

**IMPACT OF SOCIOECONOMIC FACTORS AND
INCOME DIVERSIFICATION ON POVERTY IN
PUNJAB**



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MS (Rural Development)

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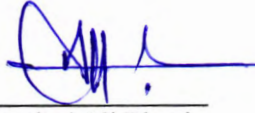
Impact of Socioeconomic Factors and Income Diversification on Poverty in Punjab

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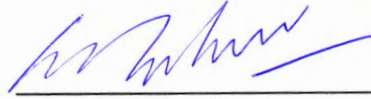
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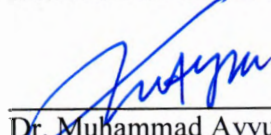
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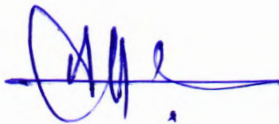


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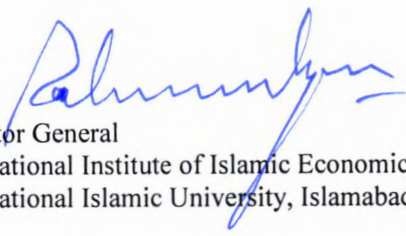
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Dedicated to my parents

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Chapter 1

Introduction

1.1 Background

The concept of multidimensional poverty can be gauged from Sen (1985) that lack of capabilities and fundamental needs for the human beings are the phenomenon which is to be redressed. This definition makes evident that poverty can be scrupulously measured by a number of factors of wellbeing. This seminal work further breaks the grounds for policy makers or researchers to have poverty incidences via suggesting two way progressions to measure the underlying prevalence of the poverty. This two way progression comprises identification and aggregation. Identification stage refers to make out the poor or to identify the poor, while second stage, aggregation addresses measurement of the poverty after having recognition of the factors, affecting poverty.

Conventionally, poverty has been seen through the means of unidirectional factors which embedded with monetary indicators such as income and expenditure approaches. Intuitional and logical reasoning is observed by the proponent of unidirectional money-metric approach that potential purchasing power leads households to enjoy wealthier and healthier life by dint of having higher income or efficient purchasing power (Townsend, 1970; World Bank, 2000; Laderchiet *al.*, 2003; Rao, 2006). The major negative aspect of this approach is a belief that market exists (for) or supports to all attributes. Nonetheless, market fails whenever some

attributes or public goods cannot be purchased owing to existence of imperfect markets. Income related approach fails to give surety of quality of life even a household is concentrating on above the specified poverty line. Second drawback of this money-metric approach is that a household may not be a poor according to income or consumption approach but it may be deprived of some basic necessities of life, with some members of his family (Thorbecke, 2005; Mariaraet *al.*, 2010).

Besides the money-metric approach or one-dimensional poverty, another approach which is non-money-metric poverty is proposed by Sen (1976, 1985). He focused on deprivation of the ends by comparing with deprivation of means. Therefore, this approach deals wellbeing with fixing consideration on the freedom of choice and achievements. The term basic capabilities are the paramount concern of this approach and it can be explained in terms of wellbeing of a human such as people should be capable of well fed and educated themselves, be healthier and decent to lead their life. They ought to be least concern to meet their basic provisions of life (Townsend, 1979; Mariaraet *al.*, 2010). Hence, inclusion of the least level of capabilities ought to be inevitable, while constructing poverty indices.

Sen (1985) proposed a second meaning of poverty through aggregating the information for the construction of indices to have multidimensional poverty incidences. This underlying process aims to aggregate the individual level information into single information for concerned households (Tsue, 2002; Bourguignon and Chakravarty, 2003).

Historically, addressing poverty has been paramount concern for the policy makers. In 70s, some good advancement in poverty reduction can be witnessed. Nevertheless, it (poverty) has

been reduced till end of 1980s, but it again reversed in 1990s and started increasing (Amjad and Kemal, 1997). This increase in poverty is concentrated more in rural areas than that of urban areas and it appeared as rural phenomenon (Arif, 2000). Planning Commission of Pakistan rendered poverty incidence that over 64 million people are falling below the poverty line out of 160 million people in 2008 and interestingly, almost 40 percent people of urban areas are living in the slum areas. Similarly, UNDP (2010) computed multidimensional poverty 54 percent in Pakistan.

Besides policies and programed initiatives for poverty alleviation by different governments, poverty, especially in rural areas continued to increase in Pakistan up till now (Anwar *et al.*, 2004). It is the need of time to find the most appropriate way of reducing poverty and achieving development objectives of the country in order to raise the standards of living of the people.

Agriculture is the predominant activity for most of the households in Asia as it offers a strong option for stimulating growth, overcoming poverty, and improving food security (World Development Report 2008). The focus of the majority of the poverty alleviation strategies had been on the growth and enhancement of agriculture sector. On the other hand, the rapid increase in population and land sub-division had resulted in small farm sizes. Moreover, areas with huge population have decreased the availability of land for agricultural purposes that will cause a decline in incomes of the households dependent on agriculture (Awotideet *al.*, 2012; Marenyaet *al.*, 2003). This scarcity of land advocates the point that agricultural activities might not remain the solitary or even the main sources of earning and therefore farming households could not climb out of the poverty by engaging themselves in agricultural activities alone.

The existing literature on livelihood diversification across the developing world has stressed on the increasing role of off-farm earnings in poverty alleviation (Bryceson, 1996). Several studies (Marter, 2002; Matshe and Young 2004; Serra, Godwin and Featherstone, 2005; Kijima, Matsumoto and Yamano, 2006; Haggblade *et al.*, 2007; Jan *et al.*, 2009) stated that livelihood theory and income diversification help in reducing household income changeability, giving an additional source of income and sometimes even employment which have suggestions for rural poverty reduction and can play a substantial role towards improving welfare of the households. Thus, the contribution of off-farm income sources to the rural and urban economy cannot be ignored because it grew significantly during the last two decades and its share in the total household income lied between 30% and 50% in some of the developing countries.

The literature defines the term "income diversification" to explain four different but interrelated concepts (Minot *et al.*, 2006). The first definition of income diversification denotes an increase in the number of income sources or the balance among these different sources (Joshi *et al.*, 2003; Minot *et al.*, 2006; Dercon, 1998). A second definition states that income diversification is the expansion in the importance of non-crop or non-farm income (Reardon, 1997). A third definition of income diversification stresses the shift from subsistence food production to a feasible and commercial agriculture (Delgado and Siamwalla, 1997). Finally, income diversification can be well-defined as the process of transferring from low-value crop production to a high-value crop production, livestock, and non-farm activities (Minot *et al.*, 2006). For our study, we have adopted the second definition of income diversification.

The reasons of diversification always remain much debated. According to (Reardon *et al*, 1998), households use income diversification as a risk management strategy or to deal with shocks that have occurred. Some households in developing countries originate the majority of their income from one source only. The literature on livelihood sustainability concluded that a number of households avoid a prolonged period of dependence on only one or two sources of income (Reardon 1997; Bryceson 1999; Ellis 2000; Toulminet *al*. 2000). Diversification of sources of income has been presented as one of the strategies that households use to minimize their income variability and to safeguard a minimum level of income, (Alderman and Paxson, 1992). Numerous reasons prompt individuals and households to diversify their income, assets and activities. The reasons are divided into two categories: "push factors" and "pull factors" (Barrett *et al.*, 2001). Pull factors include new income opportunities generated by market development (Davis and Pearce, 2001), improvement of infrastructure for asset accumulation. Push factors include liquidity constraint, high transaction costs, credit market failure and the seasonality of agricultural activity (Sahn, 1989).

Material with references from Islamic perspective on poverty has been added in Introduction chapter. Following text has been added "The words for poverty (i.e. Faqr, Faqir plural form of fuqara) are mentioned in the Holy Quran twelve times. Ten out of twelve verses are related to material poverty. While, it has been used for spiritual poverty two times in the Holy Quran. The issue of poverty is also mentioned in Hadiths. The Hadiths indicate that poverty is an important danger and threat for both individuals and societies. The Prophet clearly points out that poverty is an unwanted situation from which every Muslim should protect himself/herself (IbnHanbel, II/231, 250, 410). Indeed, while He himself prayed, "O my Allah, I refuge to you from the evils of

poverty" (IbnHanbal, VI/57, 207; Abu Dawud, Adab, 101) and He advised his friends with the following prayer "Refuge to Allah from the evils of poverty, famine, degradation, oppressing and oppressed" (IbnHanbal, II/540)."

1.2: Problem Statement

There is a burgeoning literature available on measurement of poverty and its determinants namely education, health, and relationship with other socio economic variables [Alderman and Paxson, 1992; Goletti, 1999; Kapunda, 2003; Cheema, 2005;Eakin, 2005; Awotide, 2012] . However there is dearth of literature on socioeconomic determinants of poverty especially in the context of rural area of Punjab. The existing empirical studies on income diversification have some limitations. As there is little focus on the role of income diversification in connection to socioeconomic settings. Therefore, the current study will address this gap in literature and will address issue of poverty and its socioeconomic determinants and income diversification in rural area of province Punjab of Pakistan. This study would be fruitful while fabricating policy for alleviation of poverty especially for rural areas because diversification of income is an important way out to tackle poverty.

1.3: Objectives

Primarily this study aims at finding impact of diversification of income and some socioeconomic determinants on multidimensional poverty in Punjab. Specifically objectives of this study can be outlined as:

- To explore socioeconomic factors affecting income diversification in Punjab

- To identify role of socioeconomic factors and income diversification on poverty in Punjab.
- To suggest policy implication on the basis of obtained results.

1.4 Organization of the Study

After discussing introduction in chapter one, subsequent part of the study comprises on four chapters and review of some important and relevant studies is weaved up in chapter two. Chapter three is furnished with the definitions of the variables, data source and methodology which would be employed in this study and chapter four holds empirical findings and discussion on obtained results, whereas, this study will be concluded and some recommendations will be suggested on the basis of obtained results in chapter five.

Chapter 2

Literature Review

This chapter holds discussion on some important studies regarding poverty, measurement of poverty, and income diversification related. These important studies are reviewed as below.

Adams (1993) has found the association of off-farm income to poverty and income inequality in Pakistan. Three year survey (1986-89) of 727 rural households has been used and the objective of that survey was to identify the factors which affect poverty in Pakistan. The study found five major sources of income including non-farm income, livestock, farm income, income from rents and income obtained from transfer payments. Non-farm income was one of the major sources of income of rural households that was playing an important role in reducing poverty and income inequality. Further, about 40% of the total income of households received from non-farm income was twice the other rural income sources. The literature however shows no consensus over its impact on income inequality as Chinn (1979) and HO(1979) in Taiwan showed the positive impact of off-farm income on income inequality, while Delgado and Malton (1992) found the negative relationship.

Delgado and Siamwalla (1997) investigated that farm-level diversification such as the adoption of alternative income-generating activities by farm households, was seldom thought of as an explicit objective by economists. They suggested that because of agricultural transformation and well-functioning of markets, agriculture shared a diminishing portion of the overall national product. In these cases development depended on commercializing rural areas. Diversification

could be used as a risk reduction strategy as people were interested in more productive off-farm activities. Therefore they suggested that government should provide incentives to the farmers and solutions to the environmental issues faced by them in order to increase farm production or to help them diversify their earning sources.

Reardon (1997) after reviewing the existed data in Africa established that there happened to be a significant relation between total household income and off-farm income share in that total income. He found that there was an unequal distribution of earnings from nonfarm activities even though equal distribution was very important for farm investment and food security. Consequently, rural households with limited landholdings and assets were also least capable of meeting their requirements through participation in nonfarm activities and income diversification was not possible for them to assure them food security and they could not make an investment for entry into other markets. He stated that this deficiency could result in increasingly skewed land distribution and of other assets in rural Africa.

Goletti (1999) stated that use of rural industrialization and agricultural diversification as a strategy for poverty reduction and rural income growth had several and complex dimensions, requiring enormous resources and time. The presence of poverty in rural areas, low productivity of labor, low level of urbanization, poorly integrated markets, infrastructural development, poorly functioning factor markets such as credit and land, underdeveloped rural industrial organizations were some of the constraints in diversification decisions and opportunities of the households. He suggested that by involving a number of the rural population in terms of labor in production activities, growth could be boosted and could result

in poverty reduction. He further suggested that smallholder farmers should be given incentives to invest in various sectors other than agriculture that would help in attaining desired growth and improved standard of living for the people.

Janvry and Sadoulet (2001) studied the income strategies that rural households adopt in Mexico. Data from 928 households was collected and using the Tobit model they found that education was the most important factor in encouraging the households to participate in activities other than agriculture. Native adults of rural areas had limited access to education and therefore they were less aware of the diversification concept than the people living in urban areas with the same level of education. The availability of non-agricultural employment opportunities were also a major source inspiring people to diversify their income and improve their participation in off-farm employment. They observed that women were mostly restricted to their regional areas and had limited access to opportunities available in urban areas. They suggested that rural infrastructure should be improved and provision of off-farm employment should be ensured in order to provide better opportunities to rural households to diversify their income sources and participate in accelerating economic growth.

Escobal (2001) examined the causes of off-farm income diversification among rural households in Peru. He used the data for rural communities comprising 2284 households, collected by Living Standard Measurement Studies (LSMS) for the years 1995-97. He found that people had realized the importance of off-farm employment other than depending on agriculture solely and more than 51% of their income was being originated from nonfarm employment. He studied the reasons for the diversification behavior of households and found that public assets

such as the provision of roads and private assets such as access to credit and education significantly influenced households' diversification decisions. He suggested that providing improved access to these assets will increase the self-employment as well as wage employment in non-agriculture sector among rural households

Erasdo (2003) studied the variations in income diversification as a result of droughts or changes in macroeconomic policy. Data collected by two comparable national income, expenditure and consumption surveys exhibited that number of households earning their income from private sources grew substantially while from government sources declined. Nevertheless, there was a significant difference in the level of diversification among rural and urban areas, as better-off households were inclined to be more diversified in rural areas whereas it was the opposite in urban areas where poor families diversified more. The results recommended that households having more varied income base were a lot better in resisting the negative impacts of weather shocks and macroeconomics policy changes as compared to households having a non-diversified income base.

Joshi *et al.* (2003) stated that agricultural diversification was strongly influenced by infrastructure development, price policy, technological improvements and urbanization. They found that agricultural diversification resulted in increased employment opportunities and increased exports, hence, providing the people with improved standard of living. They suggested that production of high value commodities needed to be enhanced through proper institutions. Market improvements and access to basic transportation and infrastructure

facilities could help in improved production boosting agricultural growth, strengthening income of small farmers and promoting exports.

Kapunda (2003) examined the link between diversification and poverty reduction. The Botswana's city had a vision that by 2016 it will have diversified economy, with industry, mining, manufacturing, tourism and services all making a noticeable contribution. He compared two local income and expenditure surveys for the year 1985/86 and 1993/94 and found that income inequality didn't decrease significantly in this period. He stated that female headed households were poorer as compared to male headed households where majority of the poor population resided in rural areas. He concluded that constraints on diversification were basically the lack of infrastructural facilities, inadequate incentives for labors, improper policy formations, technological deficiencies and slow progress in productive sector.

Schwarze and Zeller (2005) studied two features of income diversification, one was to use diversification as a shift from farm activities and second was to increase the number of income sources. They observed that well-off households get 40% of their income from non-farm activities whereas poor households have only 10% of their income share in off-farm activities. They used the Tobit model to assess the causes of off farm diversification. Results showed that demographic indicators and access to credit had a positive impact on income diversification. The Shannon diversification index was used to check the diversity of income and evenness of these income sources. The incidence of crop failure had a positive impact on the index whereas demographic indicators had a negative effect.

Eakin (2005) concluded that households with lesser asset possessions had more diversified income portfolios. He used data from six villages in Andhra Pradesh, India. He also found greater diversification amongst households with asset holdings over a particular level, suggesting that there existed a U shaped relationship between diversification and asset holdings.

Barrett *et al.* (2005) studied income diversification approaches, incentives and varied restrictions on diversifying income in rural Africa. They collected the data from various national surveys and associations. They found that strategies adopted for livelihood earnings including non-farm income resulted in the higher income generation and greater mobility of income. On the other hand, households having limited access to off-farm activities and insufficient productive assets (i.e. livestock and land) had to depend on the agriculture sector completely and it was more difficult for them to come out of the poverty trap. They suggested that the nonfarm economy should be boosted by providing more opportunities to the rural households and providing them with the access of credit and market.

Satriawan and Swinton (2005) investigated the effects of human capital on off-farm and on-farm income activities in Pakistan. Two sets of the data—cross sectional and panel data collected by International Food Policy Research Institute (IFPRI) 1986-1989 have been used to examine the comparison, and for cross sectional data 1986 year was used. It was found that education had a minor influence on the farm earnings but the experience had strong positive effects on farm income, while human capital was positively affecting non-farm income. Further, they

investigated that the effects of education were overstated in the case of cross sectional data due to absence of fixed effects.

Minot *et al.* (2006) using both primary and secondary data studied the relation between income diversification and poverty in Vietnam. Regression analysis showed that livelihood diversification was strongly affected by availability of land and labor. Small farm size and large number of family members, level of education and extent of market access encouraged the households to opt for more income sources. They stated that farmers confessed that their standard of living improved with increased off-farm activities. They also noted that diversification was being carried out at a greater pace in the areas with improved market access for the households. They concluded that in order to reduce poverty, production should be raised to increase the incomes of people so that they could withstand all the economic shocks.

Bigsten and Shimeles (2007) examined the growth-redistribution adjustments for numerous African countries, and found that to alleviate poverty by 2015, assuming an unchanged income distribution, Zambia would require accomplishing an annual increase in per capita income of 4.0%. However, the impact of growth on poverty would be determined by the pattern of growth. A vital economic development question was whether fast income growth for households was linked with the diversification of their incomes or not? The regression analysis showed that the trade-off between the inequality and per capita income varied greatly among countries, and their policy choices were consequently quite different. In some circumstances small changes in income distribution had a large influence on poverty, whereas in others they suggested to rely on improving growth only.

Lawson et al. (2007) constructed a Composite Poverty Index (CPI) to see through the indicators of poverty for Togo. For this regard, Multiple Correspondence Analysis (MCA) was applied to develop CPI. Results indicated that possession of the long-lasting goods revealed reasonably towering living standard and these durable goods contributed positively towards asset poverty measuring approach. Similarly, access to pure drinking water, electricity, gas, condition of house and some other assets had been found positively contributing in asset index. Further, authors were of the view that MCA was preferred to Principal Component Analysis (PCA) due to categorical form of the data which offered significant results of poverty index in Togo.

Batana (2008) has observed poverty level of Sub-Sahara Africa by applying Alkire and Foster (AF) approach to measure poverty. Identification of the poor has been made on the basis of four dimensions such as empowerment, health, education or schooling and assets. This study reveals manifold results. These are: a) existence of the cross country differences in the case of multidimensional poverty, b) incidences obtained from AF approach are differed with the results derived from Human Development Index (HDI) a measurement of poverty, c) rural and urban comparison indicates that multidimensional poverty is more prevalent in urban areas rather than that of urban and lastly, be deficient in schooling facility is largely contributing in multidimensional poverty index.

Micevska and Rahut (2008) examined the data collected from 520 rural households and found that 60% of the total income of rural households was generated from off-farm activities. They analyzed that education was the key determinant in the household's decision whether or not to diversify their income. Women with higher education were likely to be more independent by

head of the household, age, availability of physical assets and value of output from crop production. They further discovered that most of the households were willing to diversify their income depending on their demographic indicators.

Owusu and Abdulai (2009) analyzed the impact of off-farm income on food security in Ghana by applying propensity score matching. They discussed gender heterogeneity and impact of off-farm income on household overall income as well as food security. It was concluded that the non-agricultural activities increased the income of farm households that ultimately led to a better access to consumption of food commodities to improve the food security level. Propensity Score Matching method was used to control the self-selection that normally arises when non-farm work was not random. The Northern part of the Ghana was poor, arid area and households have not been food secure. The findings of the study showed that the male had higher off-farm income level than that of the females because the males had more opportunities to earn off-farm income than women who faced low wages and fewer opportunities to earn off-farm income. Hence, men were found more participating in non-farm income activities which are important source to reduce food insecurity. Females face some other constraints as well which were restricted them to improve their levels of food security.

Iqbal et al. (2009) has found determinants of urban poverty by having evidences from a city of Pakistan, Sargodha. They designed a survey to collect information from the urban areas of Sargodha and sample size consisted of 330 households. The authors were of the view that urban areas had been perceptible and differentiable from rural areas because of demographic aspects. This study follows poverty defined officially by government of Pakistan by using data HIES (1998-99, 2006-07, and 2007-008). According to Head Count Ratio approach there was

23.4 percent urban households are below the poverty line, while for poverty gap indicator, 7.9 percent people are below poverty line in Sargodha. Further empirical results showed that household size, household age, education, infrastructure indicators and experience had been found significant variables which affected urban poverty.

Mararia et al. (2010) sought out multidimensional poverty in Kenya. They undertook the data from Demographic and Health Survey (DHS) to derive multidimensional poverty for women and children in Kenya for the period of 1993 to 2003. This study measures the two major dimensions health and household assets and for this reason, Alkire and Foster (2007) approach has been applied. To have rankings and ordering across location of the households, Stochastic Dominance (SD) approaches have been used. Further this study aims at perceiving the determinants of the multidimensional poverty. However, for this regard, Probit model has been used to see through the factors which affect the poverty: Pragmatically obtained results suggest the differences in the poverty of women and children. It is exerted from this study that asset based dimension is contributing higher than that of the health over the last decade. Contribution of the rural areas have been found more than urban areas whereas boys' contribution has been observed higher as comparing with girls. Results obtained from Probit model showed that child characteristics such as age of the child, gender of the child are found statistically significant, while housing condition, household traits and provincial variables were the important factors which had influences on multidimensional poverty in Kenya.

Abro and Sadaqat (2010) analyzed diversification towards high value crop production and alleviation of poverty in Pakistan. They observed that most of the population lived in rural areas

with agriculture as their major occupation. Agriculture contributed almost 21.8% to the country's GDP. Therefore he suggested that farmers should diversify towards production of high value crops in order to get higher returns. Crop diversification would result in more employment opportunities, women empowerment in farming and poverty reduction. He suggested that attention should be given to integrate technology in crop production to increase productivity and income of farmers that could provide them with a better opportunity to participate and invest in off-farm activities also.

Wanyama *et al.* (2010) observed that households diversify their income sources as a risk managing strategy in order to increase their welfare at the micro level. They found that a large number of farmers were involved in cash cropping but they were also participating in non-agricultural activities. Most households had the opportunity in farm and off-farm income earnings. They examined that because of lack of credit, farmers faced difficulty in diversifying their income from basic agriculture to commercial farming. Households with bigger farm size participated more in off-farm employment than those with illiterate or low educated heads. It was recommended that job creation should be given importance in both farm and off-farm employment in order to facilitate people to diversify their incomes and to reduce poverty.

Dimova and Sen (2010) examined the determinants of income diversification amongst rural families in developing countries. They studied whether income diversification was adopted by households as a means of accumulation or as a means of survival. They used panel data from Tanzania of 800 randomly selected rural households for four years and checked the behavior of income diversification among households. Surprisingly, they found that richer households had

diversified their income more and it was out of choice, not because of necessity as households tend to generate more income so that it could be used from agricultural activities to more commercial non-agricultural activities. Nevertheless they also found that poverty traps developed among those rural households who were unable to move from farm into off-farm activities. They suggested that opportunities should be given to the poor rural households to improve their agriculture productivity so that they could diversify their income sources and attain a better standard of living.

Khan et al. (2011) has investigated dimensions and measurement of multidimensional poverty in Pakistan by using data of PSLM/HIES for 1998 to 2008 data sets. It was apparent from empirical results that poverty incidence came down from 44 percent to 38 percent in 2007-008. Poverty in rural Punjab was also fallen but in Sindh province poverty incidence rose up. Balouchistan and KhaiberPakhtunKhah (KPK) witnessed higher incidences of multidimensional poverty.

Akramet *al.* (2011) explored the relationship between rural income inequality and income sources. Primary data were collected from tensile Sumandri district, Faisalabad. They have used co-efficient of variation to compute income inequality. It has been found that the distribution of land was more skewed as compared to income and livestock ownership. Positive relationship between off-farm income and income inequality has been found. For empirical purpose, Semi Log multiple regression model has been used. The education was found to be an important variable for household to reduce poverty because education as human capital could have its positive effects on the income of rural household.

Awan et al. (2012) has observed the poverty level from Punjab by using the data of Multiple Indicator Cluster Survey of Punjab (MICSP) for 2003-004. This study follows the Alikire and Foster (2007) approach to estimate poverty by opting eight proxies such as education, land, household assets, health, expenditures, sanitation and availability of water and electricity. A finding of this study shows that land deprivation, poor health and sanitation, expenditures and deprivation in education are the major variables which cause multidimensional poverty in Punjab.

Che-Mat and Abdul-Hakim (2011) examined the probability of poverty reduction if the farmers diversified their incomes. For this purpose they collected the data from 384 farming households through a comprehensive questionnaire. Using the Logit model they found that non-farm employment was an important factor helpful in poverty alleviation. Similarly the household size, education, land size, number of dependents, remittances and economic characteristics of regional area significantly impacted poverty within the households whereas age and gender were statistically insignificant to elaborate the poverty of farmers. They suggested that farmers should be given more opportunities to participate in off-farm activities that could result in increased income generation and development that could in return reduce poverty among rural households.

Idowuet *al.* (2011) identified the impact of non-farm income in alleviating poverty among rural farm households. The study used the sample of 100 rural households and analyzed the data using simple statistical measures i.e. FGT measure and Logit regression analysis. Results showed that education, age and family size significantly affected the level of poverty among the

rural households. The incidence of poverty was high (72%) and its severity was more among illiterate and aged household heads. Contribution in non-farm activities was significantly determined by age, household size, gender and education. They found that off-farm employment contributed 28% to the total households' income share whereas income shares from self-employment and non-farm wage employment were 11.34% and 10.57% respectively. They suggested that policies should be designed to promote rural literacy level and to reduce poverty by encouraging people to participate in non-farm activities without diverting attention from agriculture.

Senadza (2011) studied the contribution of non-farm income in reducing poverty and income inequality. He used the data from the fifth round of the Ghana Living Standards Survey (GLSS 5) that was conducted in 2005-06. Approximately 5065 rural observations were used for the analysis. Using a Gini inequality decomposition approach he found that increased aggregate off-farm income resulted in increased inequality among rural households. The factor decomposition of inequality showed that education was the most important and significant factor contributing to an increased income inequality. He suggested that improving variation in education among households could be the only way of providing improved access of off-farm activities to the poorer households and to reduce the gap between richer and poorer households.

Fausat (2012) studied the determinants of income diversification among rural households in Nigeria. Data was collected from 150 farming households through comprehensive questionnaire. Although agriculture was the major occupation of the respondents, yet they also

involved in off-farm activities like trading, tailoring and petty trading etc. The multiple regression analysis depicted that age, ownership of assets and educational level of household head significantly affects income diversification whereas household size, marital status and access to loan had an insignificant impact. He recommended that improving rural infrastructure could provide better opportunities for households to diversify their income.

Tasieet *al.* (2012) examined the causes of income diversification in Nigeria. Data was collected from rural households through an organized questionnaire. The results indicated that 70% of the total rural households were involved in farming that depicted agriculture as their major occupation. The results also revealed that the collective effect of non-farm activities in total income share was 74.4%. The regression analysis explained that farm size, farm investment, education, household size and value of farm's output significantly influenced the decision for off-farm income. The positive and significant coefficient of education showed that more the acquirement of formal education, more the household will look for better opportunities other than farm.

Awotideet *al.* (2012) analyzed the impacts on poverty reduction as the households diversify their income in Nigeria. They collected the data from 600 rice farming household and measured poverty by applying Foster-Greer-Thorbecke (FGT) measure. It was observed that households with off-farm wage income were better-off than those with farm income and off-farm self-employment. They used the Simpson's diversity index to find the number of sources of income and evenness of every source. To correct for endogeneity of diversification index, 2SLS approach was used. The findings depicted that household head, education, access to electricity

and affiliation with any organization had a positive and significant impact on income diversification whereas the age of farmers, farm size and absence of contacts with extension agents had a negative impact on income diversification.

Jan *et al.* (2012) studied the factors affecting the livelihood choices in rural areas of northwest Pakistan. They gathered data from two villages of Peshawar comprising 1101 households in total and after using multinomial Logit model they found that household head with no education and relatively younger age tends to diversify more. Similarly household size had a positive and significant impact on livelihood diversification as an additional member of the family reduced the chances of staying in farm employment solely. They presented that per capita income was also one of the most important factor in encouraging the households to diversify their occupations or income sources. Thus, it was concluded that in order to improve rural non-farm sector, rural developmental policies should be given priority and attention.

Khatun and Roy (2012) examined the determinants and restrictions on livelihood diversification in West Bengal by collecting the data from 200 households. They found a highly significant impact of education on livelihood diversification as improvement in education would result in better job opportunities and increased participation in off-farm activities. Simpson index was constructed by them to find livelihood diversification. They stated that household size, age, physical assets owned by households, access to credit and rural infrastructure significantly affect households' diversification decisions. They concluded that diversification could be encouraged by providing better irrigation facilities and access to urban markets. Similarly socioeconomic and agro climatic factors strongly influenced rural livelihood diversification.

Gumuşet *al.* (2012) investigated income diversification opportunities in rural Turkey and their contribution to poverty alleviation. Data was gathered from 386 farmers in 48 villages from 12 districts. Regression analysis showed that some of the districts were depending on crop production and they had other opportunities also to diversify from their main source of earning. They stated that climatic and geographical factors also influenced farmers' decisions to diversify. The lack of appropriate farm size, sufficient-income and the inadequate opportunities of lands for irrigation, the small agricultural lands, limited agricultural product marketing, high input costs, weak production organization and insufficient infrastructural services such as health, education and transportation comprised some of the constraints of the region in the way of diversification.

Muhammad *et al.*, (2012) examined the factors determining off-farm income in district Noshehra of North West Pakistan. A survey was conducted to collect data, and the Logit model was employed to find empirical results. The findings of this work indicated that farm size, household, farm employment, education, and income earned from other sources by households were the main factors affecting the off-farm income. It was observed that the farmers in developed areas devoted more time to off-farm employment because of improved infrastructure. This study also showed that most of small farmers were engaged in off-farm activities, e.g. labor, trade, commerce jobs, and part time jobs in some private firms. Overall there was a gradual transition of livelihood activities. In rural areas of Pakistan, most people were involved in farm activities but now off-farm income became a means to escape from poverty. They also discovered that farm size negatively impacted off-farm income because greater the farm size higher is the farmer's ability to earn more farm income. There have been

other important factors that significantly affect the off-farm livelihood sector which are farm income, farm unemployment, and education, age of a household, livestock holding in number and income from other sources.

Vijaya et al. (2012) observed the poverty of individual levels rather than household level in India. They measured multidimensional poverty by using the data collected from Karnataka Household Asset Survey (KHAS) to see through the individual level multidimensional poverty. Obtained results suggested that there existed intra household differences in multidimensional poverty. They used health, education; durable assets and empowerment were the dimensions to construct multidimensional poverty. Nonetheless, poverty remained 25 percent among households and 22 percent individuals had been found multidimensionality poor. Further this study anticipates gender cleavages and poverty. Evidences showed that almost 21 men were found poor and slightly difference is only 22 percent poor.

Quibria (2012) explored influences of credit market on poverty alleviation. This study employed the survey based data and Ordinary Least Square (OLS) was used to find the empirical analysis. Arthur undertook the variables for analysis were household income, scope of labor market, business skills, and technology and product demand important variables. Findings of his study showed that credit market especially informal market did have significant effects on poverty reduction. Further results indicated that credit market helped household to smooth their income and ultimately had higher food consumption which improved the health of households. Formal credit market did not have direct effect on the employment of the rural households.

Awan et al. (2012) examined the multidimensional poverty in Pakistan via using PSLM data for 2004 to 2005. They applied Alkire and Foster (2007) approach to measure the multidimensional poverty. This study chooses nine indicators empowerment, expenditures, land, sanitation, health, water, housing and assets. Evidences obtained from this study gives a pitiable spectrum of the Baluchistan where poverty has been observed worst. After her, KhaiberPakhtunKhah (KPK) has been found most poor province and Punjab was found much better as compared to other provinces of Pakistan. Further this study extracts that land, empowerment, sanitation; housing ad assets are found important factors.

Bjornsen and Mishra (2012) investigated the relationship between farm efficiency and off-farm income activities of both operator and spouse in the USA. They used using panel data for Norwegian farm households for the period 1989-2008 collected by the Norwegian Agricultural Research Institute. First, the factors which determined the off-farm work decision of both operator and spouse were analyzed by using two stage Tobit model. Then, the relationship between off-farm of both operator and spouse was gauged by employing two stage GLS fixed effect model to seek this nexus. The findings of the study were quite interesting. It was found that farm efficiency has positive and negative effects of operator and spouse participation in off-farm activities respectively. Because farm efficiency motivates farmer to engage more in farming and it provided an opportunity to spouse to enhance off-farm activities. This study also found that the subsidy has a negative and positive impact on non-farm income of both households respectively. At the end, the main result inferred from this study, was an existence of the dynamic relationship between off-farm work and farm efficiency. Further off-farm

income has a positive impact on farm efficiency but in the second stage, negative effects have been found on agricultural efficiency.

Fatima (2012) assessed the link between rural incomes and non-farm activities in Pakistan. The main objective of this study was to investigate the effects of non-farm participation in rural income by using PSLM and HIES, 2007-08 data. For empirical purpose Heckman model was employed to explore the effects of non-farm activities on farm activities. Education, household size, and land ownership were the main determinants of participation of the local population in non-farm activities. Off-farm income improved the living standard of rural households. A rural household who was engaged with off-farm income had a higher income than those who were not part of off-farm income.

Rehman (2013) examined the factors those affect decision to participate in off-farm activities in Bangladesh. For this purpose, a survey of 150 farmers was carried out. Descriptive statistics revealed that the services sector was one of the major contributors. Logistic regression was used to assess the factors empirically. This study pointed out that low farm income was the reason to participate in off-farm activities. The education and farm size were inversely related to participation in non-farm labor force. Small business activities were popular among households having less education. Empirical evidence revealed that farm size, organizational participation of households and improvements in infrastructure has been significant determinants of non-farm income.

Rabial et al. (2013) held scholarly discussion on the socio economic condition of the rural poor households in Pakistan. They were of view intuitively that education and health had been

important factors to affect the poverty. This study considers the brick industry as sample set and focuses on employee of bricks industry. Mainly, Arthurs were keen to anticipate the poor plight of the workers of under consideration sector. In this regard, this study designs a survey and conducts a theoretical research. They covered the issue via intuitions and logical reasoning meticulously. A finding of this study shows that attitude of the owners and behavior of the society has been the liable for the poor condition of the workers. They did not have proper opportunities of the education and health which consequently hurt their economic condition. Overall, poor access to credit market, improper health facilities, education and unemployment were the factors which brought about the poverty.

Kimsun and Sokcheng (2013) studied the role of income diversification during global economic and financial crisis. For this purpose they selected nine villages of Cambodia and collected the four-period panel data for the years 2001, 2004, 2008 and 2011. They constructed Herfindahl index to find the share of different income sources in the overall income of the households. After using both fixed and random effect models, they found that households with agriculture as their major occupation diversified more and people diversified their income because they had a desire of accumulation rather than using this strategy as a means of survival. Richer households were better able to withstand any shocks and to enjoy the benefits of diversified income portfolios. Therefore, accumulation based diversification didn't help in poverty reduction as compared to survival based diversification. They found that income diversification positively and significantly influenced per capita consumption whereas the impact of demographic indicators was insignificant on income diversification.

Concluding Remarks

Having reviewed some important studies from existing literature covering poverty related issues, one can find most of studies envelop with measurement of poverty and methodology for observing multidimensional but to knowledge, no study is available particularly covering effects of income diversification on multidimensional poverty in rural Punjab, Pakistan. Therefore, this study may bridge up this gap in existing literature.

Chapter 3

Data, Variables and Empirical Model

This chapter explains the data, definition of variables and methodology adopted. Section 3.1 covers discussion over data source, section 3.2 entails descriptions of variable whereas in section 3.3 methodology of the study shall be covered.

3.1: Data Source

Primarily, the main objective of this study is to investigate the impacts of income diversification on wellbeing of farm households in rural Punjab. Therefore, data of 1607 farm households have been taken from Pakistan Social and Living Standards Measurement Survey (PSLM) 2010-11 and these households are selected from agriculture section for Punjab Province. Out of these farm households, 650 households are found engaged in farm as well as other than farm activities whereas remaining households are involved in only farming. This survey is the sixth round of a series of surveys planned to be conducted up to 2015 and it is designed to provide social and economic indicators in alternate years at provincial and district level.

3.2: Definition of Variables

The variables used for the study are wellbeing index, age of household, gender of the head, dependency ratio, female ratio, income diversification, education, access to loan, net savings, participation in committee, land assets, livestock holding, and dimension of poverty as well. Now, description of these variables is given below.

Income Diversification: This study is interested in income diversification of farm households and income diversification means finding sources of income other than farm activities. With the context of this study, it can be termed as non-farm income. Because in literature the Simpson's index has been also used for income diversification of overall households (i.e. farm households and non-farm households) [Minot et al., 2006; Davis et al, 2010] and for only farm households, off farm income or non-farm income is used (Babatunde and Qaim, 2010). Therefore, off farm income is being used to see through the farmer's income diversification. It is defined as income of farming family which they are earning from non-farm sources such as private and public services, business and enterprises, remittances, and some other sources.

A dummy variable has been used to calculate off farm income and $D=1$ if farm household is found engaged in any other non-farm activity such as in private and public services, small or large business and enterprises etc. and otherwise zero if only farm activities. It has been mentioned in data description, out of 1607 farm households in Punjab, 650 households are engaged in non-farm activities or diversifying their income.

Age of Household Head: Age of household head has been taken as independent variable which is a continuous variable where maximum age is 99 years and minimum age of rural household is 16 years.

Gender of the Household Head: Gender of the household head suggested either household head is male or female. A dummy variable is constructed where if household head is male, $D=1$ and otherwise $D=0$ for female.

Farm Size: Farm size has been used as continuous variable and it is defined as agriculture land holding in acres.

Dependency Ratio: The dependency ratio is termed as the ratio of unemployed persons to working members. The dependency ratio is an indication of potential variations in population age structure to comprehend the social and economic development. It is classified into three categories that are normal dependency ratio (value of dependency ratio below 0.5), medium dependency ratio (when values of dependency ratio are between 0.5 and 1) and the third one is a severe dependency ratio (when values of dependency ratio are equal to or above 1). It is calculated as the $Dr = \text{number of households below age 15} + \text{above age 64} / \text{number of employed households who are between age 18 and 64 years}$ [Khatri-Chettri, 2006; Sultana and Kiyani, 2011; Matchaya and Chilonda, 2012; Rehman, 2013].

Education: Education of the household head has been categorized into five categories. These categories are no education, primary education, graduation, and above graduation. Information about education status would be taken from section two of PSLM (2010). Dummy variables are used for these categories.

Ownership of livestock: Ownership of livestock that is defined as dummy variable, $D=1$ for ownership of livestock otherwise zero for non-ownership.

Access to Credit: Dummy variable has been used to define it. $D=1$ household received a loan if try from formal and informal institutions otherwise zero if he tried but not received.

Participation in Committee: Committee is a form of informal investment. It has two sides receiving and payment. This is commonly exercised in society informally. Some committees are profit based and some are just like savings. Its effects on wellbeing are required to estimate. Therefore, a dummy variable has been used to define it. D=1 household participate in any sort of committee, otherwise zero.

Savings of Household: savings play important role in determining wellbeing of households, especially, in rural areas people have savings in the form of gold, jewelry, cash, and some other sources which they withdraw for marriage of their children, any shock, and to cope unpleasant incident. Nonetheless, this study applies this variable in the form of dummy variable. A dummy variable D=1 for households have savings, and otherwise zero.

Land Assets: this study is using twofold land assets: 1) residential building or land, and 2) commercial building or land. These variables are used to assess their impacts on wellbeing of households and their decision to diversification of income. Dummy variables are used to apply these assets variables.

Province of the Households: Provincial Dummy variables are also used where D=1 If the household lives in Punjab, otherwise zero. By repeating this whole procedure to construct dummies for respective provinces Sindh, KPK, and Baluchistan. To have a bird's eye view of aforementioned variables, table 3.1 can be seen.

1. Table 3.1: Definition of the Variable

Names of variables	Description
Wellbeing index	Index is generated on the basis of eight indicators by using PCA
Income Diversification	A dummy variable is used, D=1 if household is taking part in non-farm activities other than farming such as services, business, enterprises etc.
Age of Head	A continuous variable, age of household head in years
Gender of Household	Gender of household head, D=1 if male otherwise zero
Female ratio	Number of females in a family divided by family size
Never attended school	Those with household heads who never attend school, dummy variable
Primary education	Primary education of head, dummy variable
Metric education	Middle to metric education of household head in dummy variable
Graduation	Intermediate and graduation education of head, in dummy variable
Above graduation	Above graduation education, a dummy variable
Normal dependency ratio	If the value of dependency ratio is below 0.5, dummy variable
Medium dependency ratio	If the value of dependency ratio is between 0.5 and 1, dummy variable
Severe dependency ratio	If the value of dependency ratio is above 1, dummy variable
Livestock holding	Does a household owns livestock or not, a dummy variable
Access to credit market	Dummy variable, D=1 if access and D=0 otherwise
Committee participation	Dummy variable, D=1 for participation and D=0 otherwise
Net savings	Dummy variable, D=1 if household has savings otherwise zero
Land Assets	Does household has commercial and residential building or land?
Household Assets	Does Household have assets such as tv, air cooler, motorcycle, tractor, washing machine etc.?
Province	Dummy variable is used for all provinces

Source of Data: PSLM (2010-11)

Having discussed independent variables, now, we define measurement of poverty. We would measure multidimensional poverty as follow.

3.2.1 Wellbeing or Multidimensional Poverty Index

Multidimensional poverty can be gauged from Sen (1985) that lack of capabilities and fundamental needs for the human beings are the phenomenon which is to be redressed. This definition makes evident that poverty can be scrupulously measured by a number of factors of wellbeing. Therefore, this study intends to estimate the effects of income diversification on wellbeing or multidimensional poverty of the most vulnerable segment of the society i.e. farm households. This study constructed index by using Principal Composite Index (PCA) on the basis of indicators.

2. Table 3.2: Indicators of Well-Being of Rural Households

1) Ownership of livestock	Dummy variables
2) Ownership of commercial land	Dummy Variables
3) Ownership of residential land	Dummy Variables
4) Access to wash room: does household have toilet or not?	Dummy Variables
5) How many rooms are available: one room for two family members	Continuous variable
6) Do you have pakka house made of bricks?	Dummy Variables
7) Did child vaccinated?	Dummy Variables
8) Does household is under metric?	Continuous variable

Source of Data: PSLM (2010-11).

These indicators are household assets such as possession of livestock, commercial land, and residential land and does household have toilet or not, does household have pakka house or kacha?, ratio of number of rooms to family size where if a household has one room for two members are considered not poor but below it is considered poor, whereas household under metric is considered poor. This variable is continuous where zero is assign for under metric whereas rest of education is in completed education years.

Principal Component Analysis: PCA is a statistical procedure or tool that executes an orthogonal transformation to transform a set of observation of possibly correlated variables into a set of observations of linearly uncorrelated variables which commonly are called principal components. It is also important to note that the number of principal components is less than or equal to the total number of original variables. Possibly first component pertains to the largest variation and every succeeding component contains the largest variation under the constraint that it is uncorrelated with preceding components. These components are orthogonal because they are the eigenvectors of the covariance matrix and it is sensitive to the relative scaling of the original variables. It can be done by eigenvalue decomposition of a data covariance matrix or singular value decomposition of a data matrix, mostly, after the normalization of each attribute by using z-score. The results of PCA are discussed in terms of factor scores which are the values of transformed variables corresponding to particular data point and loadings which are the weights by which each normalized variable is multiplied to attain the component score [Rutstein and Johnson, 2009; Asseline, 2009].

To precede PCA, one has to follow six steps: 1) to have some data or indicators, 2) normalization of variables by using z-scores which is the subtraction of mean from original variables and divided them by their respective standard deviation, 3) to calculate the covariance matrix, 4) to calculate the eigenvalues from eigenvector of covariance matrix, since covariance matrix is square then one can calculate eigenvector and eigenvalues, 5) choosing components and forming a feature vector, 6) deriving new data set i.e. new variable is derived by multiplying the standardized original variables with weights. These steps help to execute PCA for constructing index.

3.3. Econometric Model

In literature, most of the researchers have used Logit/Probit model to deal with off-farm income and poverty related issues [Chainget *al*, 2009; Arshad and Shafqat, 2012; Fan 2012] whereas some researchers [Chang and Mishra, 2008; Tafseyet. *al.*, 2008; Zearai and Gebreegziabher, 2011] used Heckman two step selection model because of persistence of selection biasness in model due to non-farm income. Ouwsuet *al.* (2011) has used propensity score matching to find out the impact of non-farm income on poverty and food security to find out the significant differences in wellbeing level of farm households which are engaged in non-farm activities and only stayed in farm activities but this technique gives just descriptive analysis. There comes development and extensions in Heckman model which is termed as switching regression or Treatment Effect model (Madala, 1983; Green, 2003). This study has used treatment effect model to find out the impacts of income diversification on wellbeing of farm households and also to analyze counterfactual analysis because this model has advantage over conventional selection models which is discussed in next section.

3.3.1 Rationale of using Treatment Effect Model

Two major reasons to use Treatment Effect Model are: 1) tackling the selection bias problem, and 2) is to examine the counterfactual effects of income diversification on wellbeing of farm households. We have to deal with selection biasness because the effects of off-farm income may be over or underestimated if we do not see through the unobservable characteristics which determine the decision of participation into off-farm or stay in the farm sector. When the situation of decision to participate in the labor force occurs, there may emerge a statistical problem, known as selection bias and it may give us biased results (Green, 2003). Therefore, treatment effect is used because conventional Heckman model just gives the solution of selection bias but it does not give counterfactual analysis or treatment effect score.

3.3.2 Specification of Treatment Effect Model

Since the advent of sample selection models researchers have developed extensions in sample selection models [Maddison, 2006; Tesso et al, 2012]. Green (2003) suggested these extensions as "Heckit" Models and Treatment Effect Model (TEM) is also extended form of these models. It differs from sample selection model in two aspects: 1) a binary variable indicating the treatment condition (i.e. if participant is in treatment condition or non-treatment condition) is directly entered into outcome equation and 2) dependent variable of outcome equation is estimated for both treated and non-treated members. Specification of treatment effect model can be expressed in two equations as in original Heckman sample selection model:

$$\text{Outcome or Regression equation: } Y_i = \beta' X_i + \delta t + \varepsilon_i \dots \dots \dots (3.1)$$

Where y_i is out come variable which is wellbeing index in the case of ongoing study, x_i vector of explanatory variables such as: age of household head, gender of household head, female

ratio, lower dependency ratio, medium dependency ratio, access to loan, savings of household, participation in committee, commercial land, residential land and provincial variables, β is parameters and t is a dummy variable coming directly from selection equation which is known as treatment effect¹ score in outcome equation. It gives counterfactual analysis or significant differences of treated and non-treated households. In selection equation it is dependent variable or selection variable in dummy form $t=1$ if farmer has diversified his income or $t=0$ he stayed in only farm activities. Further ϵ_i error term of outcome equation.

In selection equation, Probit model is estimated and similar to the Heckman model unobservable are estimated from the selection equation from where selection biasness is observed with the help of inverse mills ratio or known as Lambda or selection hazard and it is used as an explanatory variable in outcome equation automatically in outcome equation. As (Green, 2003) suggested that the Heckman Selection model tells the presence of selection bias while Treatment Effect model is appropriate to have treatment effect which is adjusted in the selection equation automatically. One thing is notable; treatment effect model deals treatment effect score and selection simultaneously. Specifically selection equation is formulated as:

(Selection equation)
$$t_i^* = z_i\gamma + u_i \dots\dots\dots (3.2)$$

Where, $t_i = 1$ if $t_i^* > 0$ and $t_i = 0$ otherwise

$$\text{Prob}(t_i = 1 | z_i) = \varphi(z_i\gamma) \text{ and } \text{Prob}(t_i = 0 | z_i) = 1 - \varphi(z_i\gamma)$$

¹ Treatment Effect is the average casual effect of binary variable on outcome variable of interest. Here, it gives counterfactual analysis: significant differences of outcome variable (wellbeing of households) between treated households (those who are diversifying their income) and non-treated households (those farm households which are not diversifying their income or staying on only farm activities).

Similar to the Heckman model, Treatment Effect model also used the Probit model which is given the name of selection equation or treatment equation. The dependent variable is in dichotomous form that off-farm income participation=1 otherwise farm income participation=0. This is formulated in the following equation where t is discontinuous variable. If $t=1$ (participated in non-farm income) otherwise $t=0$ (for only participation in farming) and t^* could be estimated when $t=1$ if $t^*>0$ and for $t=0$ otherwise.

In the above selection equation, z_i' is a vector of explanatory variables like age of household head, gender of head, medium dependency ratio, lower dependency ratio, access to credit, household asset, no education, education primary, metric education, graduation, ownership of livestock, savings, participation in committee, commercial land, residential land, provincial dummies are the independent variables respectively. Further, γ is a vector of coefficients and μ_i is a random disturbance. Where, ε_i and u_i are bivariate normal with mean zero and

covariance matrix $\begin{bmatrix} \sigma & \rho \\ \rho & 1 \end{bmatrix}$. Given sample selection and that t is an endogenous variable, the

evaluation task is to use the observed variables to estimate the regression coefficient β , while controlling for selection bias induced by non-ignorable treatment assignment.

Selection biasness is captured through Lambda or inverse mills ratio and it is termed calculated as ratio $\lambda = \phi(z_i\gamma) / 1 - \Phi(z_i\gamma)$. Here, ϕ is a density function and γ shows the distribution of normal respectively. Inverse Mills Ratio is computed from the selection equation and is used in outcome equation automatically in treatment effect model whereas in conventional selection model it is used as additional variable explanatory variable. If lambda or inverse mills ratio is

found statistically significant then it means there was selection biasness and has been corrected in the model.

Chapter 4

Results and Discussion

This chapter entails descriptive analysis and discussion on empirically obtained results in some detail. Section 4.1 covers some discussion over situation of poverty provincially whereas section 4.2 hatches discussion on obtained results from treatment effect model.

4.1: Descriptive Analysis

In this section, this study hatches some discussion on non-farm participation and poverty provincially which has been also displayed in tables.

4.1.1 Prevalence of Multidimensional Poverty

The central concern of this study is to find out impacts of income diversification on poverty of rural households in Punjab, Pakistan. It comes out from wellbeing index that overall Pakistan is experiencing 50 percent multidimensional poverty. Therefore, it is very important to see through the incidence of poverty for provinces which is given in table 4.1. In our selected sample, province Punjab contains 1607 rural households out of 3249 and she is experiencing 40.14 percent multidimensional poverty. Rests of provinces are experiencing it high as compared to Punjab.

3. Table 4.1: Province

wise Poverty

Provinces	Frequency	Poverty %
Punjab	1,607	40.14
Sindh	740	64.59
KPK	602	50.66
Baluchistan	300	75.00
Total	3249	

It is worth noting that Baluchistan is facing 75 percent poverty that shows the pitiable condition of her and it indicates less attention of concerned authorities. Sindh stands on 3rd position where poverty is 64.59 percent and it also shows poor and meager condition of Sindh province whereas KPK is experiencing 50.66 percent out of 602 rural households (see Table 4.1).

4.1.2 Non-Farm income and Poverty

Primarily, this study keeps focus on farmers' wellbeing and their income diversification. It is very important to see through the differences between those farmers who are engaged in only farming or earning farm income and those who are able to diversify their income i.e. earning non-farm income.

From table 4.2, it is evident that out of 3249 farm households 38.69 percent households are involved in earning income from other than farm income as well while rests of 61.31 percent households are found earning from only farming.

4. Table 4.2: income Diversification and Poverty

Employment Status	Frequency %	Multidimensional poverty %
income Diversification	40	34
No income Diversification	60	66

Above table also shows the difference of poverty between both sorts of households. Notably, one can see that those households which are participating in non-farm income or who are diversifying their income, are found having 34 percent level of poverty whereas, those who are not able to diversify their income are experiencing higher level of poverty.

Provinces	Frequency	Non-farm participation %

5. Table 4.3: Income

Province Wise Diversification

Punjab	650	51.71
Sindh	195	15.51
KPK	349	27.76
Baluchistan	63	5.01

Further province wise income diversification also can be seen from table 4.3; it is evident from table that 51.71 percent households are engaged in Punjab in selected sample. After Punjab, KPK has been found 27.76 farm households percent participating non-farm activities to diversify his income. Again Baluchistan province has been found the lowest income diversification which is only 5 percent.

In sum from above discussion it transpires that Punjab province is found less poor province as compared to rests of provinces but among these, Baluchistan has been found most poor province where non-farm activities are monstrously small. Further descriptive analysis suggests that those farm households which are involved in diversifying their income are found less poor comparing with only sticking on farming.

4.2: Findings Obtained from Treatment Effect Model for Punjab

Now, this study comes to its prime objective to find out the impacts of income diversification on multidimensional poverty or well-being farm households and also finding out significant differences between the level of well-being of only farm income earning households and income diversified farm household. In above section, execution of cross tabulation by using software STATA version 12, suggests differences between poverty level of both sorts of farm households. This section finds discussion on empirically obtained results, estimated from treatment effect model.

Justification of using treatment effect model has been given in chapter 3rd of ongoing study in some detail but in short, it is used because of two reasons: 1) non-randomness comes due to unobservable differences of farmers' income decision to move towards income diversification, 2) finding counterfactual analysis which can be observed from treatment effect score. That's why treatment effect model has been preferred to conventional Heckman models.

Dependent variable in outcome equation is well-being index or reversely multidimensional poverty index which is a continuous variable and it is regressed on age of household head, gender of household head, low, medium and severe dependency ratio, savings of households, access to credit market, commercial and residential land and directly inclusion of dummy variable, income diversification from selection or treatment equation where it is dependent variable but in outcome equation it works as treatment effect score where its interpretation suggests us significant differences in well-being of both only farm income earning households and non-farm income earning farm households. Further in selection equation independent variables are same as in outcome equation and in addition to these, categories of education are used i.e. no education, primary education, metric education, graduation, and above graduation has been kept as reference category.

Empirical findings suggest that overall model is good fitted because Wald chi square statistic has been found highly significant which confirms model is good fitted. Further inverse mills ratio or selection hazard gives the confirmation of the presence of selection bias and it is being corrected because Lambda is highly significant whereas direct inclusion of dummy variable, income diversification in outcome equation has been found highly significant at one percent significance level. Treatment score is 0.838 at 0.000 p-values, it can be interpreted as, other things remain constant, those farm households which have diversified their income have 0.838 higher score comparing with only farm income earning. It suggests that there are significant differences between the well-being of farm income earning and income diversified farm households in rural Punjab among farm households. Later one is enjoying more well-being as compare to first one; remaining other things same (see table 4.4 bottom part of outcome equation). Empirical results obtained from treatment effect model are consistent with

descriptive analysis and moreover, these results are matched with the findings of de Janvry *et al* (2005) and Ali *et al* (2013).

Age of the household head has been found statistically insignificant and Table 4.4 indicates that in outcome equation, age of head is negatively affecting the well-being, other things remain constant. Further gender of the head found positively affecting poverty which also indicates that male household heads are less poor comparing with female headed households but these results are also not significant.

Dependency ratio is affecting the well-being of households negatively and statistically significant. Other things remaining same it is found that households which have lower or severe dependency ratio are enjoying less well-being because unproductive members may increase pressure on working members and to meet higher dependency especially less resourceful household may suffer. That's why, its negative effects are quite logical.

Savings of household has been found insignificantly affecting the well-being and suggesting that it enhances the well-being of rural households. Those households who have some net savings are found enjoying more well-being or betterment. Whereas access to credit has been found statistically significant and its impacts are found negative on the betterment of farmers, other things remain same. Actually at the moment, farmers receive loan and may fulfill his need that is often unproductive one and he/she faces difficulties to repay the loan, therefore, it may reduce the betterment of farmers. Simply, negative effects are the scourge of misuses of loans especially in rural areas.

This study uses an interesting variable that is farmer's participating in informal investment or committee participation. Obtained results indicate that it has negative effects on well-being which are statistically significant. It is may be due to give committee monthly and at somewhere he receives in aggregate amount but this study suggests it reduces the betterment of farmers.

Finally, land asset variables such as ownership of residential land, and commercial land are found highly statistically significant and positively affecting the betterment of farmers. Land

assets are important assets which may make farmers in position to entertain good living standard, other things remaining same. These results are commensurate with literature (Kabubu-Mariaraet *al*, 2010).

Variable of livestock holding is found positively affecting the wellbeing of rural household of Punjab. Empirically obtained results suggest that those households who hold or own livestock are experiencing more wellbeing as compared to those households who do not have any livestock species. Livestock species are been important source of food as well as source of income for farm households which ultimately lead to improve the wellbeing.

Now this study discusses the findings obtained from selection or treatment equation where dependent variable income diversification in dummy variable form. This equation is like a probit regression. Findings suggest that age of head is revealed with positive sign; other things remaining constant, older households are more likely to decide to diversify his income. It may be due to the experience of farmer, and his some resources let him to do work in other than farm practices. Further gender of household head has been found insignificant determinant which is found negatively affecting the likelihood to diversify his income. Female headed households more inclined to diversify her income. Female heads may encourage her family members to find out some other sources of income so that they may escape themselves from vulnerability but these results are statistically insignificant.

Empirically obtained results from selection equation for dependency ratio is suggesting that other things remain same, dependency ratio is affecting decision to diversify income positively and significantly which may be because of burden of unproductive members those farmers are force to find out some other sources of income and further those households who have more female members are less likely to diversify their income because it is found negatively and statistically significantly affecting the farmers' decision to diversify their income.

Access to credit market may foster the farmers to move him out of financial constraints. Therefore, farmers who have access to credit are more likely to diversify his income. But these findings are not significant. Similarly, savings have also been found positively and significantly

affecting the likelihood to diversify his income which shows, those households who have savings are able to diversify income.

Further participation in committees has also been found statistically significant in determining the decision to diversify income. Households which are engaged in committees are more likely to diversify their income. It is a sort of informal investment and its impact on wellbeing are not certain whether it may enhance living standard or not but it is significantly determine the decision to diversify income. These results are matched with the findings of Ali *et al* (2013).

This study uses ownership of commercial and residential building as independent variables where reference category is those farmers who just possess agricultural land. Results show that farmers who have commercial land or buildings are more likely to diversify their income and it also has positive effects on wellbeing of rural households. These results are not significant but it enhances wellbeing of households.

6, Table 4.4: Estimation of Treatment Effect Model (Punjab)

N=1607 Wald chi2(21)=1145.71 Prob> chi2=0.000				
well_being Dependent Variable: Outcome Equation				
	Coef.	Std. Err.	z	P>z
Age	0.000307	0.000929	0.33	0.741
Gender	-0.02776	0.066393	-0.42	0.676
Low dep.	-0.04821	0.031713	-1.52	0.128
Medium depratio	-0.09777	0.031727	-3.08	0.002
Committee parti	-0.11766	0.050757	-2.32	0.020
Dum saving	-0.02422	0.038579	-0.63	0.530
Loan	-0.06458	0.026125	-2.47	0.013
Commercial land	0.411373	0.049543	8.3	0.000
Residential land	0.954757	0.035104	27.2	0.000
Livestock	0.264591	0.039343	6.73	0.000
Income diversifica.	0.838721	0.137349	6.11	0.000
_cons	-1.2336	0.100268	-12.3	0.000
Income Diversification (Dummy Variable): Selection Equation				
	Coef.	Std. Err.	Z	P>z
Age	0.008029	0.00249	3.22	0.001
Gender	-0.19248	0.177781	-1.08	0.279

Low dep. ratio	0.230296	0.078634	2.93	0.003
Medium dep. ratio	0.215965	0.079876	2.7	0.007
Committee parti.	0.420703	0.118151	3.56	0.000
Dummy saving	0.399878	0.089348	4.48	0.000
Loan	0.073141	0.07067	1.03	0.301
Commercial land	0.068448	0.131857	0.52	0.604
Residential land	0.040574	0.094755	0.43	0.669
Livestock	-0.37559	0.086919	-4.32	0.000
No education	-1.24907	0.338786	-3.69	0.000
Primary education	-1.13388	0.343371	-3.3	0.001
Metric education	-1.05116	0.337946	-3.11	0.002
graduation	0.95608	0.353935	-2.7	0.007
Household assets	0.202502	0.070369	2.88	0.004
Land size	-0.01401	0.002929	-4.79	0.000
_cons	0.688752	0.407645	1.69	0.091
Lambda	-0.49276	0.08442	-5.84	0.000

Impacts of education are observed highly significant and variable of education has been categorized in five categories i.e. no education, primary education, metric education, graduation, and above graduation. Here, in selection equation, above graduation or higher education has been kept as reference category and results suggest that all categories are found with negative signs which suggests that other things remaining same, farm household heads which are highly educated are more likely to take part in off farm activities means they have more likelihood to diversify their income. They are not sticking on only farming but also have higher chances to earn income from other sources as well. Households those which are not highly educated or totally illiterate are less likely to diversify their income. These findings are matching with the findings of Qaim and Babatunde (2010).

Livestock possession has been used as independent variable in selection equation and empirically obtained results indicate that it has been found negatively and significantly affecting the likelihood of diversification of income. Other things remain constant, households who possess livestock, are more likely to stay on farm related activities and have less likelihood to diversify their income.

Land size variable has been found as affecting significantly to diversification of income and its impacts are negative which suggest that those farm households who have higher land size, they are more likely not to move out of agricultural activities and there is possibility that they may not diversify their income.

Consequently, this study finds positive effects of income diversification on farmers' wellbeing and further treatment effect model suggests those farmers which are involved in earning non-farm income are found enjoying more betterment or wellbeing as compared to those which only stick on farm activities. These findings are for overall country.

4.2.1 Estimated Results Obtained from Treatment Effect Model: A provincial Analysis

Having discussed the findings obtained from treatment effect model for overall Punjab but now, additional results for provinces shall be discussed.

7. Table 4.5: Provincially Income Diversification

Provinces	Treatment Effect (Income diversification)	Lambda (Inverse mills ratio)
Punjab	0.8387209***	-0.492762***
Sindh	-0.101023*	.0651771*
KPK	.4411047***	-0.2423087***
Baluchistan	.0116508***	-0.0228431*

To have provincial analysis, this study estimates individually model for every province. Table 4.5 entails information of treatment score or effects of income diversification on wellbeing, selection hazard provincially. Rests of the information is given in tables which are lying in

appendix if someone wants to see the detail of estimation, estimated for remaining three provinces i.e. Sindh, KPK, and Baluchistan.

Table 4.5 shows evidently treatment effect score Punjab is much higher than other provinces and income diversification has positive effect on wellbeing but surprisingly, income diversification has negative effect on wellbeing in Sindh. The plausible reason for the negative sign for Sindh province can be larger rural agricultural sector with less diversification as compared to smaller and stagnating industrial urban sector. Moreover, income diversification has much strong effect on wellbeing in Punjab and KPK. Value of lambda has been found significant which shows confirmation of the presence of selection bias.

The treatment effect model has been executed to find out the difference in the wellbeing of farm households which are diversifying their income and those who are sticking only on farming. The results suggest that income diversification has positive and significant effects on wellbeing and it makes the difference between those households which are earning non-farm income and only farm income earning households. The poverty in Punjab is 40 percent poverty which is lower than other provinces and Baluchistan has been found the poorest province.

Chapter 5

Conclusion and Policy Implication

This chapter deals with the conclusion of whole study and some recommendations shall be suggested on the basis of obtained results.

5.1: Concluding Remarks

Primarily, this study aims at investigating the impacts of income diversification on wellbeing of rural households in Punjab. The central focus of this study is on farmers because to have the better understanding of the importance of income diversification, farm households has its own significance because farmers have only choice to earn farm income, therefore, it would be imperative to diversify their income to enhance wellbeing. A major portion of population of Pakistan dwells in rural areas and they are the most vulnerable and are still feasting for the attention of concerned authorities or policy makers. Therefore, this study is making endeavor to see through the impacts of farmers' income diversification on their poverty or wellbeing. Second contribution of this study is to calculate multidimensional poverty for only farmers. Income diversification is income of farming family other than farm sources such as from remittances, private and public services etc.

To meet these objectives, data of 1607 farm households for Punjab are collected from PSLM (2010) and treatment effect model is used because of persistence of selection bias due to non-randomness in income diversification which ultimately gives birth to selection bias and to have counterfactual analysis or finding treatment effect score which implies significant differences between both farmers who are engaged in diversifying their income and those who just stayed on farm activities.

Wellbeing index is constructed by using Principal Component Analysis (PCA) on the basis of nine indicators commercial and residential land holding, livestock holding, some infrastructural variables i.e. having toilet, its own residence, number of rooms, structure of house, education and does child vaccinated or not. It comes out that almost 40 percent farm households are found multidimensional poor who are deprived of aforementioned indicators.

Treatment effect model contains two equations: outcome equation where dependent variable is wellbeing index and is regressed age, gender, loan access, savings made by households, participation in committee, land resources, and direct inclusion of income diversification from selection equation which gives effects of income diversification on wellbeing as well as counterfactual. Moreover, in selection equation, where dependent variable is dummy income diversification and is regressed on socioeconomic characteristics of households such as all those variables used in outcome equation and in addition education, farm size and livestock holdings are used.

Baluchistan has been found as the poorest province where 75 percent poverty was concentrated and Punjab is experiencing 40 percent poverty and from descriptive analysis. It also comes out those farmers who are engaged in diversifying their income are found less poor than that of only farmers. Empirically obtained results suggested that there are significant differences in wellbeing of farmers who are working in non-farm activities and those farmers who just stick in farming. Income diversifying households have higher treatment score than that of not diversifying their income. These significant differences are even found in four provinces as well. Interestingly, results suggest KPK was holding higher treatment score than Punjab. Only Punjab province has been found experiencing wellbeing as compared to rest of provinces.

Other than income diversification, commercial building or land holding has been found major variable which affects wellbeing positively and it also affects likelihood to decide income diversification positively throughout the analysis. Dependency ratio has negative effects on wellbeing whereas it affects decision to diversify income positively. Farm size is also an important determinant to affect income diversification which affects statistically significant. Those families which have more land size, they are less likely to diversify their income.

Higher education has positive effects on decision to diversify income as compared to under graduation or illiterate households. Savings, loan access, and participation in informal investment are also found significantly affecting wellbeing and income diversification but their impacts on wellbeing are still found under questions because of inefficient use or misuse of

loans and savings. Further selection biasness persisted in model which has been solved through selection equation.

5.2: Policy Implication

Having concluded whole study, now, this study intends to recommend some policies from obtained results. Major findings suggest that income diversification appears as paramount variable to reduce poverty; hence, some recommendations are given as:

- a. Farmers' income can be enhanced through expansion of rural micro financing such as building banks, public and private institutional support to making easier access of loan etc.
- b. Education has been important weapon to diversify especially higher education, so, rural areas are still lacking good and technical education. Education must be at prime agenda while formulating rural development policies. Marginal sects of farmers should be made able to diversify their income so that they may escape themselves from poverty.
- c. Baluchistan has been found the poorest provinces even, other than Punjab all provinces are calling for the attention of concerned authorities and they should be given strong development consideration via expending education.

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Appendix

Table: Estimation of Treatment Effect Model (Sindh)				
N = 740		Wald chi2(22) = 6072.88		
Prob> chi2 = 0.0000				
Well_being Dependent Variable: Outcome Equation				
	Coef.	Std. Err.	z	P>z
Age	0.001205	0.000558	2.16	0.031
gender	-0.19352	0.089293	-2.17	0.030
Scq04	0.021563	0.001611	13.39	0.000
low_dep	0.019843	0.017084	1.16	0.245
medium_dep_ratio	-0.01211	0.014928	-0.81	0.417
commitee_parti	0.022746	0.030149	0.75	0.451
dum_saving	0.060598	0.022334	2.71	0.007
loan	-0.00384	0.014466	-0.27	0.791
commercial_land	0.538684	0.066607	8.09	0.000
residential_land	1.791497	0.026064	68.74	0.000
livestock	0.17136	0.014404	11.9	0.000
dum_non_fincom	-0.10102	0.056073	-1.8	0.072
_cons	-1.79164	0.097704	-18.34	0.000
dum_non_fincom (Dummy Variable): Selection Equation				
	Coef.	Std. Err.	z	P>z
Age	0.015293	0.004353	3.51	0.000
gender	-1.29873	0.679739	-1.91	0.056

low_dep	0.053033	0.142144	0.37	0.709
medium_dep_ratio	0.110542	0.121318	0.91	0.362
commitee_parti	0.874983	0.18627	4.7	0.000
dum_saving	0.440477	0.174299	2.53	0.011
loan	0.141446	0.116623	1.21	0.225
commercial_land	0.629648	0.571437	1.1	0.271
residential_land	-0.4058	0.19798	-2.05	0.040
livestock	-0.19351	0.113667	-1.7	0.089
no_education	-0.97877	0.461318	-2.12	0.034
metric_edu	-0.96468	0.478877	-2.01	0.044
graduation	-0.55628	0.487209	-1.14	0.254
prim_edu	-0.66381	0.465041	-1.43	0.153
household_assets	0.097874	0.132713	0.74	0.461
s10ac1	-0.07745	0.013606	-5.69	0.000
_cons	1.632686	0.87158	1.87	0.061
lambda	0.065177	0.033818	1.93	0.054

Table: Estimation of Treatment Effect Model (KPK)

N = 602 Wald chi2(22) = 1048.87

Prob> chi2 = 0.0000

well_being Dependent Variable: Outcome Equation

	Coef.	Std. Err.	z	P>z
Age	0.002452	0.001075	2.28	0.023
gender	-0.09796	0.05361	-1.83	0.068

Scq04	0.016263	0.003488	4.66	0.000
low_dep	-0.01637	0.036338	-0.45	0.652
medium_dep_ratio	-0.01019	0.031983	-0.32	0.750
commitee_parti	-0.03343	0.048873	-0.68	0.494
dum_saving	-0.05	0.045674	-1.09	0.274
loan	-0.04768	0.029119	-1.64	0.102
commercial_land	0.342662	0.096914	3.54	0.000
residential_land	1.372886	0.048015	28.59	0.000
livestock	0.139779	0.03099	4.51	0.000
dum_non_fincom	0.441105	0.136137	3.24	0.001
_cons	-1.66506	0.106586	-15.62	0.000
dum_non_fincom (Dummy Variable): Selection Equation				
	Coef.	Std. Err.	z	P>z
Age	0.002616	0.004269	0.61	0.540
gender	-0.00667	0.209559	-0.03	0.975
low_dep	0.21527	0.140111	1.54	0.124
medium_dep_ratio	-0.01858	0.12621	-0.15	0.883
commitee_parti	0.106964	0.195158	0.55	0.584
dum_saving	0.514776	0.16116	3.19	0.001
loan	-0.17352	0.11158	-1.56	0.120
commercial_land	1.221301	0.536384	2.28	0.023
residential_land	0.097343	0.190031	0.51	0.608
livestock	0.053492	0.122122	0.44	0.661
no_education	-0.5057	0.461609	-1.1	0.273

metric_edu	-0.22505	0.470019	-0.48	0.632
graduation	-0.37614	0.532623	-0.71	0.480
prim_edu	-0.55189	0.477631	-1.16	0.248
household_assets	0.306833	0.141197	2.17	0.030
s10ac1	-0.04959	0.012723	-3.9	0.000
_cons	0.442068	0.536863	0.82	0.410
lambda	-0.24231	0.084679	-2.86	0.004

Table: Estimation of Treatment Effect Model (Balouchistan)				
N=300 Wald chi2(22)=2722.45				
Prob> chi2=0				
well_being Dependent Variable: Outcome Equation				
	Coef.	Std. Err.	z	P>z
Age	-0.00025	0.000984	-0.25	0.801
gender	-0.24976	0.167479	-1.49	0.136
Scq04	0.013809	0.00241	5.73	0.000
low_dep	-0.04593	0.036917	-1.24	0.213
medium_dep_ratio	0.012791	0.027909	0.46	0.647
committee_parti	-0.02039	0.039635	-0.51	0.607
dum_saving	0.088958	0.049837	1.78	0.074
loan	-0.06724	0.031177	-2.16	0.031
commercial_land	0.126399	0.221214	0.57	0.568
residential_land	1.743124	0.03956	44.06	0.000
livestock	0.16409	0.025183	6.52	0.000

dum_non_fincom	0.011651	0.138062	0.08	0.933
_cons	-1.57509	0.176165	-8.94	0.000
dum_non_fincom (Dummy Variable): Selection Equation				
	Coef.	Std. Err.	z	P>z
Age	0.016869	0.007686	2.19	0.028
gender	-5.76495	176.4546	-0.03	0.974
low_dep	0.667843	0.220777	3.02	0.002
medium_dep_ratio	0.265367	0.222409	1.19	0.233
commitee_parti	0.397512	0.27753	1.43	0.152
dum_saving	0.390863	0.338103	1.16	0.248
loan	-0.43937	0.267051	-1.65	0.100
commercial_land	6.335533	252.6358	0.03	0.980
residential_land	0.074924	0.385212	0.19	0.846
livestock	-0.15525	0.222593	-0.7	0.486
no_education	-0.31857	0.456637	-0.7	0.485
metric_edu	0.214733	0.508657	0.42	0.673
graduation	1.007739	0.620556	1.62	0.104
prim_edu	-0.11939	0.50394	-0.24	0.813
household_assets	-0.25969	0.184687	-1.41	0.160
s10ac1	0.003812	0.013133	0.29	0.772
_cons	4.079287	176.456	0.02	0.982
lambda	-0.02284	0.080033	-0.29	0.775