (0.001)
Total_asset	0.000*** (0.000)	0.000*** (0.000)	0.000** (0.000)
Distancebus	−0.001** (0.000)	−0.000 (0.000)	0.000 (0.000)
Timebus	−0.010 (0.010)	−0.011 (0.007)	−0.007 (0.006)
Distanceschool	−0.000** (0.000)	0.000 (0.000)	0.000 (0.000)
TimeCBD	−0.021 (0.017)	−0.020* (0.011)	−0.006 (0.006)
Firewood	−0.272 (0.510)	−0.932** (0.371)	−0.334 (0.275)
Rubbishdump		1.082 (0.690)	−2.587 (1.849)
Hily	0.527 (0.510)	0.728** (0.336)	−0.202 (0.305)
Mountain	1.358 (0.849)	−1.077 (1.066)	0.538 (0.471)
Plateau	−0.003 (1.083)	0.929 (0.625)	0.935* (0.532)
_cons	−1.105 (0.744)	−1.594*** (0.480)	−1.856*** (0.370)
Log likelihood	−94.976	−177.701	−241.266
Pseudo R^2	0.1745	0.1642	0.0540
Number of obs.	526	544	544

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

3.2. The interrelationship between two cases

Given that the three mutually exclusive and exhaustive business activities modeled above have no natural ordering, SURBP regression for three combinations is employed in analyzing households' choice of income portfolios. Here, the interrelationship between lending out money and engaging in private sector first is analyzed and presented in Table 3.

Table 3. Determinants of lending out money and engaging in private sector

	Lending out money	Engaging in private sector
Familysize	0.070** (0.035)	0.014 (0.042)
Livearea	0.000 (0.000)	−0.000 (0.001)
Total_asset	0.000** (0.000)	0.000*** (0.000)
Distancebus	0.000 (0.000)	−0.000 (0.000)
Timebus	−0.003 (0.003)	−0.006 (0.004)
Distanceschool	0.000 (0.000)	0.000 (0.000)
TimeCBD	−0.003 (0.003)	−0.009* (0.005)
Firewood	−0.190 (0.151)	−0.471** (0.188)
Rubbishdump	−1.432 (0.996)	0.531 (0.385)
Hily	−0.085 (0.167)	0.434** (0.184)
Mountain	0.314 (0.274)	−0.542 (0.502)
Plateau	0.539* (0.322)	0.499 (0.353)
_cons	−1.154*** (0.211)	−1.009*** (0.256)
Rho	0.166 (0.107)	
Log likelihood		
Number of obs	544	

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

After taking out the effects of the explanatory variables, the correlation coefficient between the error terms of the two equations was 0.166, which is statistically insignificant ($p > 0.1$). This finding implies that there is a positive relationship between lending out money and engaging in private sector decisions. So, if the household is more likely to lend out money, then the probability of engaging in private sector is higher and vice versa.

See Table 4, in the case of interrelationship between renting out house and engaging in private sector, the correlation coefficient between the error terms of the two equations was −0.0418, which is statistically insignificant ($p > 0.1$). This finding implies that there is a negative relationship between renting out house and engaging in private sector decisions. So, if the household is more likely to rent out house, then the probability of engaging in private sector is lower and vice versa.

See Table 5, regarding interrelationship between renting out house and lending out money, the correlation coefficient between the error terms of the two equations is 0.131, which is statistically insignificant ($p > 0.1$). This finding implies that there is a positive relationship between renting out house and lending out money decisions. So, if the household is more likely to rent out land, then the probability of lending out money is higher and vice versa.

3.3. The interrelationship among renting out house, lending out money, and engaging in private sector

An MVP model is estimated to take into account the fact that Chinese rural households simultaneously consider many alternative business activities when they attempt to drop out agricultural production. The MVP model used in this study consists of three binary choice equations. These choices are for the business strategies used by Chinese rural households operating in three industries, namely: renting out house, engaging in individual and private economic sectors, and lending out money to other. The empirical results obtained from the MVP model estimation are summarized in Table 6.

According to estimated results of MVP models, the three estimated bivaraite correlation coefficients of among the residuals of renting out house, lending out money, and engaging in private sector are all insignificant. These results indicate that Chinese rural households make decision whether

Table 4. Determinants of renting out house and engaging in private sector

	Renting out house	Engaging in private sector
Familysize	−0.088 (0.063)	0.013 (0.042)
Livearea	0.001 (0.001)*	−0.000 (0.001)
Total_asset	0.000*** (0.000)	0.000*** (0.000)
Distancebus	−0.000*** (0.000)	−0.000 (0.000)
Timebus	−0.006 (0.005)	−0.006 (0.003)
Distanceschool	−0.000** (0.000)	0.000 (0.000)
TimeCBD	−0.011 (0.009)	−0.009* (0.005)
Firewood	−0.163 (0.251)	−0.472** (0.188)
Rubbishdump	−6.124 (957.716)	0.527 (0.385)
Hily	0.291 (0.257)	0.425** (0.184)
Mountain	0.707 (0.445)	−0.520 (0.496)
Plateau	−0.038 (0.549)	0.514 (0.351)
Intercept	−0.745 (0.369)**	−1.007 (0.255) ***
Rho	−0.0418 (0.153)	
Log likelihood	−271.632	
Number of obs.	544	

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

Table 5. Determinants of renting out house and lending out money

	Renting out house	Lending out money
Familysize	−0.086 (0.063)	0.069* (0.035)
Livearea	0.001* (0.001)	0.000 (0.000)
Total_asset	0.000*** (0.000)	0.000** (0.000)
Distancebus	−0.000** (0.000)	0.000 (0.000)
Timebus	−0.006 (0.005)	−0.003 (0.003)
Distanceschool	−0.000** (0.000)	0.000 (0.000)
TimeCBD	−0.011 (0.009)	−0.003 (0.003)
Firewood	−0.165 (0.251)	−0.191 (0.151)
Rubbishdump	−6.589 (2,530.135)	−1.424 (0.996)
Hily	0.295 (0.258)	−0.092 (0.168)
Mountain	0.693 (0.444)	0.316 (0.273)
Plateau	−0.036 (0.540)	0.546* (0.322)
Intercept	−0.753** (0.366)	−1.148*** (0.210)
Rho	0.131 (0.139)	
Log likelihood	−335.019	
Number of obs.	544	

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

Table 6. Determinants of renting out house, lending out money, and engaging in private sector

	Renting out house	Engaging in private sector	Lending out money
Familysize	−0.086 (0.063)	0.069* (0.035)	0.014 (0.042)
Livearea	0.001* (0.001)	0.001 (0.000)	−0.000 (0.001)
Total_asset	0.000*** (0.000)	0.000** (0.000)	0.000*** (0.000)
Distancebus	−0.000*** (0.000)	0.000 (0.000)	−0.000 (0.000)
Timebus	−0.006 (0.005)	−0.004 (0.003)	−0.006 (0.004)
Distanceschool	−0.000** (0.000)	0.000 (0.000)	0.000 (0.000)
TimeCBD	−0.011 (0.009)	−0.003 (0.003)	−0.009* (0.005)
Firewood	−0.166 (0.251)	−0.184 (0.151)	−0.471** (0.188)
Rubbishdump	−5.207 (99.377)	−1.454 (1.019)	0.530 (0.385)
Hily	0.292 (0.257)	−0.095 (0.168)	0.431** (0.184)
Mountain	0.707 (0.444)	0.318 (0.273)	−0.527 (0.499)
Plateau	−0.034 (0.545)	0.541* (0.322)	0.507 (0.353)
Intercept	−0.756** (0.368)	−1.143*** (0.211)	−1.004*** (0.256)
Rho			
Rho21	0.013 (0.116)		
Rho32		0.126 (0.097)	
Rho31			0.044 (0.103)
Log likelihood	−511.73984		
Number of obs.	544		

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

to be renting out house, lending out money, and engaging in private sector nonsimultaneously. After taking out the effects of the explanatory variables, the correlation coefficients between the error terms of the three equations were more than 0, which is statistically insignificant ($p > 0.1$). This finding implies that there are positive relationships among renting out house, engaging in individual and private economic sector and lending out money to other persons. So, if the household is more likely to operate one income strategy, then the probabilities of the other two are higher and *vice versa.*

The regression results indicate that household size and plateau had a positive impact on lending out money. Since the correlation coefficient between the different equations and error terms of the MVP model, rho, is not equal to 0 in the models above. It confirms that SURBP regression and MVP model are adopted correctly.

Interestingly, from Tables 2–6, coefficients of *total_asset* are 0.000 significantly. It is indicated that it may be a psychological reflect that the assets owned by Chinese rural households had a significant effect on income diversification strategies. But, zero coefficient values take no actual effects.

The estimated results confirm the hypothesis that household characteristics, locational characteristics, indoor facilities, and geographical characteristics are significantly determinant factors that have influenced on decision to choose unique income strategy.

4. Discussions

As a populous country with classic dual economy, market mechanism and urbanization in current China produce low income from crop production and high income non-agricultural income. From this point, China' setting, as a developing country, can be an example for the other countries. Moreover, income diversification of Chinese rural households can presents practical experiences for households in the countries at the stage of initial urbanization.

Basically, the hypothesis can be accepted. The findings here suggest that Chinese rural households located in plateau are more likely to lending out money in the case of one choice and two combinations, while among three combinations they are more likely to engage in private sector. This study also suggests that combinations of income diversification are strongly associated with each other but not significant. A possible explanation is that the business chose by Chinese rural households exhausts different resources of rural households. Only engaging in private sector needs labors and time investment. The lending out money and renting out house need welfare and housing, respectively.

The results are in line with prior studies. Démurger, Fournier, and Yang (2010) find households' asset positions are found to strongly affect participation in off-farm activities. Yuan and Xu (2015) that poorer households have lower probability of entering the informal credit market in rural China. The rural household fuels consumption is determined by income, resource availability, household size, and coal prices (Kaul & Liu, 1992). Zhou, Wu, Wang, Chen, and Wang (2009) indicate that traditional biomass energy use decreased greatly but still accounted for a significant proportion of all energy sources in Chinese rural households. This study is in line with an early study conducted in Henan Province, which concludes that the agricultural resources (such as per capita arable land) significantly affect rural household income with the relatively lower income level, while the geographical location shows a more significant impact on rural household income with the relatively high-income level (Li & Fan, 2010). But, this study is inconsistent with another study used data-set obtained from the Survey Department of the Research Center on the Rural Economy, Ministry of Agriculture covered more than 23 provinces from 2003 through 2006, which find income growth depends on in the households' demographic composition in rural China (Sun, Wang, & Bai, 2014).

This study enlightens us into further thought. Land remains a central and non-substitutable resource for peasant families (Ploeg, Ye, & Pan, 2014). From 2008 to 2012 in rural China, the lease rate of farmlands is growing, while the lease size is shrinking. The increasing space of the farmland lease rate is shrinking in the areas with high farmland lease rate. However, the current increasing rate of

farmland lease is still lower than that of the land deserting. This calls for a further management of farmland transfer (Bai, 2015).

Simultaneously, life upgrade of Chinese rural households is a topic of fast-moving target, with changing faces and variety. The fruit of China's frequently agricultural policies so far also enable some proportion of the Chinese rural households to adopt livelihood diversification. The overcoming of the obstacles to diversification away from farming is important for rural development in China (Knight & Song, 2003). Wang et al. (2010) indicate the insufficient and incomplete credit and insurance market and lack of skill are the main factors constraining non-farm activity diversification. Moreover, the reallocations of household labor undertaken by households are shaped by local economic structures (Chen & Korinek, 2010). Institutional environment plays an important role in livelihood diversification of Chinese rural households. I agree with Lin and Si (2014) who indicates that the government can enhance the entrepreneurial intention of rural individuals by updating entrepreneurial policies. Another result from a scientific study can deeply explained the fact. Considering the effect of nonagricultural income on increased inequality both within and across regions, households whose members are self-employed differ systematically from households whose members are wage-earners (Hare, 1994).

This study contributes to the literature in three fundamental aspects. Firstly, while the literature has been focused on the role of locational characteristics, this study tests the hypothesis regarding the link between land use and income diversification at the rural household level. Secondly, the hypothesis on the relationships between income strategy and household characteristics, locational characteristics, indoor facilities, and geographical characteristics are confirmed. Thirdly, the analysis is the first one to provide empirical evidence on the connection between income diversity and indoor facilities in China, where empirical studies on the role of geographical characteristics are non-existent. Finally, the coping strategies are very fundamental and significant for local governments. The growing share of non-agricultural industries in the output of Chinese rural households requires measures to encourage a higher level of land lease. Evidence from this study suggests that household resource, indoor facilities, locational and geographical resources may be the most important factors to achieve livelihood diversification, while at the same time ensuring multiple income sources. Income diversification of Chinese rural households after they rent out land requires functioning factor markets, which implies elimination of all restrictions on transferability of household resource, indoor facilities, locational and geographical resource.

These findings confirm the results of earlier studies. Since the rural economic reform, farmers have gained freedom to engage in non-agricultural activities inside or outside their place of residence, leading to a considerable increase in the variety of income sources for peasant households (Zhu, 1991). Moreover, the results here indirectly confirm the causes of income inequality of rural residents in China. At the very beginning of this century in China rural areas, the wage from local employment, the income from agricultural household business and the incomes from non-agricultural household business are the three income components that made the largest contributions to the inequality of the total per capita income (Zhou, 2009).

Based on the prior results, livelihood diversification method should not be popularized and spread by local and central government. Some early literature reported negative facts. Different from planting households, livelihood diversification does not improve welfare for pastoral households (Liao, Barrett, & Kassam, 2015). Income diversification activities of forestry farmers are limited because of a higher opportunity cost in harvesting forests (Duan, He, & Wen, 2016). Although the results in the study present positive facets of income diversification, the small coefficients of key variables suggest that the necessary policies are needed to assist the rural households. From the perspective of policy, external policy intervention has had heterogeneous effects on livelihood diversification across different rural income groups (Liu & Lan, 2015). Consequently, livelihood diversification should be targeted at specific population group.

5. Conclusions

The present study was undertaken to determine the effect of household characteristics, locational characteristics, indoor facilities, and geographical characteristics on income diversification of the Chinese rural households who rent out their land. The results of the logit regression, SURBP regression, MVP model highlight the positive role of the family net property. Remarkably, the life environment and conditions are influential factors to affect quality of income diversification.

On the basis of the results, local and central governments in China should create supporting policies for rural households, especially in the remote and hilly areas. Furthermore, livelihood diversification is fit for the specific rural population in the specific region and industries. The targeted fixed-point supporting policies should be strengthened based on the scientific investigations and assessments. In reality, precise business combination strategies depend on understanding market and ripe experiences of rural households. Efficaciously, local and central governmental policies should include failure tolerance, training knowledge of technology and business, and construction of orderly market environment.

The main limitation of the study pertains to the use of cross sectional survey data, which limits generalization of the findings to the broader population. Future research should use historical and regional micro-data to deepen the knowledge of feasibility of income diversification on a national scale.

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Author details
Ming Guan[1]
E-mail: gming0604@163.com
[1] School of Business, Family Issues Center, Xuchang University, Road Bayi 88, Xuchang, China.

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