Explanation of Off-farm Work Participation in Rural Pakistan

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The role of off-farm employment in augmenting household farm income in the developing countries is of special significance, given the land and water resource constraints and the alarming. rate of population growth. This study focuses on the rural household in Pakistan in an effort to understand the economic and social factors that affect off-farm work participation of male household members in the rural areas. The data are derived from the cross-section survey carried out by the International Food Policy Research Institute for the year 1986-87 as a panel study of rural households. The parameters of the model are estimated using the standard maximum likelihood Tobit approach. Most of the results are consistent with the findings in other developing countries. The results confirm that the level of human capital plays an important role in making decisions providing for labour in off-farm work activities. The study also highlights the fact that farm-to-market roads and village electrification are some of the development strategies vital to encourage participation in off-farm work.

INTRODUCTION

Off-farm work participation has been recognised as an important phenomenon in recent economic literature, especially in the context of developing countries [Shand and Teck-ann (1986); Anderson and Leiserson (1980) and Rief and Cochrane (1990)]. It has been seen as a way to alleviate rural poverty and extend the benefits of rapid growth and industrialisation to the rural masses. Non-farm wage jobs are a source not only of additional income amidst land and water resource constraints and seasonal vagaries but also help in solving the problem of population growth and unemployment. It is, therefore, of considerable policy interest to obtain an understanding of social, demographic, infrastructural, and seasonal factors that may influence non-farm job activities. This paper attempts to identify the factors affecting off-farm[1] work participation of male[2] household members in the rural areas

[1]For our purpose, off-farm labour work refers to non-farm activities in the village or the adjoining local market.

[2]Due to social and cultural constraints, female off-farm wage jobs are insignificant. Our study, therefore, concentrates on male off-farm work participation.

of three districts in Pakistan, using data collected by the International Food Policy Research Institute (IFPRI)[3] during the year 1986-87.

BRIEF THEORETICAL BACKGROUND

Various attempts have been made to analyse the interaction between the farm and off-farm labour markets [Huffman (1980); Rosenzweig (1980); Sumner (1982) and Robinson *et al.* (1982)]. The essence of these behavioural models is that the farmer's labour supply decisions are determined by maximising a utility function subject to time and income constraints. More specifically, the farmer is postulated to maximise a utility function which is a function of consumption and leisure:

$$U = U(C, L)$$

where

> U = farmer's utility;
> C = consumption; and
> L = leisure.

This is maximised subject to the constraints that total time is allocated between farm work, off-farm work, and leisure:

$$T = T_f + T_{nf} + T_n$$

where

> T = total time;
> T_f = time spent in farm work;
> T_{nf} = time spent in off-farm work; and
> T_n = home time.

There is also an expected income constraint on future consumption which is composed of the expected wage and salary earnings, the expected return on one's labour in farming, and the expected "other income" [Robinson *et al.* (1982)]. Although an individual utility, the individual budget constraint approach is adopted in these models. The influence of the labour market activities of other family-members on the individual off-farm labour supply is recognised implicitly by treat-

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[3]IFPRI has collected data in five districts of Pakistan. Due to certain missing observations and data gaps, this study is based on three districts only, viz., Faisalabad and Attock districts in the Province of Punjab and Badin District in the Province of Sindh.

ing the "other income" term as representing the total family income from all sources, less the individual off-farm wage and one's return on labour from farming.

Assuming a concave production function, the farmer faces a downward sloping demand curve for his labour in farm work. If he is indifferent between farm and off-farm work, he will utilise his labour in farm work upto the point where the value of the marginal product of his labour in farm work and the off-farm wage rate are equal. The farmer is a price-taker in the off-farm labour market and is assumed to be able to work as many hours as is desired at the available net off-farm wage rate, subject to institutional constraints which may limit the opportunity for off-farm work, and given the state of economy as it affects the demand for labour.

MODEL SPECIFICATION AND DATA

A number of approaches are described for empirically modelling the off-farm work decision [Wales and Woodland (1980); Huffman (1980); and Rosenzweig (1980)]. The common approach is to specify a wage equation, in which the wage offered is explained by individual characteristics such as education, age, and other factors which affect the demand for labour. This estimated wage is incorporated in the off-farm labour supply equation for employed individuals only. To adjust the selectivity biases, a probit model is used to estimate the probability that an individual will be employed in off-farm job activities. Due to the lack of adequate wage data, the above approach is not used in this study. Instead, a reduced form equation [Robinson *et al.* (1982)] is estimated, containing factors which are likely to influence the off-farm job participation.

The fact that most members of rural households do not earn from non-farm activities suggests the following model:

$H = \beta'X + \varepsilon$ if $\beta'X + \varepsilon > 0$

$H = 0$ Otherwise

where H is the days supplied in off-farm work and X is a set of variables which affect on-farm job activities.

The decision to participate in work off the farm depends on a variety of factors, such as age, household demography, capital and land endowment, village location, distance from the market, etc. Specifically, the following form is used to explore the factors affecting off-farm work participation.

H = f [LAND, LANDSQ, EDUC, AGE, AGESQ, DHEAD, MLABOR, FLABOR, MARKET, NPASSET, TREMIT, VELECT, DFAISAL, DBADIN, SINDR, PUNJK]

The definitions of the variables and average values are given in Table 1. The parameters of the model are estimated using the standard Tobit approach. To account for problems arising from the bounds on the dependent variables, a maximum likelihood approach is adopted.

Table 1

Mean Values and Definition of Variables

Variables	Definition	Mean Value
H	Days supplied by male members to off-farm activities (per worker per year)	12.39
LAND	Owned land in acres	13.25
LANDSQ	Land squared	1043.50
EDUC	Level of education of the member	3.29
AGE	Age of the member	28.81
AGESQ	Age squared	1037.60
DHEAD	Dummy variable, 1 if member is head of the household	0.34
MLABOR	Male labour pool [10–60 years]	3.61
FLABOR	Female labour pool [10–60 years]	2.79
MARKET	Distance from the main market [kilometers]	8.79
NPASSET	Value of the household's non-productive assets including the value of the house	40570.00
TREMIT	Value of the total remittance received from relatives or members of the households outside the village	3337.50
VELECT	Dummy variable to represent village electrification (1 if village has electricity)	0.43
DFAISAL	Dummy variable, 1 if the observation relates to Faisalabad District	0.28
DBADIN	Dummy variable, 1 if the observation relates to Badin District	0.44
SINDR	Interaction dummy, 1 if the observation relates to Sindh Province in *Rabi* season	0.22
PUNJK	Interaction dummy, 1 if the observation relates to Punjab Province in *Kharif* season	0.28

The data[4] are derived from the cross-section survey carried out by IFPRI as a panel study of rural households in Pakistan. Six regular visits were made to the households in the survey between July 1986 and August 1987 to cover the two seasons,[5] *Rabi* and *Kharif*. About 655 rural households were enumerated in three districts, viz., Faisalabad and Attock from the Punjab province, and Badin from Sindh province. Due to data gaps, our study includes only 560 households with 1464 male working members. The analysis is based on six observations for each individual member, thus giving a total of 8784 observations.

EMPIRICAL RESULTS

The average values of various determinants for a household with and without off-farm labour supply are presented in Table 2; the trends are clearly consistent with the theoretical propositions discussed in the literature. Table 3 demonstrates the maximum likelihood Tobit estimates of the coefficients of the model. Land endowment[6] is the major determinant of allocation of time between on-farm and off-farm activities. It is assumed that the smaller the size of landownership, the more essential are the non-farm jobs, so as to earn sufficient income. Each additional unit of land increases the marginal product of labour, but at a diminishing rate. Thus the relationship between the size of land owned by a household and the magnitude of the non-farm activities is assumed to be non-linear. Consistent with the predicted effect, land and land squared have formed a *U*-shaped curve; and both are significant. Thus, it can be argued that as the ownership of land increases, the magnitude of off-farm work participation decreases, but at a decreasing rate. The labour requirements in farm activities also depend on the cropping pattern of the household, and it may also affect the rate of participation in off-farm work activities. However, we did not include it in the analysis due to its endogeneity. Water resource constraints also have a major impact on the magnitude of jobs off the farm. Unfortunately, data related to on-farm water availability are not available from the IFPRI survey.

One of the major factors affecting the magnitude and direction of participation in off-farm work is the seasonal variation in farm activities. The *Rabi* season is the peak season for farm labour in the Punjab province, while it is the *Kharif* in the Sindh province. The interaction of slack season with geographical location might

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[4]For a detailed description of the sampling methodology, see International Food Policy Research Institute (1988).

[5]There are two agricultural seasons in Pakistan. The season in which crops are sown in the autumn and harvested in the following spring is called *Rabi*, while in the *Kharif* season the crops are sown in summer and harvested in the following autumn.

[6]Operational land-holding is not used in the analysis due to its endogeneity. Land endowment here refers to ownership of land by the household.

Table 2

Average Values of Determinants for a Household with and
without Off-farm Labour Supply

	Household with no Member in Off-farm Job [n = 234]	Household with at least One Member in Off-farm Job [n = 326]
Own land (acres)	15.4	8.5
Operational land (acres)	12.3	9.9
Distance to the nearest market (kilometers)	9.2	8.5
The highest education in the family (year)	4	5
Male labour force (number)	2.6	2.8
Female labour force (number)	2.4	2.5
Value of productive assets (Rs)		
Tenants	848	643
Small farmers	8040	3563
Medium farmers	4983	7299
Large farmers	37498	28092
Household per capita expenditure per year (Rs)		
Tenants	2105	2363
Small farmers	3553	3927
Medium farmers	4083	4572
Large farmers	8082	5927

Notes: (1) Per capita expenditure (proxy of income) and operational land–holdings are not used in the Tobit analysis due to endogeneity.
(2) Small farms are defined as own land less than 12.5 acre, medium farms as farms between 12.5 and 25 acres, while farms above 25 acres are categorised as large farms.

Table 3

Maximum Likelihood Estimates of Tobit Coefficients of
the Off-farm Work Participation Model

Variables	Estimates	t-values
LAND	−1.10	−13.51
LANDSQ	0.04	11.69
EDUC	0.94	3.75
AGE	8.16	21.86
AGESQ	−0.11	−20.60
DHEAD	10.68	4.19
MLABOR	−0.85	−1.35*
FLABOR	3.37	5.10
MARKET	−1.08	−5.57
NPASSET	−0.004	−1.97
TREMIT	−0.01	−8.32
VELECT	6.52	2.93
DFAISAL	7.16	2.98
DBADIN	−11.61	−3.54
SINDK	4.98	1.80
PUNJR	−0.47	−0.21*
INTERCEPT	−157.67	−21.69

*Denotes that the coefficient is *not significant* at least at 10 percent
level of significance.

help explore seasonal patterns in non-farm job activities. The empirical results
depict a mixed pattern. In the Sindh province, where off-farm job opportunities are
fewer as compared with the Punjab province, the seasonal interaction dummy vari-
able is positive and significant. It can be argued, therefore, that farmers shift their
labour to off-farm activities in the slack season. The significant seasonal variation in
off-farm jobs is not evident from the sample in the case of the Punjab province, and
it seems that off-farm jobs have, more or less, a fixed nature.

An inverted *U*-shaped relationship between the age of member and off-farm
job is hypothesised and tested in many empirical studies related to off-farm work
participation. The results of this study also suggest the quadratic effect of age on the
level of off-farm work. Off-farm job activities may increase with age as experience
and job skills increase, but then subsequently decline. Further, the elderly members

do not want to commute and may like to work on-farm. There is no *a priori* expectation that the head of household works more in the off-farm labour force. However, it is expected that he would do more overall work. The findings in Table 2 reveal a significant and positive contribution to off-farm work by the head of household.

Household labour endowment affects the individual member's value of time in work, off the farm, on-farm, and at leisure. A positive association is expected between the female labour pool and the level of work off the farm by male members. The variable representing the female labour pool is in accordance with our prior belief that females may assume the work on-farm and relieve some of the male members to work off the farm. Thus, the female labour pool is a stimulant for individual male members to work outside the farm. The negative, but not significant, impact of the size of the household male labour pool on an individual's own labour supply or off-farm work decision may reflect either the relationship of wealth to leisure or the substitution between individuals.

It has been empirically tested that in Pakistan education has pronounced effects on technical efficiency in on-farm activities [Azhar (1991)]. The education or level of human development is also related to off-farm job activities. Thus, a positive impact of education on the value of time in off the farm work is hypothesised. The results of this study confirm that years of schooling, which is a proxy for the level of human capital, plays an important role in the magnitude of work off the farm. This phenomenon is consistent with the results of other empirical research done in developing countries [Shand and Teck-ann (1986); Robinson *et al.* (1982)].

The value of non-productive assets[7] or the wealth of a household increases the demand for leisure and thus negatively affects the level of off-farm job activities. Similarly, the value of remittances received by a household may influence the level of jobs off the farm. Both variables are consistent with leisure as a luxury.

A proxy for village modernisation is the access of the village to electricity. A positive impact of village electrification on off-farm job participation is predicted on the assumption that villages having electricity are proximate to the district capital and thus are more prosperous, productive, and modernised, and have access to a large off-farm labour market. The variable behaves as expected. Moreover, the marginal effect of this variable is quite large, implying that village electrification and modernisation is an important factor contributing to work off the farm.

The distance from village to market is a proxy for the opportunities for labour utilisation available to the household, as well as a proxy for commuting costs. Thus, *a priori* expectation is that the farther the market, the less will be the level of work off the farm due to commuting costs and other cultural factors. The coefficient corresponding to the variable representing distance from the nearest market is also

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[7]The value of productive assets is not included in the analysis due to its obvious endogeneity.

consistent with our prior belief that the higher the commuting costs, the less the desire to work outside the farm.

Off-farm work participation is also affected by the geographical location of villages. The differences in the level of development, access to large labour markets, different cropping zones, and other socio-cultural variables may affect the level of work off the farm. The positive and significant impact of Faisalabad District on off-farm work participation is evident from the results. Faisalabad District is the wealthiest and the most modernised district in our sample. It has the highest average education level as compared with the Districts of Badin and Attock. Moreover, it offers more opportunities of work in a number of small-scale industries, particularly in the textile sector.

CONCLUSIONS

Besides providing necessary support to raise agricultural productivity and enhance the level of household income, rural development policies must also be addressed to encourage off-farm job activities. Therefore, to alleviate rural poverty, the factors affecting off-farm work participation are important in designing such policies. This paper, based on the intensive panel data collected by IFPRI, predicts the variables which may affect or influence the decision by rural household-members regarding off-farm job activities.

The results presented in the paper confirm the importance of education in decision-making for the provision of labour in off-farm work activities. Another policy-oriented determinant of off-farm work participation is the distance from the nearest market to farm-household, which is a proxy for road, infrastructure availability, and commuting costs (both physical and psychic costs). From the policy perspective, village electrification is also considered to be an important factor for boosting off-farm work participation.

The interpretation of results presented in the paper needs to be approached with caution for a number of reasons. First, the most important factor in making decisions regarding farm and non-farm employment is the individual's preference. However, the measurement of these preferences is very difficult from such data. Second, the labour market in many rural areas, especially for part-time work, is not characterised by perfect competition and instantaneous labour supply [Robinson *et al.* (1982)]. Therefore, our focus while discussing the results was the direction of the effects of variables on off-farm labour supply rather than their magnitude. Similarly, it is difficult to infer from these results how off-farm labour markets would behave in responding to the changes in market wage rates or taxes and subsidies. Finally, income from work off the farm is safe from the vagaries of weather and seasonality, and thus provides some protection to rural masses from nutritional and food defi-

ciencies, especially in the slack season. The study highlights the fact that farm-to-market roads, village electrification, and expenditure on education are some of the development strategies that not only encourage participation in off-farm work but are also vital to improve the welfare of the rural areas.

REFERENCES

Anderson, D., and M. V. Leiserson (1980) Rural Non-farm Employment in Developing Countries. *Economic Development and Cultural Change* 28.

Azhar, R. A. (1991) Education and Technical Efficiency during the Green Revolution in Pakistan. *Economic Development and Cultural Change* 39.

Huffman, W. E. (1980) Farm and Off-farm Work Decisions: The Role of Human Capital. *Review of Economics and Statistics* 62.

International Food Policy Research Institute (1988) Household Food Security in Rural Pakistan: Background Descriptive Data from Selected Districts in Pakistan. Washington, D.C. (September).

Rief, Y. M., and S. H. Cochrane (1990) The Off-farm Labour Supply of Farmers: The Case of the Chiang Mai Valley of Thailand. *Economic Development and Cultural Change* 38.

Robinson, C. *et al.* (1982) Labour Supply and Off-farm Work by Farmers: Theory and Estimation. *Australian Journal of Agricultural Economics* 26.

Rosenzweig, M. R. (1980) Neoclassical Theory and the Optimising Peasant: An Econometric Analysis of Market Family Labour in a Developing Country. *The Quarterly Journal of Economics.*

Shand, R. T., and C. Teck-ann (1986) The Off-farm Labour Supply of Padi Farmers in Kelantan, Malaysia. *The Singapore Economic Review* 31.

Sumner, D. A. (1982) The Off-farm Labour Supply of Farmers. *American Journal of Agricultural Economics* 64.

Wales, T. J., and A. D. Woodland (1980) Sample Selectivity and the Estimation of Labour Supply Function. *International Economic Review* 21.