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RURAL EMPLOYMENT AND INCOME DIVERSIFICATION IN PAKISTAN

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Rural households have different asset endowments and they either specialize in single activity or choose to earn both from farm and nonfarm activities. The study constructs Hirchman-Herfindahl Index to evaluate the household income diversification by employing survey data for rural household from Pakistan for the periods 2001-02 and 2010-11. The study estimated the determinants of household diversification by employing logit, linear and censored regression models. Our results showed that agricultural assets including landholding and livestock ownership negatively affect the income diversification. On the other hand, human capital development through education and female participation increased the household employment diversification. The households having access to transport and formal credit choose to diversify while the impact of access to road and information was found insignificant. The results also suggests the development of nonfarm sector by investing in commuting infrastructure and human capital to ensure sustainable incomes of rural households.
Keywords: Agriculture sector, rural households, labour absorption, employment choices, human capital.

INTRODUCTION

The agriculture sector is characterized by volatile output prices and its share in aggregate GDP is declining gradually. As reported in Pakistan agricultural census of 2010, farm size is shrinking over time in Pakistan, which is the case in most of the developing countries (Agriculture Census Report 2010). Therefore, the agricultural sector is disadvantaged in providing reliable employment to the masses. Furthermore, the Green Revolution has changed the labor and agricultural output relationships. Initially, labour absorption increases due to the expansion of irrigation technologies and cropping intensity (Jayasuriya and Shand, 1986). Mechanization causes a gradual change in factor intensities and the farm production becomes more capital intensive (Buttel *et al.,* 1985; Reid, 2011). It results in a massive shift of workers with low skill levels either looking for nonfarm work in the rural sector or migrates to urban centers for employment. Pakistan is also hard hit with the climate change, wherein damages from floods, droughts, and heat waves are increasing in the recent years (Environment and Climate Change Report, 2013; Memon and Sharjeel, 2015). Poor rural households who lack physical and human capital are the most vulnerable and even minor shocks can affect their income. Therefore, measures to mitigate the risk of disasters need to include sustainable livelihoods for rural households. Livelihood diversification enables rural households to make a diverse portfolio of activities and social support capabilities for survival and to improve living standards.

Land and livestock holdings of households are perceived to determine the family income in rural areas. The family income also relies on the abilities of its members to diversify earning sources between farm and nonfarm sectors in order to manage the uncertainty related to agricultural income (Reardon, 1997; Anwar *et al*., 2004; Démurger *et al*., 2010; Davis *et al*., 2010; Ahmad *et al*., 2017). Farm work is the predominant occupational choice of households in the rural areas of Pakistan. The rural household is fundamental decision-making unit for allocation of labor services of its members among the farm and nonfarm activities for income. It sells its labor and output in the market and also purchases inputs and labor services from the market. Land and labor are substitutable in the farm and other sectors (Arif *et al*., 2000). The human capital may affect the nonfarm work decision through reduced factor intensity in the farm sector (Fafchamps and Quisumbing, 1999; Kurosaki, 2001; Beyene, 2008; Hitayezu *et al.,* 2014). The poorly endowed rural household chooses income diversification as a survival strategy because farm activities alone may not provide sufficient income. The landless families if have education and social capital would be inclined more towards the nonfarm sector. Rural nonfarm activities involve the provision of inputs and some allied services by the domestic cottage industry.

Since the late 1990s, a large number of empirical studies indicate that rural nonfarm sector and income diversification has been focused in development research (Canagarajah *et al.,* 2001; Ellis and Mdoe, 2003). Several case studies and primary data sets suggested that the income from the nonfarm sector is increasing (Davis, 2006; Haggblade *et al*., 2007). These studies evaluate the implication of rising nonfarm sector on agricultural policy and find it a strategy of the rural household to cope with natural upheavals and policy shocks. Studies on poverty and employment strategies in the rural

sector emphasize on the employment diversification by making the nonfarm sector vibrant (Leones and Feldman, 1998; McElwee and Bosworth, 2010; Ullah *et al*., 2015). Some studies examined the relationship between participation in rural nonfarm employment using individual and household characteristics such as gender, education, road access, access to electricity and water, landholding etc (Adams and Alderman, 1992; Yang, 1997; Arif *et al*., 2000; Kaur, 2010; Bezu *et al*, 2013).

The medium-term development framework (MTDF 2005-10) focused on agriculture growth in Pakistan on one hand and more employment opportunities on the other. The public expenditures on the provision of rural to urban road connect and other transport infrastructure development has increased in the country especially during the Mid-2000s. Utilizing the micro data set from nationally representative surveys, this study aims to evaluate the changes in diversification trends. The access to rural income opportunities and choices made by the household members depend on strategic, behavioral and structural factors as well as household characteristics. Structural factors are mainly motivated and monitored by government development plans like MTDF. The composition of farm and nonfarm activities chosen by the households are also affected by the availability of infrastructure. Household characteristics include physical capital such as, landholdings and the human capital captured by education, experience, household size, and dependency ratio. In this backdrop, this study has two objectives. First, to evaluate the magnitude of employment diversification of rural households and the second is to assess the significant determinants of this employment diversification. Figure 1 describes the broad framework of the study.

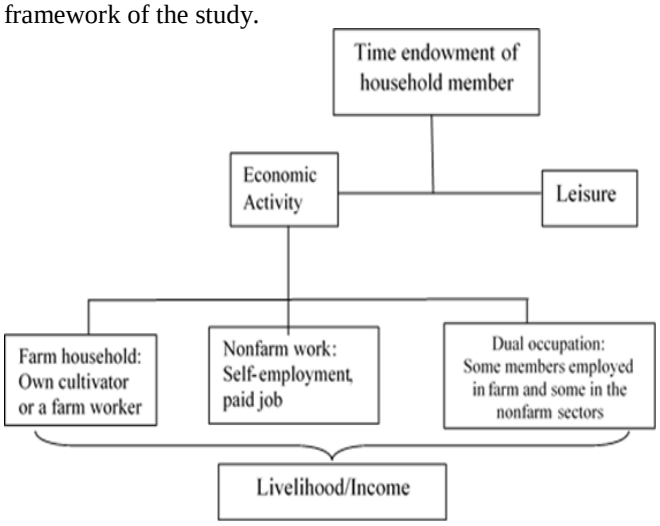

Figure 1. The framework of the household employment choice and income diversification.

MATERIALS AND METHODS

To achieve the study objectives, this study utilizes the survey data of Pakistan Social and Living Standards Measurement Survey (PSLM) collected by the Pakistan Bureau of Statistics. PSLM collects countrywide information using large sample on key social indicators as well as on income and consumption, household size; the number of employed people and their employment status, main sources of income; consumption patterns; the level of savings; and the consumption of the major food items. The PSLM provides data on employment choice of rural household by separating it into agricultural and non-agricultural categories.[1] The use of PSLM enables to draw more reliable and generalizable estimates and policy implications at the national level (see Pakistan Bureau of Statistics, 2014-15][2].

The details of sample size against different sources of income are given in Table 1. The nonfarm self-employment refers to income-generating activities related to some service provision domestically. The employment choice of rural household is categorized into agricultural and non-agricultural categories. Agriculture farm sector can further be divided into subcategories of owner-cultivator, share-cropper, contract cultivator and livestock holding whereas the non-agricultural work choice is categorized into employer, self-employed and paid-employee as given in Table 1.

Table 1. Sample Size Descriptive of PSLM.

Category	Frequency distribution	
	2001-02	2010-11
Sample Size	13635	13717
Farm	4822	5015
Own cultivator (%)	49.13	35.01
Share cropper (%)	18.37	11.67
Contract cultivator (%)	4.69	4.27
Livestock only (%)	5.60	10.65
Paid Employee (%)	22.21	38.34
Nonfarm	8813	8702
Employer (%)	2.92	0.57
Self-employed (%)	28.67	17.40
Paid Employee (%)	69.03	81.89

The data reveal that percent share of own cultivator and share-cropper has decreased during 2001-02 and 2010-11 whereas, the category of paid farm employees showed an increasing trend. A similar trend prevails in the nonfarm sector and paid employees. All the employment categories have been divided into the farm and nonfarm employment choices after matching them with the occupational and industrial categories. However, the total income of rural household is

[1] PSLM was initially named as PIHS till 2001-02

[2] http://www.pbs.gov.pk/content/pakistan-social-and-living-standards-measurement

achieved by aggregating wage income, profit income, in-kind consumed goods, and pension or any other received benefits. The share of the farm and nonfarm sources is calculated at the household level.

Rural household chooses farm activity by default and the nonfarm employment indicates the extent of diversification. A higher share of nonfarm income in the rural household may be referred to as more diversification that may result in reducing vulnerability to shocks and reduced incidence of poverty. Most of the time, diversification index is obtained either by the count of activities or by a weighted sum of a portfolio of activities. Different approaches are adapted to determine the share of the nonfarm sector in rural incomes. One-dimensional attempts focus on the quantification and estimation of the share of only nonfarm income in total household income (Block and Webb, 2001; Quizon and Sparrow, 2001; Lanjouw *et al*., 2001; Davis *et al*., 2010). Another branch of studies has adopted one or more of two-dimensional indexes, such as the complement of the Herfindahl-Hirschman index (HHI), the Berry index, and the entropy measure of diversification (McNamara and Weiss, 2005; Mishra, *et al.,* 2010). To measure the intensity of diversification, the study employed HHI using the formula given as follows.

$$HHI = \sum_{j=1}^{n} S_j^2$$

Here S_j is the proportion of each source in the household income. It is calculated for every household and increases continuously with higher diversity. Many econometric models such as regression or quintile regressions are used in agricultural economics literature to estimate the degree of income diversification among rural households (McNamara and Weiss, 2005). This study estimates diversification intensity and its determinants in two-steps. Firstly, the HHI is constructed by measuring the share of farm and the nonfarm incomes earned both from self-employed and wage worker in the total household income. Secondly, the determinants of diversification are explored using three different models. The explanatory factors for diversification are broadly defined as comprising of physical capital (including agricultural land, commercial land and livestock holding); human capital (education and female participation); social capital (connectivity); and institutional capital (including access to road, transport and credit). In Model l , the diversification is taken as a dichotomous variable and is estimated through logit modelling technique. In Model 2, the dependent variable of diversification i.e., HHI is continuous and standard ordinary least square technique (OLS) is applied to estimate the determinants of diversification. The distribution of HHI revealed that there are many observations with value "one" and with an excess of zeros implying that most households specialize and choose to participate only in a single activity. In order to get consistent estimates void of biasedness, in Model-3, a Tobit model is estimated[3]. Estimates of all the three regressions with the same set of explanatory variables are used to check the robustness of results. The research problem is investigated through estimating three models using alternative methods. The general form of the model is given:

$$Y_i = \beta_o + \beta_1(\text{ownership of agriculture land})_i + \beta_2(\text{size of agriculture land})_i + \beta_3(\text{farm income})_i + \beta_{4i}(\text{nonfarm income})_i + \beta_5(\text{number of livestock})_i + \beta_6(\text{value of livestock assets}) + \beta_7(\text{ownership of business land}) + \beta_8(\text{satisfactory access to transport}) + \beta_9(\text{satisfactory access to road}) + \beta_{10}(\text{Connectivity})_i + \beta(\text{Average Education of household})_i + \beta_5(\text{female participation})_i + U_i$$

***Qualitative analysis*:** The variables are listed in Table 2 and their relevance for diversification is presented based on statistical measures of association through Chi-squares technique.

The descriptive analysis shows an association between each explanatory variable with the dependent variable. The two-way table of the categorical dependent variable is compared with categorical independent variables that provides the statistical relationship through Chi-square ($\chi 2$-test). The null hypothesis for $\chi 2$-test assumes that there is no association between these variables while the alternative hypothesis is that there does exist some association. Nonetheless, the nature of this association is not ascertained through this test. For all the explanatory variables with the *p*-value of $\chi 2$-test, less than 0.05 implies the existence of an association between the concerned variable and dependent variable. It shows interesting results. For instance, there is a 15% chance that a household diversifies if it owns land as compare to landless households where only 11% diversify. The diversification trend is increasing over time as the results of 2010-11 showed that 21% of rural households who own land diversify as compare to landless households where only 7% choose to diversify implying that landless households generally choose only nonfarm employment. It reiterates our argument that generally resource-poor rural households diversify. Female participation increases diversification by 11% in 2001-02. PIHS 2001-02 shows that the highest rate of diversification is prevailing in the rural households from Sindh as compared to 16% in Punjab, 17% in KPK and only 7% in Balochistan.

The computing facility for the household that includes transportation source, availability of infrastructure like roads and public buses, access to information and access to credit

[3] Wooldridge (2002) established fact that Tobit models avoid the potential bias accruing from large number of zeroes in the dependent variable.

Table 2. Qualitative determinants of diversification at the household level.

Variable	Definition of variable (Dichotomous)	Diversifying households (%)	
		2001-02	2010-11
Agriculture Landholding	Owns Agriculture Land	14.60	20.6
	Doesn't Owns Agriculture Land	11.31	7.1
Business Landholding	Owns Business Land	13.44	21.5
	Doesn't Hold Business Land	11.82*	11.4
Non-Agriculture Land	Owns Non-Agriculture Land	10.51	24.5
	Doesn't Hold Non-Agriculture Land	11.98	11.1
Female Participation	Yes	18.99	21.1
	No	8.29	8.1
Market access (Bus Service)	Satisfactory access to Bus Service	17.09	12.8
	Unsatisfactory access to Bus	11.55	9.2
Market Access (Roads)	Satisfactory access to Road	19.79	12.1
	Unsatisfactory access to Road	13.58	10.7
Credit Access	Satisfactory Access to Bank	-	13.5
	Unsatisfactory Access to Bank	-	8.4
Information	Have TV/ computer	13.92	14.3
	Haven't TV/ Computer	11.44	9.8
Province	Punjab	15.73	15.6
	Sindh	19.61	8.7
	KPK	16.67	11.2
	Baluchistan	7.65	5.8

increase the chances of rural households undertaking multiple activities thereby increasing the diversification. Comparison between the data from two surveys shows that percentages of household those who choose to diversify livelihood are rising over time. The ownership of physical capital drives a household to diversify as there is an increasing trend between 13% and 10% in 2001-02 to 24% and 21% in 2010-11 for business landholding and non-agricultural landholding respectively.

RESULTS

This section presents the estimation results of the three models mentioned earlier. Results are displayed in Table 3 for the years 2001-02 and 2010-11. The magnitude, direction and the significance of the coefficients of all the explanatory variables are consistent in three different estimations and explain fairly well the actual situation of diversification in rural areas of Pakistan. In Model 1 the dependent variable is dichotomous; 'diversify' and 'do not diversify'. Most of the variables are insignificant in this model except the income and female participation. However, linear and censored regression models give more robust results. A noteworthy result is that landholding appears insignificant in all the models. Estimates are insignificant for the variables like ownership of agricultural land and size of agricultural land, ownership to business land and satisfactory access to the road.

It implies that most forms of physical capital are insignificant in explaining income diversification. However, the social and human capital are statistically significant. Limited agricultural landholdings of rural households force them to look for alternative earning sources to augment the household income. The variables representing income from farm and nonfarm sectors are highly significant in all the models. The coefficients of these variables are consistent and show that higher income from any source does not favor diversification that is, higher incomes would lead the household to specialization rather than diversification. Limited agricultural landholdings of farm households may drive households to look to diversify in earning activities. Therefore, the coefficient of the size of agricultural land is statistically significant and has a negative impact on income diversification index. It is more plausible for the households with larger farm sizes to choose a specialization in the farm activities.

Gardner (1992) reported that declining poverty of farm household, diverging farm and nonfarm wage rates, and the link between decreasing farm population share vis-à-vis rising farm incomes together suggest that mobility of the lowest income people out of agriculture would solve the farm problem (Mishra and Gillespie, 2011). The highest schooling years of any of the household member and the female participation affect income diversification positively and are statistically significant and the results are supported by the Gueye (2014). These results indicate that human resource quality and quantity of households motivate them to diversify employment. Again, household income diversification increases as education and quality of labor increases.

Table 3. Estimates of rural income diversification.

Dependent Variable: HHI	PIHS 2001-02			PSLM 2010-11		
	Model 1 Logistic	Model 2 OLS	Model 3 Censored Regression	Model 1 Logistic	Model 2 OLS	Model 3 Censored Regression
Ownership of Agriculture Land	-0.2177	-0.0010	-0.0010	-1.030*	-30.421*	-0.781*
Size of Agriculture Land (acres)	-0.3760	-0.0003	-0.0004	-0.053*	0.043	-0.023*
Farm Income	2.326*	0.037*	0.0367*	0.0012*	13.914*	0.0015*
Nonfarm Income	2.238*	0.036*	0.0358*	0.003*	14.201*	0.0002*
Number of Livestock		-	-	0.021*	1.040	0.0110**
Value of Livestock Assets	-0.985	0.0004*	0.0004*	0.001	0.00004	0.0001
Ownership of Business Land	-0.257	-0.002	-0.002	-0.456*	-0.233	-0.451*
Satisfactory Access to Credit/Bank	-	-	-	0.167*	10.900*	0.106**
Satisfactory Access to Transport	4.515	0.035*	0.035*	0.223*	13.300**	0.147*
Satisfactory Access to Road	-0.538	0.001	-0.001	-0.014	5.911	-0.014
Connectivity	-2.250	0.010*	0.010*	0.014	-52.700	0.005
Education	0.073	0.001*	0.001*	0.043*	1.601*	0.032*
Female Participation	2.741*	0.004*	0.003*	1.071*	3.312*	0.563*

Note: the asterisk value represents significant results at 5% level of significance.
Even if standard OLS assumptions are not met, findings are still valid by virtue of robust standard errors.

The study uses education and female participation as proxies for human capital. Both the variables affect income diversification significantly and positively indicating that human capital enables rural households to tackle physical resources constraints. Yang (1997) and Imai (2015) found that education increases the wage work of farm workers. Huffman and Lange (1989) also find that a husband or wife with more schooling had a significantly greater probability of performing nonfarm work.

The significant positive impact of the total value of livestock implies that households consider livestock as assets and higher the value of livestock, lesser will be the diversification. Estimation results suggest that social capital such as information availability and the connectivity to the global production market through internet or cellular facility promotes diversification. The public expenditures on the provision of rural to urban road connect and other transport infrastructure development has increased in Pakistan that essentially connect the farm with the market. Our results show a positive role of infrastructure as diversification increases with the satisfactory transport system. It is obviously due to the access of rural household to the labor markets thus enabling them to spare some of the household members to the nonfarm sector (Barrett *et al.*, 2001a; Liu *et al.*, 2008; Babatunde and Qaim, 2010; Mohantay, 2016). Satisfactory access to transport has a statistically significant positive effect on income diversification.

Investigation of the wide categories of the explanatory variables suggests that physical capital lead the household not to diversify while human capital drives the household to opt for income diversification. The only variable representing the social capital is also insignificant suggesting its irrelevance to the employment decision of the household. The ownership and size of agricultural and business land are found detrimental to diversification in all the models and for both the periods. The satisfactory access to transport and formal credit availability motivate diversification among the rural households. However, the access to road and information does not appear significant in any of the estimated models

Earnings from a single source that is, farm or nonfarm incomes are boosting diversification as the income earned from one source enable the household to invest and raise the income from other sources. Access to formal financial markets has a significant positive impact on diversification. Households that are satisfied with the available credit services and are able to receive a loan in the last years have more tendency to diversify income. Economic theory of market analysis suggests that if financial markets are complete, individuals consume the permanent part of their income and save the temporary positive earnings. Likewise, if consumers are risk averse they will purchase insurance to relieve themselves from earnings risk. Nonetheless, markets are generally incomplete in rural areas of developing countries due to various reasons, the individuals act outside of financial markets to reduce consumption variability.

DISCUSSION

In rural households of Pakistan, the insufficient availability of information sources such as internet and computers and lack of skills and training limit the capacity of rural households to timely respond to the new market trends that ultimately decrease well-being. Similarly, farm and nonfarm income variables have a positive relationship with the dependent

variable. The household with an access to satisfactory transport tend to diversify and the magnitude of the coefficients are sufficiently high in the later period. The role of schooling in increasing productivity is central in the new economic growth models. The estimates suggest that the role of government in providing improved infrastructure is important. Overall, an improved institutional setting along with a better distribution of assets and non-farm activities enable rural households to generate incomes and thus can reduce the poverty among rural households.

Over the past few decades, improved inputs and mechanization increase the labor productivity of farm workers that resulted in the lesser need of workers in the farm operations. The nonfarm sector has enormous potential in providing employment in the rural sector that can ensure sustainable income for rural households. Pakistan Rural Household Panel Survey (PRHPS) conducted by IFPRI illustrates that the nonfarm sector is bigger than the farm sector, however, the output of nonfarm enterprises is constrained by inadequate electricity supply and credit availability.

Considering the overall degree of diversification, the socio-economic status has a mixed effect. The significant and negative influence on the HHI reveals that as wealth increases in terms of business land which is proxy for the enterprise, the diversification behavior changes. A notable part of the income of rural households tends to originate from activities that make them self-sufficient in food particularly milk, meat and other daily consumables. The insignificant but positive sign of the value of livestock and the value of non-agriculture land further support the argument of self-sufficiency and the importance of nonfarm activities for diversification. Surprisingly, information and connectivity with global markets through information technology or cellular facility do not influence the diversification significantly. The insignificant estimate of connectivity variable signifies the need for educating rural households to enhance efficient use of information technology. Past studies find an important role of assets in making rural livelihood sustainable (Nepali and Pyakuryal, 2011). Arif *et al*. (2000) stated that education, gender, and household size determine the individual's employment in the nonfarm sector of Pakistan and our estimates are also consistent with this study. Canagarajah *et al*. (2001) also observed that nonfarm income depends on education, the age of the individuals, and its distance from the market.

In the last two decades, the role of infrastructure is recognized in reducing poverty. The significant positive influence of satisfactory access to bus service in both the discrete choice and the intensity of diversification models confirms the positive role of infrastructure in Pakistan. The availability of mechanical transport supports the members who are paid employees in the nonfarm sector. Surprisingly, our results show that access to road negatively and insignificantly affect diversification. The occurrence of shocks related to cropping activities within the past decade has not affected the overall diversification of income through farm income, which is empirically proven by the size and significant positive sign of the coefficient given in Table 3. The analysis indicates a rising trend of diversification in the rural sector incomes. The literature identifies different changes that take place in the development process favoring nonfarm employment such as, reduced returns to smallholder agricultural production; environmental degradation, increasing water shortages and cultural and social changes. The employment diversification borne of desperation, poverty and lack of capital assets may be taking place as well as some resourceful households choose diversification for the improved living standard. For them, diversification is a matter of choice and opportunity. This is evident in our empirical analysis, which shows that lack of physical capital leads household members to nonfarm work and higher income from a single source will also persuade families to choose employment diversification. Diversification critically dependent on the availability of farm and nonfarm employment. The role of institutions is pivotal in the provision of enabling the environment to rural households in diversifying their income especially to most vulnerable segments of the rural population lacking physical, social and human capital. (Nazir *et al*., 2013). The education and skill development, especially through vocational training programs can cherish employment in the nonfarm sector.

Appropriate policies need to be devised to stimulate and facilitate diversification and to mobilize resources to enhance the opportunities for vulnerable groups such as women, landless, and the poor. In the absence of required intervention in the rural economy, the migration of semiskilled labor would increase to the already crammed cities and may develop urban slums without improving the welfare of the migrants. The focus of national long-term Vision 2025 is on urban-led growth and excessive urbanization. The feeble strategy inevitably pulls youth towards cities that are incapable of providing jobs and living to the internal migrants. Vibrant nonfarm sector and employment diversification will make sustainable employment endogenous in the rural sector.

***Conclusion*:** From above outcomes, it can be concluded that that agricultural resources including landholding and livestock holding promote specialization in the farm employment. The human capital boosts the employment diversification that ensures sustainable household income. The families with access to transport and formal credit diversify, while the effect of access to road is found inconsequential. Moreover, the improvement of nonfarm sector by putting resources will lead to diversification that will ensure decent standard of living in rural areas of Pakistan.

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