

Structural Impediments to Livelihood Diversification in Rural Areas: Evidence from Disaster Prone District in Rural Sindh, Pakistan

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Abstract

Economy of rural Pakistan predominantly relies on agriculture sector which is why rural household income is severely affected by climate variability and increase in natural disasters. Rural households cannot solely rely on agriculture sector in the long run because it is no longer a stable source of income. Therefore, an income diversification strategy is necessary to ensure sustainability of income for rural households in Pakistan. The study examines the drivers of diversification in rural households of the district Dadu in Sindh province. Regression analysis on survey data for 350 households reveals that education is a key determinant of household income and allows income diversification from non-agricultural sources. The interaction between savings and education significantly increase the income diversity at household level. Consistent with the expectations, income diversification appears to be positively correlated with per-capita income; however in the initial stages of diversification it may not have positive affect. The result reveals that when the income diversification reaches a threshold level it starts affecting the per-capita income positively. There is immense potential for on-farm and off-farm livelihood opportunities, however not at par to break the chain of poverty. This is mainly because of structural impediments such as low economic and socio-economic developments. Thus do not allow making effective and efficient use of available and diversified livelihood sources.

Keywords: Economic Development, Poverty, Disasters, Sustainability

JEL classification: O19, I32, Q54, Q56

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1. Introduction

Despite decades of global efforts for rural economic integration and development, today a substantial proportion of world rural population is living in extreme poverty. While in terms of rural – urban population distribution, the former still dominates the latter in terms of size. Thus, considering the size of rural population it is estimated that more than three fourth (at least 70 percent) of world's very poor belongs to rural geography (IFAD, 2011). The size of the rural population is highest in South Asia (more than 500 million people), while people in the sub-Saharan Africa have the highest incidence of rural poverty. Almost 80 percent of extremely poor people from South Asia live in rural areas (IFAD, 2011).

“Neither of these facts (rural phenomenon: size of rural population and poverty dynamics) is likely to change in the immediate future, despite widespread urbanization and ongoing or approaching demographic transitions across regions. Now and for the foreseeable future, it is thus critical to direct greater attention and resources to create new economic opportunities in the rural areas for tomorrow's generations”.

(Jamal, 2014b, pp. 1)

The main target of every economic policy is to improve the living standards of the residents. In developing countries, often the focus of policy makers is to devise strategies and policies that improve income distribution to reduce poverty (Adams, 1995). However, existing literature on issues in rural economies and associated poverty reveals that there is a need of thorough understanding of economic, social and socio-economic dynamics of rural geography. The concept of inclusive growth encompasses the provision of equal opportunity and the protection and access to employment to rich and poor alike. Poor in rural areas then become the target of inclusive growth strategies as they are the most vulnerable group.

Rural economies in most developing countries heavily depend on agriculture which is prone to shocks through natural disasters. In an event of a shock to agriculture sector, long run income streams of agriculture dependent rural households are severely affected. In order to reduce the impact of external shocks, income diversification strategies have been applied in developing countries to guard rural households against external shocks and to increase the sustainability of the rural household income. Diversification has two main aspects; one is the shift away from the agriculture activities, and the second is the increasing mix of income sources including on-farm and off-farm activities (Schwarze and Zeller, 2005). Diversification in the context of off-farm and non-farm activities has gained importance in

line with growing concept of sustainability because of seasonal nature of the traditional rural economy, increasing water scarcity, frequent drought and uncertainties.

Pakistan is an agro-based economy, and the agriculture sector plays an important role in country's total productivity and economy. According to Labour Force Survey of Pakistan (2014-15), about 61 percent of the rural labour force in Pakistan and 35 percent of country's total labour force is dependent on agriculture sector. In last ten years, the agricultural productivity and growth are declining due to a boom in services sector that now accounts for more than 50 percent of GDP in Pakistan. The volatility in agriculture growth is due to increasing cost of agriculture inputs, low support prices, climate variability, water shortage and higher frequency of natural disasters particularly flooding and untimely rainfall. With high population growth and ever increasing living cost, the rural households are under constant stress of generating more income to survive.

In the last decade, Pakistan has been affected by increased climate variability. Sindh province, due to its geographical location and low level of disaster preparedness, has been the most affected province from climate induced hazards such as floods, water stress, salinity, desertification, drought and cyclones. Studies suggest that agricultural productivity has declined due to changing climate patterns (Iqbal, Goheer and Khan, 2009). In 2010, the Government of Sindh declared Badin, Dadu, Tharparkar and Thatta districts as disaster/hazard prone areas in Sindh⁴. All these districts are largely dependent on agriculture as the main source of livelihoods thus they are at the risk of both food and water insecurity.

District Dadu is the only district amongst other disaster prone districts which is affected by all types of climate induced disasters due to its widespread topographic characters. These natural disasters include earthquake, flooding, rain flooding, river intrusion and drought. Further, the district Dadu is relatively more vulnerable to extreme natural events due to lack of economic opportunities and high dependence on agriculture based livelihoods. The challenge is to identify the potential resources to combat the challenges faced by rural calamity-hit areas. Therefore, it is highly important to understand the household diversification, existing opportunities and potential impacts in the selected rural economy of Pakistan. The increasing population and declining natural resources also has consequent impact on diversification in the livelihood sources at the household level. Quite surprisingly, despite the recognized importance of improving rural household income, Pakistan is one of

⁴ The Express Tribune, June 30, 2010

the least studied countries at a micro level to understand the rural household income impetus as well as off-farm rural activities and their impact on rural household income. The importance of diversification in household income is also a relatively understudied area in Pakistan. Thus, the current study is an attempt to examine the impact of diversification on household income as well as to identify the determinants of income diversification from farm-based to non-farm based in the empirical investigation.

2. Literature Review

The conceptual and theoretical framework for the research study has been taken from the existing contributions on the rural economy, the rural household income sustainability and diversification. The important aspect of the literature is the recent studies on the sustainability analysis of rural economy amidst growing external shocks including the climate change (Agbola et al., 2008; Chambers, 1991; Davis, 2007; Sarah, 2012). All above areas are considered important for the knowledge and understanding that how important is to recognize the rural household income impetus.

The livelihood and income diversification of household is closely associated with flexibility, resilience and sustainability (Ellis, 1999). However, not all the rural households are flexible by means of capacity to diversify and they may not have equal access to economic opportunities (Barett, Reardon, and Webb, 2001). The literature on income diversification reveals that the overall impact of income diversification is the improvement of social welfare through developing new economic opportunities (Boughton et al., 2006). Income diversification enables the households to cope with shocks by means of reducing livelihood vulnerabilities (De Janvry, Fafchamps and Sadoulet, 1991). Thus, diversification allows households to reduce vulnerability and increase food security (Barett, Reardon, and Webb, 2001; Schwarze and Zeller, 2005; Ahmed, 2012).

Farm-based sources of income are considered important for the rural household because of the high dependency on agricultural employment. However, non-farm income guards these households against external shocks and leads to greater earnings and consumption of the rural households (Barett, Reardon, and Webb, 2001; Schwarze and Zeller, 2005; Carletto et al., 2007). The combination of farm-based and non-farm-based income helps in improving standard of living and reducing poverty and inequality. With respect to food insecurity, the households having access to non-farm income are better-off as compared to those who solely rely on farm-based income (Agbola et al., 2008). According to Dolan (2012);

“Evidence also suggests that households are diversifying away from farming due to land and capital constraints that make reliance on agriculture as a sole income source less viable. However, the potential for, and benefits of, diversification are contingent upon the nature of household headship, as well as upon the kinds of off-farm activities in which households are likely to engage.”

Kanwal, Khan and Zheng (2016) argue that insufficient resources is the main bottleneck in establishing full employment opportunities and income avenues for sustainability in rural Pakistan. Their study empirically assessed the determinants of non-farm income diversification in four targeted villages. They concluded that the pattern of non-farm employment is the same across villages (self-employment such as shopkeeper, and other private micro-entrepreneurships; wage workers such as construction and sales activities) but it had positive impact on absolute income of the rural households. They also found that education, household size, and access to credit are significant determinants of income diversification in rural areas.

Ghimire, Huang, and Shrestha (2014) in their investigation on determinants of non-farm activities in Central Nepal, found age, education of household head, and family size to be the significant determinants of participation in nonfarm income activities whereas poor infrastructure and lack of market access hinders the nonfarm income opportunities in rural areas. Similarly, Agyeman, Brempong and Onuman (2014) found positive significance of age, education, and the rural infrastructure in determining the diversification in farm household of Ghana.

Velazco and Pinilla (2012) studied the determinants of income diversification in the rural areas of the poor region of North and Central Peruvian Sierra. Their empirical assessment shows that landholding positively and significantly explains farm-based income whereas education is an insignificant determinant of diversified off-farm activities. Moreover, despite the low productivity in off-farm based income sources, the poor families still prefer to adopt the non-farm based income source as risk reducing strategy.

Ahmed (2012) observed the determinants of income diversification in the context of income and food security. The author assessed the off-farm activities as a supplementary income of rural household. The results revealed that age and household head's education strongly affect the household income, while the household size does not. Additionally, the author also noted

that increase in access to economic activities and infrastructure development are positively correlated with diversified livelihood opportunities.

Hashmi and Sial (2008) in their study estimated the trends of rural poverty and its determinants in the selected districts of Punjab province, Pakistan. They used binary logistic model and headcount measure for the purpose of analysis. The household size and dependency ratio are found to poverty trap for rural households, while education and livestock release the household for being a poor. They also pointed out the impact of social infrastructure on rural income and significance in reducing poverty.

3. Data and Methodological Framework

3.1 Data Composition

Empirical analysis of the present study is based on survey data from district Dadu comprising of 700 individuals (one male and one female) from 350 households, covering the demographic profiling of 2533 members of the selected households. The data was collected from rural circles of 15 union councils of 4 talukas in district Dadu. The geographical coverage represents all type of topographies in the district. The data was collected by Social Policy and Development Center (SPDC) during the year 2014-15.

3.2 Model Specification

As per the objective of the study, the study explores the determinants of diversification to understand dynamics of livelihood in rural areas. Before getting into directly the determinants of diversification, the study first assesses the impact of income diversification on household income. The relationship between income diversification and per-capita income is complex as higher diversification is likely to increase the income opportunities for household which would lead to higher per-capita income. However, since the cross-sectional framework does not account for the possibility of reverse causality, it might also be that poor households are forced to look for income opportunities other than their own profession. Such a possibility will show an increase in diversification for low-income households. The model to assess the impact of income diversification on per capita income can be written as:

$$\ln y_i = \beta_0 + \beta_1 FS_i + \beta_2 EM_i + \beta_3 Age_i + \beta_4 Edu_i + \beta_5 LS_i + \beta_6 AgIn_i + \beta_7 Land_i + \beta_8 \ln Div_i + \epsilon_i \text{ --- Equation (1)}$$

In equation 1, $\ln y$ = log of per-capita income of the household, FS = family size, EM = number of earning members, Age = age of the household head, Edu = the average education

years at household level, LS = value of the livestock owned, Land = agricultural land owned by the household, AgIn = agriculture income, lnDiv = log of Diversification Index and ϵ = idiosyncratic error term. Family size is expected to have a negative correlation with per-capita income as higher the number of individuals in the household, lower the per-capita income (Croppenstedt, 2006). Average household education, ownership of land and diversification are expected to have positive and significant impact on household per capita income.

To explore the determinants of diversification, the study uses the econometric specification of Schwarze and Zeller (2005). Some of the variables used in the original study are dropped in this study due to data unavailability. The model for determinants of income diversification can be written as:

$$\ln Div_i = \beta_0 + \beta_1 EM_i + \beta_2 Dep_i + \beta_3 Edu_i + \beta_4 GHH_i + \beta_5 Sav_i + \beta_6 AgrInc_i + \epsilon_i - - -$$

Equation (2)

Where **Dep** = dependency ratio and **GHH** = gender of household head.

The diversification is measured using inverse of Herfindahl Index for three different sources of income (agriculture, non-agriculture and livestock). Herfindahl Index is a measure of concentration (or specialization in your case). The inverse of Herfindahl Index then gives us a measure of diversification.

$$Div = 1 / \sum_{i=1}^I s_i^2$$

Where s_i is share of an income source (agriculture, non-agriculture or livestock) from the total income, sum of all income shares equal to one (1). Diversification calculates equality of shares, the more they move towards equality, the higher is the diversification.

The parameters for econometric models described above are estimated using ordinary least squares. Ordinary least squares methodology provides a simple estimation framework suitable for cross-sectional analysis which is why most of the cross-sectional studies in economics rely on ordinary least squares for estimation of the parameters. However, one of the limitations of estimations based on cross-sectional data is that one cannot make causal inferences from these estimations. Moreover, in cases where endogeneity is suspected, OLS estimations based on cross-sectional data should be interpreted with caution.

4. Data Analysis and Results

The descriptive statistics of the data used in the empirical analysis is presented in table in appendix Table 3 and correlation matrix is given in Table 4. Table 3 shows that average yearly income for a household in district Dadu is Rs. 93,424.93. In per-capita terms, average household income is Rs. 14,521.94 with a minimum of 0 and maximum of Rs. 76,800. The average family size of the survey was approximately 7 persons in a household with the minimum being 1 and maximum being 22. On average there are 2 earning members in the family and an average age of the household head is around 43 years. With respect to gender disparity, 85% of the head of the households were male, while average education of the family on average is 1.5 years. Correlation matrix in Table 4 shows that most of the correlations are below 0.6 which indicates that multicollinearity bias may not arise in our estimations. Variance Inflation Factor (VIF) scores are also used in the analysis to ensure that the multicollinearity problem does not exist. Moreover, cross sectional data usually suffers with the problem of heteroscedasticity, therefore robust standard errors are used to interpret the significance of the coefficients.

Impact of Diversification on Household Income

Estimation results based on ordinary least squares primarily to understand the impact of diversification on household income along with other selective variables for model specifications 1 (equation 1) are presented in Table 1. The VIF score for the main model without interaction is 1.24 which is significantly lower than 10 and we can conclude that there is no multicollinearity in this estimation.

Table 1 shows that diversification has a strong positive correlation with income per capita of rural households in Dadu. Our result strongly suggest that income diversification is crucial for the livelihoods of these households. Column (2) of the table includes a quadratic term of the diversification index which has a positive sign but after inclusion of the quadratic term, the main effect of diversification turns negative. This result shows that initially when households increase income diversification, their income per capita is affected negatively but after reaching minima, income diversification start rewarding with positive impact on per capita income. Colum (3) presents the interaction between average education and income diversification which shows that average education does not moderate the relationship between income diversification and per capita income.

Table 1: Impact of Diversification on Per Capita Income. Dependent Variable Per Capita Income

	(1)	(2)	(3)
Family Size	-0.103*** (0.014)	-0.103*** (0.014)	-0.103*** (0.014)
No. of Earning Members (Excluding, Unpaid Family Helpers)	0.150*** (0.031)	0.154*** (0.032)	0.151*** (0.032)
Age of Head of HH	0.003 (0.002)	0.003 (0.002)	0.003 (0.002)
Gender of the household head Male = 1	0.625*** (0.097)	0.629*** (0.096)	0.623*** (0.096)
Average Education Years in Household	0.113*** (0.015)	0.111*** (0.015)	0.101*** (0.021)
Livestock Value (1000000)	0.808** (0.337)	0.894*** (0.340)	0.817** (0.336)
Agri Land Acre	0.005*** (0.002)	0.005*** (0.002)	0.006*** (0.002)
Log Inverse Herfindahl Index	0.070*** (0.025)	-0.019* (0.059)	0.050* (0.036)
Log Inverse Herfindahl Index X Log Inverse Herfindahl Index		0.016** (0.007)	
Log Inverse Herfindahl Index X Average Education Years in Household			0.008 (0.007)
Constant	8.730*** (0.142)	8.746*** (0.144)	8.751*** (0.145)
Observations	317	317	317
R-squared	0.354	0.359	0.356
Adjusted R-squared	0.337	0.340	0.337

Robust standard errors in parenthesis

*p<0.1, **p<0.05, ***p<0.01

The coefficient for family size shows that family size is significantly correlated with per-capita income with negative sign. The result is in line with the hypothesis and earlier studies (Croppenstedt, 2006) that larger family size is expected to decrease per-capita income levels in the household. Estimations also show that higher the number of earning members, high the the per-capita income level of the household level.

Consistent with the human capital theory, average education years of the household is strongly correlated with the per capita income (Croppenstedt, 2006; Fadipe, Adenuga, and Lawal, 2014; Singh et al., 2012). The analysis also shows that ownership of agricultural land and livestock is positively correlated with per capita income. Testing for gender-bias, our results show that when head of the household is a male, the household is highly likely to have

higher per capita income as compared to the one with female head of the household. Age of the household head does not seem to significantly affect per capita income of a household. The hypothesis for farm size states that larger the owned farm size is, the higher the income will be.

Determinants of Income Diversification

The empirical estimation results for the determinants of diversification (equation 2) are presented in Table 2.

Table 2: Determinants of Income Diversification in Dadu, Sindh

	(1)	(2)	(3)
No. of Earning Members (Excluding, Unpaid Family Helpers)	0.133*** (0.044)	0.118*** (0.042)	0.139*** (0.045)
Gender of the household head Male = 1	0.394** (0.155)	0.267* (0.144)	0.126 (0.168)
Average Education Years in Household	0.116* (0.066)	0.228*** (0.079)	-0.042 (0.037)
Dependency Ratio	0.056 (0.070)	0.051 (0.069)	0.056 (0.070)
Household Savings (100000 PKR)	-0.027 (0.091)	-0.332*** (0.108)	-0.049 (0.088)
HH Agricultural Income (100000 PKR)	-0.293* (0.167)	-0.339** (0.169)	-0.333* (0.175)
Average Education Years in Household X Household Savings (100000 PKR)		0.143*** (0.048)	
Average Education Years in Household X Gender of the household head Male = 1			0.196** (0.078)
Constant	-0.043 (0.189)	-0.143 (0.189)	0.145 (0.183)
Observations	317	317	317
R-squared	0.065	0.137	0.078
Adjusted R-squared	0.047	0.118	0.057

Robust standard errors in parenthesis, *p<0.1, **p<0.05, ***p<0.01

Table 2 shows that having higher number of earning members in the household helps in income diversification strategy. This result is robust across four estimations in Table 2. Results also show that when head of a household is a male and as average education of a household increases, it is more likely to diversify. However, the significance of these two coefficients is not robust across specifications. Negative and significant correlation of

agricultural income shows that if a household receives high agricultural income, it may not feel a need to diversify their income stream. Extending the analysis, column (2) includes the interaction between savings and average years of education. When this interaction is included, the main effect of savings became significant with a negative sign, showing that households with high savings are less likely to diversify. However, when interacted with average education of the household, savings has a positive and strongly significant correlation with diversification. It shows that households that can save, spend their savings on education of their members which in turns allows them to diversify their income stream in the long run. It is also noteworthy to mention that after inclusion of the interaction between savings and education, the coefficient of the main effect of average education becomes significant at 1% as compared to 10% percent in the main specification. In column (3), the interaction between gender of the household head and average education is positive and significant at 5% which shows that when head of a household is positive, education has a stronger impact on income diversification.

5. Conclusion and Discussion

The main results of the empirical analysis in the previous sections show the importance of education as a determinant of income levels. It also shows that income diversification is a strong determinant of per capita income of rural households in Dadu. The results show that at initial levels of diversification, per capita income declines but when it reaches a threshold level, it starts to affect per capita income positively. The overall conclusion of the analysis highlights the role of diversification and human capital as a determinant of household income.

Results for the determinants of diversification show that male household heads are more likely to engage in non-agricultural income sources. When interacted with average education levels, households with male head are more likely to benefit from education to increase their income diversification. The analysis also shows that savings significantly interact with education to increase income diversity of households.

Livelihood opportunities in the rural areas of Pakistan and Sindh province are in dismal state, and are not at par to break the chain of poverty and inequality in the district. In the absence of proper compensated off-farm livelihood opportunities, there is a high dependency on farm-based activities in the rural areas. Thus, the ownership of agricultural land is always

considered a valuable asset that can be either self-cultivated, or share cropped or rented for the income generation.

6. Policy Implication

Pakistan is predominantly a rural economy, despite this, the rural population has been neglected since so long in terms of social and economic development. Globally, the rural economy is considered to be the engine of the economic growth. Additionally, they are also the custodians of country's rich natural resources. The existing state of economic and social development requires much attention especially for the provision of basic necessities, education and health care facilities. Besides these, the growing population and increase in labour force demand productive economic opportunities. Considering the labour intensive skills of the rural population there is a need to develop policies to support the labour segment by bringing the small-scale manufacturing industries. Beside this, it is equally important to enhance the rural entrepreneurship for home-economic activities including the livestock associated activities. Improvement of existing rural infrastructure is fundamental for any sustainable employment and development policies in the rural areas.

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Appendix

Table 3: Descriptive Statistics

Description	Mean	Sd	Min	Max
Total Household Income (PKR)	93424.93	86850.71	0	684500
Total Household Income per capita (PKR)	14521.94	11794.35	0	76800
Family Size	6.885714	3.580202	1	22
No. of Earning Members	2.248571	1.488614	0	10
Age of the Head of the Household	42.78571	12.72713	11	90
Gender of the age of the household	.8428571	.3644564	0	1
Cumulative education years of the household	10.73714	14.75898	0	115
Average education years of the household	1.485486	1.872344	0	11
Livestock ownership (value in PKR)	51761.69	97319.06	0	1000000
Agricultural Land in Acres	2.42	14.2908	0	250
Saving (PKR)	-91613.28	107416.8	-623200	332176
Agricultural Income (PKR)	26669.56	42501.64	0	420000
Non-agricultural income (PKR)	47760.34	79746.62	0	615600
Income diversification	43.9	461.74	1	7720.55
<i>Count (N) = 350</i>				

Table 4: Correlation Matrix

S.#	Description	1	2	3	5	6	7	8	9	10	11	12	13
1	Family Size	1											
2	Dependency Ratio	0.17	1										
3	Age of the Household	0.14	-0.12	1									
5	No. of Earning Members	0.57	-0.2	0.15	1								
6	Agriculture Land in Acres	0.01	-0.06	0.03	-0.02	1							
7	Average Education of the Household	0.01	-0.25	0	-0.01	0.2	1						
8	Gender of Household Head	0.28	0.06	-0.04	0.08	0.07	0.06	1					
9	Savings	-0.04	0.06	-0.02	0.05	0.03	0.07	-0.06	1				
10	Agriculture Income	0.17	-0.07	-0.02	0.04	0.58	0.24	0.22	0.05	1			
11	Per capita Total Income	-0.16	0.34	0.05	0.02	0.25	0.42	0.24	0.33	0.27	1		
12	Livestock in Rs.	0.23	-0.09	0	0.13	-0.02	-0.03	0.16	-0.04	0.15	0.03	1	
13	Income Diversification	0.19	0.06	0.05	0.24	-0.02	-0.05	0.14	0.01	0.14	-0.09	0.18	1