Modern Management Based on Big Data IV
A.J. Tallón-Ballesteros (Ed.)
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doi:10.3233/FAIA230200

Influence of the Targeted Poverty Alleviation Policy on the Livelihood of Poor Farmers in Western China

Jin'e MA and Qingfeng HOU[1]
The school of Marxism of Gansu Agricultural University, Lanzhou730070, China

Abstract. This paper surveyed 589 farmer families from three different areas in Western China to analyze the influence of the targeted poverty alleviation policy on livelihoods of low-income families. We can conclude that the policy has led to an obvious increase in the total income of low-income families, as well as positive effects on those poor families who rely on agriculture and government subsidies. Yet the policy showed little impact on low-income families that rely on non-farm income. The program has also encouraged farm families to increase their various sources of capital stock. Hence, we suggest that the Chinese government institute policies that provide more balanced growth and support a more sustainable development path for the rural economy and society. This might involve increasing human capital, increasing rural employment, and promoting a more efficient allocation of rural resources.

Keywords. Targeted poverty alleviation, livelihood, influence

1. Introduction

The Chinese government has been focusing on the alleviation of poverty in fourteen extremely poor areas for a long time. Three of these areas are the Qinba Mountain Area, Liupan Mountain Area and Tibetan Area, which span many provinces in north-west China. Poverty is widespread in these areas and there are many economic challenges. Since the implementation of the targeted poverty alleviation policy in 2014, the life pattern of farmers and herdsmen in these areas has changed markedly. An important part of the program is the use of residence officers who live in the rural areas and research ways of improving livelihoods. They develop improvement plans that involve distribution of farm inputs, improvements in technology, and even distribution of clothing and food. As a result of these efforts, rural livelihoods have been improved. but it is not clear that these investments have generated sustainable increases in the economic status of poor farmers. This is a significant issue not only for researchers but also the Chinese government. The long-term, sustainable effects of these policies is vitally important to future poverty alleviation schemes.

Chinese scholars have documented and explained the poverty problem [1] (Zhou 2002); focused on specific anti-poverty policies and actions [2-5] (Hong 2003, Zhu 2004,

[1] Qingfeng Hou, the school of Marxism of Gansu Agricultural University, Lanzhou 730070, China; 373418622@qq.com.

Du 2005, Xiang 2013); researched ways to measure and construct the poverty index [6] (Lu 2007); and assessed the achievements of the poverty alleviation programs [7-11] (Wei et. al. 2017, La et. al. 2018, Ni et. al. 2018, Hu et. al. 2017, Zhang et. al. 2017). But research that analyzes the effect of targeted poverty alleviation interventions on the livelihood of low-income families over time and space remains relatively unexplored. This research examined 38 villages from the Qinba Mountain, Liupan Mountain, and Qinghai Tibetan Areas and acquired detailed farmer data from interviews in 2016 and 2017. We use the difference in difference (DID) model to analyze the economic changes between targeted and non-targeted families before and after the targeted poverty alleviation policy. The goal of this research is to make a valid assessment of the effects of the targeted poverty alleviation policy in these areas. The research will also explore sustainable development methods for low-income families to see whether China's overall development goals are being met.

2. Literature Review

Analyses of targeted poverty alleviation policies mainly focus on the objectives of the policy and an assessment system for measuring results. The World Bank (1996), United Nations (1997), Asian Development Bank, Organization for Economic Cooperation and Development, Overseas Development Agency, and German Technical Assistance Company have all made great efforts in assessing poverty policies. Based on Chinese national data, Yang (2011), Zhang and Wang (2013), Hu and Fan (2014), Bai and Li (2013), Wang (2015) explored and developed an effect assessment system for targeted poverty alleviation based on Chinese national data [12-16]. Bai and Li (2013), Wang (2015), Liu and Chen (2016), Qing et. al. (2010), Ma (2002) did similar work based on the regional data [15-18].

Santa Clara City，California，brought about the comprehensive performance model (CPM) of assessment for poverty alleviation in 1998. This model includes three aspects: defining the mission, establishing goals, developing performance measures [19] (DJ Bernstein,2000). Ravallion (2008) used the propensity score matching (PSM) method to assess poverty alleviation efforts of developing countries, which emphasized the importance of methods and data collection for these assessments [20]. Habibov (2009) used the data envelop analysis (DEA) method to measure the influence of poverty reduction projects on poverty incidence [21]. Park (2009) used the matching method and panel data to analyze the influence of public financial poverty alleviation projects on low income and rural families, and concluded that these projects had not increased the income of these very poor people [22].

The assessment systems for targeted poverty alleviation developed by the academic world are comprehensive but too complicated and it lacks systematic valuation. This paper uses the relatively comprehensive and systematic sustainable livelihood theory established by Chambers and Conway in the 1980s. The Department for International Development (DFID) developed the sustainable livelihood frame in 1990 and Scoones perfected this framework to be more organized and simplified. This research will bring together Chinese and international theory and assessment methods using the difference-in-difference (DID) model to provide a more accurate analysis of targeted poverty alleviation policies.

Among all the theories of livelihood, the sustainable livelihood framework designed by DFID is relatively comprehensive by dividing livelihood assets into five aspects

including nature, material, financial, human, and social capital. Natural capital means the land, water and biological resources that can be used to maintain human livelihoods, including renewable and non-renewable resources. Material capital means assets created through the productive progress of humans, including housing, infrastructure, means of production and equipment. Financial capital is the most convertible form of capital including cash, cash equivalents and credit capacity. Human capital is the knowledge, skills, labor capacity and physical condition that people reach through various investments and strategies. Social capital is the process system that is formed through social networks. Poverty and vulnerability are created by imbalances within the five livelihood capitals. Therefore, by internal development and external intervention, the livelihood capital structure of farmers can be perfected so that sustainable development is attained by disadvantaged groups.

Key findings from Chinese research on livelihood change is that internal and external factors must change to improve farmer well-being. Li, Li and Zuo (2004) formulated the livelihood paths of farmers and point out that there are many ways for improvement – expanding agricultural operations to utilize available family labor, exiting farming and moving out of the community, cooperating with other farms in concentrating agricultural production to attain scale, and diversifying their employment beyond agriculture. Qin and Mao (2009) agree that there are various ways to promote livelihood change for Chinese minorities [23]. Meng (2008) suggest that factors including ecology, technology, history and culture can influence the livelihood change of the Shui nationality [24]. Tian (2011) believes that the livelihood pattern of the Tu nationality changed based on the adaptation of local ecological environment to the social environment of Tibet and China [25]. Liu (2012) discovered that climate change had influenced the livelihood of farmers and herdsmen according to on-site research of stock farming and agricultural production in Erdos [26].

3. Data Sources, Research Technique and Variable Selection

3.1. Data Sources

Data used in this research come from surveys (taken in 2016 and 2020) of 589 farmers in Qinba Mountain Area and Liupan Mountain Area in Gansu Province and Qinghai Tibetan Area. The farmers were chosen randomly from a geographically stratified sample of the areas. The research area includes 6 counties and 29 villages. In the sample are 372 targeted families and 217 non-targeted families. We acquired the criteria for the targeted poverty alleviation program and basic information about the villagers from the data archives, but the data used in the analysis come from the questionnaires and in-depth interviews.

Qinba Mountain Area and Liupan Mountain Area encompass subtropical humid, subtropical semi-arid, subtropical monsoon and mainland monsoon climates. The mean annual precipitation is 358mm and the mean by villages varies between 335 and 450 mm. The sample villages are mainly in mountainous regions and hilly lands in remote locations. The climate in Qinghai Tibetan Area encompasses inland semi-arid and plateau continental climates. The average elevation of sample villages is over 2860m and the annual average temperature is 3.27℃, varying between -1.2℃ and 7.8℃. The mean annual precipitation is 358mm and the village average varies from 335mm to 450mm. The villagers in all three areas live in very dispersed areas and public infrastructure lags

other areas in China. Communications is limited between these villages and the outside world, and economical and social development lags. During the survey, we also interviewed village heads, model farmers and other village leaders to collect data that are hard to acquire from questionnaires, such as basic village and infrastructure conditions. Furthermore, we used these sources to cross validate the data collected from the surveys.

3.2. Sample Description

The data for the research come from the questionnaires collected from the 29 villages of this project. During the field research, the project team gave out 600 questionnaires to farmers and the number of valid questionnaires is 589, an effective rate of 98.17%. The questionnaires included information on whether it was a targeted poverty alleviation family, its location, and gender, age and education level of the family members. The statistics of the sample include: 372 targeted poverty alleviation families and 217 non-targeted poverty alleviation families. The age of interviewees was: 2.2% less than 29 years old; 11.2% aged between 30 and 39; 30.7% between 40 and 49; 27.7% aged between 50 and 59; and 28.1% aged 60 and over. For the education level: 16.5% of the interviewees had no elementary school diploma; 41.8% had an elementary school diploma; 31.3% had a junior high school diploma; and 10.2% had a senior high school or higher diploma. We also checked whether the data collected from the questionnaires had good intrinsic consistency. The result showed that the Cronbach's Alpha and the KMO value are all higher than 0.8, which means that the sample data have good intrinsic consistency.

3.3. Research Methods

This paper uses the difference in difference (DID) model to analyze the influence of the targeted poverty alleviation policy on farmer income. By comparing changes before and after the implementation of the policy for households covered by the policy and those not covered by the policy, the result of targeted poverty alleviation can be assessed. The basic idea is to divide the samples into two groups, the first group is the treatment group, which is influenced by the policy, while the second group is the control group, which is not affected by the policy. The DID estimator is the difference in change in certain factors, such as income, between the treatment group and the control group.

Let group A stand for the treatment group, and group B stand for the control group. The dummy variable, D, identifies the control group, so when D=1, it means the household participated in the poverty alleviation program, and when D=0, it means they did not participate. The dummy variable, T, identifies the time period, so when T=0, it is before the policy implementation, and when T=1, it is after the policy implementation. Thus, the regression equation for analyzing the influence of the targeted poverty alleviation policy is:

$$Y = \beta_0 + \beta_1 T + \beta_2 D + \beta_3 TD + \varepsilon \quad (1)$$

TD is the product of the two dummy variables and ε is the disturbance term, which is assumed to be randomly distributed with mean zero and constant variance. For farmers in the control group, when D=0, the model can be expressed as $Y = \beta_0 + \beta_1 T + \varepsilon$,

therefore, the income of farmers in the control group before and after the implementation of the policy can be expressed as:

$$Y = \begin{cases} \beta_0, if \quad T = 0 \\ \beta_0 + \beta_1, if \quad T = 1 \end{cases}$$

The average change of income for the control group from the targeted poverty alleviation policy is:

$$diff1 = (\beta_0 + \beta_1) - \beta_0 = \beta_1$$

For the treatment group, when D=1, the model can be expressed as $Y = \beta_0 + \beta_1 T + \beta_2 + \beta_3 T + \varepsilon$, therefore, the income of farmers in the treatment group before and after the implementation of the policy can be expressed as:

$$Y = \begin{cases} \beta_0 + \beta_2, & if \quad T = 0 \\ \beta_0 + \beta_1 + \beta_2 + \beta_3, & if \quad T = 1 \end{cases}$$

The average change of income for the treatment group from the targeted poverty alleviation policy is:

$$diff2 = (\beta_0 + \beta_1 + \beta_2 + \beta_3) - (\beta_0 + \beta_2) = \beta_1 + \beta_3$$

An important assumption of the DID model is that the without policy effect, the treatment group and control group should have the same average effect. Hence, the net effect of the targeted poverty alleviation policy on low income families can be shown as the TD parameter, β_3, the DID estimated value. It measures the effect after the implementation of the policy, also known as the net policy effect.

The fixed effect model is used in order to control for other factors during the process of empirical analysis:

$$Y_{it} = \beta_0 + \beta_1 T_t + \beta_2 D_i + \beta_3 T_t D_i + \beta_4 X_{it} + \varepsilon_{it} \qquad (2)$$

In the equation above, i stands for farmers and t stands for time. The income of farmer i in time t can be expressed by Y_{it}, the group dummy variable D_i was used to measure whether the farmers joined the policy. When D_i=1, it means that farmers participated in the policy, when D_i=0, it means the farmer did not. The time dummy variable T_t stands for the period before or after the implementation of the policy. When $T_t = 1$, it means after the policy and when $T_t = 0$, it means before the policy. The $T_t D_i$ coefficient is the DID estimate of the policy's effect on farmer income. X_{it} is a set of control variables that influences income change.

3.4. Variable Selection

Dependent variable. The main object of the research is to explain farmers livelihood. The livelihood of farmers in the study area come from agricultural livelihood, non-agricultural livelihood, and government-supported livelihood that relies on subsidies. Total family income of farmers was used to measure the alleviation effect; agricultural income was used to measure agricultural livelihood; non-farm income was used to

measure non-agricultural livelihood; and policy income was used to measure government-supported livelihood.

Control variables. Livelihood theory suggests that the main factors that affect farmer livelihood assets, which includes natural, material, financial, human, and social capital. Measures of natural capital include per capita family land area, the condition of the trees and grassland, and the subjective condition of the natural environment. Material capital includes value of fixed assets, the living space, and housing structure. Human capital includes the household's labor force, education level, and health condition. Social capital includes the neighborhood's subjective condition, farmers' participation in the village committee, and the infrastructure's condition. Definitions for all the explained and control variables are given in Table 1.

Table 1. Definition of major variables in DID model.

Name	Measure	Explanation
Explained Variables	Effect of targeted poverty alleviation policy (Y)	Total family income
	Agricultural livelihood (Y1)	Agricultural income
	Non-agricultural livelihood (Y2)	Non-farm income
	Government-supported livelihood (Y3)	Subsidy income
Explaining variable	Treated	Experimental group =1, control group=0
	Time	Before experiment=0, after experiment=1
Control variables	Family arable land per capita (X1)	Agricultural acreage/family population
	Condition of trees and grasslands (X2)	More=0.9, no change=0.6, less=0.3
	Condition of natural environment (X3)	Excellent=1, better=0.75, general=0.5, poor=0.25
	Family fixed assets value (X4)	Observed value
	Living space (X5)	Observed value
	Housing structure (X6)	Brick-concrete=1, post and panel=0.75, civil structure=0.5, makeshift house=0.25
	Family cash holdings (X7)	Observed value
	Farmers debt and credit availability (X8)	Have ability=0.9, hard=0.6, no ability=0.3
	Total family labor force (X9)	Observed value
	Householder education level (X10)	University=4, senior high=3, junior high=2, elementary=1, no school=0
	Health condition (X11)	Good=1, chronic=0.75, other=0.5, disabled=0.25
	Neighborhood condition (X12)	Good=0.9, common=0.6, bad=0.3
	Participation in village committees (X13)	Often=1, occasionally=0.75, seldom=0.5, never=0.25
	Infrastructure condition (X14)	better=1, no change=0

3.5. Descriptive Analysis of Variables

Table 2 provides the survey results by province, Qinghai and Gansu. The income figures show that there is a great difference between the farmers surveyed in the two provinces. Total household income for the Qinghai respondents was 58,572.52 yuan before the poverty alleviation program and 78,534,54 yuan after the program (an 8.52% increase). Over 76.58% of the total household income for the Qinghai respondents was from agriculture. Total household income for the Gansu respondents was 26,536.62 yuan before the poverty alleviation program and 38,104.36 yuan after the program (a 10.9% increase). Over 87.48% of the income from these farmers comes from non-farm activities, their agricultural income did not increase as much as their total household income.

Total household income for total respondents was 41,257.32 before the poverty alleviation program and 50,532.2 after the program (a 5.63% increase). Over 53.48% of

the income from these farmers comes from non-farm activities. The income-earners in these households are mostly migrant workers, though they do have farm plots and herd livestock.

Table 2. Survey results by province.

area	period	Per capita disposable income (¥)	Household agricultural income (¥)	Household non-farm income (¥)	Family policy income (¥)	Total household income (¥)
Qinghai	Before experiment	15797.57	36346.67	13568.51	8815.32	58572.52
	After experiment	19888.00	44308.56	21567.98	12658.00	78534.54
Gansu	Before experiment	6508.00	4407.42	24979.23	1375.59	26536.62
	After experiment	9341.00	4785.18	31699.65	1619.54	38104.36
total	Before experiment	9993.73	16392.61	20697.37	4167.35	41257.32
	After experiment	13299.05	20582.10	24188.38	5761.71	50532.20

Table 3 shows summary statistics of the entire sample. Household income for the sampled farmers increased from 45,028.35 yuan to 64,608.55 yuan from 2016 to 2020. So, household incomes were 19,580.2 yuan higher, a 43.48% increase. Agricultural income increased from 15,808.7 yuan to 30,055.48 yuan; non-agricultural income increased from 25,521.4 yuan to 30,854.82 yuan; and policy income increased from 3698.25 yuan to 3698.25 yuan.

Table 3. Index and the descriptive statistics.

Variables Name	Measurement Index	Before the Policy		After the Policy	
		Mean Value	Standard Deviation	Mean Value	Standard Deviation
Explained Value (Y)	Total Family Income (Y)	41257.32	3327.25	50532.20	5356.95
	Agricultural Income (Y1)	16392.61	3200.4	20582.10	5366.29
	Non-agricultural Income (Y2)	20697.37	1255.07	24188.38	1259.6
	Policy Income (Y3)	4167.35	173.31	5761.71	173.31
Explaining variable (DID)	**Treated**	**Treated =260, Contral =300**			
	Time	**Before the Policy=2016, After the Policy=2020**			
Control Variables (X)	Family arable land per capita (X1)	24.25	60.32	19.74	70.31
	Condition of the of trees and grasslands (X2)	0.52	0.14	0.93	0.192
	Condition of natural environment (X3)	0.61	0.09	0.86	0.324
	Family fixed assets value (X4)	25312.59	41700.96	27810.84	52445.8
	Living space(X5)	79.54	38.06	100.56	42.34
	Housing structure(X6)	0.47	0.345	0.78	0.26
	Family cash holdings (X7)	22831.78	41456.7	26119.46	42558.29
	Farmers debt and available credit (X8)	0.44	0.14	0.75	0.26
	Total family labor force(X9)	3.03	1.44	3.04	1.44
	Householder education level(X10)	0.31	0.15	0.42	2.28
	Health condition(X11)	0.90	0.23	0.95	0.26
	Neighborhood condition(X12)	0.87	0.20	0.88	0.22
	Participation in village committees(X13)	0.57	0.11	0.86	0.23
	Infrastructure condition (X14)	0.35	0.12	0.99	0.08

The amount of farmers' livelihood capital also increased with the condition of the trees and grassland in natural capital increasing from 0.52 to 0.93, and the subjective condition of the natural environment increasing from 0.61 to 0.86. The per capita land area of households fell from 24.25 to 19.74, which is likely due to a government policy to move some cropland into forests, which would decrease land area for the household. The value of material capital increased from RMB 25,312.59 to RMB 278,10.84, and the housing area increased from 79.54 square meters to 100.56 square meters. The amount of household cash in financial capital increased from 22,831.78 yuan to 26,119.46 yuan, and the household borrowing ability increased from 0.44 to 0.75, indicating that the borrowing conditions for the farm households improved. The average educational level of household heads increased from 0.31 to 0.42, and the health status increased from 0.9 to 0.95. The neighborhood conditions changed little between the two years, but the condition of infrastructure and participation in village committee meetings changed significantly. These measures of social capital show a significant improvement over the two years.

4. Model Results and Analysis

4.1. Basic Estimation Result of DID

The DID model presented in equation (1) was fitted using the Stata15 quantitative analysis software. The estimate of the difference in difference is $ß_3$ in equation (1); the estimate of the average effect for the treatment group (targeted farmers) is $ß_2$ in equation (1); and the estimate of the average time effect is $ß_1$ in equation (1). The results of the estimation are shown in Table 4. The columns show the results for the four dependent variables, Y, Y1, Y2 and Y3.

Table 4. Results of the basic DID model.

	Y	Y1	Y2	Y3
DID	0.0142*	0.0134** (0.0092)	-0.0179 **(0.0086)	0.0314***(0.0112)
	(0.0167)			
Treated	0.0036	0.0034***(0.0013)	-0.0038	0.0051***(0.0016)
	(0.0028)		***(0.0016)	
T	0.0121	-0.0059***(0.0031)	0.0119	-0.0039
	(0.0108)		(0.0065)	(0.0042)
cons	-0.0051**(0.0018)	-0.0018***(0.0009)	0.0013	-0.0046***(0.0008)
			(0.0015)	

***, ** and * stands for $p<0.01$, $p<0.05$ and $p<0.1$, respectively. The numbers in parentheses are standard errors.

The DID estimate for the effect of the targeted poverty alleviation on total household income is 0.0142and the coefficient is significantly different from zero at the 10% level. This means that the average household receiving the targeted poverty assistance had 1.4% more income in 2020 than those households outside the program. Thus, the program was successful in increasing household incomes.

The poverty alleviation program increased agricultural income by 0.0134 and the coefficient is significantly different from zero at the 5% level. So, the average household receiving the targeted poverty assistance had 1.3% more income in 2020 than those households outside the program. This percentage is slightly lower than the overall increase in household income from the program.

The program reduced non-agricultural incomes by 0.0179 and the coefficient was significantly different from zero at the 5% level. Thus, targeted households on average reduced their non-farm income by a relatively large amount (1.8%). The biggest increase in income for targeted households was in the form of government subsidies. The coefficient for government subsidies was 0.0314 and the coefficient was significantly different from zero at the 1% level. So targeted households received 3.1% more subsides than households outside the program.

When comparing the targeted poor families with non-poor families, the targeted poverty alleviation policy has obvious positive effects on agricultural livelihood and government-supported livelihood of poor families. After participating, total family income, agricultural income and policy income of poor families increased faster than non-poor families. While the effect on non-agricultural income was obviously negative, which means that those participating in the policy likely reduced that work efforts off the farm relative to non-poverty families.

4.2. The Estimated Result When Bring in the Control Variables

The results of the DID model in equation (2) is shown in Table 5. The independent variables in the model are the family's arable land per capita (X1), condition of the trees and grasslands (X2), condition of the natural environment (X3), fixed assets value (X4), living space (X5), housing structure (X6), family cash holdings (X7), farmer debt and available credit (X8), family labor force (X9), householder education level (X10), family member health condition (X11), neighborhood condition (X12), participation in village committees (X13) and infrastructure condition (X14).

Table 5. Results of DID model with control variables.

	Y	**Y1**	**Y2**	**Y3**
DID	0.0385***(0.0113)	0.0184***(0.0049)	-0.0112**(0.0061)	0.0323***(0.0089)
Treated	0.0085***(0.0018)	0.0062***(0.0021)	-0.0021	0.0053***(0.0024)
			(0.0023)	
T	0.1342**(0.0631)	-0.0231	0.0119	0.1512**(0.0645)
		(0.0242)	(0.0213)	
X1	-0.0353	-0.0645**(0.0285)	-0.0889	0.1221*
	(0.0801)		(0.0621)	(0.0136)
X2	-0.0216*(0.0123)	0.01779*(0.0089)	-0.0007	-0.0368***(0.004)
			(0.0079)	
X3	0.0115	0.0046	0.0072	0.0015
	(0.0162)	(0.0082)	(0.0079)	(0.0169)
X4	0.0638	0.1023**(0.0554)	-0.1131*(0.0692)	0.0415
	(0.0698)			(0.0336)
X5	0.0341	-0.0376*(0.0213)	0.0741	-0.0028
	(0.0471)		(0.0499)	(0.0291)
X6	-0.1236***(0.0457)	-0.0204	-0.0671	-0.0371(0.02791)
		(0.0182)	(0.0546)	
X7	1.329***(0.2168)	0.7539***(0.1022)	0.3781*	0.2115***(0.0817)
			(0.2742)	
X8	0.0343	-0.0103	0.0271	0.0157
	(0.0384)	(0.0138)	(0.0252)	(0.0369)
X9	0.1295***(0.0506)	0.0654***(0.0236)	0.1382***(0.0321)	-0.0671
				(0.0412)
X10	-0.0721***(0.0216)	-0.0141	0.0251*	-0.0827***(0.0207)
		(0.0092)	(0.0153)	
X11	-0.1002**(0.0489)	-0.0016	0.0211**(0.0099)	-0.1259**(0.0551)
		(0.0121)		
X12	-0.0203	0.0007	-0.0128	-0.0092

	Y	Y1	Y2	Y3
	(0.0342)	(0.0182)	(0.0096)	(0.0328)
X13	0.0091	0.0032	0.0026	0.0041
	(0.0258)	(0.0082)	(0.0099)	(0.0282)
X14	0.0311**(0.0153)	0.0206	0.0031	0.0123
		(0.0172)	(0.0113)	(0.0135)
Cons	0.0249*	-0.0043	0.0009	0.0304* (0.0158)
	(0.0144)	(0.0045)	(0.0042)	
R- squared	0.4877	0.6011	0.1751	0.1601

***, ** and * stands for p<0.01, p<0.05 and p<0.1, respectively. The numbers in parentheses are standard errors.

The results for the estimation of model (2) shows that the estimated effect of the targeted poverty alleviation policy on total livelihood (Y), agricultural livelihood (Y1), non-agricultural livelihood (Y2), and government-supported livelihood (Y3) are identical in sign and similar in magnitude to the results without the control variables. The elasticities for total, agricultural, non-agricultural, and government-supported livelihood are 0.0385, 0.0184, -0.0112 and 0.0323, respectively. The coefficients are generally more significant with the control variables, where all of them are significant at the 5% level and three are significant at the 1% level. Again, when comparing poor families with non-poverty families, the targeted poverty alleviation policy has obvious positive effects on the total family income, agricultural income and policy income. The effect on non-agricultural income stays negative, so the policy reduces average non-agricultural income of poor families.

The results for the control variables show that higher family cash holdings, more family laborers and better infrastructure condition have a positive and significant influence on the household income. The housing structure, household head education level, and the family health condition have a negative and significant influence on household income.

Many of the control variables significantly influenced agricultural income. The condition of the trees and grasslands, fixed assets value, and family labor force number had positive and significant effects on agricultural livelihood. The family's per capita land holdings and the size of their living space had significant negative effects on agricultural income. Households with more natural capital, material capital and human capital have more income.

Family cash holdings, family labor force, education level of the household head and the family's health condition have positive and significant impacts on non-agricultural livelihood. The family's fixed assets were the only control factor which negatively influenced non-agricultural livelihood. Thus, financial and human capital have a major influence non-agricultural income of farmers.

The family's arable land per capita has a positive and significant effect on policy income while the household head's education level and the family's health condition have significant negative effects on policy income.

4.3. Robustness Test

In order to analyze the stability or robustness of the regression results, we replaced total family income with agricultural income and gradually increased the number of control variables to test the stability of the DID results. We began with natural capital controls (E), and progressively added material capital (M), financial capital (F), human capital

(H) and social capital (S). Table 6 shows that the DID regression results changed very little. This suggests that the regression results are stable.

Table 6. Robustness test of the model.

		Uncontrolled variable			Gradually introducing E, M, F, H and S		
DID		0.0128**	0.0129**	0.0168***	0.0177***	0.0191***	0.0179***
		(0.0056)	(0.0055)	(0.0054)	(0.0053)	(0.0053)	(0.0053)
E	X1		-0.0331**	-0.0476***	-0.0762***	-0.0721***	-0.0726***
			(0.0162)	(0.0178)	(0.0149)	(0.0159)	(0.0172)
	X2		0.0212***	0.0211***	0.0189***	0.0181***	0.0191***
			(0.0057)	(0.0057)	(0.0057)	(0.0057)	(0.0057)
	X3		0.0020	0.0028	0.0017	0.0013	0.0011
			(0.0071)	(0.0072)	(0.0071)	(0.8721)	(0.0071)
M	X4			0.1186***	0.1026***	0.1125***	0.1031***
				(0.0189)	(0.0189)	(0.0193)	(0.0194)
	X5			-0.0109	-0.0058	-0.0078	-0.0072
				(0.0125)	(0.0135)	(0.0124)	(0.0135)
	X6			-0.0462***	-0.0463***	-0.0462***	-.0462***
				(0.0123)	(0.0121)	(0.0113)	(0.0114)
F	X7				0.1398***	0.1415***	0.1408***
					(0.0222)	(0.0221)	(0.0221)
	X8				-0.0175*	-0.0155	-0.0152
					(0.0096)	(0.0096)	(0.0097)
H	X9					0.0454***	0.0453***
						(0.0159)	(0.0161)
	X10					-0.0073	-0.0072
						(0.0199)	(0.0199)
	X11					-0.0048	-0.0051
						(0.0131)	(0.0131)
S	X12						-0.0025
							(0.0112)
	X13						0.0061
							(0.0106)
	X14						0.0281
							(0.0631)

***, ** and * stands for $p<0.01$, $p<0.05$ and $p<0.1$, respectively. The numbers in parentheses are standard errors.

5. Conclusion and Advice

5.1. Conclusion

It is found by on-the-spot investigation that the poverty-stricken peasants' overall income has been increased dramatically due to the government's targeted poverty alleviation policy, especially those who rely heavily on agricultural production as their main way of living and benefit from government subsidies. But the income increase is not so obvious for those peasants whose way of living is not dependent on agricultural production. Therefore, the income of peasantry living in Zang (Tibetan area of Qinhai Province) has not increased as much as those living in Qinba and Liu Panshan Mountainous areas. As a result, the targeted poverty alleviation policy exerts a stronger impact on the peasants and herdsmen in Qinhai Tibetan District than peasantry living in Qinba and Liu Panshan Mountainous areas in Gansu Province.

Different livelihood assets have different influences on livelihood of poor peasantry. Because the time interval is relatively short before and after the assessment, the increase

in human capital is very low. However, the increase of human capital has a greater impact on the income of poor peasantry compared with off-farm livelihoods. Meanwhile, financial capital plays an important role in increasing income of peasants with agricultural livelihood than those with non-agricultural livelihood. Despite the great changes before and after assessment of material capital, natural capital and social capital, through regression analysis, found that they have little effect on increasing income of poor peasantry.

Through a comprehensive analysis, the research points out that the change of livelihood assets is dramatic since the implement of the targeted poverty alleviation policy on sample peasant households while the financial capital and material capital have been improved a lot. The natural capital and social capital obviously changed to a certain degree as well. The change of human capital is relatively stable due to the limitation of the time interval before and after the program. Because human capital plays a key role in increasing income of poverty-stricken peasantry, giving priority to improving the human capital of poor households and promoting balanced development of the five types of livelihood capital are major strategies for constructing sustainable livelihoods of poor peasantry. In this analysis of the targeted poverty alleviation policy on peasantry's livelihood, the conclusion is not final due to the following factors: firstly, the time interval for the panel data is relatively short; and secondly, small sample size, which is also the key point of future research.

5.2. Suggestion

It is suggested that improvements in rural human capital in poor areas is to be focused on equalization of public service. Secondly, in order to uproot poverty thoroughly and solve the problem of intergenerational transmission of poverty, the necessary material and fund support should be provided for those students from poverty-stricken families who enter cities to pursue better education as an escape from substandard basic education in poor areas. Thirdly, to add cultural activities to peasants' life during their slack farming season to improve peasants' cultural quality. Fourthly, strengthening training of laborers so that the members from poor families have more skills.

Furthermore, the following measures should also be taken. One, to accelerate rural land system reform by advancing market allocation of agriculture production factors, clarifying the ownership of the land, breaking the dependence between peasants and their land; guaranteeing the production elements can be circulated not only in the countryside but also between countries and cities. Putting the sparsely-distributed pieces of land together thus the natural capital of peasants engaging in planting will be increased.

The peasants' enthusiasm, creativity and internal growth momentum of the economy will be stimulated by encouraging peasants to participate in some activities such as public service. One of the most effective measures is to diversify peasants' cultural activities, improve their cohesion and excite their own power of developing. Besides, to solve the problems of peasants' relatively inactive participation in public affairs resulting from unbalanced allocation of resources, the widening gap over incomes year by year and the lack of the sense of identity among neighbors' and so on. To promote management level over democracy, solve rural social justice and equality. As a result, a stable social order and a harmonious life in the countryside can be achieved and social capital can also be promoted.

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