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Guest Editors: **Gavin W. Jones and Ghazala Mansuri**

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Rural Poverty Dynamics in Pakistan: Evidence from Three Waves of the Panel Survey

G. M. ARIF and SHUJAAT FAROOQ

1. INTRODUCTION

Poverty analysis in developing countries including Pakistan has in general focused on poverty trends based on cross-sectional datasets, with very little attention being paid to dynamics—of transitory or chronic poverty. Transitory poor are those who move out or fall into poverty between two or more points of time whereas the chronic poor remain in the poverty trap for a significant period of their lives. The static measures of households' standard of living do not necessarily provide a good insight into their likely stability over time. For instance, a high mobility into or out of poverty may suggest that a higher proportion of a population experiences poverty over time than what the cross-sectional data might show.[1] It also implies that a much smaller proportion of the population experiences chronic poverty contrary to the results of cross-sectional datasets in a particular year [Hossain and Bayes (2010)]. Thus, the analysis of poverty dynamics is important to uncover the true nature of wellbeing of population. Both the micro and macro level socio-demographic and economic factors are likely to affect poverty movements and intergenerational poverty transmission [Krishna (2011)].

A close look at the data on poverty levels and trends in Pakistan for the last five decades leads to two broad conclusions: first, poverty reduction has not been sustainable but has fluctuated remarkably; and second, a large proportion of the population has been found around the poverty line, and any micro and/or macro shock (positive or negative) is likely to have pushed them into poverty or to have pulled them out of it. But these poverty dynamics are generally not addressed in poverty reduction strategies of the country. The reason is that although the existing poverty literature in Pakistan is prolific in descriptive studies based on the cross-sectional household surveys such as the Household Integrated Economic Survey (HIES), studies on poverty dynamics, which need longitudinal datasets, are scant.

The few available studies on poverty dynamics in Pakistan have generally been based on two rounds of a panel household survey.[2] Their contribution to knowledge is

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[1]See for example, Adelman, *et al*. (1985), Gaiha and Deolalikar (1993) for India; Jalan and Ravallion (2001) for China; Sen (2003) and Hossain and Bayes (2010) for Bangladesh; Kurosaki (2006), Arif and Bilquees (2007), Lohano (2009) and Arif, *et al*. (2011) for Pakistan.

[2]See, for example, Kurosaki (2006), Arif and Bilquees (2007), Lohano (2009) and Arif, *et al*. (2011).

substantial, but data on more rounds (waves) uncover the dynamics more effectively. For example, the incidence of chronic poverty has generally been higher in two-round surveys than in surveys which had more than two rounds, suggesting that there could be only a small proportion of population that remains in the state of poverty for extended period of time. Effective and right policies, based on the philosophy of inclusiveness, can bring them out of poverty, which could be a big socio-economic achievement for a developing country like Pakistan.

The major objective of this study is to analyse the dynamics of rural poverty in Pakistan using the three waves of a panel household survey carried out by the Pakistan Institute of Development Economics (PIDE) in 2001, 2004 and 2010. This analysis of poverty dynamics is important from both the micro and macro perspectives. From micro-perspective, demographic dynamics and change in household assets may have an impact on the poverty movements. Similarly, the macroeconomic situation, which fluctuated remarkably during 2001 to 2010—moderate growth during the first six years of 2000s and sluggish growth with double-digit inflation particularly the high food inflation since 2007—is likely to have affected a household's well-being. The earthquake in 2005 and floods in 2010 may also have lasting impact on the living standard of population.

The rest of the paper is organised as follows. A brief review of the literature on dynamics of poverty has been presented in Section 2, followed by a discussion on the data source, analytical framework and sample characteristics in Section 3. Cross-sectional poverty estimates have been discussed in Section 4 while the dynamics of rural poverty and its determinants are examined in Sections 5 and 6 respectively. Conclusions are given in the final section.

2. A BRIEF LITERATURE REVIEW

The findings of poverty dynamics studies carried out in different parts of the world during the last four decades are summarised in Appendix Table 1. The 'never-poor' category shown in the last column of this table shows the percentage of households (or population) that did not experience any episode of poverty during the different waves of the respective surveys. In contrast, the 'always-poor' category in the table represents the chronic poverty, proportion of households (or population) that remained poor in all rounds of the respective surveys. Although it is not possible from the data presented in Table 1 to find out a direct association between the number of waves and the proportion of households in the 'never-poor' category or in 'always-poor' category, the data do show that as the number of waves increases, the proportion of chronic poor (always-poor) as well as 'never-poor' in general declines with a corresponding increase in the transitory poverty (poor for some time).

The literature has identified several factors associated with the dynamics of poverty. The changing socio-demographic and economic characteristics of the household have been considered as the key drivers of chronic and transient poverty. The demographic characteristics such as larger household size and/or dependency ratio are associated with chronic poverty as they put an extra burden on a household's assets and resource base [Jayaraman and Findeis (2005); Sewanyana (2009)]. Changes in household size and age structures (young, adult and elderly) are also linked with the movements into and out of poverty because of their distinct economic consequences [Bloom, *et al.*

(2002)]. Additional children not only raise the likelihood of a household to fall into poverty but it also lead to intergenerational transmission of poverty due to reduction in school attendance of children with a regressive impact on poorer households [Orbeta (2005)]. Households headed by females are more likely to be chronically poor [John and Andrew (2003)]; majority of these women are serially dispossessed (divorced or widowed), therefore, may promote intergenerational poverty [Corta and Magongo (2011)]. The male-oriented customary inheritance system also disadvantages the female [Miller, *et al.* (2011)].

A number of studies have shown that the increase in human capital reduces the likelihood of being chronic poor or transient poor. Such evidence from literature has been found in the milieu of the education of household head [Wlodzimierz (1999); Arif, *et al*. (2011)] as well as the education of children, which helps to overcome the persistent poverty [Davis (2011)]. Regarding health, the inadequate dietary intake triggers off a chain reaction, leading to the loss of body weight and harming physical growth of children [Hossain and Bayes (2010)]. The households that have a permanent disabled person are relatively more likely to face persistent poverty [Krishna (2011)].

Both the chronic and transient poverty are also closely associated with the tangible and less-tangible composition of assets of the households [Davis (2011)]. It can be viewed in terms of land ownership [Jalan and Ravallion (2000); Arif, *et al*. (2011)], livestock ownership [Davis (2011)], possession of liquid assets [Wlodzimierz (1999)], remittances [Arif, *et al*. (2011)] and access to water, sanitation, electricity and ability to effectively invest in land [Cooper (2010)]. Mobility in land ownership is highly linked with transient poverty [Hossain and Bayes (2010)]; the size of inherited land from parents is a significant predictor to remain non-poor [Davis (2011)]. Location also plays a vital role to create opportunities for households. The households living in remote areas with less infrastructure and other basic facilities are more likely to be chronic and transient poor [Deshingkar (2010); Arif, *et al.* (2011)]. Asset-less households are more likely to fall into poverty if the economy is not doing well and/or the distribution of assets is highly unequal [Hossain and Bayes (2010)]. In Pakistan, the land distribution is more skewed than income distribution [Hirashima (2009)] as about 63 percent of the rural households are landless while only 2 percent of the rural households owned 50 acres or more, accounting for 30 percent of the total land [World Bank (2007)].

Households face a variety of risks and shocks i.e. macroeconomic shocks, inflation, natural disasters, health hazards personal insecurity, and socially compulsive expenses such as dowry. The customary and ceremonial expenses on marriages and funerals may sometime push the households into a long-term poverty [Krishna (2011)]. Using a six wave dataset from rural China, Jalan, and Ravallion (2001) found a significant fall in household consumption following a shock; higher the severity of the shock, more time would be needed to recover from it. In agricultural regions, loss of land, floods and lack of irrigation system also push households into poverty [Sen (2003)]. Based on the life history analysis in rural Bangladesh, Davis (2011) found that a variety of shocks at various life stages of people determine the pattern of transient and intergenerational transmission of poverty.

3. DATA SOURCE, ANALYTICAL FRAMEWORK AND SAMPLE CHARACTERISTICS

In a longitudinal or panel survey, same households (individuals as well) are interviewed during its different rounds or waves. This study has used three waves of a panel dataset; the first round, named as the 'Pakistan Rural Household Survey' (PRHS) was carried out in 2001 in rural areas of 16 districts, selected from all four provinces of the country: Attock, Faisalabad, Hafizabad, Vehari, Muzaffargarh and Bahawalpur in Punjab; Badin, MirpurKhas, Nawabshah and Larkana in Sindh; Dir, Mardan and Lakki Marwat in Khyber Pakhtunkhwa (KP); and Loralai, Khuzdar and Gwader in Balochistan. The second round of the PRHS was carried out in 2004; but it was restricted to 10 districts of Punjab and Sindh. Because of security concerns the panel districts in KP and Balochistan were not made part of the round two. The third round, which was conducted in 2010, covered all the above-mentioned 16 panel districts. An urban sample was also added in the third round, and it was re-named as the 'Pakistan Panel Household Survey' (PPHS). The sample of the panel survey may have over representation of the poor regions. For example, in Punjab the sample includes six districts, of which three are located in Southern Punjab, the poorest region of the province. In the Sindh sample, the more urbanised districts, where poverty is likely to be low such as Karachi and Hyderabad, are not included in the sample.

In rounds Two and Three of the panel survey, split households were also interviewed. A split household is a new household where at least one member of an original panel household has moved and is living permanently. This movement of a member from a panel household to a new household could be due to his/her decision to live separately with his/her family or due to marriage of a female member. The households split within a sampled village were interviewed; in other words, the movement of a panel household or its members out of the sampled village was not followed because of high costs involved in this type of follow-up. The size of sample for each round is shown in Table 1. The total size varies from 2721 households in 2001 to 4142 households in 2010.

Table 1

Households Covered during the Three Waves of the Panel Survey

		PRHS 2004			PPHS 2010				
	PRHS 2001	Panel house-holds	Split house-holds	Total	Panel house-holds	Split house-holds	Total Rural house-holds	Urban house-holds	Total Sample
Pakistan	2721	1614	293	1907	2198	602	2800	1342	4142
Punjab	1071	933	146	1079	893	328	1221	657	1878
Sindh	808	681	147	828	663	189	852	359	1211
KP	447	–	–	–	377	58	435	166	601
Balochistan	395	–	–	–	265	27	292	160	452

Four features of the three rounds of the panel data are noteworthy. First, urban households, which have been included for the first time in the sample in the third round held in 2010, are not panel households, hence they are excluded from the present analysis. The urban sample, however, has been used for the cross-sectional poverty

estimation. Second, split households are not strictly panel households, particularly those where a female has moved due to her marriage. Thus the matching of split households with the original panel households is not straightforward. So the split households are also not included in the analysis. Third, only rural sampled households in Punjab and Sindh are covered in all three rounds, so the analysis of the three-wave data is restricted to these two provinces. Fourth, for the analysis of all rural areas covering four provinces, panel data are available for the 2001 and 2010 rounds.

In the panel survey, a major concern is the sample attrition. Table 2 presents the attrition rate for different rounds. Between 2001 and 2010, the rate was around 20 percent while the rate during 2004-2010 was as high as 25 percent. The attrition rate in Balochistan is higher than the rate in other provinces (Table 2). The reasons for high attrition rates during 2004-2010 include temporary absence of a panel household, out-migration to a new locality and the decision of a household not to be part of the panel survey.

A legitimate concern in panel dataset involves the level of sample attrition and the degree to which attrition is non-random. A skewed exit from the panel household might generate a non-representative sample that would lead to the biased estimates. For the three waves of the panel dataset, the analysis of the sample attrition was found to be random as it did not show significant differences between the attritors and non-attritors for a set of interested indicators, particularly consumption and poverty (Appendix Tables 2 and 3). Thus, the attrition in the panel data is not a pervasive problem for obtaining consistent estimates.

This study has used all three rounds of the panel survey to include cross-sectional as well as a longitudinal dataset. In the cross-sectional analysis, all the sampled households are included whereas in poverty dynamic analysis, only panel households have been included. In the dynamics analysis, as noted earlier, the split households are excluded, although ideally for comparison these household should be merged with those households from which they were separated. But the merging of a new household with the household from which a woman has moved out after her marriage is not straightforward.

Table 2

Sample Attrition Rates Panel Households—Rural

	2001-2004	2001-2010	2004-2010
Pakistan	14.1	19.6	24.9
Punjab	12.9	17.1	23.8
Sindh	15.7	18.3	26.2
KP	–	16.1	–
Balochistan	–	33.2	–

The study has used the official poverty line for 2001 and 2004, which was inflated for 2010.[3] The used poverty lines are: Rs 723.4 per adult per month for 2001; Rs 878.64 for 2004; and Rs 1671.89 for 2010. All the three waves of the panel dataset have detailed

[3]The Planning Commission of Pakistan measured official poverty line by using the Pakistan Integrated Household Survey (PIHS) 1998-99 dataset, based on 2,350 calories per adult equivalent per day.

consumption modules covering all aspects of consumption including food and non-food items. Household is the unit of analysis; however, the data have been weighted by the household size for poverty estimation.

To distinguish chronic poor from transitory poor, this study has used two approaches: 'spell' and 'component'. In the spell approach, 'the chronic poor are identified based on the number or length of spells of poverty they experience—so that all poor households are classified as either chronic poor or transient poor' [McKay and Lawson (2002)]. The 'components' approach distinguishes the permanent component of a household's income or consumption from its transitory variations. Under this approach, 'households are identified as being chronically poor if their average consumption level falls below the poverty line, and transient poor if their average consumption level exceeds the poverty line but their consumption falls below it in at least one period' [Mckay and Lawson (2002)]. The estimates of chronic poverty, based on the spell and component approaches, are likely to differ because these two approaches are quite distinct from each other.

Under the 'spell approach', a two-step analysis is carried out. In the first step, change in poverty status is examined for two rounds; 2001 and 2004; 2004 and 2010; and 2001 and 2010. The four categories of change in the poverty status between any two periods are: never-poor, poor in two periods, moved out of poverty, and moved into poverty. In the second step, all the three waves of the panel dataset are used to explore poverty dynamics and two types of categories have been established. The first type comprises of four categories; poor in all three periods (chronic poor), poor in two periods, poor in one period and never poor. The second type consists of five categories: poor in all three periods, moved out of poverty, fell into poverty, moved in and out of poverty and never-poor. [4] Similarly, under the 'component approach', for the two-wave panel datasets, a household is defined as 'transitory poor' if its real average per adult equivalent consumption exceeds the poverty line but the consumption of any one period falls below the poverty line. For three-wave panel dataset, 'transitory poor' have two categories; two-period poor if the real average per adult equivalent consumption exceeds the poverty line but it falls below the poverty line for two periods. A household is defined as one-period poor if its real average per adult equivalent consumption level exceeds the poverty line but it falls below the poverty line for one period. Thus four categories have been recorded: poor in all three periods (chronic), poor in two periods, poor in one period and never-poor.

The determinants of poverty are examined to study poverty dynamics through the multivariate analyses. The following three equations have been estimated:

$$PD_{01\text{-}10\,i} = \alpha_i + \alpha_1 I_i + \alpha_2 Hd_i + \alpha_3 Rg_i + \mu_{2i} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

$$PD_{04\text{-}10\,i} = \alpha_i + \alpha_1 I_i + \alpha_2 Hd_i + \alpha_3 shock_i + \alpha_4 Rg_i + \mu_{3i} \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

$$PDs_{01\text{-}04\text{-}10\,i} = \alpha_i + \alpha_1 I_i + \alpha_2 Hd_i + \alpha_3 Rg_i + \mu_{4i} \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

$$PDc_{01\text{-}04\text{-}10\,i} = \alpha_i + \alpha_1 I_i + \alpha_2 Hd_i + \alpha_3 Rg_i + \mu_{4i} \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

[4]Moved out of poverty are those who were poor in the first two rounds and non-poor in the third round, or poor in the first round and non-poor in the next two rounds. Same method has been followed for falling into poverty with reverse direction.

In Equations 1 and 2, the dependent variables $PD_{01\text{-}10i}$ and $PD_{04\text{-}10i}$ represent the change in poverty status between two rounds (2001 and 2010; 2004 and 2010) within the above-mentioned categories.[5] Equation 3 includes all the three waves of the panel (2001, 2004 and 2010), where the dependent variable PDs has five outcomes; poor in three periods (chronic poor), fell into poverty, moved out of poverty, moved in and out of poverty and never-poor. In the first 3 equations, the dependent variable poverty dynamics has been measured by spell approach, while in Equation 4, it is based on the component approach, with three outcomes; poor in three rounds (chronic poor), transitory poor (poor in 1 or 2 rounds) and never-poor. On the right hand side of Equations 1–4, individual, household and community characteristics have been included. Vector I_i measures the characteristics of the head of household (gender, age, education), vector Hd_i measures the household characteristics (household size, dependency ratio, household structure, agriculture and livestock ownership) and Rg_i measures the province of residence. In Equation 2, the shock variable has also been added to examine the impact of natural, inflationary and business shocks on poverty and poverty dynamics. Equations 1 to 3 analyse the poverty dynamics where the dependent variable has more than two outcomes; therefore, the multinomial logistic regression has been applied.

The data on some selected socio-economic variables, as reported in the three waves of the panel survey, are presented in Table 3. According to the PPHS-2010 (3rd wave), the average household size was 7.6 members; 7.8 in rural areas and 7.1 in urban areas. Between 2001 and 2010, the average household size in rural areas declined marginally. Although the overall proportion of female headed households is low (4.8 percent), it doubled between 2004 and 2010 in both the cross-sectional and panel households. It could be attributed to male out-migration or death of male head of household, transferring the headship to his widow. The mean age of the head of household has marginally increased over time. More than 80 percent of the rural households are headed by illiterates or persons having up to primary level education (Table 3). Only 4 percent of rural households are headed by persons having more than 10 years of education.

Data on land ownership show a decline in the medium-level landholdings (3-10 acres), with an increase in small landholdings (≤ 3 acres) among the panel households. The distribution of inherited land may be the major contributing factor in this decline in land ownership. More than two-thirds of the sampled households own livestock; a modest decrease in the ownership of large animals has also been observed while in the case of small animals, the ownership increased between 2001 and 2004 but declined to the 2001 level in 2010. The ownership of housing is universal, and there is a marked change from *kaccha* (mud) houses to *pacca* (cemented) houses. However, the mean number of persons per room remained around 4 with no considerable change over time (Table 3). There is no major difference between rural and urban areas in average of persons per room.

[5]The 2001-2004 period has not been included in the analysis since it has already been examined by Arif, *et al*. (2011). Their findings are shown in Appendix Table 4.

Table 3

Socio-economic Characteristics of the Sampled Households in 2001, 2004 and 2010

	A Cross-sectional Analysis					Panel Households (Rural Punjab/Sindh only)		
	2001	2004	2010			2001	2004	2010
Characteristics	Rural	Rural	Rural	Urban	Overall			
Average household size	8.0	7.7	7.8	7.0	7.6	7.9	7.9	8.1
Female headed households (%)	2.5	2.2	4.1	4.3	4.2	2.4	2.3	4.8
Mean age of head (years)	47.2	47.5	48.5	46.8	48.0	47.2	48.6	51.3
Educational Attainment of the Head of Household (%)								
0-5 year	80.0	83.0	76.0	61.0	71.0	80.7	80.3	78.0
6-10 year	16.0	13.0	18.0	25.0	20.0	15.5	15.2	17.0
11 and above year	4.0	4.0	6.0	15.0	9.0	3.8	4.5	5.0
All	100	100	100	100	100	100	100	100
Land Ownership (%) by Category								
Landless households	49.1	57.5	56.6	91.2	67.4	48.1	48.8	48.2
Small landholder (up to 3 acres)	22.7	17.9	19.1	3.0	14.1	20.4	21.3	24.2
Medium landholder (> 3 to 10)	17.4	15.1	14.0	3.3	10.7	19.0	18.5	15.8
Large landholder (> 10 acres)	10.8	9.6	10.3	2.5	7.8	12.5	11.4	11.9
All	100	100	100	100	100	100	100	100
Housing unit ownership (%)	94.4	–	94.3	83.1	90.8	97.2	–	95.4
Livestock ownership (%)	72.2	73.6	67.1	16.1	51.2	73.9	75.6	72.6
Large animal ownership (%)	59.2	59.5	55.6	10.9	41.6	40.2	61.8	61.7
Small animal ownership (%)	42.9	50.4	43.6	9.7	33.0	65.7	51.8	49.1
House Structure (%) by Category								
Kaccha	61.8	–	47.1	16.8	37.6	57.2	–	48.1
Mix	21.5	–	27.6	22.1	25.9	27.0	–	21.7
Pacca	16.7	–	25.3	61.1	36.5	15.8	–	30.3
All	100	100	100	100	100	100	100	100
Number of persons per room	3.9	–	4.0	3.7	3.9	4.4	–	4.3

Source: Authors' estimation from the micro-data of PRHS-2001, PRHS-2004 and PPHS-2010.

4. POVERTY TRENDS: A CROSS-SECTIONAL ANALYSIS

Table 4 presents data on the cross-sectional incidence of poverty for all the three rounds. It also shows the incidence of poverty separately for Punjab and Sindh provinces, where all rounds of the survey were carried out. Overall poverty in 2010 is estimated at 20.7 percent; 22.4 percent in rural areas and 16.6 percent in urban areas. [6] Poverty estimates for rural Punjab and Sindh show that poverty decreased from 31.3 percent in 2001 to 24.1 percent in 2004; but it increased to 27 percent in 2010. When we take into account the data for all provinces, which is available for 2001 and 2010, Table 4 shows the decline in poverty by 5 percentage points from 27.5 percent in 2001 to 22.4 percent in 2010. The key message from the cross-sectional analysis is that, as in the past, poverty during the last one decade has also fluctuated. However, when the poverty in 2010 is compared with that in 2001, a modest overall decline is recorded. It suggests that the benefits of economic growth during the first half of the last decade in terms of poverty reduction largely disappeared during the second half.

[6]One can expect high poverty rates from PPHS dataset as compared to the rates based on the Pakistan Socio-economic Living Standard Measurement (PSLM) dataset because about half of the sampled PPHS districts are drawn from the poor regions of Sindh and south Punjab, with no representation from major cities except Faisalabad. Moreover, the PSLM dataset is not representative at district level, thus the poverty comparison between PPHS and PSLM based on these 16 districts cannot be justified. However, for the whole 2010-11 PSLM sample, the Country MDG Report 2013 has shown the incidence of poverty at 12.4 percent which is considerably lower than the estimates based on the 2010 PPHS.

Table 4

Incidence of Poverty: A Cross-sectional Analysis of the Three Waves of the Panel Survey (2001, 2004 and 2010)

Survey Year	All Provinces	Punjab and Sindh
2001 – Rural only	27.5	31.3
2004 – Rural only	–	24.1
2010- Rural	22.4	27.0
2010-Urban	16.6	–
2010-All	20.7	–

Source: Authors' estimation from the micro-data of PRHS 2001, PRHS 2004 and PPHS 2010.

Table 5 shows poverty trends in rural Punjab and Sindh for the panel households only. In panel A of the Table, split households are excluded but the original households from which these households have separated are included. In panel B, the latter have also been excluded, leaving only pure panel households without any split. This type of classification is likely to capture the effect of demographic change (splitting) on the well-being of households.[7] Trends are same; poverty which was 29.5 percent in 2001 declined to 23.6 percent in 2004, but it increased to 26.6 percent in 2010 (panel A in Table 5). However, the fluctuation is more pronounced when poverty estimates are based on pure panel households (Panel B). Poverty in rural Punjab and Sindh declined sharply from 29.5 percent in 2001 to 21.8 percent in 2004, and then it jumped to 28 percent in 2010. The change (or decline) in poverty levels between 2001 and 2010 is marginal, at only 1.5 percentage points.

Table 5

Incidence of Rural Poverty in Punjab and Sindh: A Cross-sectional Analysis of the Panel Households Covered in 2001, 2004 and 2010.

Panel A	2001	2004	2010
Punjab and Sindh	29.5	23.6	26.6
Punjab	20.2	18.4	20.9
Sindh	40.2	29.2	32.6
Southern Punjab	26.2	23.4	34.1
North/central Punjab	14.6	13.8	8.2
(N)	1395	1395	1395
Panel B			
Punjab and Sindh	29.5	21.8	28.0
Punjab	17.6	16.9	20.6
Sindh	42.6	27.0	35.4
Southern Punjab	25.0	22.5	35.1
North/central Punjab	11.7	12.4	8.3
(N)	1092	1092	1092

Source: Authors' estimation from the micro-data sets of PRHS-2001, PRHS-2004, and PPHS-2010.

Note: In panel A, same households covered in three waves are included. But, split households are excluded except the original households from which one or more households are split. In panel B, all split households including the original households are excluded.

[7]However, in this study only the differences in the incidence of poverty between different types of households are examined. Its thorough investigation is left for the subsequent analysis.

The other key message from panel B of Table 5 is that the behaviour of Punjab and Sindh about change in poverty status is not similar, and even within Punjab, the situation in Southern Punjab is markedly different from the other parts of Punjab (North/Central). In North/Central Punjab region, poverty remained almost at the same level between 2001 and 2004 and declined considerably between 2004 and 2010 (Table 5 panels A and B) while in Southern Punjab and Sindh it first declined between 2001 and 2004 and then increased between 2004 and 2010. In Southern Punjab, the increase in poverty between 2004 and 2010 is much larger than the decline between 2001 and 2004, thus showing a net increase in poverty between 2001 and 2010 period. Although it is difficult to explain these regional differences in poverty levels, a number of studies have shown poor and soft physical infrastructure [Arif, *et al*. (2011)], less diversified resources with highly unequal distribution of land [Malik (2005)], poor market integration, low urbanisation and low industrialisation and fewer remittances in Southern Punjab and Sindh as compared to the North/Central Punjab as the key differentiating factors.

5. RURAL POVERTY DYNAMICS

As noted earlier, only two-wave data (2001 and 2010) are available for all provinces, whereas the three-wave data are available for Punjab and Sindh provinces. The analysis of rural poverty dynamics is carried out in three steps. In the first step, the movements into or out of poverty are examined by the number of waves, using both the spell and component approaches. In the second step, a bivariate analysis for poverty dynamics has been carried out by looking at different socio-demographic characteristics using the spell approach. Multivariate analyses have been carried out in the third step. This section covers the analysis based on the first two steps, while the next section covers the third step, the multivariate analysis. Table 6 shows results on rural poverty dynamics based on two-wave data for three periods; 2001-04; 2004-10; and 2001-10. Both the 2001-04 and 2004-10 waves contain data for Punjab and Sindh only while the 2001-2010 rounds have information for all four provinces. Under spell approach, four movements of poverty dynamics, while under component approach, three movements of poverty dynamics are shown in Table 6. Results based on all three waves of the panel data are presented in Table 7 and discussed later in this section.

Table 6

Rural Poverty Dynamics Using Two-wave Dataset

Poverty Dynamics	2001-04 (Punjab and Sindh only)	2004-10 (Punjab and Sindh only)	2001-10 (all Provinces)
Spell Approach			
Poor in two Waves	9.7	8.6	9.1
Moved out of Poverty	18.2	13.1	15.9
Fell into Poverty	13.7	18.0	13.3
Never Poor	58.4	60.3	61.8
All	100.0	100.0	100
Component Approach			
Chronic Poor	18.0	16.2	16.5
Transitory Poor	24.7	23.5	21.7
Never Poor	58.4	60.3	61.8
All	100.0	100.0	100
(N)	(1422)	(1395)	(2146)

Source: Authors' estimation from the micro-data of PRHS-2001, PRHS-2004 and PPHS-2010.

Table 7

Poverty Dynamics by Region (Rural only) Using Three Waves (2001, 2004 and 2010)

Change in Poverty Status	Total Sample (Sindh and Punjab)	Punjab			Sindh
		Total	Central – North (excluding South)	South	
Spell Approach					
3 Period Poor (Chronic)	4.0	3.7	1.1	6.5	4.3
2 Period Poor	16.6	10.3	6.2	14.7	23.1
1 Period Poor	30.9	24.0	17.4	30.8	38.1
Never Poor	48.5	62.0	75.4	48.1	34.4
All	100.0	100.0	100.0	100.0	100.0
Component Approach					
3 Period Poor (Chronic)	15.1	10.8	5.0	16.8	19.5
2 Period Poor	6.8	4.4	2.4	6.4	9.3
1 Period Poor	29.7	22.9	17.2	28.7	36.8
Never Poor	48.5	62.0	75.4	48.1	34.4
All	100.0	100.0	100.0	100.0	100.0
N	(1395)	(792)	(417)	(375)	(603)

Source: Authors' estimation from the micro-data of PRHS 2001, PRHS 2004 and PPHS 2010.

Table 6 shows that both the spell and component approaches yield same results on never poor category; however, significant differences are found in the magnitude of chronic and transitory poverty. There are less chronic poor and more transitory poor under the spell approach than under the component approach, suggesting that the choice of definition can influence the dynamics of poverty. Under spell approach, for example, around 9 percent of the sampled population remained poor in two rounds or waves, whereas approximately 60 percent of the population was in the `never-poor' category, those who have not experienced poverty during the two given rounds. The remaining 30 percent of population have either moved out of poverty or fallen into poverty. The movement out of poverty out-numbered the movement into poverty in 2001-2004 and 2001-2010 periods. During 2004-2010, however, more people fell into poverty than those who escaped poverty. It appears from the movement of households into or out of poverty that the 2004-2010 period witnessed a net increase in poverty while it decreased during the other two periods, 2001-2004 and 2001-2010. Under the component approach, 16 to18 percent of the sampled households are chronic poor in two rounds of panel, while 22 to 25 percent of the households are transitory poor who either moved out or fell into poverty whereas the remaining 60 percent of the population was in the 'never-poor' category (Table 6). It appears that the spells approach has identified more movement into and out of poverty than the component approach, which focuses on a household inter-temporal average permanent income, rather than on year to year variations. The findings of this study are similar to Gaiha and Deolalikar (1993) who found that in rural South India 'only one third of those defined as innately poor that is as having permanent income levels below the poverty line are poor in each of the nine rounds of data available'.

To observe the clustering around poverty line, poverty line was inflated as well as deflated by 10 percent, and the results under the component approach are given in Appendix Table 5. The impact of these changes in the poverty line is more profound on both 'chronic poverty' and 'non-poor' categories than on the 'transitory' poverty. An increase in the poverty line, for example, reduces the likelihood of remaining in the non-poor state while it increases the probability of chronic poverty.

Poverty estimates based on the three waves of data are presented in Table 7, which shows the dynamics different from the two wave data. Again, there are less chronic poor and more transitory poor under the spell approach than under the component approach. The component approach shows higher proportion of the chronic poor. The most important information from the results of two approaches of poverty dynamics is that during the first decade of this millennium, more than half of the rural population (51 percent) in two largest provinces, Punjab and Sindh, were in a state of poverty at least at one point in time. Within this poor group, the major share goes to those who were poor in round one (31 percent), although considerable proportion is found to be poor in two-rounds under the spell approach. Chronic poor, those who remained poor in all three waves are only 4 percent under spell approach, but 15 percent under the component approach.

Table 8 shows change in poverty status through five categories describing poverty dynamics as outlined in methodology section: moved out of poverty, fell into poverty, moved in and out of poverty, chronic poor and never poor. The results under the spell approach show that there is no major difference in moving out of poverty or falling into poverty. However, a substantial proportion, around 15 percent of the households changed their poverty status more than once during three rounds of the panel survey. Moving into or out of poverty is higher in Sindh and Southern Punjab than in central-north Punjab, reflecting more vulnerability in the former region.

Table 8

Poverty Dynamics by Region (Rural only) Using Three Waves (2001, 2004 and 2010)—Spell Approach

Change in Poverty Status	Total Sample (Sindh and Punjab)	Punjab			Sindh
		Total	Central – North (excluding South)	South	
Chronic Poverty	4.0	3.7	1.1	6.5	4.3
Moved Out of Poverty	17.0	10.6	10.3	11.0	23.5
Fell into Poverty	15.8	13.9	5.8	22.3	17.7
Moved Out and Fell into Poverty	14.8	9.8	7.5	12.1	20.0
Never Poor	48.5	62.0	75.4	48.1	34.4
All	100.0	100.0	100.0	100.0	100.0
N	(1395)	(792)	(417)	(375)	(603)

Source: Authors' estimation from the micro-data of PRHS 2001, PRHS 2004 and PPHS 2010.

It appears from the poverty status change statistics in Table 6 to 8 that chronic poverty is very low in north-central Punjab under both the spell and component approaches. Movement into and out of poverty under the spell approach is also relatively small in this region as three-quarters of the population is found to be in the 'never-poor' category. The findings of the component approach show a small proportion (2.4 percent) in the category of two-period poor. However, the situation in both Southern Punjab and Sindh is quite different and alarming especially in rural Sindh where about two-thirds of the population has been below the poverty line for one or more periods and only one-third are in the 'never-poor' category. It suggests that rural poverty is more persistent in Sindh and Southern Punjab than in North/Central Punjab. Four broad conclusions can be drawn from the three-wave data.

- First, when a longer period is considered, say last 10 years, the proportion of population who ever lived below the poverty line during this period is much larger (51 percent) than we usually get from the cross-sectional survey datasets.
- Second, moving into and out of poverty is a common phenomenon in rural Pakistan. This movement directly depresses the desired status of `never-poor'.
- Third, while the spell approach indicates that a small proportion of population has been in the state of poverty for 10 years, the component approach indicates higher incidence of chronic poverty.
- Fourth, rural poverty appears to be more persistent in Sindh and Southern Punjab, particularly in Sindh, than in North/Central Punjab.

Who are the chronic or transitory poor (moved into or out of poverty)? Demographic and other characteristics of the household stratified by the number of times households remained in poverty are presented in Table 9. The persistence of poverty in terms of higher incidence of chronic poverty, lower chances of staying in never-poor status and moving into or out of poverty is relatively more common among households headed by less educated persons, and having no ownership of land and livestock, suggesting the structural nature of rural poverty in Pakistan. Like in other parts of the world and consistent with earlier studies, family size and dependency ratios are linked to poverty dynamics. Larger family size and high dependency ratios are associated positively with chronic poverty and negatively with the desired state of 'never-poor'.

Table 9

Poverty Dynamics by Selected Characteristics, Based on 3-waves Data (Spell Approach)

Characteristics in 2001	3-period Poor	2-period Poor	1-period Poor	Never Poor	All
Sex of the Head					
Male	3.7	16.8	21.1	48.4	100
Female	7.0	13.4	12.8	66.8	100
Family Size					
1-4	0.7	13.9	22.7	62.7	100
5-7	3.0	11.2	27.7	58.1	100
8-9	4.9	15.8	30.1	49.3	100
10+	4.3	21.9	34.9	38.9	100
Dependency Ratio					
Low	0.8	10.1	22.9	66.2	100
Medium	4.3	16.2	34.5	45.0	100
High	5.5	22.1	33.5	38.9	100
Education of the Head					
0 to 5	4.0	19.4	31.4	45.2	100
6-10	3.3	5.8	26.9	64.0	100
Above 10	0.0	3.7	32.6	63.5	100
Remittances					
No	3.8	17.0	30.5	48.6	100
Yes	0.0	5.0	41.6	53.4	100
Livestock					
No	5.3	21.2	32.4	4.11	100
Yes	3.3	15.5	30.2	51.0	100
Land Ownership					
No Land	5.1	24.1	34.2	36.6	100
Some Land	2.8	11.0	28.1	58.1	100

Source: Authors' estimation from the micro-data of PRHS 2001, PRHS 2004 and PPHS 2010.

Movement into and out of poverty is also more common among large households with high dependency ratio than among small households (Table 9). Regarding the gender of the head of household, on the one hand, more female headed households are chronically poor than the male headed households; but, on the other hand, the proportion of female headed households who did not experience poverty in the last 10 years (never-poor) is much larger (67 percent) than the corresponding proportion of male headed households (48 percent). It is thus difficult to jump to the conclusion that female headed households are worse off than the male headed households. The findings suggest that there may be different characteristics and dynamics of better-off and worse-off female-headed households; in other words, a binary which leads to rather different outcomes. For example, could it be that the worse-off tend to be those where the husband has deserted or died, whereas the better-off tend to be those where the husband is working overseas.

6. DETERMINANTS OF RURAL POVERTY DYNAMICS

Determinants of rural poverty dynamics are examined separately for two-wave and three-wave data; however, the multinomial logit technique has been applied to study both types of dynamics, in view of more than two categories of the dependent variable. As reported earlier, the change in poverty status based on two-wave panel dataset has been recorded in four categories: poor in two periods, moved out of poverty, moved into poverty and never-poor. In the analysis of three waves, poverty dynamics have three categories: poor in three periods (chronic), poor in one or two periods, and never-poor. The never-poor category is used as the reference category. For the two-wave data, the multivariate analysis is carried out separately for 2001-2010 and 2004-2010 periods.[8]

Following the poverty dynamics literature in multinomial logit models, correlates of a base year, which include four sets of independent variables are regressed on the poverty dynamics. The first set includes the characteristics of head of households (age, age^2, sex and education). Demographic and health factors are part of the second set, while economic status of households i.e., land and livestock ownership, structure of the housing unit and room availability are used as the third set of independent variables. Regional and provincial dummies are used as the fourth set. All these correlates are not available for all three rounds, so there is a minor variation in independent variables across the models. Difference in some selected independent variables between two periods has also been used in different models i.e. household size, dependency ratio, education of the head of household, and ownership of land and livestock. Based on the PPHS 2010 dataset, the shock variable has also been incorporated into the 2004-2010 analysis as the shock variable covers the last five years.

6.1. An Analysis of Two-wave Data

Four multinomial logit models have been estimated using the two-wave data and results are presented in Tables 10-11. In model 1, which covers the 2001-2010 period, gender of the head of household has not shown a significant association with poverty dynamics. Age of the head, however, is negatively associated with movement into poverty, It suggests that an increase in the age of head of household first empowers

[8]For the 2001-04 period, see Appendix Table 4.

Table 10

Multinomial Logit Model: Effects of 2001 Socio-economic Characteristics on Rural Poverty Dynamics (2001-10)

	Model-1			Model-2		
Correlates (2001)	Chronic Poor/Non-poor	Moved out / Non-poor	Moved into/ Non-poor	Chronic Poor/ Non-poor	Moved out/ Non-poor	Moved into/ Non-poor
Sex of the head (male=1)	–0.95	–0.694	0.499	–1.199**	–0.813**	0.222
Age of the Head	–0.03	0.031	–0.044**	–0.007	0.036	–0.032
Age^2 of Head	0.00	0.000	0.000**	0.000	0.000	0.000
Education of the Head	–0.08*	–0.038**	–0.049*	–0.094*	–0.040**	–0.084*
Household size	0.14*	0.139*	0.037**	0.218*	0.123*	0.119*
Dependency Ratio	0.24*	0.084	0.133**	0.560*	0.171	0.370*
Household with one member abroad (yes=1)	–2.69	–0.246	–0.670	–2.823	–0.203	–1.224
House Structure (PACCA=1)	–0.94*	–0.443*	–0.451*	–0.880*	–0.454*	–0.467*
Electricity Connection (yes=1)	–0.56*	0.096	0.161	–0.401**	0.162	0.122
Toilet facility (yes=1)	–0.62**	–0.778*	–0.202	–0.628**	–0.766*	–0.158
Animals (Nos)	–0.04*	–0.118*	0.002	–0.156*	–0.120*	–0.067*
Land Holdings (acres)	–0.12*	–0.034*	–0.029*	–0.119*	–0.036*	–0.041*
Number of rooms per person	–2.11*	–2.295*	0.137	–3.607*	–2.402*	0.099
Presence of disable person (yes=1)	0.21	0.057	–0.404	0.222	0.047	–0.491
South Punjab/North Punjab	1.55*	0.139	1.469*	1.391*	0.218	1.501*
Sindh/North Punjab	1.94*	0.744*	1.397*	1.466*	0.814*	1.140*
KP/North Punjab	–1.06**	–1.147*	–0.649**	–1.424*	–1.064*	–0.853*
Baluchistan/North Punjab	1.52*	0.993*	0.865*	1.586*	1.101*	0.780*
Constant	–1.81	–1.477**	–2.112*	–2.113**	–1.436	–2.602*
Difference in Household Size	–	–	–	0.131*	–0.031	0.139*
Difference in Dependency Ratio	–	–	–	0.373*	0.094	0.290*
Difference in Education of Head	–	–	–	0.021	–0.013	–0.074*
Difference in Land Holdings	–	–	–	–0.016	–0.006	–0.030*
Difference in Animals	–	–	–	–0.141*	0.000	–0.085*
LR chi-2		678.13 (54)			825.30 (69)	
Log likelihood		–1827.00			–1706.83	
Pseudo R^2		0.1565			0.1947	
N		2,124			2,080	

Source: Authors' estimation from the micro-data of PRHS 2001and PPHS 2010.

*denote significant at 5 percent, **denote significant at 10 percent.

households through his/her economic activities not to fall into poverty but in old age this empowerment weakens and raises the probability of households to fall into poverty. Education of the head of household has a significant and negative association with all three poverty states, suggesting, on the one hand, that households headed by literate persons are less likely than illiterates to be in chronic poverty or falling into poverty. On the other hand, they are also less likely to escape poverty. It is not easy to explain this phenomenon since education is considered as an important factor to help individuals and households to move out of poverty. However, it does indicate that education is not a sufficient factor to make a transition from being poor to being non-poor.

Table 11

Multinomial Logit Model: Effects of 2004 Socio-economic Characteristics on 2010 (Rural only)

	Model-3			Model-4		
Correlates (2001)	Chronic Poor/Non-poor	Moved out / Non-poor	Fell into/ Non-poor	Chronic Poor/ Non-poor	Moved out/ Non-poor	Fell into/ Non-poor
Sex of the head (male=1)	–16.328*	–0.707	–1.014	–16.339*	–0.700	–0.511
Age of the Head	0.010	–0.005	–0.042	0.021	0.005	–0.048
Age^2 of Head	0.000	0.000	0.000	0.000	0.000	0.000
Education of the Head	–0.055	–0.063*	–0.045**	–0.072**	–0.077*	–0.073*
Household size	0.200*	0.150*	0.124*	0.266*	0.126*	0.204*
Dependency Ratio	0.310**	0.227**	0.204**	0.460*	0.307**	0.264**
Household with one member abroad(yes=1)	–30.879	–0.621	–0.008	–31.823	–0.506	0.012
Animals (Nos)	–0.152*	–0.051*	–0.019	–0.232*	–0.045**	–0.128*
Loan Obtained Last Year	–0.106	–0.378**	0.269	–0.155	–0.370**	0.281
Land Holdings (acres)	–0.076*	–0.008	–0.061*	–0.082*	–0.014	–0.101*
Unexpected shock (no shock as ref.)						
Natural shock	–0.046	0.491	0.785**	0.022	0.473	0.691**
Inflation shock	0.344**	0.397	0.425	0.269**	0.315	0.463**
Business and others shock	1.311	0.155	0.579	1.240	0.201	0.560
South Punjab/North Punjab	1.324*	0.487	1.640*	1.281*	0.479	1.320*
Sindh/North Punjab	1.526*	–1.067*	1.989*	1.159*	1.055*	1.410*
Constant	–21.097	–2.852*	–2.096**	–21.456	–2.884*	–2.484**
Difference in Household Size	–	–	–	0.122*	–0.055**	0.231*
Difference in Dependency Ratio	–	–	–	0.198	0.081	0.067
Difference in Education of Head of Household	–	–	–	0.001	–0.020	–0.053
Difference in Land Holdings	–	–	–	–0.040	–0.020	–0.108*
Difference in Animals	–	–	–	–0.098*	0.001	–0.164*
LR chi–2		253.68 (45)			353.44 (60)	
Log likelihood		–853.273			–783.07	
Pseudo R^2		0.1294			0.1841	
N		997			978	

Source: Authors' estimation from the micro-data of PRHS-2001, PRHS-2004 and PPHS-2010.
*denote significant at 5 percent, **denote significant at 10 percent.

Two household-level demographic variables, family size and dependency ratio have a positive and statistically significant association with the chronic poverty and the probability of falling into poverty. Regarding the movement out of poverty, dependency ratio is insignificant, but the household size has a positive and significant sign, suggesting that it helps households to make transition out of poverty. It seems that household size helps this transition probably when the dependency ratio is low with the addition of an adult working member. So the target could be the lowering of dependency ratio primarily through a decline in fertility, which is still high in Pakistan, particularly in its rural areas.

The household-level economic variables including the ownership of land and livestock, housing structure *(pacca)* and availability of room have a significant and negative association with both chronic poverty and falling into poverty. But these variables also have a significant and negative association with the movement out of poverty. Apparently this association is also difficult to explain. The possible explanation

could be that households with a better economic position in terms of land, livestock and housing are less likely to be in poverty for long duration or fall into poverty than staying in the non-poor status. In other words, they were relatively more likely to be in the non-poor status between the two given rounds (2001-10).

Regional dummies have some interesting features. During the 2001–2010, holding other things constant, the people of Southern Punjab were more likely than their counterparts in North/Central Punjab to be in the state of chronic poverty or falling into poverty. The dummy variables representing Sindh and Balochistan provinces show results similar to those of Southern Punjab except that they also have a significant and positive association with making a transition out of poverty. The KP population is less likely than North/Central Punjab to be in chronic poverty or making a transition into or out of poverty (Table 10). It supports the bivariate analysis, which has shown larger poverty movement in Southern Punjab and Sindh than in North/central Punjab. It further shows the vulnerable situation in Balochistan as well.

In model 2, differences in the values of five correlates (household size, dependency ratio, education, landholding and animals) between the 2001 and 2010 are added in the multinomial logit model. There is no major change in results when compared to model 1 except that the sex of the head of household which was insignificant in Model 1 turned out to be significant in model 2. The reverse is the case for the age (age^2) of the head of households. Male headed households are less likely than households headed by females to be in chronic poverty or to move out of poverty. However, all the new variables—difference in two periods—have shown a significant and expected relationship with poverty dynamics. The difference in household size for example has a positive relationship with chronic poverty or falling into poverty. Its relationship with moving out of poverty is not significant. The same is the case for the dependency ratio. Difference in both the landholding and education has a negative and significant association with moving into poverty. The difference in livestock ownership has also shown a negative association with chronic poverty as well as falling into poverty (Table 10). It suggests that not only the initial socio-demographic conditions of households but also a change in these conditions overtime has correlation with the poverty dynamics. Thus, the message is that a positive change in socio-demographic and economic conditions of households can lead to positive outcomes in terms of improving the well-being of households. Our findings are to some extent consistent with Davis (2011) who shows that the tangible assets i.e. land, livestock are the important protective assets as compared to the less tangible assets i.e. education and social networks. The present analysis, however, shows the importance of both types of assets for poverty reduction.

The multinomial logit results for the rural poverty dynamics for 2004–2010 are presented in Table 11. It is worth repeating that the 2004 round of the PRHS covered Punjab and Sindh provinces, so the models 3 and 4 are limited to rural areas of these two provinces. But the findings of these models are not different from the results of models 1 and 2, with a couple of exceptions. The sex of the head of household which was insignificant earlier turned out to be significant; the male headed households are less likely than female headed households to be chronically poor.

The new variable 'loan obtained last year' had a negatively significant association with moving out of poverty. Thus, the borrowing did not help escape poverty between the 2004 and 2010 period. However, these could have been "desperation borrowings", oriented to survival rather than escaping from poverty. Natural shocks increase the likelihood of moving into poverty while the inflation is positivity associated with chronic poverty. The results are consistent with other studies.[9] Business shock, however, has not shown a significant impact on poverty movements. Finally, as expected, households in south Punjab and Sindh are more likely than households in north-central Punjab to be chronic poor or moved into poverty (Table 11).

6.2. Analysis of Three Waves Data

Table 12 presents the multinomial logit results based on three-wave panel data, where the dependent variable has five categories; chronic poor (poor in 3-periods), moved out of poverty, fell into poverty, moved in and out of poverty, and never-poor. The latter is used as the reference category. Results reported in Table 12 are based on the spell approach while the results based on component approach are given in Table 13. In both the approaches, the correlates are from the 2001 round of PRHS, and the difference in selected variables between 2001-2010 have also been included in the analyses.

First consider the findings of the spell approach presented in Table 12. The findings are more consistent with economic rationale than the analysis based on the two-wave data. For example, education of the head of households has significant and negative relationship with chronic poverty or being fallen into poverty (Model 5) and even moving in and out of poverty (model 6) as compared to those who are never poor. So, in the long run, say a decade, education is a very strong factor to keep households in the desired status of never-poor. Household size and dependency ratios have positive association with the chronic poverty as well as with falling into poverty or change in poverty status by more than once in three waves. All economic variables such as ownership of land and livestock, structure of housing units *(pacca)* and availability of rooms have significant and negative association with the chronic poverty, falling into poverty and being poor in one or two periods. In terms of regions, both rural Sindh and Southern Punjab are more likely than North/Central Punjab to be in the state of chronic poverty and various types of transitory poverty.

The addition of five variables showing difference between 2001 and 2010 period does not affect the overall results (model 6). These variables also have significant association with the poverty dynamics; an increase in household size or dependency ratio worsens the household well-being while a positive change in soft assets and physical assets (land and livestock) improves it.

Finally, the correlates of the change in poverty status using the component approach based on all three waves of the panel datasets are presented in Table 13. Two models have been estimated, and three categories of change in poverty status have been included in these models: chronic poor, transitory poor and non-poor. The difference between models 7 and 8 is that change in 5 selected explanatory variables (household size, dependency ratio, education of the head of household, landholding and animals) is included in the later while other variables are same in both models. These two models are

[9]Jalan and Ravallion (2001), Sen, (2003), Davis (2011), Lawrence (2011).

Table 12

Multinomial Logit Model: Effects of 2001-02 Socio-economic Characteristics on Change in Poverty Status between 2001-02 and 2010-11-Spell Approach (Rural Area of Punjab and Sindh only) (Based on the Three Waves of PPHS)

	Model-5				Model-6			
Correlates (2001-02)	Chronic Poor / Non-poor	Moved out / Non-poor	Fell in/ Non-poor	Moved in and out/ Non-poor	Chronic Poor / Non-poor	Moved out / Non-poor	Fell in/ Non-poor	Moved in and out/ Non-poor
Sex of the head (male=1)	–1.019	–1.025**	0.883	–0.181	–0.992	–1.149*	0.750	–0.318
Age of the Head of Households	–0.009	0.002	–0.065*	–0.045	–0.007	0.012	–0.064*	–0.026
Age^2 of Head of Household	0.000	0.000	0.001*	0.000	0.000	0.000	0.001*	0.000
Education of the Head of	–0.122*	–0.042**	–0.062*	–0.034	–0.157*	–0.041	–0.097*	–0.050**
Household size	0.228*	0.202*	0.092*	0.138*	0.339*	0.174*	0.196*	0.178*
Dependency Ratio	0.268	0.130	0.144	0.134	0.536*	0.279**	0.349*	0.327*
Household with one member abroad	–10.880	0.707	–0.448	0.640	–11.045	0.876	–0.627	0.859
House Structure (PACCA=1)	–0.903*	–0.349**	–0.146	–0.459*	–0.804**	–0.350**	–0.088	–0.426**
Electricity Connection (yes=1)	0.197	–0.226	–0.022	–0.211	–0.099	–0.099	–0.109	–0.252
Animals (Nos)	–0.196*	–0.171*	–0.047*	–0.019	–0.325*	–0.155*	–0.124*	–0.079*
Land Holdings (acres)	–0.109*	–0.059*	–0.066*	–0.035*	–0.111**	–0.065*	–0.085*	–0.025*
Number of rooms per person	–1.735	–2.299*	0.104	–1.460*	–1.916	–2.632*	–0.205	–2.392*
Presence of disability (yes=1)	–0.623	–0.177	0.689**	–0.064	–0.642	–0.119	–0.632	–0.037
South Punjab/North Punjab	1.432*	0.087	1.482*	0.379	1.371*	0.181	1.486*	0.320
Sindh/North Punjab	1.401*	1.013*	1.664*	1.025*	0.890	1.076*	1.304*	0.785*
Constant	–2.709	–0.643	–2.140**	–0.733	–3.134	–0.754	–2.563**	0.072
Difference in Household Size	–	–	–	–	0.171*	–0.036	0.176*	0.244*
Difference in Dependency Ratio	–	–	–	–	0.318**	0.157	0.287*	–0.032*
Difference in Education of Head	–	–	–	–	0.007	–0.012	–0.085*	–0.010
Difference in Land Holdings	–	–	–	–	–0.063	–0.005	–0.076*	–0.080
Difference in Animals	–	–	–	–	–0.174*	0.021	–0.103*	–0.961*
Pseudo R^2	0.1315				0.1706			
N	1382				1349			

Source: Authors' estimation from the micro-data of PRHS 2001, PRHS 2004 and PPHS 2010.

Note: The split households covered in 2004 and 2010 are included for the estimation of poverty.

*denote significant at 5 percent, **denote significant at 10 percent.

Table 13

Multinomial Logit Model: Effects of 2001-02 Socio-economic Characteristics on Change in Poverty Status -Component Approach (Rural Area of Punjab and Sindh only) (Based on the Three Waves of PPHS)

	Model-a		Model-b	
Correlates (2001)	Transit Poor/ Chronically Poor	Non-poor/ Chronically Poor	Transit Poor/ Chronically Poor	Non-poor/ Chronically Poor
Sex of the head (male=1)	0.823	0.916	0.942	1.281**
Age of the Head of Households	0.028	0.060**	0.032	0.052
Age^2 of Head of Household	0.000	–0.001*	0.000	–0.001*
Education of the Head of Household	0.054**	0.095*	0.034	0.095*
Household Size	–0.041	–0.190*	–0.089*	–0.266*
Dependency Ratio	–0.153	–0.260*	–0.337*	–0.620
Household with one member abroad	–0.254	–0.582	0.352	–0.179
House Structure (PACCA=1)	0.348	0.648*	0.347	0.607*
Electricity Connection (yes=1)	0.143	0.206	0.321	0.382**
Animals (Nos)	0.006	0.073*	0.063**	0.158*
Land Holdings (acres)	0.058*	0.102*	0.054*	0.093*
Number of rooms per person	0.435	1.148**	1.441	2.626*
Presence of disability (yes=1)	0.172	0.434	0.119	0.338
South Punjab/North Punjab	–0.441	–1.043*	–0.438	–1.103*
Sindh/North Punjab	–0.394	–1.556*	–0.293	–1.323*
Constant	–0.111	0.430	–0.221	0.442
Difference in Household Size	–	–	–0.048**	–0.106*
Difference in Dependency Ratio	–	–	–0.180*	–0.392*
Difference in Education of Head of Household	–	–	–0.075**	–0.018
Difference in Land Holdings	–	–	0.022	0.039**
Difference in Animals	–	–	0.055*	0.094*
LR chi-2	381.57 (30)		443.85 (40)	
Pseudo R^2	0.1395		0.1700	
N	1,409		1,349	

Source: Authors' estimation from the micro-data of PRHS 2001, PRHS 2004 and PPHS 2010.
Note: The split households covered in 2004 and 2010 are included for the estimation of poverty.
*denote significant at 5 percent, **denote significant at 10 percent.

different from the earlier models (1-6) in the use of reference category; the non-poor category was earlier used as the reference category while in models 7 and 8 'chronic poverty' is used as the reference category. However, results presented in Appendix Table 6 are similar to models 1-6 in which non-poor category serves as the reference category.

However, despite this change in the reference category as well the use of component approach; the overall findings are similar to earlier models based on the spell approach. Age has a positive association with the probability of being non-poor than being chronic poor while age^2 has a significant and negative sign. Education increased the probability of staying in non-poor state or making a transition out of chronic poverty. As expected, two demographic variables, household size and dependency ratio are negatively associated with the probability of being non-poor. All economic variables land, housing, animals and number of rooms per person have a positive association with the probability of being in non-poor state than being in chronic poverty. Residence in Sindh and South Punjab reduced the likelihood of being in non-poor status.

There is no major change in the results of model 8 where 5 variables showing change overtime have been included. An increase in household size and dependency ratio reduce the likelihood of being in non-poor category while an increase in landholding has a significant and positive effect on the probability of being non-poor. In short, although the incidence of chronic poverty under the component approach is different and higher than the incidence estimated under the spell approach, the correlates of chronic poverty under two approaches are similar. Human capital, household assets, demographic pressure, living conditions and region of residence are the most important factors that influence poverty movements.

Moreover, it appears from the investigation of rural poverty dynamics through the two- and three-wave data that the latter gives more consistent explanation of the change in poverty status over time than the former. It is particularly difficult to find out from a two-wave data analysis the factors that contribute to a transition out of poverty. Another important message from the analysis of poverty dynamics is that not only the initial socio-demographic conditions of the household are crucial in explaining the dynamics; a change in the demographic, economic and human capital related factors plays a key role in changing the well-being status of households.

7. CONCLUSIONS

This study has used the three rounds of the panel datasets, conducted in 2001, 2004 and 2010 to examine the poverty dynamics in rural Pakistan. These rounds have also been used for cross-sectional analysis to examine the trends in rural poverty. The poverty has been estimated by using the official poverty line. Based on the spell and component approaches, chronic and transitory poverty are estimated separately for the two and three waves of the panel data. For the two waves, the panel households were grouped into four categories under the spell approach, and were grouped into three categories under the component approach. In three-wave data analysis, two types of categories were formed under the spell approach. The first type comprises of four categories: chronic poor, poor in one or two periods, and never-poor, while the second type comprises of five categories: poor in all three periods, moved out of poverty, fell into poverty, moved in and out of poverty and never-poor. Under the component approach, four categories have been recorded: poor in all three periods (chronic), poor in two periods, poor in one period and never-poor.

According to the spell approach based on the two wave panel, around 9 percent of the households remained poor in two periods. It declined to only 4 percent when three-wave data is taken into account. Poverty movements based on the three waves of panel dataset show that more than half of the rural population in Punjab and Sindh remained in poverty for at least one period. Under the component approach, 16 to18 percent of the sampled households were chronically poor in two rounds of the panel while 22 to 25 percent of the sampled households were transitory poor who either moved out or fell into poverty. The spell and component approaches indicate differences in the incidences of chronic and transitory poor. The later has shown a higher incidence of chronic poverty, in fact, 4 times higher than the spell approach.

However, in a multivariate analysis, the findings are similar under both approaches. Demographic variables, household size and dependency ratio have a

significant positive association with chronic poverty as well as falling into poverty. Economic variables such as the ownership of land and livestock, housing structure *(pacca)* and availability of room have a significant and negative association with chronic poverty. Both inflationary and natural shocks are likely to keep households either in chronic poverty or push them into the state of poverty. As expected, a change in both the demographic and economic factors at the household level affects the poverty dynamics; the demographic burden increases the probability of falling into poverty while a positive change in economic status improves the households' well-being.

Policy interventions for the chronically poor may not be same as for the transitory poor (moving into or out of poverty). The former may need financial assistance in the short term to smooth their consumption such as the Benazir Income Support Program or the distribution of *zakat;* but such programs may not be sufficient to escape poverty. The latter may be targeted through interventions in the labour market to increase their employability and productivity. It can be done through a multi-sectoral approach that aims to: improve human capital as well as the employability of working age population; create assets for the poor, provide microfinance ; lower the dependency ratio by reducing fertility; and minimise the risks associated with shocks (inflation, flood, drought etc.). The village-level infrastructure and rural-urban linkages have also been effective in influencing poverty dynamics in other developing countries. The North Punjab region of Pakistan is a successful case, where better human capital, strong rural-urban linkages and access to international labour market have played a role in controlling rural poverty. It is recommended that the poor rural areas of the country should be targeted for some specific interventions, based on a multi-sectoral approach: improving human capital, creation of assets, addressing the demographic concerns, and developing both the village-level infrastructure and rural-urban linkages.

Appendices

Appendix Table 1

Number of Waves and Dynamics of Poverty in Different Parts of the World

Country	Time Frame	Number of Waves	Source	Welfare Measure	% of Households		
					Always Poor	Sometime Poor	Never Poor
Chile (Eight Rural Communities)	1968-1986	2	Scott, 2000	Income per capita	54.1	31.5	14.4
Pakistan (IFPRI)	1988-2005	2	Lohano, 2009	Income per capita	41.3	43.1	15.6
South Africa	1993-1998	2	Carter, 1999	Expenditures per capita	22.7	31.5	45.8
Ethiopia	1994-1995	2	Dercon and Krishnan, 2000	Expenditures per capita	24.8	30.1	45.1
Pakistan (PSES)	1998-2000	2	Arif and Faiz, 2007	Expenditure per capita	22.4	28.8	48.8
Pakistan (PRHS)	2001-2004	2	Arif et al., 2011	Expenditure per capita	11.3	32.2	56.5
Uganda	1992-1999	2	Ssewanyana, 2009	expenditure per adult	18.4	44.5	37.1
Ethiopia	1994-95, 1997	3	Abbi, and Andrew, 2003	expenditure per adult	21.5	16.8 (2-periods) 19.4 (1-period)	51.1
India (NCAER)	1968-1971	3	Gaiha, 1989	Income per capita	33.3	36.7	30
India (NCAER)	1970/71-1981/82	3	Bhide and Mehta, 2006	Real per capita expenditure	21.3	17.3	61.3
Indonesia	1993,1997, 2000	3	Widyanti, *et al.* 2009	per capita household expenditure	4.2	30.1	65.7
Zimbabwe	1992-1996	4	Hoddinott, *et al*. 1998	Income per capita	10.6	59.6	29.8
Uganda	1992-1996	4	John and Andrew, 2003	Expenditure per capita	12.8	57.3	30
Pakistan (IFPRI)	1986-1991	5	McCulloch and Baluch, 1999	Income per adult equivalent	3	55.3	41.7
China (Rural)	1985 -1990	6	Jalan and Ravallion, 1999	Expenditure per capita	6.2	47.8	46

Appendix Table 2

Household Expenditure: OLS Regression Model 2001-2010

Variables	Full Sample	Always in (Non-attrition)
Age	0.00719*	0.00851*
Age^2	–2.89e-05	–3.89e-05
Literacy	0.191***	0.183***
Family Size	–0.385***	–0.405***
Land Ownership	0.217***	0.216***
Livestock	0.128***	0.126***
Own House	–0.0312	–0.0378
Constant	7.064***	7.085***
Observations	2,237	1,829

Source: Authors' estimation from the micro-data of the Panel Survey.

***P<0.01; ** P<0.05, * P<0.10.

Appendix Table 3

Correlates of Poverty: Logistic Regression Model 2001-2010

Variables	Full Sample	Always in (Non-attrition)
Age	–0.0122	–0.0235
Age^2	5.31e–05	0.000139
Literacy	–0.553***	–0.528***
Family Size	1.156***	1.290***
Land Ownership	–0.680***	–0.687***
Livestock	–0.501***	–0.528***
Own House	0.145	0.114
Constant	–1.740***	–1.687***
Observations	2,237	1,829

Source: Authors' estimation from the micro-data of the Panel Survey.
*** P<0.01; **P<0.05; * P<0.1.

Appendix Table 4

Multinomial Logit Model: Effects of 2001 Socio-economic Characteristics on Change in Poverty Status between 2001 and 2004 (Rural Area of Punjab and Sindh Only) (PRHS)

	Model a			Model b		
Correlates (2001-02)	Chronic Poor/ Non-poor	Moved out of Poverty/ Non-poor	Fell into Poverty/ Non-poor	Chronic Poor/ Non-poor	Moved out of Poverty/ Non-poor	Moved into Poverty/ Non-poor
South Punjab/North Punjab	0.136	0.317	0.129	0.102	0.331	0.096
Sindh/North Punjab	1.183*	1.281*	0.620*	1.105*	1.317*	0.471**
Household Size	0.269*	0.198*	0.173*	0.342*	0.187*	0.214*
Female Headed Households	0.535	–0.567	–0.354	0.635	–0.528	–0.239
Age of the Head	0.054	–0.024	0.021	0.042	–0.019	0.024
Age^2 of Head	–0.001	0.000	0.000	0.000	0.000	–0.000
Dependency Ratio	0.384*	0.234*	0.091	0.484*	0.313*	0.176
Literacy of the Head	–0.483*	–0.449*	–0.265	–0.489*	–0.422*	–0.324
Health Expenditure (per capita)	–0.001*	–0.001*	0.000	–0.001*	–0.001*	0.00007
Farm Households	–0.259	0.436	0.248	–0.274	0.452	0.161
Housing Unit Ownership	–0.356	0.284	–0.006	–0.197	0.264	0.084
House Structure (PACCA=1)	–0.667*	–0.232	–0.236	–0.767*	–0.205	–0.344
Credit	–0.231	–0.061	0.247	–0.289*	–0.074	0.245
Total Large Animals	–0.308*	–0.212*	–0.133*	–0.396*	–0.208*	–0.149*
Total Small Animals	–0.067**	0.001	0.053*	–0.050	–0.006	0.065*
Land Holdings	–0.094*	–0.048*	–0.015*	–0.104*	–0.047*	–0.167*
Electricity Connection	–0.564*	0.014	–0.616*	–0.681*	0.007	–0.717*
Agriculture Employed	–0.220	–0.461*	–0.264	–0.225	–0.469*	–0.261
Construction Sector Employed	0.196	0.529	0.909*	0.200	0.516	0.841*
Difference in Household Size	–	–	–	0.114*	–0.018	0.115*
Difference in Dependency Ratio	–	–	–	0.408*	0.189	0.375*
Difference in Education of Head	–	–	–	–0.004	0.014	–0.028
Difference in Large Animals	–	–	–	–0.105*	0.008	–0.026
Difference in Land Holdings	–	–	–	–0.061*	–0.024**	–0.602
Constant	–3.341*	–2.260*	–2.913*	–3.599*	–2.400*	–3.195*

Source: Arif, *et al.* (2011).
* significance at 5 percent, ** significance at 10 percent.

Appendix Table 5

Rural Poverty Dynamics with Arbitrary Cut-offs Using Two-waves Data — Component Approach

Poverty Dynamics	2001-04 (Punjab and Sindh only)	2004-10 (Punjab and Sindh only)	2001-10 (all Provinces)
Poverty line Inflated by 10 %			
Chronic Poverty	25.0	23.1	22.5
Transitory Poor	24.6	24.0	23.3
Non-Poor	50.5	53.0	54.2
All	100.0	100.0	100
Poverty line Deflated by 10 %			
Chronic Poverty	12.0	10.0	11.3
Transitory Poor	20.7	21.7	18.1
Non-Poor	67.3	68.3	70.6
All	100.0	100.0	100
(N)	(1422)	(1395)	(2146)

Source: Authors' estimation from the micro-data of PRHS-2001, PRHS-2004 and PPHS-2010.

Appendix Table 6

Multinomial Logit Model: Effects of 2001-02 Socio-economic Characteristics on Change in Poverty Status—Component Approach (Rural Area of Punjab and Sindh only) (Based on the Three Waves of PPHS)

	Model-7		Model- 8	
Correlates (2001)	Chronic Poor/ Non-poor	Transitory Poor/Non- poor	Chronic Poor/ Non- poor	Transitory Poor/Non- poor
Sex of the head (male=1)	–0.916	–0.093	–1.281***	–0.340
Age of the Head of Households	–0.060***	–0.032	–0.052	–0.020
Age^2 of Head of Household	0.001**	0.000	0.001	0.000
Education of the Head of Household	–0.095*	–0.040**	–0.095*	–0.061*
Household size	0.190*	0.149*	0.266*	0.177*
Dependency Ratio	0.260**	0.107	0.620*	0.282**
Household with one member abroad	0.582	0.327	0.179	0.530
House Structure (PACCA=1)	–0.648*	–0.301**	–0.607**	–0.260***
Electricity Connection (yes=1)	–0.206	–0.063	–0.382***	–0.061
Animals (Nos)	–0.073*	–0.067*	–0.158*	–0.096*
Land Holdings (acres)	–0.102*	–0.044*	–0.093*	–0.039*
Number of rooms per person	–1.148***	–0.713***	–2.626*	–1.185**
Presence of disability (yes=1)	–0.434	–0.263	–0.338	–0.219
South Punjab/North Punjab	1.043*	0.602*	1.103*	0.664*
Sindh/North Punjab	1.556*	1.163*	1.323*	1.031*
Constant	–0.430	–0.541	–0.442	–0.663
Difference in Household Size	–	–	0.106*	0.058*
Difference in Dependency Ratio	–	–	0.392*	0.212**
Difference in Education of Head of Household	–	–	0.018	–0.058**
Difference in Land Holdings	–	–	–0.039***	–0.016
Difference in Animals	–	–	–0.094*	–0.039*
LR chi-2	381.57 (30)		443.85 (40)	
Pseudo R^2	0.1395		0.1700	
N	1,409		1,349	

Source: Authors' estimation from the micro-data of PRHS 2001, PRHS 2004 and PPHS 2010.

Note: The split households covered in 2004 and 2010 are included for the estimation of poverty.

*denote significant at 5 percent, **denote significant at 10 percent

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Child Malnutrition and Poverty: The Case of Pakistan

G. M. ARIF, SHUJAAT FAROOQ, SAMAN NAZIR, and MARYAM SATTI

1. INTRODUCTION

The role of economic factors, particularly income and consumption, in the wellbeing of a population is well documented. The well-being, however, does not depend solely on these factors, social indicators such as life expectancy, health, education and nutrition serve an important complementary function [Linnemayr, *et al.* (2008)]. The most significant social problems in many developing countries including Pakistan are widespread child malnutrition, high infant mortality and low literacy. Child malnutrition is considered as the key risk factor for illness and death, contributing to more than half the deaths of children globally [Cheah, *et al.* (2010)]. It also affects the child morbidity rate and poses threat to their physical and mental development, which results in lower level of educational attainment [Chirwa and Ngalawa (2008)]. The recent literature therefore considers the nutrition status as an important dimension of individual wellbeing [Babatunde, Olagunju, and Fakayode (2011)].

Although the causes of child malnutrition are interrelated and multi-sectoral involving many different aspects of life [Cheah, *et al.* (2010)], food insecurity, poor nutritional status of mothers, frequent infections, lower utilisation of health services and care provided to children are considered the most important correlates of malnourishment [Linnemayr, *et al.* (2008)]. There is, however, no consensus in the literature regarding the role of poverty in child malnutrition. Results are rather mixed. Several studies have shown malnutrition as a reflection of poverty, with people not having enough income to buy food, while many other empirical studies have found no association between poverty and child malnutrition [Chirwa and Ngalawa (2008)].

The performance of Pakistan in social indicators including the nutritional status of children is not satisfactory. Although the proportion of underweight children has declined during the last one and a half decade, approximately one-third of young children are still counted as underweight, according to the 2011 National Nutrition Survey (NNS). Stunting and wasting, the other two measures of children's nutritional status have deteriorated. Thus, child malnutrition in Pakistan can be considered as a widespread phenomenon.

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The question is how this phenomenon can be explained? Is the malnutrition of children related to poverty status of their households or are other factors particularly child illness, health status of their mothers and access to health care services the major determinants? An investigation of this question is vital in view of both poor health indicators (particularly high infant and child mortality) and instability in poverty reduction in the past. The findings of earlier studies are not conclusive. Alderman and Garcia (1993) found that illness and diarrhea are strongly related to the poor nutrition among young children in Pakistan. Arif (2004) found a significant relationship between poverty and weight-for-age, but no association of poverty with stunting or wasting. He, however, did not take into account the endogeneity of the welfare index (poverty) in the nutritional status equation. As Chirwa and Ngalawa (2008) argue:

The poor nutritional status of children in a household may reflect the lack of adequate calorie intake that may in turn affect the health status of adults. The poor health of adults may negatively affect their income earning potential and demand for calories that may adversely affect the nutritional status of children and members of the household.

The major objectives of this paper are: first, to examine the trends in child malnutrition during the last decade using three-round data of a longitudinal household survey; and, second, to find its correlates, focusing on household poverty. It has used individual (child), household and community level variables to understand variations in child malnutrition. Poverty status of households is the key factor used in this study to understand the malnutrition phenomenon.

The rest of the study is organised as follows. The conceptual framework, data sources and methodology used in the study are discussed in Section 2, followed by a presentation of the trends in child malnutrition and poverty in Section 3. The socio-demographic determinants of child malnutrition are presented in Section 4, which include gender and age of children, mother and household characteristics. The determinants of child nutrition are examined in a multivariate analysis in Section 5 while the penultimate section presents the discussion on poverty and child malnutrition nexus in Pakistan, followed by conclusions in the final section.

2. CONCEPTUAL FRAMEWORK, DATA SOURCES AND METHODOLOGY

The nutritional status of children is determined by factors that can be divided into three main categories; immediate, underlying and basic causes [UNCIEF (1990)]. Immediate causes are linked with the dietary intake and occurrence of diseases in children while the underlying causes encompass the access to food for children and mothers, their health care and the environmental conditions. Basic causes include economic, political and institutional structure of the country and availability of resources. Poverty can affect child nutrition through dietary intake or inability of a household to buy sufficient food. Food inadequacy increases the chances of infections and frequent infections cause nutritional deficiencies. Although many studies have explored the poverty and child malnutrition nexus, its robustness is not established [Pal (1999)]. As Sununtar (2005) shows:

Malnutrition is the result of marginal dietary intake compounded by infection. In turn, marginal dietary intake is caused by household food insecurity, lack of clean water,

lack of knowledge about good sanitation, and lack of alternative sources of income. It is also compounded by inadequate care, gender inequality, poor health services, and poor environment. While income is not the sum total of people's lives, health status as reflected by level of malnutrition is.

The conceptual framework, which this study has used to examine the determinants of children's nutritional status, is based on the household utility maximising model by specifying a household production function [Becker (1965); Behrman and Deolalikar (1988); Strauss and Thomas (1995)]. In this model, it is assumed that a household has preferences that can be characterised by the utility function, *U* which depends on consumption of a vector of commodities, *X*, leisure, *L*, and quality of children represented by their nutritional status, *N*:

$$U = u(X, L, N) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Household utility is maximised subject to several constraints, including a time specific nutrition production function and income constraints. The nutritional status of children is determined by food availability, morbidity, access to health services and the quality of care at home. The nutritional outcome of each child measured by standard anthropometric measures can be derived as:

$$Ni = n(C, W, H, Z, e) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

Where *C* is consumption, *W* is a vector of child-specific characteristics, *H* is a vector of household specific characteristics, Z is a vector of health variables and e is child-specific disturbance term. In equation 2, *N* is measured by standardised anthropometric measures of height-for-age, z-score (HAZ), weight-for-age, z-score (WAZ) and weight-for-height, z-scores (WHZ). The z-scores are computed by using the World Health Organisation recommended reference population [WHO (2006)]. The WAZ of a child, for example, is the difference between the weight of the child and the median weight of the reference population of the same age and sex, divided by the standard deviation (SD) of the weight of same group of children:

$$\text{WAZ} = \frac{Wi - Wr}{SD} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

Three anthropometric measures, WAZ, HAZ and WHZ, provide different information about the nutritional status of children. HAZ measures stunting, a condition that reflects chronic malnutrition. WHZ measures the current nutritional status of a child while WAZ captures aspects covered in both HAZ and WHZ [Chirwa and Ngalawa (2008)].

Pakistan Institute of Development Economics (PIDE) has carried out three rounds of a longitudinal (panel) survey in 2001, 2004 and 2010. The first (2001) and third (2010) rounds of the survey collected data on age, weight and height of children, necessary for anthropometric measurement. This study has used these two rounds of data to see changes in child nutritional status during the last decade; whereas, to study the determinants of child nutrition, all the three rounds data (2001, 2004 and 2010) have been used. The sample of the first two rounds of the panel survey (2001, 2004) consisted of only rural areas of 16 districts located in four provinces of the country, and it was named as the Pakistan Rural Household Survey (PRHS). The third round sample survey, carried

out in 2010, was named as the Pakistan Panel Household Survey (PPHS) since it includes both rural and urban areas of these 16 districts [for more detail, see Arif and Farooq (2012)]. The total rural sample of the 2010 PPHS consisted of 2800 households while the urban sample comprised of 1342 households, leading to the total sample of 4142 households. In the PPHS-2010, data on weight and height of all children less than 6 years old were obtained. However, this study has included in the analysis 6-59 months old children. The study has identified in this age group 3218 children, about half of them (48.2 percent) female (Table 1). The data on weight is available for 80 percent of the children while the data on height is available for approximately two-third of the sampled children.

Table 1

Sampled Children by Region and Gender, PPHS-2010

Region	Both Sexes	Male	Female
Total	3218	1666	1552
Urban	844	440	404
Rural	2374	1226	1148

Following the WHO recommendations, for WAZ analysis, children with –6 to 5 z-scores are included. For HAZ and WHZ, the children with –6 to 6 and –5 to 5 scores are included [WHO (2008); WFP and CDC (2005)]. Outliers or children out of the given ranges were found more in HAZ z-scores than in WAZ and WHZ scores. A child is characterised as malnourished if s/he is more than two standard deviations below the standard reference population. While these anthropometric measures are important indicators of child malnutrition, child health itself could be considered an extreme form of child malnutrition. Selective child mortality could then lead to biased estimates if children who have died by 2010 and are missing from the sample. These children were more likely to be from households that are extremely poor. This selective attrition has been checked with no evidence of higher child morality in the poorest households.

Equation 2 has been used to examine the determinants of child nutritional status in 2010. Individual characteristics of children, household level characteristics and community variables are included into this equation. Individual child characteristics include age and gender of the child. Parental characteristics include the level of educational attainment of mother. Two housing related variables included in the equation are the structure of dwelling units (*pacca/katcha*) and availability of toilet—a village level variable. Per capita consumption expenditure is used in the equation for poverty status of the household. Availability of lady health workers at the village level represents the health care services while the region of residence (urban/rural) is a community variable.

Per capita expenditure, a household level variable, is likely to be determined, as reported earlier, by the anthropometric outcomes through its effect on the health status of adults and their earnings [Chirwa and Ngalawa (2008)]. In order to account for the endogeneity problem, the following methodology has been adopted:

(i) The analysis in the first stage is limited to rural panel households covered in 2001 and 2010. To get robust estimates, per capita expenditure in 2001 is

used in equation 2 to explain variation in the 2010 child nutrition status. As the sample is limited to children below 5 years old in 2010, who were not born in 2001 therefore their nutrition outcomes are less likely to affect 2001 poverty status (or consumption expenditure). Both the OLS and two-stage least square (2SLS) techniques are used in the analysis: in OLS, the actual per capita expenditure in 2001 has been used to explain the child nutritional status in 2010, while in 2SLS, per capita expenditure in 2001 is instrumented by 2001 household variables including landholding, ownership of livestock, work status of the head of households and household size.

(ii) In the second stage, per capita expenditure is replaced by change in poverty status between 2004 and 2010. The change in poverty status has four categories: poor in two rounds (2004 and 2010); non-poor in two rounds; moved out of poverty; and moved into poverty. The last two categories are combined to represent transitory poverty. The analysis is carried out only for the 2004 and 2010 rural panel households. The official poverty line has been used for poverty estimation [for details, see Arif and Shujaat (2012)].

(iii) In the final stage, the analysis has used the 2010 PPHS full sample (rural and urban), and per capita expenditure is replaced by the perceived household food security. The OLS technique has been applied in this stage, where perceived food security indicators are used as independent variables instead of per capita expenditure.

3. TRENDS IN CHILD NUTRITION AND POVERTY

Pakistan has a long history of data collection on socio-economic and demographic issues through household surveys, but information on child nutrition is generally missing in these surveys. It is, thus, difficult to analyse the trends in nutritional status of children for a long period of time. However, the NNS carried out in 1985-87, 2001 and 2011 has to some extent filled the gap. Some other surveys, though relatively smaller in their sample sizes, such as Pakistan Socio-economic Survey (PSES) 2001, Pakistan Demographic and Health Survey (PDHS) 1990, PRHS 2001 and PPHS-2010, have also gathered data on height and weight of children to determine their nutritional status. Table 2 has pulled together information from these sources on three well known anthropometric measures; underweight, stunting and wasting for rural and urban areas. According to the NNS series, the incidence of underweight among children aged 6-59 months old has gradually declined from around 48 percent in 1985-87 to about 32 percent in 2011. This decline has been observed in both rural and urban areas. The two rounds of the panel dataset, PRHS-2001 and PPHS-2010 also support the NNS data and show a decline in underweight children during the last decade, although the NNS and the panel data show different magnitudes of underweight children. However, despite this decline in the proportion of underweight children overtime, at present more than one-third of children (32 percent in NNS-2011 and 39 percent in PPHS-2010) are underweight.

Table 2

Trends in Child Nutrition in Pakistan

	% Underweight			% Stunted			% Wasted		
Data Source	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
NNS 1985-7	47.9	–	–	41.8	–	–	10.8	–	–
NNS 2001	41.5	42.3	38.7	31	32.5	24.5	11.6	11.2	12.1
NNS 2011	31.5	33.3	26.6	43.7	46.3	36.9	15.1	12.7	16.1
PDHS 1990	40.4	–	–	50	–	–	9.2	–	–
PSES 2001	48.2	51.4	41.7	49.7	52.7	43.5	–	–	–
PRHS 2001	–	56.6	–	–	64.4	–	–	18.4	–
PPHS 2010	39.4	39.8	38.1	63.9	64.5	62.1	17.9	17.2	19.9

Note: The differences between figures may be due to methodological variations among these surveys. PDHS 1990-1 used NCHS standard with reference population of children (0-59) months. The figures reported for NNS 2001 are percent median with reference population (6-59) months. PRHS, PSES, PPHS-2010, NNS-2011 are using reference population of 6-59, 0-59, 6-59 and 0-59 months respectively.

The situation of other two anthropometric measures, stunting and wasting, is different and alarming. The stunting, which reflects chronic malnutrition, has increased between 2001 and 2011. According to the NNS-2011 data, around 44 percent of children were stunted. This proportion is about 2 percentage points higher than the stunting in 1985-87 (Table 2). The panel data, however, show no major change in stunting between 2001 and 2010. Overall, the magnitude of stunting is much higher in the panel datasets (PRHS-2001 and PPHS-2010) than in the NNS dataset. According to the NNS series, the incidence of wasting has also increased from 11 percent in 1985-87 to 15 percent in 2011. The panel series, however, shows a mild decline in wasting, from 18 percent in 2011 to 17 percent in 2010. The deterioration in stunting overtime, with the high prevalence of underweight (more than one-third), reflects the weak performance of Pakistan in improving the nutritional status of children.

The data in Table 2 are also presented separately for rural and urban areas. All data sources indicate higher prevalence of underweight and stunted children in rural areas than in urban areas. However, in contrast, wasting appears to be moderately higher in urban areas than in rural areas. Majority of malnourished children in urban as well as rural areas are in the 'severe' category (Table 3). The proportion of children in this category is very high in case of stunting. Thus not only is the overall prevalence of stunting high, but also children are severely malnourished.

Table 3

Child Nutrition Status (Moderate/Severe) by Region, 2010

	% Underweight			%Stunted			%Wasted		
Nutritional Status of Children	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Normal	56.9	57.7	56.7	31.2	32.6	30.7	61.8	61.9	61.8
Moderate	15.7	15.0	15.9	20.2	23.2	19.2	8.9	9.4	8.7
Severe	23.7	23.1	23.9	43.7	38.9	45.4	9.0	10.5	8.5
Over Weight/Height	3.7	4.2	3.5	4.9	5.3	4.8	20.3	18.2	21.0
Total	100	100	100	100	100	100	100	100	100

Source: Authors' computation from the micro-data of PPHS-2010.

Note: Normal children are healthy children having Z-scores between –2 and +2 SD, while Z-scores for moderate malnourished child are below –2 SD and severe malnourished child are below –3 SD.

The available data on the poverty levels and trends in Pakistan for the last five decades show that poverty reduction has not been sustainable; rather that it has fluctuated remarkably. In late 1980s, when approximately half of the children were malnourished (underweight), poverty was at a very low level, only 17 percent. There is a consensus in the poverty literature about a sharp rise in poverty in the 1990s. The incidence of poverty, as estimated from the three rounds of panel survey (2001, 2004 and 2010), also illustrates that poverty has fluctuated during 2001-2010 (Table 4). First poverty declined from 31.3 percent in 2001 to 24.1 percent in 2004 and then increased to 27 percent in 2010 in two major provinces of Pakistan, Punjab and Sindh. In rural Pakistan, poverty declined by 5 percentage points, from 27.5 percent in 2001 to 22.4 percent in 2010. In 2010, the overall poverty was estimated at 20.7 percent with a higher incidence of poverty in rural areas (22.4 percent) than in urban areas (16.6 percent).

Table 4

Incidence of Poverty: A Cross-sectional Analysis of Three Waves of the Panel Survey (2001, 2004 and 2010)

Survey Year	All Provinces	Punjab and Sindh
2001 – Rural only	27.5	31.3
2004 – Rural only	–	24.1
2010 – Rural	22.4	27.0
Urban	16.6	18.5
All	20.7	24.4

Source: Arif and Shujaat (2012).

Poverty estimates based on the three rounds of data show that during the last decade, more than half of the rural population (51 percent) in two largest provinces, Punjab and Sindh, remained in the state of poverty at least for one point in time. Within this poor group, the majority was categorised as 1-wave poor (31 percent), although considerable proportion, around 17 percent, is found to be poor in 2-periods. Chronic poor, those who remained poor in all three waves is only 4 percent, which is less than half of the population who remained poor in two waves. The three-wave data are spread over 10 years period, 2001 to 2010. During this decade, only a small proportion of households remained continuously in the state of poverty. Movement into and out of poverty is a common phenomenon in Pakistan, particularly in its rural areas.

Table 5

Poverty Dynamics by Region (Rural only) Using Three Waves (2001, 2004 and 2010)

	Total sample (Sindh and Punjab)	Punjab			
Change in Poverty Status		Total	Central – North (excluding South)	South	Sindh
3 Period Poor (Chronic)	4.01	3.71	1.06	6.46	4.32
2 Period Poor	16.60	10.34	6.17	14.65	23.12
1 Period Poor	30.90	23.97	17.41	30.76	38.12
Never Poor	48.48	61.98	75.36	48.14	34.44
All	100.0	100.0	100.0	100.0	100.0
N	(1395)	(792)	(417)	(375)	(603)

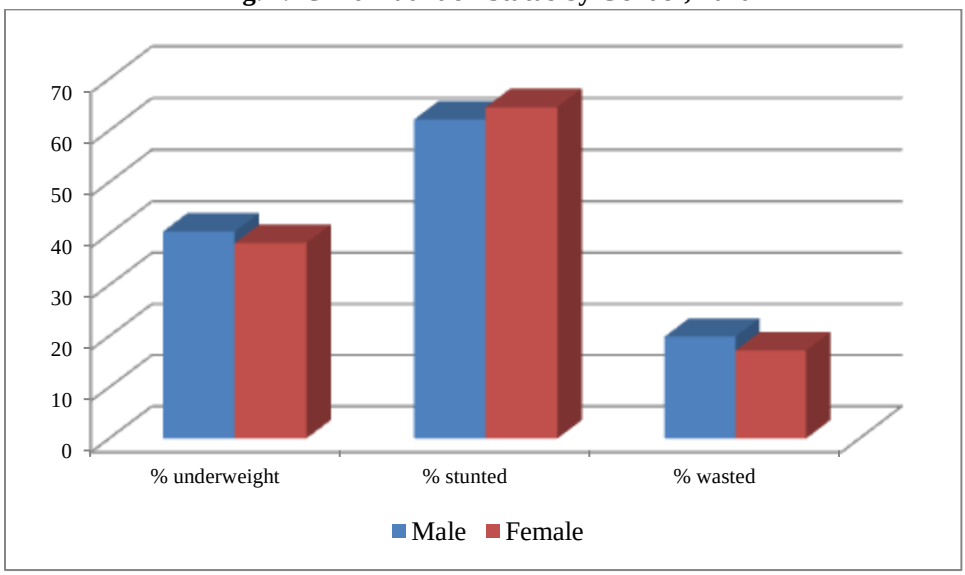
Source: Arif and Shujaat (2012).

4. SOCIO-DEMOGRAPHIC DIFFERENTIALS OF CHILD MALNUTRITION

Figures 1-3 present data on three anthropometric measures by gender for the total sample as well as rural-urban areas, while Figure 4 presents data on the nutritional status of children by their age. Overall there is no major gender difference in the three measures. However, gender differences are more profound within the rural and urban areas. In rural areas, for example, more males are underweight and wasted than females while in urban areas the prevalence of malnutrition (under weight and wasting) is higher among females than among males. It is not easy to explain these gender differentials in rural and urban areas. However, it appears from the available studies in Pakistan and elsewhere in subcontinent that evidence on gender differentials in child nutritional status is inconclusive. As Shah, *et al*. (2003) while studying child nutrition in 64 villages of Sindh (Pakistan) found no difference in stunting between male and female children. In rural Bangladesh, Choudhury, *et al*. (2000) found that female children were more likely to be severely malnourished than male children. However, the nutritional survey in 2005-06 in India reveals no significant difference in nutrition status (stunting and wasting) between boys and girls[1]. A recent study in urban slum of India found the prevalence of malnutrition higher among female children than among male [Damor, *et al*. (2013)].

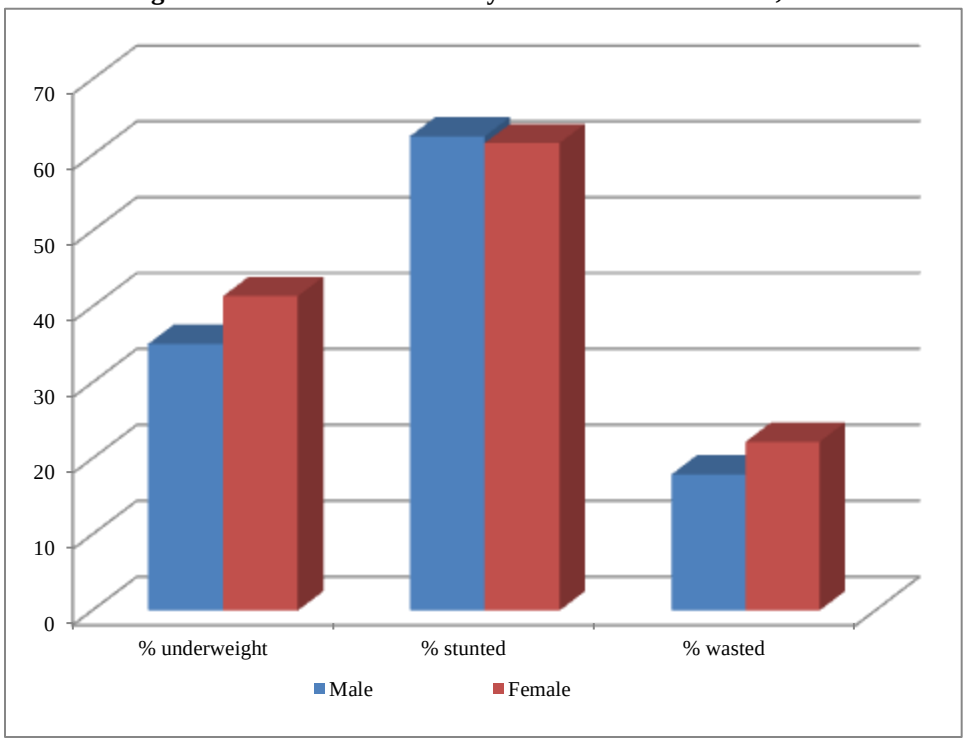
Figure 4 shows a nonlinear relationship between the age of child and the three measures of his nutritional status. In the case of underweight, it is highest for the 6-11 months old children. It decreases for the next age group (12-21 months), but it increases for the 2-3 years old children. The lowest prevalence is found for children in age group 48-59 months. Despite these variations across the age groups, the minimum prevalence of underweight stands at 36 percent, suggesting widespread malnutrition in all age groups of the sampled children. The situation is not different for stunting and wasting (Figure 4).

Fig. 1. Child Nutrition Status by Gender, 2010



[1] *www.ifpri.org/sites/default/files/publications/oc63ch04.pd*

Fig. 2. Child Nutrition Status by Gender in Urban Areas, 2010



Source: Authors' computation from the micro-data of PPHS-2010.

Fig. 3. Child Nutrition Status by Gender, 2010

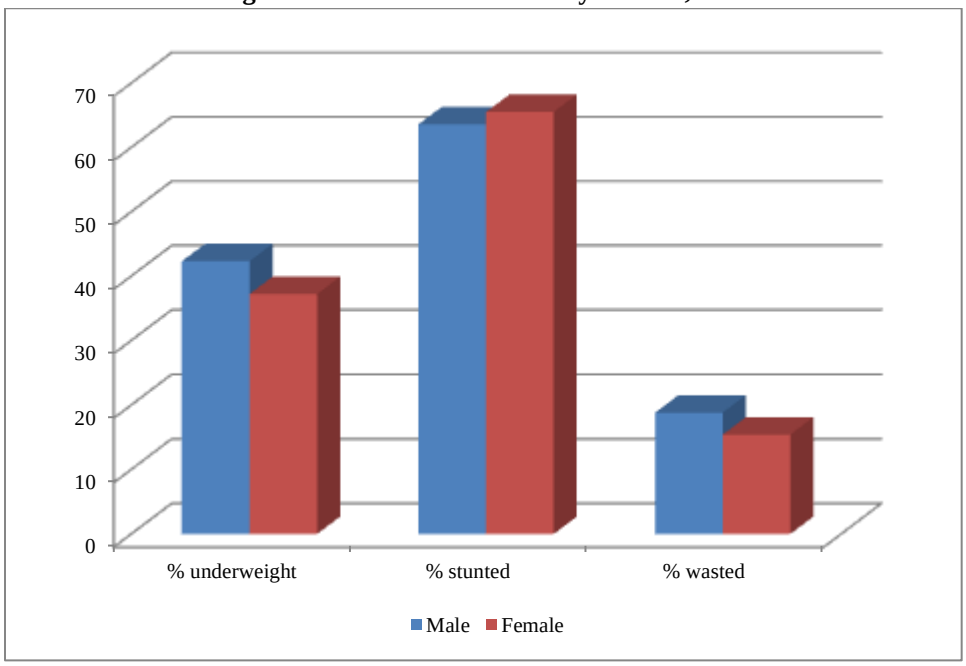
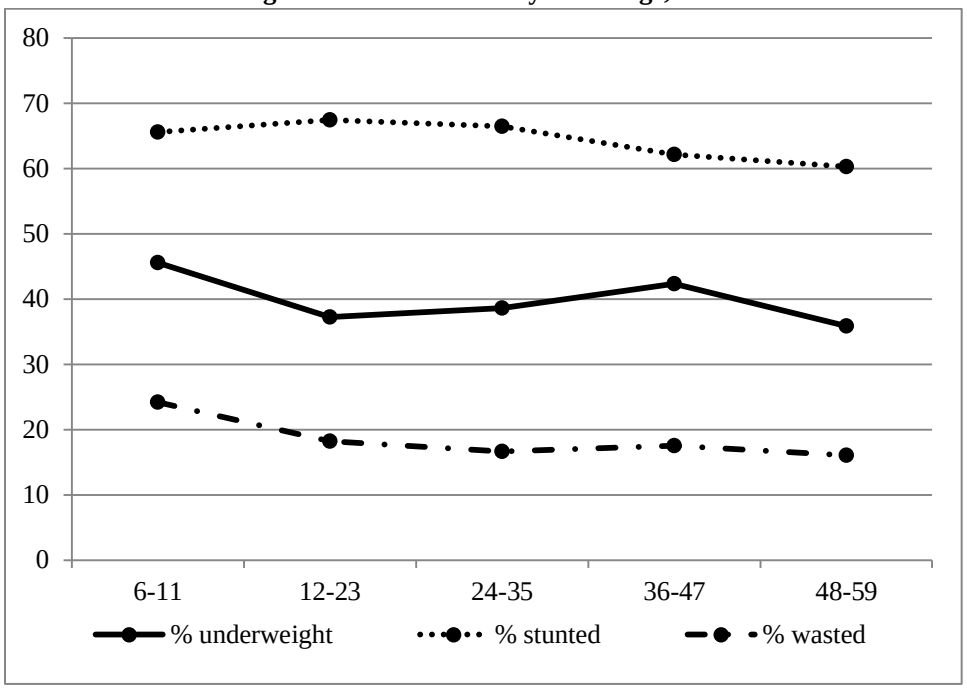


Fig. 4. Nutrition Status by Child Age, 2010



Source: Authors' computation from the micro-data of PPHS-2010.

5. DETERMINANTS OF CHILD NUTRITION

The determinants of child nutritional status are examined by estimating the Equation 2, where WAZ z-scores, WHZ z-scores and HAZ z-scores are used as the dependent variables. Independent variables include child characteristics (gender and age), child illness (incidence of diarrhea), education of mother, per capita expenditure as an indicator of household poverty, number of siblings, environmental factors (structure of the dwelling unit), access to toilet (a village level variable), availability of LHWs at village level and the region (rural-urban) of residence. As noted in Section 2, because of the endogeneity problem, per capita expenditure of 2001 are instrumented by 2001 household ownership of land and livestock, work status of the head of household and household size. The 2SLS regression has been used. In addition, 2004 poverty status and change in poverty status between 2004 and 2010 has also been used to predict the nutritional status of child. Table 6 provides the summary statistics of the 2010 dependent and independent variables.

The mean values for the z-scores of WAZ, HAZ and WHZ are –1.55, –2.38 and 0.12 respectively. Per capita expenditure is computed at Rs.1167 per month. About half of the sampled children are female and their mean age is about 31 months (Table 6). About 9 percent of the children had diarrhea during the month preceding the survey. More than half of the housing units where children live are *pacca* (cemented) and more than 50 percent of the households have been visited by LHWs and have a toilet with flush.

Table 6

Summary Statistics for Dependent and Independent Variables

Determinants	Mean	Minimum	Maximum	S.D	N
WAZ	–1.55	–5.98	4.94	1.96	3540
HAZ	–2.38	–6.01	6.00	2.20	2742
WHZ	0.12	–4.99	5.00	2.22	2280
Per Capita Expenditure in 2001 (Rs)	1166.68	1048.76	148.88	22102.39	
Child Characteristics					
Sex (male =1)	0.53	0	1	0.50	4604
Age (in months)	31.36	6	59	14.97	3218
Number of Siblings (< 2)	0.21	0	1	0.415	6509
2-3	0.35	0	1	0.489	4214
4-6	0.26	0	1	0.449	4214
7+	0.06	0	1	0.24	4214
Incidence of Diarrhea last 30 days (yes=1)	0.09	0	1	0.295	4635
Mother Characteristics					
Mother Education (No education)	0.81	0	1	0.49	4635
Primary (yes=1)	0.08	0	1	0.27	4635
Secondary(yes=1)	0.07	0	1	0.25	4635
College(yes=1)	0.04	0	1	0.19	4635
Housing and Hygiene					
Housing type (*Pacca*=1)	0.33	0	1	0.47	4616
Community Factor					
Toilet in village (in %)	54.87	0	100	34.02	4604
LHW presence in village (in %)	57.79	0	100	30.35	4604

Results based on 2001–2010 panel households for the three equations (WAZ, HAZ and WHZ) are presented in Table 7 where OLS and 2SLS methods have been applied. The First Stage regression results of 2SLS have been presented in Appendix Table 1 which suggests that all the six excluded instruments are highly correlated with per capita expenditure. The question is whether the instruments for per capita expenditure are uncorrelated with the disturbance process. To answer that, we computed the test for over identifying restrictions and results are presented in Appendix Table 2 where both the Sargan and Basmann test shows that specification of the equation is satisfied.

Overall, the results of both techniques (OLS and 2SLS) are similar except for per capita expenditure, which shows a significant association with child malnutrition in the OLS model while it turns out to be insignificant in the 2SLS model (Table 7). It supports the existing literature that impact of poverty on the nutritional status of children is ambiguous.

The gender variable has significant and negative relation with WAZ and WHZ, showing that boys are more likely than girls to be underweight and wasted. Age has a positive impact on WAZ while Age^2 has also a significant and positive association with the WAZ scores , suggesting a non-linear relationship, which implies that boys gradually improve their weight/age score. The coefficient of Age^2 is not significant in 2SLS.

The number of siblings does not have a significant effect on all the three anthropometric measures of nutritional status. The incidence of diarrhoea had a statistically significant negative association with the three anthropometric measures. It appears that morbidity adversely affects the growth of children by reducing the ability of a body to convert food into energy. Surprisingly mothers' education effect turned out to be statistically significant only on WAZ, and not on HAZ and WHZ.

An environmental factor represented by the availability of flush toilet at village level has a statistically significant relationship with WAZ and WHZ scores, but the relationship is insignificant for the HAZ scores. It appears from this association that the village level environmental factors such as toilet with a flush system affect the current health status more than impacting the chronic malnutrition (HAZ).

The role of LHWs in improving the nutritional status of children is positive with statistically significant association with WAZ, HAZ and WHZ scores. It means that the availability of health services at village level help to improve not only the current nutritional status but also affect child growth in the long term through improving the HAZ and WHZ.

Table 7

The Determinants of Child Malnutrition-OLS and 2SLS Estimates (only 2001 and 2010 Panel Households)

	OLS			2SLS		
	WAZ	HAZ	WHZ	WAZ	HAZ	WHZ
Determinants	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Per capita exp._2001 (Rs)	0.001**	0.002	0.001***	0.001	0.001	0.000
Per capita exp._2001 (sq)	0.001	0.001	0.001	0.001	0.001	0.000
Sex (male=1)	–0.312*	–0.100	–0.233***	–0.328*	–0.090	–0.237***
Child age (months)	0.034**	0.023	–0.013	0.032***	0.028	–0.010
Child age^2	0.001***	0.001	0.001	0.001	0.001	0.000
Number of Siblings (<2 as reference)						
2-3	0.040	0.077	0.044	0.059	0.103	0.026
4-6	–0.066	0.208	–0.195	–0.056	0.287	–0.218
7+	0.154	0.168	–0.292	0.176	0.267	–0.313
Diarrhea (yes=1)	–0.420*	0.185	–0.295***	–0.429*	0.219	–0.307***
Mother's education (no education as reference)						
Primary	0.032	0.187	0.158	–0.053	0.189	0.129
Secondary	0.434*	0.052	0.456	0.394*	–0.020	0.475
College	0.620*	0.744	–0.338	0.630*	0.614	–0.292
Housing Type (Pacca=1)	–0.049	–0.032	–0.253	–0.063	–0.074	–0.255
Toilet Facility (% at village level)	0.005*	0.001	0.011**	0.005*	0.000	0.012*
LHW visited (% at village level)	0.014*	–0.005	0.012*	0.014*	0.005*	–0.012*
Constant	–1.505*	–2.883	0.523*	–1.571*	–3.208*	0.589*
N	1,328	998	1,010	1.311	986	1,873

Source: Authors' estimation from the micro-data of PRHS 2001 and PPHS 2010.
Note: * significant at 1 percent, ** significant at 5 percent, *** significant at 10 percent.
Note: Per capita expenditure of 2001 is instrumented.

To explore further the relationship between poverty and the nutritional status of children (weight for age), per capita expenditure, which represents the 2001 poverty status, has been replaced by the poverty status in 2004 and change in poverty status between 2004 and 2010 in two models, as given in Table 8.The hypothesis is that the poverty of a household in recent past and movement in poverty status affect the nutritional status of children. As noted earlier, the sampled children included in the nutritional status equation were 6-59 months old. The PPHS was carried out in the last quarter of the year 2010, as part of the panel survey. Its earlier round was carried out in 2004, but only in rural areas of Punjab and Sindh, the two largest provinces of the country. Poverty in 2004 or a change in the poverty status of households between 2004

and 2010[2], when the sampled children were born, may have an impact on their nutritional status. Table 8 shows the results of OLS for WAZ, where two models have been estimated. In model-1, per capita household expenditures are replaced by the household poverty status in 2004; poor in 2004 are given the value 1, zero otherwise. In model-2, two dummies of poverty dynamics are used; transitory poor and chronic poor while the third category, remained non-poor in 2004 and 2010, is used as the reference category.

Table 8

The Impact of Poverty and Poverty Dynamics on Child Underweight—OLS Regression

	Model-1		Model-2	
Determinants	Coeff.	Std. Error	Coeff.	Std. Error
Poverty status in 2004 (poor=1)	–0.257	0.172	–	–
Poverty dynamics (non-poor as reference)				
Chronic (poor in 2-periods)	–	–	–0.109	0.207
Transitory (moved into or out of poverty)	–	–	–0.141	0.132
Sex (male=1)	–0.287**	0.118	–0.292**	0.119
Child age (months)	0.025	0.019	0.027	0.019
Child age^2	0.001	0.001	0.001	0.001
Number of Siblings (<2 as reference)				
2-3	0.086	0.153	0.079	0.155
4-6	–0.090	0.160	–0.094	0.162
7+	0.043	0.251	0.026	0.254
Diarrhea (yes=1)	–0.604*	0.173	–0.614*	0.175
Mother's education (no education as reference)				
Primary	0.281	0.226	0.261	0.228
Secondary	0.399	0.295	0.443	0.300
College	–0.483	0.457	–0.493	0.460
Housing Type (Pacca=1)	0.104	0.140	0.087	0.142
Toilet Facility (% at village level)	0.009*	0.002	0.010*	0.002
LHW visited (% at village level)	0.012*	0.003	0.012*	0.003
Constant	1.536*	0.341	–1.538*	0.348
N	966		954	

Source: Authors' estimation from the micro-data of PRHS 2004 and PPHS 2010.
Note: * significant at 1 percent, ** significant at 5 percent, *** significant at 10 percent.

The model-1 examines the effect of poverty status in 2004 on the child nutritional status in 2010 while model-2 deals with the effects of poverty movements on the child nutritional status. No single category of poverty or poverty dynamics turned out to be statistically significant (Table 8). It shows that the recent past poverty status, as well as household's movement into or out of poverty even the chronic poverty is not relevant to the nutritional status of children in Pakistan. It is noteworthy that age, age-square and education of mother that were statistically significant in the WAZ models shown in Table 7 did not turn out to be significant in the models shown in Table 8. There is no change in the significance of other variables.

[2]Based on this panel data, Arif and Farooq (2012) have estimated that between 2004 and 2010, 15 percent of the households moved out of poverty while 18 percent fell into poverty. Another 9 percent households were identified as chronic poor, remaining in poverty in two rounds, 2004 and 2010.

In the PPHS-2010, the sampled households in both rural and urban areas were asked if they faced food shortage during the last 12 months. In another similar question, they were asked whether the food during last 12 months has been insufficient for the household members. These two questions show the perception of households about the food security. This type of household perception may not reflect a true picture of the household food security because it does not determine for how many days they have faced food shortage and what is the nature of the food shortage. However, it does provide information about the households that have faced food shortage for some time during the 12 months preceding the survey. The PPHS-2010 shows that about one-third of the households reported such shortage.

In the final stage of analysis, the Equation 2 is estimated by replacing 2001 per capita expenditure with the household's perceived food security variables, as discussed above. If a household faced food shortage or food was insufficient during the last 12 months, it was coded 1, otherwise zero. Two models (for WAZ only) have been estimated. In model-3, the variable food shortage is used while in model-4, it is replaced by the perceived food insufficiency. Table 9 presents the findings of the OLS regression. The variables representing food security or food shortage also did not turn out to be statistically significant. Like poverty, the perceived food shortage is not related to the nutritional status of children. The regional dummy (rural-urban) was entered into the models to examine the effects of community factor on the nutritional status and it appears

Table 9

OLS for Underweight Children (Perceived Food Security)

	Model-3		Model-4	
Determinants	Coeff.	Std. Error	Coeff.	Std. Error
Food Shortage (yes=1)	0.1790	0.788	–	–
Sufficient Food (yes=1)	–	–	0.094	0.079
Sex (male=1)	–0.2707*	0.0764	–0.268*	0.076
Child age (months)	0.0251**	0.0123	0.024**	0.012
Child age^2	–0.0002	0.0002	0.000	0.000
Number of Siblings				
2-3	–0.0667	0.0929	–0.066	0.093
4-6	–0.2056**	0.1036	–0.221**	0.104
7+	0.0322	0.1762	0.032	0.176
Diarrhea	–0.3954*	0.1210	–0.397*	0.121
Mother's Education				
Primary	0.1087	0.1410	0.110	0.141
Secondary	0.1226	0.1566	0.134	0.157
College	0.2596	0.2060	0.263	0.207
Housing Type (Pacca=1)	–0.0987	0.0905	–0.094	0.090
Toilet Facility (% at village level)	0.0057*	0.0014	0.006*	0.001
LHW visited (% at village level)	0.0085*	0.0013	0.009*	0.001
Region	–0.2373**	0.1050	–0.246**	0.105
Constant	–1.4245*	0.2130	–1.307*	0.215
N	2,479		2,476	

Source: Authors' estimation from the micro-data of PPHS 2010.

Note: * significant at 1 percent, ** significant at 5 percent, *** significant at 10 percent.

from negative sign of this variable that the nutritional status of urban children is lower than their rural counterparts. Since the difference in child malnutrition is significant between the rural and urban areas, the determinants of malnutrition are also estimated separately for these two sub-samples and are reported in Table 10. Age of the child, which has significant positive association with the malnutrition in full sample models, lost its significance in rural/urban separate models. Mother's education that was insignificant in full model, turned out to be significant in the rural model, showing the importance of women education for child welfare in rural settings. No major difference could be found in the magnitude and significance of other variables used into these two separate models.

Table 10

OLS for Underweight Children (Perceived Food Security)

	Rural Only		Urban only	
Determinants	Coeff.	Coeff.	Coeff.	Coeff.
Food shortage (yes=1)	0.174	–	0.185	–
Sufficient Food (yes=1)	–	–0.024	–	–0.389
Sex (male=1)	–0.331*	–0.328*	–0.082	–0.088
Child age (months)	0.017	0.016	0.023	0.025
Child age^2	0.000	0.000	0.000	0.000
2-3	–0.002	–0.002	–0.192	–0.214
4-6	–0.215***	–0.233**	–0.122	–0.116
7+	0.055	0.055	0.001	–0.039
Diarrhea	–0.444*	–0.443*	–0.214	–0.163
Primary	–0.096	–0.074	–0.497*	–0.550*
Secondary	0.374**	0.383*	–0.122	–0.174
College	0.301	0.326**	0.395	0.315
Housing Type (Pacca=1)	–0.067	–0.055	–0.137	–0.147
Toilet Facility (% at village level)	0.005*	0.006*	0.008**	0.007**
LHW visited (% at village level)	0.009*	0.010*	0.007*	0.007*
Constant	–1.350*	–1.261*	–1.910*	–1.634*
N	1,849	1,847	630	629

Source: Authors' estimation from the micro-data of PPHS 2010.

Note: * significant at 1 percent, ** significant at 5 percent, *** significant at 10 percent.

6. DISCUSSION: EXPLANATION OF POVERTY—CHILD MALNUTRITION NEXUS IN PAKISTAN

A major finding of this study is that the nutritional status of children in Pakistan is predominantly related to their exposure to illness (diarrhoea), provision of health care services and environmental factors. The recent past poverty status of a household or change in poverty status over time as well as the perceived food shortage are not significantly associated with child malnutrition. Now the question is how to explain this lack of association between the poverty and child nutritional status. As noted earlier, there is no consensus in the literature regarding the role of poverty in child malnutrition.

Several studies have shown malnutrition as the reflection of poverty, while other empirical studies have found no association between poverty and child malnutrition [Chirwa and Ngalawa (2008)]. As NEPAD (2004) notes, "[the] availability and access to sufficient quantity and quality of affordable food is necessary but not sufficient to ensure adequate nutrition". Alone the food security and low poverty cannot make a household nutritionally secured. Beside poverty, other basic determinants of nutrition are social, economic, political, cultural and non-food factors i.e. care and health [ACC/SCN-IFPRI (2000)]. A nutrition secure society is a society that achieves the adequacy of food, adequate maternal and child care, and good health and environmental services [Gillespie and Haddad (2003)].

In the case of Pakistan, based on the PSES-2001, Arif (2004) has earlier found a positive impact of per capita expenditure (or poverty) only on weight-for-age, but no association with stunting or wasting. But, he did not account for the endogeneity problem. When endogeneity problem is addressed in the present study, poverty has shown no association with all three anthropometric measures (underweight, stunting and wasting). As shown earlier, Pakistan has not experienced a sustained reduction in poverty during the last five decades, it has fluctuated. In the 1990s, poverty increased, but the prevalence rate of underweight declined. Poverty during the first half of the last decade declined, but it increased in its second half. Although the proportion of underweight children declined during the last decade, stunting and wasting remained unchanged or even increased.

Poverty in Pakistan is largely considered a rural phenomenon, but there is no major difference between urban and rural areas in child malnutrition (see Table 2). This can be partially explained by the rural economy dynamics. Despite highly unequal land distribution, about two-thirds of the rural households are engaged in production of some food items from agriculture or/and livestock related activities, ensuring necessary dietary intake of household members. Moreover, social and financial support is deeply embedded in Pakistani culture, where the vulnerable households get support from their neighbours, relatives and well-off families and thus maintain their subsistence nutritional intake. Such support is even enhanced when some households or group of society face some natural or unnatural negative shocks. The Government of Pakistan also provides a number of direct and indirect transfers and subsides to the poor to protect them from both the short and long-term social and financial insecurity. A number of targeted direct transfers in the public sector such as *zakat, Baitulmal* and Benazir Income Support Programme (BISP) help in the provision of food. Nayab and Farooq (2012) have found a positive impact of the BISP on food consumption.

Evidence from other countries like India shows that the issue is not about having enough food; there is a need to look beyond income levels, poverty and food availability [Mendelson (2011)]. The episodes of illness, particularly diarrhoea, reduce the ability of body to convert food into energy, leading to high levels of malnutrition among children. Children who suffer from illnesses, even though their dietary requirements are met, cannot grow robustly as excessive nutrition losses occur during the frequent episodes of disease [Rosenberg, Soloman, and Schneider (1977)]. The frequent episodes of diarrhoea account for high neonatal and infant mortality, which is the second most killing disease among children in world [UNCIEF (2011)]. Pneumonia is also one of the leading killers

of Pakistani children [UNICEF (2012)].[3] There is a strong association between the incidence of diarrhoea and lack of access to safe drinking water. The access to clean water is another major concern in both urban and rural areas of the country. For example, in Karachi, the largest city of the country, the 22 percent water samples as provided by the government were found to be either non-chlorinated or containing insufficient amount of chlorine.[4] While the reduction in poverty is vastly dependent on private household consumption expenditures, the improvements in child malnutrition are largely driven by public expenditures. Improved sanitation and access to clean water, usually invested by the government, can have significant impact on malnutrition [IFPRI (2005)].

Similarly, the significance of LHWs in the present analysis shows the importance of child care services in improving the nutritional status of children. In Pakistan, the health facilities are very poor as the country has been spending only 0.6 percent of its GDP on health services over the last two decades. The pervasive and troubling weaknesses in the health system have caused high mortality and diseases among women and children.[5]

7. CONCLUSIONS

The high prevalence of malnourishment among children in Pakistan remains a critical issue in policy debate. This study has examined the trends in child malnutrition and assessed its linkages with the characteristics of children, provision of health care services and the poverty status of households. The study found very high levels of malnutrition among children and no significant association between poverty and child malnourishment. No association could be found between the perceived food shortage and child malnutrition. Child malnutrition is deeply rooted in child illness, environmental factors and weak health system.

Several policy suggestions emerge from the findings of this study. First, Pakistan should not assume that economic growth or poverty reduction will automatically translate into improved child nutrition. Measures for enhancing actions about social determinants of health, and specific programs for improved early life nutrition are needed to reduce child malnourishment.

Second, the existing child and maternal health care services in the country are inadequate for improving child nutritional status. Many developing countries, some with even more limited resources than Pakistan, are 'on the track' to improve maternal and child health. The key weaknesses in Pakistan, which hold back the country's progress in this regard, are insufficient financing, poor governance, lack of skilled health workers, and inequalities in access to healthcare.[6] Thus, direct investments in appropriate health interventions, focusing on women and children, are necessary to improve child health and nutrition.

Third, the high incidence of child illness, particularly diarrhoea, needs to be overcome by preventive measures, including the awareness about hygienic environment

[3]UNICEF (2012).DAWN newspaper, October 10, 2012.

[4]DAWN newspaper, October 10, 2012.

[5]UN Report titled "Every Women, Every Child: From Commitment to Action" DAWN newspaper, October 10, 2012.

[6]DAWN newspaper, October 10, 2012.

and specific dietary intake during illnesses that compensate nutrient losses. Finally, the positive contribution of LHWs to child nutrition shows the importance of the provision of door to door health care services in Pakistan. The LHW program should be universalised, particularly in rural areas.

Appendix Table 1

The Determinants of Child Malnutrition-First Stage Results of 2SLS Estimates

Determinants	WAZ Coeff.	HAZ Coeff.	WHZ Coeff.
Per Capita Expenditure (sq)	0.001*	0.001***	0.001***
Sex (male=1)	–3.850	–14.513	–9.549
Child age (months)	–13.175***	–17.540***	–16.327***
Child age^2	0.235***	0.276***	0.263***
Number of Siblings (<2 as reference)			
2-3	–65.278	–80.815	–44.428
4-6	–275.538*	–276.345*	–249.020*
7+	–266.647*	–208.969***	–274.388**
Diarrhoea (yes=1)	–109.193	–165.675***	–125.630
Mother's Education (no education as reference)			
Primary	–19.636	–23.394	31.325
Secondary	267.604*	305.398**	221.665
College	410.926*	434.357**	340.260
Housing Type (Pacca=1)	79.325	102.945	107.340
Toilet Facility (% at village level)	3.676*	4.117*	3.635
LHW visited (% at village level)	1.202	–0.348	0.747*
Education of Head of Household in 2001 (up to primary as ref.)			
6-10	421.998*	382.563*	572.025*
11 and above	356.412*	234.755	275.157***
Work status of head_01 (yes=1)	111.699***	154.156***	169.502**
Household size_ 01 (numbers	–46.771*	–47.740*	–50.111*
Land_01 (in acres)	2.000***	3.520***	2.962
Large animals_01 (in numbers)	48.971*	41.336*	39.993*
Constant	1410.542*	1523.364*	1560.652*
F-stat	13.26	9.16	9.70
R-square	0.1705	0.1596	0.1659
Adjusted R-square	0.1577	0.1422	0.1488
N	1,311	986	977

Source: Authors' estimation from the micro-data of PRHS 2001 and PPHS 2010.
Note: * significant at 1 percent, ** significant at 5 percent, *** significant at 10 percent.

Appendix Table 2

Over Identification Test

	WAZ	HAZ	WHZ
Sargan (score) chi2(5)	4.79804	1.45916	2.28048
	(p = 0.4410)	(p = 0.9177)	(p = 0.8091)
Basmann chi2(5)	4.73853	1.43019	2.23757
	(p = 0.4486)	(p = 0.9210)	(p = 0.8154)

Source: Authors' estimation from the micro-data of PRHS 2001 and PPHS 2010.

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Welfare Impact of the Lady Health Workers Programme in Pakistan

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1. INTRODUCTION

With the year 2015 fast approaching, Pakistan is not likely to achieve most of the health targets set in the Millennium Development Goals [Pakistan (2010)]. High levels of child and maternal mortality and child malnutrition are among the major health challenges facing the country. Along with this enhanced vulnerability for children and women there is also an economic divide in the society because these health challenges are more profound for the poor segment of the population than for the better off. Another divide is between the rural and urban populations due to concentration of health facilities in urban centres of the country. The high cost of dealing with health issues adversely affects the poor and rural population, lowering their productivity and limiting their lifetime achievements. Without substantially improved health outcomes it is impossible to break out of the cycle of poverty [OECD (2003)].

The government of Pakistan has taken several initiatives to improve the health status of the population, particularly women and children, and the Lady Health Workers (LHW)[1] programme is one such initiative. The LHW programme was launched in 1994 with the core objective of reducing poverty by providing essential primary health care services to people at large and hence also improving the national health indicators. The programme also envisaged to contribute to the overall health sector goals of improvement in maternal, new-born and child health, provision of family planning services, and integration of other vertical health promotion programmes.

The performance of the LHW programme was evaluated by the Oxford Policy Management (OPM) in 1999 and 2008-09. According to their 1999 report, the LHW programme has had a positive impact on the health outcomes in its catchments areas.

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[1]LHWs provide primary healthcare services, including disease prevention, cure and rehabilitative services, and family planning, in rural areas and urban slums, with more than 75 percent of the population served by LHWs living in rural areas. LHWs reside in the locality they serve and their homes are called health houses. Each LHW covers approximately 200 houses, which is an average of over 1200 individuals. LHWs are supposed to visit each household in their assigned area at least once a month. Each LHW is attached to a government health facility, from which they receive training, a small allowance, and medical supplies. Provincial and district coordinators monitor and supervise the LHWs. The average annual salary of LHWs is $343 who are not allowed to engage in other paid activities. 110,000 currently deployed. Target is 150,000.

These outcomes include childhood vaccination rates, reversible methods of contraception (especially in rural areas), antenatal services, provision of iron tablets to pregnant women, child growth monitoring and control of childhood diarrhoea among the lower income and poor households. The OPM 2008-09 evaluation report stated that the LHWs have played a substantial role in preventive and promotive care and in delivering some of the basic curative care to the communities, along with providing referral to emergency and tertiary care [OPM (2009)].

The evaluations of the LHW programme, however, did not carry out an in-depth analysis of the distributional impact of the programme. Health and poverty nexus is well documented and the literature shows that a family's wellbeing is strongly tied to the physical health of its members (WHO, 2003). An effective intervention in the health sector improves the delivery of health services, which impacts positively the health status of a population. This improvement in the health status affects the well-being of the people by enabling them to take benefit of the available economic opportunities more efficiently.

The present paper aims to: analyse whether the LHWs serve the poor and the vulnerable disproportionately; examine the contribution of the LHW programme in improving child and maternal health; and analyse the poverty reduction impact of the LHW programme. To achieve these objectives the paper is organised into five sections. The next section presents a very brief review of the health and poverty situation in Pakistan. It also outlines the main features of the LHW initiative. The data source and methodology used in the paper are discussed in section 3 followed by investigating whether the LHW programme has served the poor disproportionally in section 4. The health seeking behaviour of the beneficiaries (women visited by the LHWs) and non-beneficiaries (women not visited by the LHWs) is examined in section 5. Section 6 explores the impact of the LHW programme on the health outcomes of women and children and their poverty status. The final section presents the conclusions of the study and draws some policy recommendations.

2. HEALTH, POVERTY AND THE LHW INITIATIVE: A BRIEF REVIEW

Child and maternal health are considered important summary indicators of the development of a country. MDGs 4 and 5 are related to child and maternal health. Goal 4 is to reduce child mortality while goal 5 is to improve maternal health. Pakistan has made some improvements in the indicators related to these goals but the progress remains slow and unsatisfactory. Table 1 presents data on child and maternal health indicators, covering the 1990-91 to 2008-09 period along with the MDG targets for 2015. Pakistan lags behind in achieving the goals for two important indicators of child health. The first goal is to reduce under-five mortality to 52 deaths per 1000 by 2015 from its current level of 94 deaths per 1000. The second goal is reduction in infant mortality to 40 deaths per 1000 live births from the current level of 75 deaths per 1000 live births. It seems difficult to attain both these goals by 2015. The performance for immunisation of children and reduction in diarrhoea cases can, however, be considered satisfactory (Table 1). The performance of indicators related to maternal health shows that while Pakistan has made significant progress in reducing maternal mortality from 533 maternal deaths

Table 1

The Performance of Health Sector and Poverty Situation in Pakistan

Indicators	1990-91	2001-02	2004-05	2005-06	2006-07	2007-08	2010-11	MDG Target 2015
Poverty incidence	26.1	34.5	23.9	22.3	n/a	17.2	12.4[a]	13
MDG indicators related to reducing infant and child mortality								
<5 mortality	117	n/a	n/a	n/a	94	n/a	89 (2012-13)	52
Infant mortality rate	102	77	77	76	75	n/a	66 (2014)	40
Proportion of fully immunized children (12-23 months)	75	53	77	71	76	73	81	>90
Proportion of 1 year children immunized against measles	80	57	78	76	77	76	82	>90
Proportion <5 suffered from diarrhoea	26	12	14	12	11	10	11	<10
MDG indicators related to improve maternal health								
Maternal Mortality Ratio*	533	350	400	380	276	n/a	260	140
Proportion of skilled birth attendance	18	40	48	35	37	40	47	>90
Contraceptive prevalence rate	12	28	n/a	n/a	29.6	30.2	35 (2012-13)	55
Total fertility rate	5.4	n/a	n/a	n/a	4.1	3.85	3.6	2.1
Proportion made at least 1 antenatal check-up (for births in last 3 years)	15	35	50	52	53	56	58	100

Source: Government of Pakistan (2010), Pakistan Millennium Development Goals Report, Planning Commission, GOP, Islamabad.

Note: * – MMR estimates, like in most other places similar to Pakistan, are very uncertain, with a wide range of error.

a: These figures may be considered interim indication of poverty situation in the country, according to the Pakistan Economic Survey 2013-14.

per 100,000 live births in 1990-91 to 276 in 2006-07 (Table 1), the achievement of the target of 140 by 2015 seems difficult in such a short time. Similarly, despite an improvement in the proportion of women using contraceptives, receiving antenatal care services and delivering by skilled birth attendants, the progress is slow in achieving the targets set for the year 2015. A considerable decline in total fertility rate from 5.4 in 1990-91 to 3.8 in 2008-09 is not sufficient to achieve the target of replacement level fertility (2.1 births per women) by 2015.

Table 1 also presents data on poverty trends and the MDG target for 2015. If we look at the findings of the PPHS we see a fluctuating trend in poverty incidence, with poverty decreasing during the period 2001 to 2004 and increasing in 2010 from what it was in 2004 [Arif and Shujaat (2014)]. This concurs with the erratic poverty trends shown in Pakistan during the last five decades. While the poverty was very high in the 1960s (40 percent), it declined in the 1970s, and the declining trends continued in the 1980s, reaching to a level of only 18 percent in 1987-88. Poverty, however, began to rise again in early 1990s till the beginning of the new millennium when the headcount ratio was about 35 percent. In addition to the decline in economic growth the inflows of foreign remittances, which are believed to be one of the major factors reducing poverty during the 1970s and 1980s, also declined markedly during the 1990s. There was a sharp decline in poverty during the first half of the last decade, from 34.5 percent in 2000-01 to 22.3 percent in 2005-06. This declining trend continued and poverty dropped to a low level of 12.4 percent in 2010-11[2] (Table 1). In recent times the economy of Pakistan has been facing severe challenges with a declining rate of economic growth, double-digit

[2]However, this figure has been reported in the 2013-14 Pakistan Economic Survey as an interim indication of poverty situation in the country.

inflation—particularly food inflation, power shortage, soaring oil prices and poor law and order situation. But the inflows of foreign remittances, which played a major role in poverty decline in the past, have increased to more than US$ 10 billion per annum. Irrespective of the poverty estimates for the more recent period, historical trends show instability in poverty reduction.

The strategy of poverty reduction in Pakistan on the one hand has focused on sustained high economic growth and on the other hand it gives equal importance to income transfers as well as investment in human capital by improving health and education indicators. In health sector initiatives[3] the LHW programme is unique in terms of its objectives, coverage and provision of services to women and children. The core objective of the programme is reduction in poverty by providing essential primary health care services to mothers, new-borns and also to improve child health, provision of family planning services, and integration of other vertical health promotion programmes. It began with the strength of a little over 30,000 LHWs in the mid-1990s and over the years it has expanded to a strength of over 100,000 LHWs currently deployed in all districts of the country. The selection criteria for a LHW include: female should preferably be married; be permanent resident of the area for which she is recruited; has minimum 8 years of schooling preferably matriculate; should be between 20 to 50 years; preference will be given to women with past experience in community development and willingness to carry out the services from home. Rural areas and the communities living in urban slums across the entire country are the targeted areas/communities of the LHW programme. The coverage of LHW programme is reported as 83 percent in 2008-09, according to the 2013-14 Pakistan Economic Survey. Although a large number of LHWs are stationed in each district of the country, the programme, however, does not exist in hard to reach areas of some districts. The main constraints for non-coverage are non-functional health facilities and unavailability of women meeting the selection criteria set for recruitment as LHWs [Pakistan (2011)].

The LHWs provide services to communities at their doorstep. They also act as a liaison between a community and the formal health system and ensure support from NGOs and other departments. The LHWs coordinate with other maternal and health care providers (i.e. midwives, traditional birth attendants and local health facility) in the community for appropriate antenatal and postnatal services. The LHWs are also responsible for making nutritional interventions such as anaemia control, growth monitoring, accessing common risk factors causing malnutrition and nutritional counselling. LHWs also provide treatment for common diseases, for which they are provided with inexpensive drug kits.

3. DATA AND METHODOLOGY

This study adopts a mixed approach by combining qualitative and quantitative methods to accomplish its objectives. The main reason for combining these approaches is

[3]The health programme includes Expanded Programme on Immunisation, AIDS Control Programme, Malaria Control Programme, National T.B. Control Programme, National Programme for Family Planning and Primary Health Care, National Programme for Prevention and Control of Blindness, National Maternal Newborn and Child Health Programme, Cancer Treatment Program, Drug Abuse, Dengue Epidemic and Control Program and Food and Nutrition Programmes [Pakistan (2012)].

that the latter is best suited to measure levels and changes brought by an intervention and for drawing inferences from observed statistical relations between those changes and other covariates. The quantitative analysis is, however, less effective in understanding processes—that is, the mechanisms by which a particular intervention triggers a series of events that ultimately result in the observed impact.[4] For the quantitative part the study uses a multipurpose panel dataset generated by the Pakistan Institute of Development Economics (PIDE) in August-December, 2010, named as the Pakistan Panel Household Survey (PPHS) covering both rural and urban areas in 16 districts of the country. The districts are: Attock, Hafizabad, Faisalabad, Vehari, Bahawalpur and Muzaffargarh in Punjab; Badin, Mirpur Khas, Nawabshah and Larkana in Sindh; Dir, Mardan and Lakki Marwat in Khyber Pakhtunkhwa (KP); and Loralai, Khuzdar and Gwadar in Balochistan. The 2010 PPHS is the third round of the panel survey. The first and seconds rounds, named as the Pakistan Rural Household Survey (PRHS), were carried out in 2001 and 2004 respectively only in rural areas [for more details see Nayab and Arif (2014)]. A health module was included in 2001 and 2010 rounds of the panel survey. This study has used these two datasets; but for the impact analysis, it has relied primarily on the 2010 PPHS.[5]

The units of analysis are the ever married women in the reproductive ages (15-49 years) and children under-five in the survey sample as they mainly comprise the target population of the LHW programme. In the 2010 PPHS as well as in the 2001 round, women in the sampled households were asked whether their household was visited by an LHW in three months preceding the survey and if yes what was the frequency of her visit. Based on LHW visits, two methods have been adopted to divide the sampled women and children into two broad categories: the beneficiaries, and the non-beneficiaries. The first method uses the household level data where the beneficiaries are those households that were visited by the LHWs during the reference period; and the non-beneficiaries include those households that were not visited by the LHWs. The second method relates to the village level LHW visits where the beneficiaries are those villages where LHWs on average have visited 20 percent or more of the households during the reference period; and the non-beneficiaries are those villages where on average less than 20 percent of the households were visited by the LHWs. The PPHS 2010 survey did not have the relevant community level information and since LHWs are deployed at the village level the second method was devised to overcome this shortcoming.

Using the household and village level visits of LHWs, the quantitative analysis is carried out in three steps. First, it examines whether the LHWs serve the poor more than the rich. For this purpose a simple analysis of calculating the proportions of beneficiaries (women) by income quintile and the level of their educational attainment is carried out. A multivariate analysis is also carried out with a binary dependent variable—the beneficiaries (or visited by LHWs=1) and non-beneficiaries (not visited=0):

$$P(X_i) = \text{Prob}\,(D_i = 1 | X_i) = E(D | X_i) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

[4]Vijayendren Rao and Michael Woolcock; Integrating Qualitative and Quantitative Approaches in Programme Evaluation.

[5]For the sample size, see Appendix Table 1.

Where

$P(X_i) = F(h(X_i))$
$F(h(X_i))$ can be the normal or the logistic cumulative distribution
$D_i = 1$ if beneficiary and 0 otherwise (non-beneficiary)
X_i is a vector of pre-treatment characteristics.

The second step relates to the investigation of the health seeking behaviour of the beneficiary and non-beneficiary women, focusing on the use of contraceptives, antenatal care, place of delivery of last birth, and child immunisation. Lastly, in the third step the paper estimates the impact of the LHW programme on maternal and child health related indicators and poverty level by the method of propensity-score matching (PSM) developed by Rosenbaum and Rubin (1983).

However, it is not straightforward to compute the welfare impact of the LHW programme for the non-beneficiary sample. Taking the mean outcome of the non-beneficiary women as an approximation is not advisable as the beneficiaries and non-beneficiaries usually differ in socio-economic characteristics even in the absence of the programme, and such a process could lead to a selection bias [Kopeinig (2008)]. The PSM is one of the possible solutions to solve this selection bias problem with the idea to find a comparison group that looks like the beneficiary group in all aspects except one - the comparison group does not benefit from the programme [Ravallion (2003)].

In the PSM analysis, the beneficiaries of the LHW programme (women as well as children) are the "treated units" while the non-beneficiaries are "non-treated units". Beneficiaries are matched to the non-beneficiaries on the basis of the propensity score by meeting the two conditions. The first condition is the balancing of pre-treatment variables given the propensity score, if $p(X)$ is the propensity score, then;

$$D_i = X_i \mid p(X_i). \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

If the balancing hypothesis is satisfied, the pre-treatment characteristics must be the same for both the beneficiary and non-beneficiary groups. In other words, for a given propensity score, exposure to benefit (or treatment) is a randomised experiment and, therefore, beneficiary and non-beneficiary should be on average observationally identical. The second condition is the un-confoundedness given the propensity score. Suppose that assignment to beneficiaries is un-confounded i.e.

$$\begin{aligned} Y_1, Y_0 &= D_i \mid X_i \\ &= D_i \mid p(X_i). \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3) \end{aligned}$$

When the assignment to beneficiaries is un-confounded conditional on the variables before benefit (or treatment), assignment to beneficiaries is un-confounded given the propensity score.

Using the Equation 1, first the propensity scores are calculated through the logistic regression and then the *Average Treatment on the Treated* (ATT) effects based on the propensity scores (Rosenbaum and Rubin, 1983) are estimated as:

$$\begin{aligned} ATT &= E(Y_{1i} - Y_{0i}) \\ &= E(ATE \mid D_i = 1) \\ &= E[Y_{1i} \mid D_i = 1] - E[Y_{0i} \mid D_i = 1] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4) \end{aligned}$$

Where:

Y_{1i} is the potential outcome if the individual is treated (beneficiary), and
Y_{0i} is the potential outcome if the individual is not treated (non-beneficiary).

In order to make the working sample comparable, it has been restricted to only those units with probabilities that lie within the region known as the common support, that is, the area where there are enough of both, control and treatment observations, to proceed with comparison [Dehejia (2005)]. The PSM method has been applied on the PPHS 2010 micro dataset to analyse the impact of the LHW programme on maternal and child health and poverty. For poverty impact of the LHW programme, the consumption approach has been used by inflating the official poverty line for 2010.[6]

A qualitative analysis was carried out to complement the quantitative analysis of the present study. For this purpose fieldwork was conducted in 10 localities of 8 selected districts of Pakistan covering all the provinces. To cover the regional differences as much as possible districts were selected to include the variations that may exist in the functioning of the LHWs across the country. Only rural areas were selected for the qualitative part of the study on the premise that the LHWs programme is mainly rural based and has a more important role to play in the rural areas than in urban areas. The selected districts were: Attock (North Punjab), Hafizabad (Central Punjab), Rajanpur (South Punjab), Mardan and Swabi (KP), Turbat (Balochistan) and Badin and Mirpur Khas (Sindh). The qualitative analysis is focused on four main areas of investigation regarding the LHWs programme including coverage; delivery; advocacy; and hindrances/ suggestions for improvement.

Two villages from each of the above mentioned districts were selected, one having an LHW programme and the other being without it. The latter was selected for the sake of comparison and to see how the absence of the programme affected the community. The qualitative information used in each of the selected villages is as follows:

(1) Villages with LHW Programme
(2) Focus group of women (beneficiary/non-beneficiary)
(3) Interview with LHWs
(4) Villages without LHW *Programme*

(1) **Focus Group of Women**

Interviewers from the local areas, knowing local languages, were hired to conduct both the FDGs and aforementioned interviews. Their minimum qualification was masters and preference was given to those who had previous field experience, especially to those who had the knowledge of the LHW programme. Two one-day workshops were conducted in Islamabad and Karachi to train the interviewers for the fieldwork. Interviewers from Punjab and KP were given training in Islamabad while those working in Sindh and Balochistan were trained in Karachi. The main purpose of the qualitative fieldwork and its questions was explained to the interviewers during the training. They were also made to understand the functioning of the programme and the interview

[6]The 2010 PPHS has a comprehensive consumption expenditure module. For more detail, see Arif and Farooq (2012).

techniques used in the field. The field notes were analysed for this study by the authors themselves (see guides used in the field in Annex 2).

4. HAS THE LHW PROGRAMME SERVED THE POOR DISPROPORTIONATELY?

Table 2 sets out the data on the proportion of women visited by the LHWs by quintile. It shows that the LHWs are certainly not covering only the poor. As can be seen from Table 2, 50 percent of the poorest women (quintile1) reported visit by an LHW as compared to 54 percent of the 5th (richest) quintile. From these figures it might be inferred that the LHWs do not select their clients on the basis of their wealth or economic status. This notion, however, is negated when we look at the figures broken down by urban-rural residence. While the LHWs reach out more to the poor (59 percent) than to the rich (44 percent) households in the urban areas, the trend is reversed for the rural areas (see Table 2). Regarding the level of educational attainment, Table 2 shows that in rural areas, LHWs visit slightly more the literate and educated women, but, in urban areas more illiterate women are visited by the LHWs than the literate/educated women, though the difference is small.

Table 2

Proportion of Beneficiary Women in 2001 and 2010 (%)

	PPHS 2010			PRHS 2001
Quintile	Total	Urban	Rural	Rural Only
Q1	50.2	59.3	47.0	13.2
Q2	53.3	41.2	58.7	15.1
Q3	55.7	54.6	56.2	14.9
Q4	53.9	54.5	53.6	21.8
Q5	54.0	44.1	57.0	21.4
Level of Educational Attainment				
No education	52.2	53.0	51.9	16.1
Primary	60.8	48.5	67.8	25.7
Middle	58.3	50.0	65.4	27.7
Secondary	57.1	49.2	64.8	27.1
Higher	55.1	51.6	59.2	28.6
All	53.7	51.8	54.4	17.5

Source: Authors' computation from the micro datasets of 2001 (PRHS) and 2010 PPHS.

The socio-demographic and economic characteristics at village level are given in the appendix, as Annex 3, in which the villages have been divided into four categories according to the percentage of households visited by LHWs. The four categories are based on the proportion of households visited by LHWs in a village. The categories are: not visited by LHW; below 20 percent of the households visited; below 50 percent of the households visited; and 50 percent and above households visited. Except for the number of children in the household there is no consistent pattern of LHWs' allocation at the village level at the various cut-off points, as can be seen by the trend shown by average literacy, household size, poverty, landless and livestock less households in a village (Annex 3).

The results of the multivariate analysis (logistic regression) using the equation 1, where the dependent variable is 1 for the beneficiaries and 0 for the non-beneficiaries, are presented in Table 3. In model 1, the beneficiaries' status is defined at individual level where the dependent variable is 1 if ever married women in the reproductive ages (15-49 years) are visited by the LHWs in three months preceding the survey and 0 otherwise. In model 2, the beneficiaries' status is defined at village level where the dependent variable is 1 if 20 percent or above of the households in a village are visited by the LHWs and 0 otherwise. Model 1 shows that the LHWs are more likely to visit women aged 26-35 years and less likely to visit those who have passed their prime reproductive ages (i.e. 36-49 years) compared to women in the reference category of 15-25 years. This variable is not significant in model 2. The literacy level of the women and that of the head of the household are not statistically significant regarding visits by the LHWs in model 1, but model 2 shows that literate women are significantly less likely to be visited by LHWs (Table 3). On the contrary, the household size has a significant positive impact on the LHWs' visits as an increase of one member in the household raises the probability of an LHW visit by 1.05 times in both the models. In model 1, the presence of a child has a positive and statistically significant impact on the LHW's visit- an important finding with reference to the influence of the LHW programme on women and child health (Table 3).

Table 3

Determinants of Lady Health Workers' Visits—Odd Ratio

	Model 1		Model 2	
Correlates	Odd Ratio	Std. Error	Odd Ratio	Std. Error
Age of Woman (15-25 as reference)				
26-35	1.154**	0.098	1.041	0.158
36-49	0.781*	0.070	1.039	0.165
Literacy of woman (yes=1)	0.955	0.080	0.759**	0.110
Literacy of household head (literate=1)	0.957	0.067	0.979	0.129
Household size	1.047*	0.009	1.046*	0.016
Presence of a child (yes=1)	1.301*	0.160	1.403	0.338
Sex of household head (male=1)	1.361**	0.248	1.212	0.386
Land owned (acres)	0.997	0.003	0.986*	0.005
Large animals owned (numbers)	1.065*	0.014	1.150*	0.039
Small animals owned (numbers)	0.993	0.009	0.945*	0.013
Structure of House (Katcha as reference)				
Pacca	1.064	0.097	0.551*	0.095
Mix	1.212*	0.114	1.628*	0.307
Region (urban=1)	1.178**	0.100	0.488*	0.070
Province (Punjab as reference)				
Sindh (yes=1)	1.985*	0.165	8.372*	2.046
KP ((yes=1)	1.771*	0.184	2.229*	0.496
Balochistan (yes=1)	0.089*	0.015	0.014*	0.003
LR chi2 (12)	816.44		1949.5 (16)	
Log likelihood	–2683.85		–1021.6017	
Pseudo R^2	0.13		0.4883	
N	4,515		4,517	

Source: Authors' computation from the micro datasets of 2010 PPHS.

* significant at 5 percent, ** significant at 10 percent.

The effect of land ownership (in acres) and livestock (in numbers) on an LHW visit is mixed in both the models as the impact of only large animal is significant in model 1 but both the land and livestock are statistically significant in model 2. Cemented structure (*pacca*) of houses show a significant negative association with the visit of an LHW only in model 1 whereas houses with mixed structure have a positive relationship with the LHW visits in both the models, as can be seen in Table 3. The significant coefficient of urban or rural residence shows that women in urban areas are more likely to be visited by LHWs compared to the rural women in both models. Relative to the reference category (the non-beneficiary women in Punjab), the women of two provinces, Sindh and KP, are more likely to be visited by LHWs while the women in Balochistan are less likely to be visited (see Table 3). Based on this multivariate analysis, it can be safely concluded that women are not generally selected by LHWs on the basis of their economic status as they tend to serve all women and children, and there are no major differences in the results of two models.

The findings conform to the qualitative research carried out to complement the quantitative data. In-depth and focus group interviews (FGD) done in all three districts of Punjab, namely Attock, Hafizabad and Rajanpur, show that the LHW programme is serving people of all segments of the population whether they are poor or non-poor. However, most of the people who approach the LHWs themselves for consultancy or medicine are poor as the affordability factor is a major issue for them while seeking medical assistance. In Sindh and KP a similar trend was found among the beneficiaries of the LHWs visits—LHWs in these provinces provided services irrespective of beneficiaries' economic standing. Beneficiaries in both districts of Sindh (Badin and Mirpur Khas) and KP (Mardan and Swabi) mentioned that the LHWs of their areas give equal importance to all the people. From the standpoint of both beneficiaries and LHWs, in the district Turbat of Balochistan, the programme is mainly targeting poor people. The unanimous view of the interviewed LHWs was that for them everyone was equal and they are there to serve everyone, whether they are poor or rich.

4. HEALTH SEEKING BEHAVIOUR OF BENEFICIARIES AND NON-BENEFICIARIES

Has the LHW programme influenced the health seeking behaviour of women? The two rounds of the panel data, carried out in 2001 and 2010, include a comprehensive health module, which includes the use of contraception by married women, antenatal care during the last pregnancy, and the use of ORS for diarrhoea among children. The use of contraceptives among the beneficiary and non-beneficiary women is reported in Table 4, which also shows information on the proportion of women using modern methods of contraception. Overall, 35 percent of the sampled women reported using 'any method' for contraception. There is a difference between rural and urban areas. More urban women use contraceptives than their rural counterparts. Difference can also be seen in the contraceptive behaviour of the beneficiary and non-beneficiary women. The beneficiary women have a CPR of 39 percent while non-beneficiary women have CPR of 32 percent. This difference, however, according to data presented in Table 3, is mainly in rural areas where the contraceptive prevalence rate is 37 percent among the beneficiary women as compared to 27 percent among the non-beneficiary women. The use of modern methods

is also higher among the beneficiary women than among the non- beneficiary women, particularly in rural areas. There is a marked improvement in the CPR from 2001 to 2010 period showing a positive contribution of LHWs in the use of family planning practices (Table 4).

Table 4

The Contraceptive Prevalence Rate by Status of LHW Visit and Region (%)

	PPHS 2010		PRHS 2001	
Contraception	Urban	Rural	Total	Rural Only
Beneficiaries (Visited by LHW)				
Using contraceptives	41.6	37.2	38.5	29.3
Using modern method	26.8	23.8	24.6	14.3
Non-beneficiaries (No one Visited)				
Using contraceptives	40.8	26.9	31.5	17.7
Using modern method	28.9	16.0	19.8	10.4

Source: Authors' computation from the micro datasets of 2001 PRHS and 2010 PPHS.

The data on antenatal care are presented in Table 5 for two periods, 2001 and 2010. As compared to three-quarters of the beneficiary women in 2010, two-thirds of the non-beneficiary women received antenatal care during the last birth, indicating positive impact of LHW programme on women's health. The impact, however, is evident only in rural areas. Irrespective of the LHW visit, approximately 80 percent of urban women received antenatal care during the last birth. There is an improvement among the beneficiary women between 2001 and 2010 in rural areas in receiving antenatal care and a decline in giving birth at home while there is no corresponding increase among the non-beneficiaries women. There is a modest increase between 2001 and 2010 in the proportion of beneficiary women who received tetanus injection during the last pregnancy whereas a considerable decline has been witnessed among the non-beneficiary women.

Table 5

Women Receiving Antenatal Care during the Last Pregnancy by Status of LHW Visit and Region (%)

	2010		2001	
Antenatal Care	Urban	Rural	Total	Rural Only
Beneficiaries (Visited by LHW)				
Received antenatal care	78.9	73.9	75.2	61.7
Received TT injections	83.9	83.4	83.5	80.6
Delivered at home	32.3	49.9	45.0	65.0
(Non-beneficiary) Not Visited				
Received antenatal care	81.3	61.3	66.7	50.8
Received TT injections	69.0	46.8	54.1	66.1
Delivered at home	48.4	66.1	60.2	69.6

Source: Authors' computation from the micro datasets of 2001 PRHS and 2010 PPHS.

No major difference is found in the incidence of illness and diarrhoea between children belonging to beneficiary and non-beneficiary women (Table 6). However, in case of diarrhoea the use of ORS was higher among the former than the latter. The use of traditional medicines during diarrhoea illness was higher among children living in non-beneficiary households. Child immunisation is universal but it is slightly higher among the children of the beneficiary women than among the children of the non-beneficiary women (Figure 1). In the 2010 PPHS, while examining the health seeking behaviour during the illness of children, the respondents were also asked about the first health service provider consulted for treatment. The role of LHWs was negligible in such consultation because LHWs may not be authorised to prescribe medicine but may advise for the treatment of some diseases like diarrhoea.

Table 6

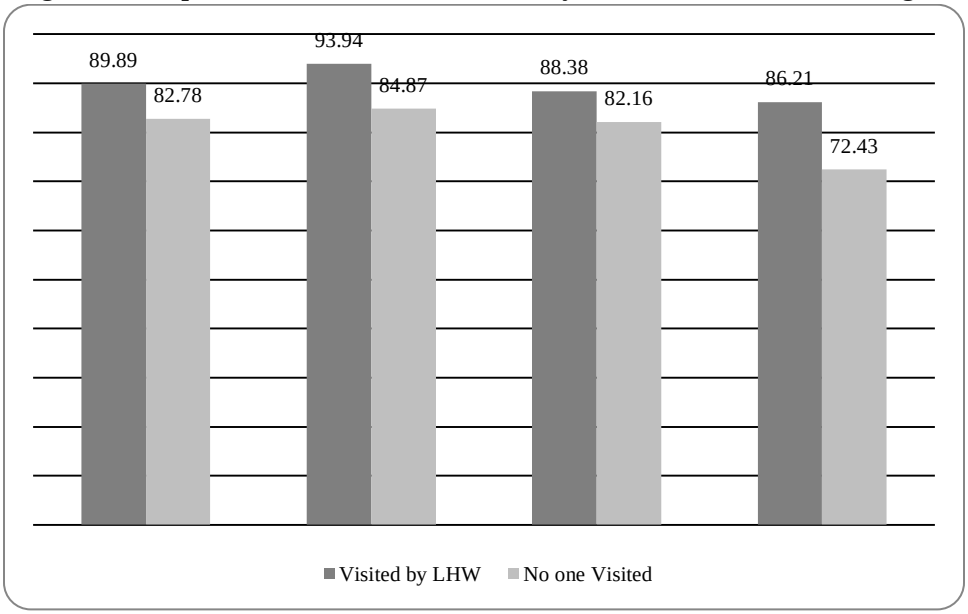
Use of ORS for Diarrhoea by Status of LHW Visit and Region

	2010		2001	
ORS	Total	Urban	Rural	Rural Only
Beneficiary (Visited by LHW)				
ORS	51.08	61.22	48.35	51.32
Home-made fluids	9.09	4.08	10.44	3.95
Medicines	29	18.37	31.87	30.26
Traditional Medicine	5.63	8.16	4.95	5.26
None of the above	5.19	8.16	4.4	9.21
Total	100	100	100	100
Non-beneficiary (No one Visited)				
ORS	42.74	53.85	41.35	44.71
Home-made fluids	6.84	7.69	6.73	6.83
Medicines	29.91	1	29.81	37.54
Traditional Medicine	11.97	7.69	12.5	7.85
None of the above	8.55	0	9.62	3.07
Total	100	100	100	100

Source: Authors' computation from the micro datasets of 2001 PRHS and 2010 PPHS.

The qualitative part of the study supports the findings of the household survey data and gives more information about variations across the provinces. When the LHWs were interviewed regarding the kind of services they offer, they said that they were performing all the services that were part of their duties and responsibilities including family planning services, child vaccination, advice on ORS making, antenatal care, and basic information about hygiene. Some of the LHWs in Hafizabad and Attock districts said that they give a practical demonstration if the community does not understand their verbal explanation, particularly in the case of ORS making.

Figure. 1. Proportion of Children Immunized by Status of LHW Visit and Region



In general women were satisfied with these services. This satisfaction, however, was not universal as some women also showed dissatisfaction for the services of the LHWs in their areas, as one woman complained:

> *"Whenever she visits us she asks about family planning services, or that if any woman is pregnant here? She does not tell us anything else".*
>
> (A women in FGD held in Attock district).

The FGDs held in areas with no LHW programme came up with interesting results. There was almost a consensus that women want the LHW programme in their villages. The non-beneficiaries mentioned that they have to go to private clinics for check-ups, but that is not feasible for them as private facilities are expensive. They reported that their children also do not get proper vaccination, as the polio vaccination teams do not visit their village frequently. Women in such areas had to opt for traditional birth attendants (dais) for deliveries, and also seek family planning services from them which are not always safe.

In Sindh, the LHWs reported a gradual change in the behaviour of the local residents regarding maternal and child care, including vaccination. The interviewed LHWs in Badin and Mirpur Khas districts reported to be carrying out vaccination programme for children along with telling the community about hygiene, family planning and maternal health. They were satisfied with the changing attitude of the people, like one of the LHW in Mirpur Khas said,

> *"They used to resist getting vaccinated but the community agrees to get their children immunised now. Pregnant women are also now ready to get vaccinated. It is our success and it is because of us that this change is coming."*
>
> (An LHW in district Badin, Sindh)

Mixed results were found for the two districts of KP included in the qualitative part of this study regarding the functioning of the LHW programme. In district Swabi, the community shows a positive response with the majority of the women satisfied with its functioning. Among the most reported services delivered by the LHWs are registration of pregnant women and new-born babies; frequent visits to expectant women; and EPI vaccination. Since the LHWs reside in the villages, people have access to them in time of need at their homes. In district Mardan, however, the response in the FGD show that the community was not very satisfied with the way the LHW programme was functioning. According to the participants of the FGD, the LHWs of the area were not regular in their visits. One respondent told that, "*She is not performing her duty well, the last time she visited us is one year ago"*. The LHWs of the two districts of KP were also interviewed to know about the services they were providing, and were found to narrate almost all the duties assigned to them on paper. Regarding their irregular visits to some of the areas they blamed the social milieu of the villages for it. They said that female mobility is not easy in KP and in some areas it is tougher than others.

> *"There are lots of problems in this area as people of this area are not very cooperative. My in-laws do not allow me to visit community on regular basis to deliver all the services I am supposed to offer to the households. Women can, however, visit me in my home if they are in need. They do come often for family planning methods and medicines".*
>
> (An LHW in district Mardan, Khyber Pakhtunkhwa)

In Balochistan, the vaccination of children against polio is one of the major services delivered by LHWs. They perform their duties efficiently and regularly and people report no complaints regarding this task. Women in the district of Turbat complain that the LHW does not provide them with any medicine. LHWs, on the other hand, reported that they are not getting medicine supplies and people blame them for that. Moreover they perceive that the LHWs are giving these medicines to their relatives and friends only. One woman in the FGD said:

> *"She does not provide us with medicines. Whenever we go to her she only has family planning pills and iron tablets and nothing else".*
>
> (A woman in the FGD in district Turbat, Balochistan)

When women were asked about their accessibility to the LHWs, they said that LHWs were accessible in their homes as well, even if they did not visit, but they prefer going to the Rural Health Centre in that case as the LHWs do not have medicine supplies at homes. The women argued that if they have to go far to get medicines they can see a doctor there as well.

Based on the above discussion one can conclude that the coverage of the LHW programme is satisfactory and its scope is wide in terms of advice for the health improvement of women and children. Regional differences are, however, evident as the performance of the Programme in Punjab and Sindh was reported to be better than in KP and Balochistan. Security is one of the reasons for relatively poor performance in these two provinces, along with the erratic supply of medicines hindering the success of the programme. The qualitative study of the areas without an LHW shows the need for enhancing the coverage of the programme to all rural areas.

5. IMPACT ANALYSIS OF THE LHW PROGRAMME

For the impact analysis of the LHW programme, three sets of variables related to the reproductive health of women, child health and poverty status have been selected. The use of contraceptives, antenatal care, vaccination (TT injection) and place of delivery represents women's health outcomes while child immunization, illness, and infant and child mortality are used for child health. The official poverty line is used to see the welfare impact of the LHW programme.

Following the methodology given in Section 3, the propensity scores and ATT effect are estimated by both the methods, which are beneficiaries' status at the individual level and beneficiaries' status at the village level. The results of equation 1 have been discussed in the previous section, showing that women are not selected by the LHWs on the basis of their economic status, rather the coverage seems to be universal within the target areas.

The results of Equation 4 are presented in Tables 7-9 with ATT parameters under three measures, namely Nearest Neighbour (NN) Matching, Kernel Matching, and Stratification Matching. The NN method matches each treated unit (beneficiaries) with the controlled unit (non-beneficiaries) that has the closest propensity score. The method is usually applied with replacement in the control units. In the second step, the difference of each pair of matched units is computed and finally the ATT is obtained as the average of all these differences.[7] In the Kernel and Local Linear methods, all the treated units (beneficiaries) are matched with a weighted average of all non-treated units (non-beneficiaries) using the weights which are inversely proportional to the distance between the propensity scores of treated (beneficiaries) and non-treated (non-beneficiaries). The stratification matching method consists of dividing the range of variation of the propensity score in a set of intervals (strata) such that within each interval the treated (beneficiaries) and non-treated (non-beneficiaries) units have the same propensity score on average [(Rosenbaum and Rubin, (1983)]. Both types of standard errors, analytical and bootstrapped have been reported in Tables 7-9, however, the Kernel matching method does not estimate the standard error by default.

5.1. Impact of LHWs Programme on Women's Health

Table 7 presents the impact of the LHW programme on women's health outcomes. The welfare impact has been calculated at the individual and village levels. Table 7 shows that the ATT impact on the use of contraceptives is only statistically significant at the individual level by Kernel method with a welfare gain of 2.5 percent. This positive effect reflects the contribution of the LHW programme in enhancing the use of contraceptives by married women. As discussed earlier, this is one of the focus areas for the LHWs, and even in the FGDs some of the participant women complained about over emphasis of the LHWs on contraceptive use.

[7] The NN method may face the risk of bad matches if the closest neighbour is far away. Such risk can be avoided by imposing a tolerance level on the maximum propensity score distance (caliper). Hence, caliper matching is one form of imposing a common support condition where bad matches can be avoided and the matching quality rises. However, if fewer matches can be performed, the variance of the estimates increases [Caliendo and Kopeining (2008); Smith and Todd (2005)].

Table 7 also shows a positive and significant ATT impact of the LHW programme on the antenatal care under all the three measures in method 1 and two measures in method 2. Compared to the non-treated units (non-beneficiary women) the treated units (beneficiary women) enjoy a positive impact of 17.7 to 21.9 percentage points in method 1 and 8.3 to 12 percentage points in method 2. Both bivariate analysis and the FGDs show positive contribution of the LHWs in antenatal care, particularly in rural areas. The third column in Table 7 shows the results about vaccination during the last pregnancy. The significant impact of the LHW programme on this variable shows a positive gain through both the methods and welfare measures, ranging from 10.6 percent to 22.9 percent.

Table 7

Average Treatment Effects of the LHW Programme on the Reproductive Health of Women Aged 15–49 Years

Method	Contraceptive Use (Yes=1)	Antenatal Care (Yes=1)	TT Injections (Yes=1)	Place of Delivery (Hospital=1)
Method 1 (at individual level)				
Nearest Neighbour				
ATT	0.027	**0.219**	**0.135**	0.070
N. Treated	2548	2548	2548	2548
N. Control	1037	503	309	308
Standard Error	0.018	0.030	0.035	0.037
t-stat	1.474	7.246	3.883	1.895
St. Error Bootstrap	0.022	0.035	0.040	0.044
t-stat	1.223	6.276	3.347	1.608
Kernel				
ATT	**0.025**	**0.177**	**0.126**	0.030
N. Treated	2548	2548	2548	2548
N. Control	1945	1945	1945	1945
St. Error Bootstrap	0.014	0.026	0.031	0.032
t-stat	1.711	6.710	4.037	0.326
Stratification				
ATT	0.020	**0.187**	**0.131**	0.004
N. Treated	2548	2548	2548	2548
N. Control	1947	1947	1947	1947
Standard Error	0.014	0.017	0.016	0.018
t-stat	1.432	10.994	8.332	0.238
St. Error Bootstrap	0.014	0.022	0.026	0.038
t-stat	1.381	8.428	5.064	0.111
Method 2 (at village level)				
Nearest Neighbour				
ATT	0.058	0.077	**0.229**	-0.005
N. Treated	3788	3788	3788	3788
N. Control	285	145	118	118
St. Error Bootstrap	0.064	0.122	0.107	0.110
t-stat	0.904	0.633	2.137	-0.046
Kernel				
ATT	0.025	**0.083**	**0.117**	0.090
N. Treated	3788	3788	3788	3788
N. Control	724	724	724	724
St. Error Bootstrap	0.036	0.046	0.063	0.088
t-stat	0.687	1.80	1.851	1.028
Stratification				
ATT	0.006	**0.120**	**0.106**	0.048
N. Treated	3788	3788	3788	3788
N. Control	724	724	724	724
St. Error Bootstrap	0.046	0.068	0.061	0.133
t-stat	0.132	1.756	1.736	0.360

Source: Authors' computation from the micro datasets of 2010 PPHS.

However, the impact of the LHW programme on delivery in a hospital is not statistically significant under all the three measures of ATT. This probably reflects that the financial inability of the sampled women to deliver in a hospital or impracticability of the distance involved to travel to a hospital could be an obstacle. Preference of the women themselves to deliver at home instead of at a health facility can not be ruled out. These findings of the PSM analysis as well as the qualitative analysis suggest that the LHWs have created goodwill in their target areas and women do trust them for seeking advice regarding different health issues.

5.2. Impact of LHW Programme on Child Health

The ATT effect of the LHW programme on the child health indicators is computed on the basis of estimated propensity scores using the logit regression (giving code 1 to children belonging to households and villages visited by LHWs and 0 otherwise in model 3 and model 4, respectively). The regression results presented in Table 8 do not show any systematic preference for the LHWs, and the region and province dummies seem to be the major differentiating factors. Children in Sindh and KP provinces are more likely to be visited by LHWs than children in Punjab while the likelihood of LHW visits reduces for the province of Balochistan.

Table 8

Determinants of Lady Health Worker Visits—Odd Ratio

	Model 3		Model 4	
Correlates	Odd Ratio	Std. Error	Odd Ratio	Std. Error
Sex of child (male=1)	1.049	0.085	0.973	0.120
Number of children at home	0.921*	0.037	0.993	0.061
Sex of household head (male=1)	1.316	0.312	0.189*	0.138
Education of household head (in years)	1.010	0.009	1.018	0.014
Number of married women in the household	0.917	0.066	0.875	0.106
Household size	1.040*	0.016	1.072*	0.024
Land ownership (acres)	0.998	0.004	0.992**	0.004
Large animals owned (numbers)	1.023**	0.013	1.088*	0.023
Small animals owned (numbers)	1.008	0.012	0.964*	0.013
Structure of House (*Katcha* as reference)				
Pacca	1.214**	0.131	0.529*	0.086
Mix	1.381*	0.161	3.115*	0.641
Region (urban=1)	1.521*	0.167	0.716*	0.103
Province (Punjab as reference)				
Sindh (yes=1)	1.971*	0.190	6.088*	1.166
KP (yes=1)	4.523*	0.766	1.000	–
Balochistan (yes=1)	0.019*	0.007	0.010*	0.002
LR chi2	711.1 (15)		1929.68 (14)	
Log likelihood	–1808.1813		–938.60784	
Pseudo R^2	0.164		0.507	
N	3,333		3,893	

Source: Authors' computation from the micro datasets of 2010 PPHS.

* significant at 5 percent, ** significant at 10 percent.

Table 9 presents the ATT effect of LHW programme on the child health indicators by both the methods; at individual level and at village level. The beneficiary children are more likely to be vaccinated than the non-beneficiary children as indicated by all three measures of ATT and by both methods. Child immunization campaigns comprise a major work load for the LHWs nationwide. Because of their local residence and good practices parents of the area seem to be relatively more willing to immunise their children. The presence of LHW has a negative effect on child illness but only under the stratification measure of ATT. Under other two measures—Kernal and NN, the effect is not statistically significant.

Table 9

Average Treatment Effects of Propensity Score Matching on Child Health Indicators

Measures/ATT	Immunization Received (Yes=1)	Child Illness (Yes=1)	Infant Mortality (Yes=1)	Child Mortality (Yes=1)
Method 1 (at Individual Level)				
Nearest Neighbour				
ATT	**0.066**	–0.013	–0.001	–0.001
N. Treated	2157	2157	2157	2157
N. Control	643	642	650	650
Standard Error	0.025	0.031	0.001	0.001
t-stat	2.609	–0.411	–1.424	–1.424
St. Error Bootstrap	0.020	0.036	0.001	0.001
t-stat	3.290	–0.352	–1.288	–1.469
Kernel				
ATT	**0.072**	–0.025	–0.001	–0.001
N. Treated	2157	2157	2157	2157
N. Control	1166	1166	1166	1166
St. Error Bootstrap	0.015	0.021	0.001	0.001
t-stat	4.690	–1.163	–1.230	–1.360
Stratification				
ATT	**0.063**	**–0.042**	–0.001	–0.001
N. Treated	2157	2157	2157	2157
N. Control	2141	2141	2141	2141
Standard Error	0.015	0.021	0.001	0.001
t-stat	4.172	–1.980	–1.396	–1.396
St. Error Bootstrap	0.015	0.019	0.001	0.001
t-stat	4.275	–2.203	–1.263	–1.258
Method 2 (at Village Level)				
Nearest Neighbour				
ATT	**0.121**	– 0.025	–0.001	–0.001
N. Treated	3146	3146	3146	3146
N. Control	244	246	262	262
St. Error Bootstrap	0.053	0.063	0.001	0.001
t-stat	2.283	–0.390	–1.111	–1.290
Kernel				
ATT	**0.103**	0.034	–0.001	–0.001
N. Treated	3146	3146	3146	3146
N. Control	677	677	677	677
St. Error Bootstrap	0.038	0.040	0.001	0.000
t-stat	2.726	0.845	–1.147	–1.315
Stratification				
ATT	**0.135**	0.019	–0.001	–0.001
N. Treated	3138	3138	3138	3138
N. Control	685	685	685	685
St. Error Bootstrap	0.056	0.047	0.000	0.000
t-stat	2.386	0.411	–1.169	–1.194

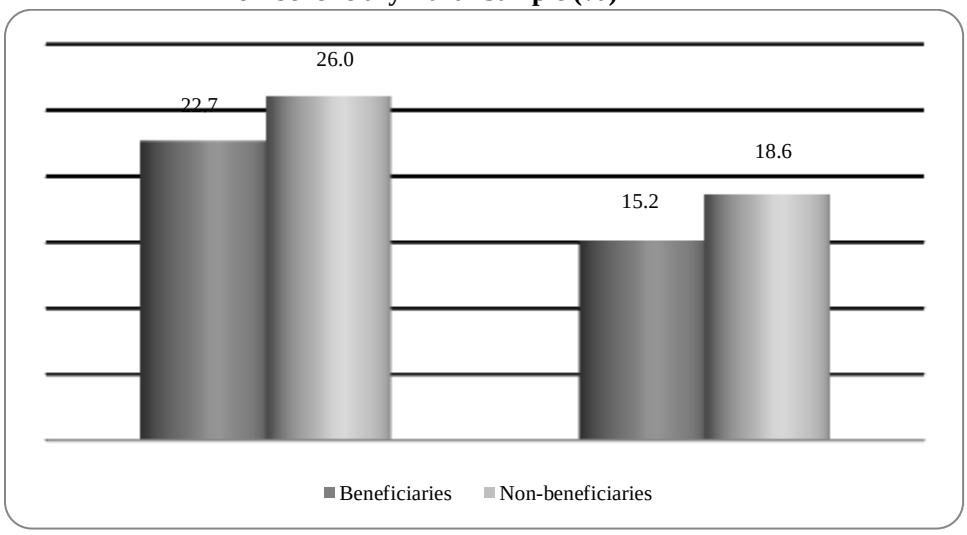
Source: Authors' computation from the micro datasets of 2001 PRHS and 2010 PPHS.

The impact of the LHW programme on infant and child mortality is not statistically significant. The incidence of diarrhoea and respiratory infection are the major causes of infant and child mortality in Pakistan. The preventive role of LHWs has surely contributed in reducing these causes of infant and mortality rate but their role has not been great enough to reduce infant and child mortality in Pakistan.

5.3. Welfare Impact of the LHW Programme

Before presenting the findings of the PSM analysis regarding the welfare impact of the LHW programme it is appropriate to discuss briefly the changes in the poverty status of the households based on the panel datasets. Figure 2 shows poverty statistics for rural and urban areas for the year 2010 and 2001 when two rounds of the panel survey were carried out. As noted earlier, this study uses the official poverty line, inflating it in the year 2010.[8] Two points are noteworthy from this figure. First, there is no major difference between the beneficiary and non-beneficiary samples in terms of their poverty status either in 2010 or in 2001 although rural poverty among the former is slightly higher. Second, rural poverty between 2001 and 2010 period declined sharply and it happened for both the beneficiary and non-beneficiary samples. Since these simple poverty statistics are not sufficient to gauge the welfare impact of the LHW programme we adopt the PSM methodology that is well suited for the purpose.

Fig. 2. The Incidence of Poverty Among the Beneficiary and Non-beneficiary Rural Sample (%)



Source: Authors' computation from the micro-data of 2001 PRHS and 2010 PPHS.

Table 10 shows the estimated ATT on poverty status under the three measures, namely NN, Kernal and stratification. The welfare impact of the LHW programme is statistically significant under all these measures. However, the impact varies across the three measures. At individual level, it ranges from 4.1 to 5.3 percentage points with the

[8]For more detail on poverty line, see Arif and Farooq (2012).

lowest under Kernel method and highest under the NN method while at village level, the welfare impact ranges from 6.3 to 23.2 percentage points. The impact is positive; the negative signs of the three measures show that the LHW programme reduces the probability of being poor. Thus, the LHW beneficiary women (and their households as well) are less likely to be poor as compared to the non-beneficiary women who have similar characteristics.

Table 10

Average Treatment Effects Under various Measures of Propensity Score Matching on Poverty, PPHS 2010

	Method		
ATT	Nearest Neighbour	Kernel	Stratification
Method 1 (at Individual Level)			
ATT	**–0.053**	**–0.041**	**–0.048**
N. Treated (number of observation)	2548	2548	2548
N. Control (number of observation)	1153	1945	1947
St. Error Bootstrap	0.022	0.011	0.017
t-statistics	–2.401	–3.630	–2.835
Method 2 (at Village Level)			
ATT	**–0.232**	**–0.063**	**–0.114**
N. Treated (number of observation)	3788	3788	3788
N. Control (number of observation)	313	724	724
St. Error Bootstrap	0.056	0.037	0.052
t-statistics	–4.110	–1.690	–2.198

Source: Authors' computation from the micro datasets of the 2010 PPHS.

One logical question which is not under the scope of this study is how the LHW programme has contributed to poverty reduction? Since the poverty measure used in the PSM analysis is based on the consumption approach the impact of the LHW programme would have been through an increase in income and consumption of the beneficiary households. The literature on health interventions and poverty suggests that an improvement in women's health can lead to their higher participation in the labour market which may in turn enhance their well-being level. Has the LHW programme contributed in enhancing female participation in the labour market? It depends on employment opportunities for women and it requires an in-depth analysis. However, the Labour Force Survey data do show an increase in female participation in the labour market from 17 percent in 2001-02 to 27 percent in 2010-11 (LFS 2012). The LHW programme could be a contributory factor through improving women health. Rural women, however, are working primarily as unpaid family helpers (LFS 2012) and may not have control over the resources earned through their engagement. Despite this, it would not be wrong to presume that women participation as family helpers may be viewed positively as it contributes to the household's strategy to ensure food security and improve household well-being.

6. CONCLUSIONS

The government of Pakistan has taken several initiatives to improve the poor health indicators in the country and the LHW programme is one of such initiatives. With an aim to reduce poverty through an improvement in the health status of population, particularly women and children, the LHWs work at the grass root level. The LHWs are recruited from the local communities to provide preventive health care services at their door step. At present they are deployed in all districts of the country and their services are available to more than half of the target population.

In order to gauge the welfare impact of the LHW initiative, the present study combines the quantitative and qualitative approaches. In the quantitative analysis the multipurpose panel datasets, PRHS-2001 and PPHS-2010, conducted by PIDE, are used. These datasets suit the quantitative analysis because they have comprehensive modules on child and maternal health and household consumption necessary for poverty estimation. They also have a comprehensive module on the performance of the LHWs. For the qualitative analysis, field work was conducted in ten rural localities of the eight selected districts of Pakistan covering all the four provinces.

The quantitative analysis of the panel datasets shows that slightly more than half of the sampled women were visited by the LHWs during three months preceding the survey. The analysis shows that the LHWs have provided their services to all segments of society irrespective of their income status. An improvement has been found in the health seeking behaviour of the beneficiary women. The qualitative analysis supported these findings.

The PSM methodology, that generates comparable samples of beneficiaries and non-beneficiaries of the LHW programme, shows that the LHW programme has a significant and positive impact on contraceptive use, antenatal care and vaccination (TT) during pregnancy. The impact of the LHW programme on child health has been evaluated by selecting four indicators, which are child immunisation, child illness, and infant and child mortality. A significant gain is observed in child vaccination and child illness. However, the LHW programme does not show a significant impact on infant and child mortality. The welfare impact of the LHW programme in terms of reduction in poverty is found to be statistically significant.

It appears from the findings of this study that the LHW programme is a pro-poor initiative. Two factors probably have played key role in its success, which are: recruitment of the LHWs from the communities where they are assigned to work, and universalization of the programme within the target areas—providing services to all women and children of the covered areas.

Considering the positive impact the LHW programme has had on its beneficiaries it is recommended that the programme may be extended to all uncovered areas as well. This was also demanded by the non-beneficiary women during the focus group discussions. Another factor that can improve the effectiveness of the programme is enhanced training of the LHWs and provision of medicines to them, especially in the provinces of KP and Balochistan. Services provided by the LHWs include family planning and antenatal and postnatal check-ups. Unfortunately, irregular and delayed supply of medicines adversely affects their functioning and creates mistrust among the LHWs and the women to whom they provide the services.

In view the complaints of women at some of the study sites about irregularity in the LHWs' visits, an effective supervision mechanism is critical. Such a mechanism can help improve the service delivery at the grass root level, further enhancing the positive impact the programme has made. In order to sustain gains made by the programme it should be made an integral component of the district health system operating in the framework of Primary Health Care (PHC) and MNCH programme. It will also help in formalising the service structure of the LHWs, which is one of their long standing demands. Likewise, integration with the PHC system will not only strengthen the LHW programme but also help the recipients through a better referral system. As a result everyone will benefit—the LHWs, the people and the health delivery system at large.

APPENDIX

Annex 1

Households Covered in PRHS 2001 and PPHS 2010

Provinces	PRHS 2001 (Rural only)	PPHS 2010		
		Rural	Urban	Total
Pakistan	2721	2800	1342	4142
Punjab	1071	1221	657	1878
Sindh	808	852	359	1211
KP	447	435	166	601
Balochistan	395	292	160	452

Annex 2

Guide for Focus Group Discussion of Beneficiary Women/Non-beneficiary Women in Area Having LHW Programme

- Knowledge about the program and source of knowledge- after an LHW visited or before? If before, from whom/where?
- Frequency of LHW's visit.
- Any factors that hinder their visits…weather/males/elders/any other.
- Coverage of LHWs. Do they visit every household or the ones only having women and children? Do you feel they are more inclined to visit a certain kind of household than others (poor/vulnerable)?
- Kind of messages they give. (infant/child health/immunisation/boiling water/ nutrition/antenatal care/contraception/hand washing/hygiene/diarrhoea).
- Ease in understanding their given advice. Practicality in following their advice and satisfaction level regarding it.
- Impact of their advice—any improvements in family health.
- Access to LHWs—ever approached them in case someone was ill in the household or waited for their visit.
- For those who are not visited- have they ever tried making LHWs visit them and reasons for non-visit in case they did not come to their household.

Interview Guide for the Focus Group not having LHW Programme

- In the absence of LHWs, their source of fulfilling health needs, including antenatal care/delivery/contraception.
- Any trouble accessing the health care service.
- Assess the contraception/immunisation rates, and who/where are deliveries taking place.
- Questions judging their knowledge about hygiene/nutrition/boiling water/ diarrhoea/ immunisation.
- Their knowledge about the LHW and MNCH programmes and desire to have it in their village as well.

Interview Guide for LHWs

- Criteria to select the households they pick to visit.
- Frequency/regularity of the visits.
- Any hindrance in performing their duties.
- Access to the community when not visiting their homes themselves.
- Kind of advice given to the women they visit, and the method of conveying the message—only verbally for do a demonstration as well.
- Availability of equipment/skills needed to perform their job.
- Satisfaction with their working conditions.
- Perception about their performance
- Suggestions for improvement

Annex 3

Average Socio-demographic and Economic Characteristics at Village Level by the Status of LHW Visit

	No visit			<20% visit			<50 % visit			50 and above % visit		
Characteristics	Overall	Rural only	Urban only	Overall	Rural only	Urban only	Overall	Rural only	Urban only	Overall	Rural only	Urban only
Literacy of Head (%)	38.6	16.1	59.9	37.2	18.7	56	41.7	33.6	57.3	45.3	43.1	50.5
Household Size (numbers)	7.4	8.6	6.3	7.1	8	6.3	7	7.3	6.4	7.9	8.1	7.4
Married Female (15–49) in household (%)	16.8	16.4	17.1	17.2	17	17.4	17.4	17.6	17.1	16.5	17.1	15.1
Children (under 5) in household (%)	7.4	7.1	7.7	7.6	7.7	7.4	8.7	9.4	7.5	9.3	9.9	8.1
Poverty (%)	20.7	23.4	17.2	16.7	18.8	13.9	21	24.6	13.2	20.6	21.3	18.8
Landless Households (%)	–	48.2	–	–	52.9	–	–	61.4	–	–	52.1	–
Livestock less Households (%)	–	34.4	–	–	33	–	–	39	–	–	29.3	–
Number of Villages	31	17	14	44	24	20	86	54	32	129	87	42

Source: Authors' computation from the micro datasets of 2010 PPHS.

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Effectiveness of Cash Transfer Programmes for Household Welfare in Pakistan: The Case of the Benazir Income Support Programme

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Cash transfer programmes are widely considered a 'magic bullet' for reducing poverty. Whether they actually have such an incredible impact on poverty reduction is debatable but they surely are gaining credibility as an effective safety net mechanism and consequently an integral part of inclusive growth strategies in many developing countries. As shown by Ali (2007), inclusive growth rests on three basic premises. First, productive employment opportunities should be created to absorb labour force. Second, capability enhancement and skill development should be focused in order to broaden people's access to economic opportunities. And lastly, a basic level of well-being has to be guaranteed by providing social protection. Safety nets are at the core of the last pillar, provided mainly through cash transfers, which can be both conditional and unconditional.

The basic rationale behind the social safety nets is to assist the poor to better manage risk and help them to adopt a strategy that protects their assets. The importance of these safety nets has been recognised not only for their social and economic value but also as a means to improve political stability and control crime and riots. These safety nets help people through short-term stress and insecurities, which if properly managed can lead to long-term poverty alleviation as well. Direct transfers by the government are a common means of providing safety net to the poor. Such transfers include direct provision of food or cash (conditional or unconditional) to the target population. Other means of providing safety nets include: education and health subsidies; energy, water and housing subsidies; and public works programmes. It is worth mentioning here that, although usually used interchangeably, there is a need to differentiate between the term social protection and social safety nets [Bari, *et al.* (2005); Sayeed (2004)]. Conceptually, analytically and by implications, social protection is a right that every citizen must have while safety nets are instruments employed to provide these rights.[1]

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[1]For a detailed discussion on defining social protection in the Pakistani context, and the difference between social protection and social safety nets see Sayeed (2004) and Bari, Hooper, Kardar, Khan, Mohammad and Sayeed (2005).

Pakistan is going through a rather prolonged phase of stagflation making the provision of social safety nets all the more important. Even during the periods of high economic growth the 'trickle-down effect' did not essentially take place, necessitating the need to introduce safety nets in the overall poverty alleviating strategies. A variety of safety net programmes exist in the country but to mitigate the situation resulting from the low economic growth and high inflation, especially food inflation, the government of Pakistan launched the Benazir Income Support Programme (BISP) in 2008. The enrolled households under BISP are paid an amount of rupees one thousand per month, without any conditions attached to them. The findings of this study, as would be seen latter, show that this cash transfer does provide relief to the recipient households but the program does have issues of targeting and exclusion.

The present paper aims to evaluate the effectiveness of the BISP in sustaining a recipient household's welfare in the face of prevailing tough economic conditions. In the sections to follow the paper would look into the: safety net programmes functioning in the country and the background to the BISP; data source and methodology employed; the evaluation of the BISP as an effective safety net initiative; and conclusions drawn from the discussion and policy recommendations.

BISP AND OTHER SAFETY NET PROGRAMMES IN PAKISTAN

Pakistan is one of the very few developing countries that guarantees social security of its citizens in the Constitution. Article 38, 'Promotion of social and economic well-being of the people', in its clause c and d states, *"The state shall: provide for all persons employed in the service of Pakistan or otherwise, social security by compulsory social insurance or other means; and provide basic necessities of life, such as food, clothing, housing, education and medical relief, for all such citizens, irrespective of sex, caste, creed or race, as are permanently or temporarily unable to earn their livelihood on account of infirmity, sickness or unemployment"* [Constitution of Pakistan (2010)].

Whether this commitment is actually fulfilled in spirit is a separate debate but a whole range of safety net programmes has been initiated in the country over the years. Discussion on all these initiatives is beyond the scope of this paper, as it focuses on the BISP. However, a summary of the safety net programmes functioning in the country is presented in Table 1. For a useful discussion on safety net programmes operating in Pakistan see, Jamal (2010), World Bank (2007), Arif (2006), Irfan (2005), Bari, *et al*., (2005).

The findings of the studies carried out to evaluate the functioning of the various safety net programmes have a general consensus that these programmes are having a positive impact but their effectiveness can be significantly improved. These programmes are hindered by issues related to coverage, targeting, and implementation [Bari, *et al.* (2005); World Bank (2007)]. These programmes aim at improving their accessibility to the poor devising means to encourage poor to move out of poverty permanently, and improving social security in the larger context as well. Other issues characterising these safety net programmes are: duplication, overlap, lack of inter-organisational coordination and fragmentation, which need to be tackled for a greater impact of these social initiatives.[2]

[2]For a detailed analysis on the current safety net initiatives by the Government of Pakistan see, Jamal (2010), World Bank (2007), Arif (2006), Irfan (2005), Bari, *et al.* (2005).

Table 1

Current Social Safety Net Initiatives with National Coverage in Pakistan

Programme	Financed by	Benefit	Target group	Coverage	Managed by
Benazir Income Support Programme	Public funds	Cash as income support	Married females belonging to very poor households	National	Fed. Govt
Microfinance	Donor funds	Cash as loan for setting up business	To poor for self-employment and move them out of poverty	National	RSPs and MFIs
Pakistan Bait-ul-Maal	Public funds	Cash support for daughters' wedding, food and education	Disabled persons, widows, orphans and households living below poverty line	National	Fed. Govt
People's Work Programme	Public funds	Cash for work	Provision of electricity, gas, farm to market roads, water supply and such facilities to rural poor	National	Fed. Govt
People's Rozgar Scheme	Commercial banks	Financing for selected businesses	Unemployed educated people	National	NBP
Subsidy on wheat, sugar and fertilizer	Public funds	In kind	Poor segments	National	Fed. Govt
Utility Stores	Public funds	Subsidy in prices	Poor segments	National	Fed. Govt
Zakat and Ushr	Levy on bank deposits and agri. yield	Cash	Deserving/needy among Muslims	National	Govt., zakat and ushr committees
Child Labour and children in bondage	Public funds	Protection and rehabilitation services	Working children facing abuse and exploitation	National	Fed. and prov. govts, FATA and GB
Employees Old-Age Benefit Scheme	Employers' contribution	Cash	Formal sector employees	National	Fed. Govt
Social Health Insurance	Individuals' contribution	Cash	General population	National	Fed. Govt
Workers Welfare Fund	Employers' contribution	Housing, schools and health facilities	Formal sector employees	National	Fed. Govt

Source: Ministry of Finance 2012:226.

Note: Abbreviations used: Fed-Federal; Govt- Government; Prov-Provincial; NBP: National Bank of Pakistan; Agri-Agriculture; RSPs-Rural Support Programmes; MFIs-Microfinance institutions.

The BISP, as stated earlier, was initiated in 2008 by the Government of Pakistan with the immediate objective of mitigating the impact of rampant inflation, especially food and fuel inflation, faced by the poor. Over the years the BISP has become the main safety net programme in the country having maximum numbers of beneficiaries among all public initiatives. By the end of the third quarter of the financial year 2011-12, the BISP covered over four million recipients nationwide with over Rs 122 billion disbursed among them [Ministry of Finance, MoF, (2012)]. The programme envisaged spreading its reach to seven million people nationwide by the end of the financial year 2011-12.

At the start of the BISP, in the absence of data for the identification of the under-privileged, the parliamentarians were entrusted with the task of identifying the deserving people in their constituencies to be provided relief. A simple application form, along with the eligibility criteria, was given to the parliamentarians at both provincial and national level to identify the underprivileged and needy in their constituencies [Khan and Qutub (2010)]. With time and in the face of criticism from opposition parliamentarians, however, a more scientific procedure was adopted. The eligible households are now identified through a survey and application of Proxy Means Test (PMT) formula. The PMT procedure estimates the welfare status of a household on a scale of 0 to 100 helping in identifying the poorest households [MoF (2012)]. For the application of the PMT formula, a nationwide Poverty Scorecard Survey was conducted in 2010 covering around 27 million households in the country. To increase the accuracy, objectivity and replicability of the survey, GPS readings were also taken, which also helped in devising coping strategies for natural disaster. After conducting this survey the eligibility criteria for households to receive the monthly cash transfer from the BISP was redefined and is as follows:

(1) The Proxy Means Test (PMT) score of the household is 16.17 or lower
(2) All the married women within a household are beneficiaries whom PMT score is below the cut off point
(3) Woman is holder of a computerised national identification card (CNIC) from NADRA.[3]

The BISP is being implemented in all four provinces of the country (namely, Punjab, Sindh, Balochistan and Khyber Pakhtunkhwa), the Federally Administered Tribal Areas (FATA), Azad Jammu and Kashmir (AJK) and the Islamabad Capital Territory (ICT). The eligible households, through their females, receive a monthly cash transfer of Rs 1000, which for a poor family with a monthly income of Rs 5000 is an increase of 20 percent, which equals to 12 percent of the minimum wage in Pakistan. It is worth mentioning here that the BISP cash assistance amount is equivalent to 60 percent of the 2010 official poverty line in Pakistan. Initially the payments to the BISP selected households were made through the Pakistan Post, which paid the money to the recipients at their doorstep. To increase the transparency of the programme, and reduce any possible pilferage, the BISP is adopting more technology based solutions such as: Benazir Debit Cards, which can be used as ATM cards by the recipients withdrawing the cash payment every month; Smart Cards, authorized by a commercial bank; and Phone to Phone Banking, by providing free mobile phones and SIMs to beneficiaries for the transfer of monthly cash assistance [MoF (2012)].

What comes as a relief regarding the design of the programme is the building in of various graduation initiatives helping the recipient households to exit from the poverty trap. Starting as a solely cash transfer programme, the BISP has been redesigned in 2011-12 to launch various initiatives in order to add a sense of permanence to the benefits gained by the recipient households [BISP (2012)]. Each of these new programmes has been initially launched in a few selected districts of the country with the aim to spread

[3]The previous eligibility criteria used before the conduction of the Poverty Scorecard Survey in 2010, will be used in this study, and be discussed in the succeeding sections.

them nationwide. Some of these initiatives include the: *Waseela-e-Haq* micro-finance programme, providing soft loans up to Rs 300,000 for setting up small businesses, to households randomly selected by computers on monthly basis; *Waseela-e-Rozgar* programme under which one member of the selected household is provided technical and vocational training to sustain his livelihood; *Waseela-e-Sehat* programme providing life insurance cover of Rs 100,000 to the breadwinner of the selected households; and *Waseela-e-Taleem* in which primary education is imparted to the children of the recipient households [MoF (2012); BISP (2012)].

It may be mentioned here that this paper restricts itself to the cash transfer programme carried out under the BISP initiative on the whole. Literature voices a strong concern about creating a dependency among households receiving such cash transfers [Kunnemann and Leonhard (2008); IBRD (2009)]. Dependency, as expressed by Samson (2009: 46) implies that, "the choice by a social cash transfer recipient to forego a more sustaining livelihood due to the receipt of the cash transfer". Worldwide evidence, however, suggests otherwise. Studies conducted in a vast number of developing countries including Brazil, Mexico, Kenya and Zambia, analysing the impact of the BISP-like cash transfers have found that workers in households receiving such cash transfers look for employment more intently than comparable poor households not receiving any such cash assistance [Samson (2009); Posel (2006); Kunnemann and Leonhard (2008); Samson and Williams (2007); Barrientos (2006); and Kidd (2006)].

Another factor, which needs our attention regarding the BISP design is the unconditionality of the cash transfer under the Programme to the recipient households. Conditionalities are basically behavioural requirements expected from the recipients in order to remain eligible to receive the cash transfer. These conditions are considered an effective tool for poverty alleviation, helping to break the inter-generational transmission of poverty by increasing the human capital of individuals. Examples of such conditions can be found in a number of successful programmes being carried out in different countries like the Oportunidades/PROGRESSA in Mexico, Bolsa Escola and Bolsa Familia in Brazil, Food for Education in Bangladesh and Programme of Advancement through Health and Education in Jamaica [Son (2008)]. The conditions laid down under these programmes are usually linked to education, especially girls' education, and health, generally women and child health. The idea behind these conditions is that handing over cash to families is not enough to deal with poverty in the long run and such conditions will obligate the recipient households to empower themselves by investing in human capital and, hence, improve their chances of decent employability and moving out of poverty on a permanent basis.

Along with achieving the socially optimal targets of human capital, conditional cash transfers have some other advantages as well including those mentioned by Adato and Hoddinott (2007):

(i) Lessening the possible stigma associated with cash transfer by considering it a part of a social contract between the recipient household and the state.
(ii) Preferred for political economy reasons, and making it politically and economically more acceptable in the larger context. Improvement in education and health indicators helps increase the credibility of a programme which otherwise might be seen with suspicion, especially by those not receiving it.

Contrary to this view there are those who believe that conditionalities compromise the very objective of poverty reduction, especially in the short run, by reducing the benefits of a cash transfer to a poor household by constraining its welfare choices. These imposed conditions can be, "expensive, inflexible, and inefficient- in the worst cases screening out the poorest and the most vulnerable. Often the burden of complying with conditionalities falls disproportionately on women" [Samson (2006: 51)]. Some of the most common concerns raised for conditionalities for a cash transfer include [as observed by Handa and Davis (2006); Samson (2009); and Basett (2008); Son (2006); and Regalia (2006)]:

(i) The high administrative cost of handling conditional cash transfer might outweigh its positive impact.
(ii) Lack of access to educational and health facilities in the poorer areas can make the condition redundant for the poor and hence making them ineligible for the cash transfer.
(iii) The preferences of the poor people may differ from the conditions imposed on them, thus, reducing the welfare gains.
(iv) Cultural and social exclusion and discrimination may leave the neediest out of the welfare circle.

Those opposing conditionalities on cash transfers also consider it demeaning to the poor as such conditions imply that the poor do not themselves know what is good for them. As argued by Basett (2008), following the traditional economic theory, cash transfers should ideally be unconditional. Individuals, as rational beings, make decisions to maximise their well-being, opting for choices where the perceived benefits outweigh the perceived costs. Going by this logic a cash transfer would be most effective with no conditions attached to it as the poor, being rational economic beings, will maximise the benefits to them. If a cash transfer reduces the opportunity cost of sending a poor household's child to school instead of work, making the perceived benefits of educating outweigh its cost, decision would be taken by the household to send the child to school even without any compulsory conditions. In a scenario where beneficiaries are informed and rational economic beings, the state is caring and markets are efficient, IBRD (2008: 48-49) believes that, "The 'theoretical default'…… should be to favour unconditional cash transfer".

As Samson (2009) observes, in some countries poverty levels are high due to structural factors and not just because of the behaviour and preferences of the poor. This would be true for any society, that has yet to overcome its structural inequalities, which may discriminate against certain people, restricting them not to avail the opportunities that might be available to them otherwise, keeping them stuck in the poverty trap. The need for a BISP-like programme, thus, becomes important in the presence of vulnerable population in the country, which is becoming more susceptible to poverty due to inflationary trends and the structural inequalities characterising the societal makeup.

DATA AND METHODOLOGY

To evaluate the BISP, the present study uses the Pakistan Panel Household Survey (PPHS) carried out by the Pakistan Institute of Development Economics (PIDE) in the

year 2010. To link the cash assistance with poverty dynamics the panel information of the survey is used. It is worth mentioning here that the PPHS is a panel dataset, comprising three waves. The Round-I of the PPHS, named Pakistan Rural Household Survey (PRHS), was conducted in 2001 in all four provinces of the country, covering 2721 rural households. The Round-II of the PRHS was carried out in the year 2004 covering 1907 households in rural Sindh and Punjab. The survey was not carried out in two provinces, Balochistan and Khyber Pakhtunkhwa (KP), due to the security conditions prevailing there at that time. The third round of the panel survey was conducted in 2010, again in all four provinces, adding an urban sample to the survey as well. Inclusion of the urban sample led to the renaming of the survey as the Pakistan Panel Household Survey (PPHS). The urban sample of the PPHS 2010 was selected from the 16 districts that were included in the PRHS-2001. The PPHS-2010, thus, covers 4142 households in all four provinces of the country, in both rural and urban areas. These over four thousand households comprise 2198 panel households in the rural areas (coming from PRHS-2001), along with 602 split households from original households, making the total rural sample stand at 2800 households. The remaining 1342 households were included from the urban areas of the selected districts to make up the total sample[4]. It may be mentioned here that the three waves of the PPHS-PRHS panel data collection is a joint effort of PIDE and the World Bank.

The PPHS-2010 covers wide ranging modules to meet the objectives of this study. A detailed section of the survey questionnaire deals with the targeting process of the various safety net programmes initiated by the government and by individuals to protect the marginalised segments of the society. A transfer/assistance module included in the PPHS-2010 provides information about the status of received transfer/assistance in three categories, namely: receive assistance; attempt but not succeed; and never attempt. The respondents are also asked about how they had utilised the received cash. There is, however, one limitation about the questions asked about the cash transfers. There is no question about the duration for which a household has been receiving any cash transfer/assistance. The survey asks a household if it has received any cash assistance in the last 12 months, without specifying the exact duration for which the transfers have been taking place. For a better analysis of the impact of these transfers on household welfare the exact duration of transfer would have been valuable.

To analyse the socio-demographic and economic characteristics of the households along with the status of received assistance, the present study classifies households into three categories, that is the: receiving group; attempt group; and never attempt group. To analyse the effect of the BISP on a household's welfare, independent of other cash transfers, two categories of households are formed. One consists of households that receive the BISP, and the other category comprises those households that receive cash transfers from sources other than the BISP.

To estimate the impact of the BISP cash assistance on a household's welfare, this study follows the *Propensity Score Matching* (PSM) method. The aim of the safety net programmes is to improve the welfare of the poor, especially the most vulnerable. However, all those in need do not necessarily receive it. Some of these households get

[4]See Annex 1 for the detailed household composition of the PRHS/PPHS sample in the three rounds of survey in 2001, 2004 and 2010.

assistance and some do not, referred to as 'receiver' and 'non-receiver' households, respectively.

Though other methods like logistic regression analysis, paired observations and double difference method can also be used to analyze the welfare impact, the PSM method was preferred due to its various strengths over the other methods[5]. For instance, the logistic regression analysis ignores the issue of 'selection bias' and considers the socio-demographic and economic characteristics of the 'receiver' and 'non-receiver' households as widely different. It is usually understood that the 'non-receiver' group is comparatively at a better welfare level and, therefore, is less likely to receive assistance from the safety net programmes, that is, it is less likely that an upper middle income or rich income household in Pakistan will receive the assistance from Zakat or Bait-ul-Maal. Taking the mean outcome of 'non-receiver' households as an approximation is also not advisable as the 'receiver' and 'non-receiver' households usually differ in socio-economic characteristics even in the absence of these safety net programmes or some time a programme purposely selects the 'receiver' households [Kopeinig (2008)]. The paired observation and double difference (DD) methods require the household information before and after the intervention, in order to analyse the welfare impact of a programme. Paired observation technique is usually applicable to one variable only by assuming no impact of other variables, making it too ideal to be applied here. The DD approach is a non-experimental approach in which the welfare changes over time are estimated relative to the outcome observed for a pre-intervention baseline. Though the baseline information is available in the PPHS, because it is a panel household survey and the 2001 and 2004 waves have the baseline information, but this information does not necessarily precede the intervention. In the present instance, the baseline information would not be homogenous as the assistance-receiving households must have gone through numerous socio-demographic and economic changes during 2004 to 2010 period, making it impossible to capture the heterogeneity over the whole duration.

The Propensity-Score Matching (PSM) method developed by Rosenbaum and Rubin (1983) is one of the possible solutions to deal with the issue of 'selection bias'. The rationale behind this technique is to find a comparison group that has similar characteristics to those of the 'receiver' group in all aspects except one, that is the comparison group does not get any cash assistance. This method balances the observed covariates between the 'receiver' group and the 'non-receiver' group based on the similarity of their predicted probabilities of receiving the assistance, called their 'propensity scores'. The difference between PSM and a pure experiment is that the latter also ensures that the treatment and comparison groups are identical in terms of the distribution of unobserved characteristics [Ravallion (2003)].

As noted earlier, two groups were identified in the PPHS on the basis of status of cash assistance: the receivers and the non-receivers. In the PSM analysis, the former are the 'treated units' while the later are 'non-treated units'. Treated units are matched to the non-treated units on the basis of the propensity score. See Appendix A for a detailed explanation on the PSM methodology.

$$P(X_i) = \text{Prob}(D_i = 1 | X_i) = E(D | X_i) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

[5]Nssah (2006). Propensity Score Matching and Policy Impact Analysis a Demonstration in Eviews. WPS 3877. The World Bank. Washington, D.C.

Where $D_i = 1$ if the household has received assistance and 0 otherwise and X_i is a vector of pre-treatment characteristics. Before estimating the PSM, two conditions should be met to estimate the *Average Treatment on the Treated* (ATT) effect based on the propensity score (Rosenbaum and Rubin, 1983). The first condition is the balancing of pre-treatment variables given the propensity score. If the balancing hypothesis is satisfied, the pre-treatment characteristics must be the same for the target and the control groups. The second condition is that of the unconfoundedness given the propensity score. If assignment to treatment is unconfounded conditional on the variables pre-treatment, then assignment to treatment is unconfounded given the propensity score. Using equation 1, first the propensity scores are calculated through logistic regression, and then the *Average Treatment on the Treated* (ATT) effect is estimated by four different methods: Nearest Neighbour Matching; Kernel Matching; Stratification Matching; and Radius Matching;

$$\begin{aligned} \text{ATT} &= E\,(Y_{1i} - Y_{0i} \mid D_i = 1) \\ &= E\,(ATE \mid D_i = 1) \\ &= E\{E(Y_{1i} - Y_{0i} \mid D_i = 1, p(X_i))\} \\ &= E\{E(Y_{1i} \mid D_i = 1, p(X_i))\} - E[E\{Y_{0i} \mid D_i = 0, p(X_i))\} \mid D_i = 1\} \end{aligned} \quad \ldots \quad (2)$$

Where

Y_{1i} is the potential outcome if household is treated, and
Y_{0i} is the potential outcome if household is not treated

The above discussed methodology of Propensity Score Matching (PSM) method has been applied to the PPHS-2010 dataset to analyse the impact of the BISP on a receiving household welfare. Since household welfare is a multi-dimensional phenomenon, therefore the impact has been estimated on five indicators which are: poverty; food expenditure per capita; health expenditure per capita; school enrolment of children of age 5-14; and employment status of women of age 15-64.

Following the empirical exercise, firstly the propensity scores have been estimated on the basis of Equation 1 where the dependent variable is whether the household is a receiver or a non-receiver. On the right side of the equation 1, the three sets of explanatory variables have been used which can be the major reasons for getting assistance. These three sets of variables are: the individual characteristics, including the head of the household's sex, education and employment status; the household characteristics, including female to male ratio, household size, dependency ratio, number of persons per room, land and livestock assets, shocks and presence of a disabled person in the household; and the regional characteristics including region and province. Since the dependent variable is dichotomous in nature with two outcomes: received assistance or did not receive assistance, therefore, the Binary Logistic Regression has been applied to estimate the determinants of receiving assistance whereas the 'not-receiver' group serves as the reference category. Using the '*psmatch2, pscrore, attnd, attk, attr and atts'* commands in STATA, comparison has been made between the treated and non-treated units and the welfare impact has been calculated.

After calculating the propensity scores, the *Average Treatment Effect on the Treated (ATT)* has been estimated. In order to make the working sample even more comparable, the sample has been restricted to only those units with probabilities that lie within the region known as the *common support*, which is the area where there are enough of both, control and treatment observations, to proceed with the comparisons [Dehejia (2005)]. This also means that those units have been excluded where the treated and non-treated units do not have comparable values.

EVALUATION OF THE BISP

Any effective social safety net programme needs to fulfil certain criteria, including [Pasha, *et al*. (2005); World Bank (2007)]:

(i) *Targeting*: the extent to which a programme reaches its intended target population rather than those who do not actually need it.
(ii) *Coverage*: the proportion of the target population that benefits from a programme.
(iii) *Administrative cost*: the proportion of the administrative cost against that used on the benefits.
(iv) *Accessibility*: the ease with which an eligible household could access the programme socially, monetarily, logistically and administratively.
(v) *Adequacy*: the sufficiency of the safety net, like a cash transfer, to have any positive effect.
(vi) *Positive incentive effect*: safety nets that have a positive incentive not only help to sustain the programme but also serve to alleviate poverty in the larger context.
(vii) *Sound financing source*: safety nets with well-defined, self-reliant sources are fiscally more sustainable than those relying on ad hoc, external sources.
(viii) *Independence from other transfers*: a transfer taking place under a programme should not exclude other transfers which may have net negative effects on household's welfare.

Before we look into the performance of the BISP using some of the above mentioned criteria[6] let us first see how many households are receiving cash assistance, and their sources, in the study sample. As reported by the respondents in the PPHS-2010, and shown in Table 2, 10.7 per cent of the households are receiving cash assistance from a variety of programmes, with no major difference in the trends between the urban and the rural areas. Among these programmes, the BISP is the largest programme as it covers about two-thirds of the total households receiving any form of cash transfer, in both the rural and urban areas.

[6] Some of the stated criteria to evaluate social safety net programmes, such as the administrative cost to carry out the programmes, and sound financing sources, are macro level issues and, thus, beyond the scope of this study.

Table 2

Number of Households Receiving Cash Transfer by Type/Source of Assistance and Region

	National	Urban	Rural
Total Number of Households	4142	1342	2800
Households Receiving Cash Transfers from Government Programmes			
Benazir Income Support Programme	285	87	198
Food Support Programme	17	5	12
Zakat	19	2	17
Bait-ul-Maal	10	3	7
Food items on subsidized rates	5	3	2
People's Rozgar Programme	7	1	6
Others	29	8	21
Households Receiving Cash Transfers from Individuals			
Private Zakat	21	8	13
Private Ushr	3	1	2
Fitrana/Sadqaat	16	7	9
Assistance/Gift in kind	23	8	15
Total Number of Households Receiving Cash Transfers from Any Source	435	133	302
Percentage of Households Receiving Cash Transfers from Any Source	10.7	10.5	10.8

Source: Authors' estimation from the micro-data of PPHS 2010.
Note: Total number of households in the study sample is 4142.

As can be seen from Table 2, the received cash assistance has two major categories, that is, cash assistance received from government sources and cash assistance received from the individual sources, making a total of 10.7 per cent of the total households receiving at least some sort of cash assistance. Table 3 shows that out of these 10.7 per cent cash receiving households, a significant proportion of the households (8.8%) is getting assistance only from one source, and with the rural areas showing a slightly higher proportion of households receiving cash transfer as compared to urban areas. There are only a few households, which are getting assistance from two or more than two programmes, i.e., a household may be getting assistance from the private Zakat and also from Bait-ul-Maal.

Table 3

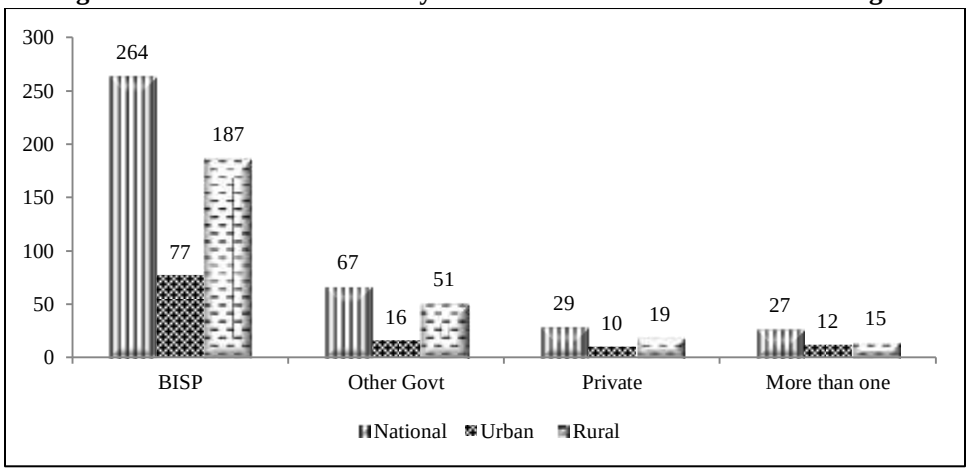
Percentage of Households with the Number of Received Assistances by Region

Number(s) of Cash Transfers	National	Urban	Rural
0	90.47	90.94	90.26
1	8.79	8.04	9.13
2	0.52	0.87	0.36
3 and more	0.22	0.16	0.25
All	100.00	100.00	100.00
N	(4,061)	(1,269)	(2,792)

Source: Authors' estimation from the micro-data of PPHS 2010.

As shown in Table 2 and 3, there are 435 households, which have received assistance from various programmes and some of them have also benefitted from more than one programme. Coming to the BISP and the number of its beneficiaries, we see from Figure 1 that the BISP receiving households outnumber all other public and private funded safety net initiatives put together. At the national level, 264 households were receiving cash transfer under the BISP, 67 households were getting assistance from other state-run safety net programmes, 29 households were assisted by private sources, and 27 households were those which received assistance from multiple sources, making a total of 387 net households (see Figure 1).

Fig. 1. Number of Households by Source of Assistance Received and Region



Source: Authors' estimation from the micro-data of PPHS 2010.

As can be seen from Figure 1, the BISP is the largest safety net programme covering more than two-thirds of the households receiving any form of assistance in the study sample. As stated earlier, one of the key objectives of the BISP was to help the poorest of the poor households against rising inflation by providing for their basic needs as these people have few physical and soft assets to cope with any shock.

As the aforementioned discussion shows, cash transfers from the various programmes have been split into three categories, namely assistance from: the BISP; other government programmes; and private sources. Likewise, the sample households have also been grouped into three categories: recipient households; never-attempt households and the attempt households. Table 4 summarises the patterns trends for cash transfers across the four provinces and the two regions as reported by the PPHS sampled households. The proportion of households receiving BISP assistance is the highest in the province of Sindh (13.6 percent), followed by Balochistan (8.5 percent), KP (4.9 percent) and Punjab (3.1 percent). Across the regions, not much difference is found between the proportions of households receiving the BISP assistance in the rural (7.1 percent) and the urban (6.9 percent) areas (Table 4). Although it is difficult to explain some uneven distribution of the BISP cash across the provinces found in this study and more in-depth data are required to construe whether it is a political phenomenon or is due to any other reason. This trend can be attributed to one probable reason that is over representation of

the poorer regions, particularly from Sindh and Balochistan, in the PPHS sample. While the poorer districts of Badin, Larkana and Loralai, in the province of Sindh and Balochistan, are included in the sample, the more urbanised and well-off districts of Karachi, Hyderabad and Quetta are not represented.

Another interesting factor to be noted in Table 4 is the proportion of households falling in the 'attempt group' category. About 16 percent of the sampled households at the national level tried to get assistance from the BISP but had not succeeded. Across the regions more than one-fifth of the households attempt unsuccessfully to get some cash assistance under the BISP in urban areas, while in the rural areas this percentage is less with 14 percent. We may infer that the urban inhabitants might have attempted more due to better information and accessibility available to them as compared to the rural community (Table 4). Contrary to the BISP distribution pattern, the percentage distribution in other government programmes and in private programmes is much lower and smoother, in both the 'attempt group' and the 'received group', showing little variation across the provinces and regions. (Table 4).

Table 4

Distribution of Household's Assistance Receiving Status by Region (%)

	Received	Attempted	Never Attempted	Total
BISP				
Overall	7.0	16.2	76.8	100.0
Rural	7.1	13.8	79.1	100.0
Urban	6.9	21.4	71.8	100.0
Other Government				
Overall	2.1	3.1	94.9	100.0
Rural	2.7	2.8	94.9	100.0
Urban	1.7	3.6	94.7	100.0
Private				
Overall	1.2	0.0	98.8	100.0
Rural	1.0	0.1	98.9	100.0
Urban	1.5	0.0	98.5	100.0

Source: Authors' estimation from the micro-data of PPHS-2010.
Note: Due to rounding off some of the figures appear as zeros.

BISP's Targeting

For any social safety net programme to be successful, the issue of targeting is of utmost importance. Before the Proxy Means Test (PMT) formula was adopted to identify the eligible households, the BISP had a set of seven criteria that a household had to fulfil to be eligible to receive cash assistance under the programme. Since the PPHS-2010 was conducted before the introduction of the new PMT formula, we will evaluate the efficiency of the BISP targeting on the basis of its initial criteria. The initial criteria regarding the eligibility of a household to receive BISP cash transfer included:

(i) A monthly income of less than Rs 6000.
(ii) No family member in government service.

(iii) Possession of no or less than 3 acres of agricultural land or up to 3 marlas residential property.
(iv) Possession of Computerized National Identity Card.
(v) Should not be beneficiary of other support programmes.
(vi) Should not have an account with a foreign bank.
(vii) Should not possess a passport or an overseas Pakistani identity card.

In this study a cross-check evaluation has been made on the basis of available information in PPHS dataset of two indicators, which are land holding and getting assistance from other government sources. The above-mentioned BISP criteria show that an eligible household should possess less than three acres of land. However, Table 5 shows that about 10.5 per cent of the BISP-receiving households have land ownership ranging from 3 to 10 acres, and another 5.6 per cent have landownership of 10 acres and above, thus making a total of 16.1 per cent of the receiving households being ineligible in case of strict application of the stated criteria. The criteria seem to be followed most strictly in the province of Punjab, and to be most lax in KP (Table 5). The cross-check analysis also shows that 12 BISP receiving households (that is approximately 4 percent) are also receiving assistance from some other government sources, which violates the conditions set forth by the BISP design, as can be seen from Table 5.

Table 5

BISP Targeting: Compliance with the Landholding and Multi-source Assistance Criteria

	National	Punjab	Sindh	KP	Balochistan
Eligibility Criteria 1: Land Ownership					
No land	73.0	79.2	72.2	61.3	73.7
Small landholding (< 3 acre)	10.9	18.9	10.8	22.6	10.5
Medium landholding (3 to < 10 acres)	10.5	1.9	11.3	12.9	2.6
Large landholding (> 10 acres)	5.6	0.0	5.7	3.2	13.2
Total	100	100	100	100	100
N	285	55	161	31	38
Eligibility Criteria 2: Not Getting Cash from other Government Sources					
Number of Households	12	4	5	2	1

Source: Authors' estimation from the micro-data of PPHS 2010.

Along with comparison of the households receiving cash assistance against the BISP's prescribed criteria, another way of evaluating the programme targeting is to look into the socio-demographic and economic characteristics of the BISP receiving and non-receiving households. Table 6 shows that the recipient households on average have bigger household sizes, poor education of the heads of the households and less working heads as compared to the other two categories, that is the never attempt and attempt groups. Regarding assets, the households receiving cash assistance are comparatively more deprived than the never-attempt and attempt groups as the recipient households have fewer assets, including house, land and livestock ownership. Two broad conclusions can be drawn from Table 6. First, the recipient households are at a disadvantageous position as compared to the never attempt and attempt group. And second, the attempt

group, though better than the received group, is also under-privileged, and has much lower socio-economic characteristics than the never attempt group. Similar results have been found by other studies done on the topic in Pakistan, including that done by Arif (2006).

Table 6

BISP Targeting: Socio-Economic Characteristics of Households by Status of Assistance

Characteristics[1]	Never Attempt	Received	Attempt
Household size (number)	7.5	8.0	7.8
Education of head (average years)	3.9	2.7	3.1
Heads employed (%)	79.0	76.5	82.1
HH facing shock in last 5 years (%)	86.4	80.9	86.6
Disabled person in home (%)	3.8	4.0	5.7
Under debt households (%)	23.5	34.0	38.1
Not owned house (%)	8.5	10.1	12.0
Katcha house (%)	61.3	75.5	70.9
Persons per room (number)	3.7	4.3	4.4
Large animal (number)	1.6	1.2	1.0
Small animal (number)	1.5	1.8	1.4
Land owned (acres)	3.5	2.1	2.0

Source: Authors' estimation from the micro-data of PPHS 2010.

Note: 1- Numbers represent average numbers, percentages and the proportion of each characteristic in the three stated categories, respectively.

A deeper insight into BISP recipient, attempt and never attempt households will help us evaluate the BISP *vis-à-vis* its targeting. Table 7 presents the status of the households with different socio-demographic and economic characteristics by the status of received assistance. Based on the PPHS 2010 dataset, these characteristics have been grouped at individual and the household levels. The individual level characteristics are related to the heads of households; while the household level characteristics include family size, dependency ratio, presence of permanent disabled person in home, room availability, ownership of land and livestock, and experience of natural shocks.

Regarding individual characteristics, sex of the head of the household is related to the status of received assistance from the BISP, as can be seen from Table 7. The female-headed households have a higher rate of receiving BISP assistance as compared to the male-headed households. Also it is worth noting that there is a much higher percentage of those households which are attempting to get BISP cash transfers, reflecting an overall public interest in the programme (Table 7). The education of the head of the household has a negative association with receiving the BISP assistance as the households headed by more educated persons are less likely to get any assistance from the BISP. A similar trend prevails among the attempt group as well, with fewer educated household heads attempting to get BISP cash assistance (Table 7).

A household's demographic, health and risk characteristics are also closely related to the households' assistance receiving status (see Table 7). With rising dependency ratio more households are found to be receiving BISP assistance, with an even higher

proportion attempting to receive it. Households that have presence of a permanently disabled person, or those who have experienced a shock during the five years preceding the survey, do not show any definitive trend in receiving the BISP assistance. However, these results do show large number of those households, which are attempting to receive the cash assistance (Table 7). It would not be wrong to infer that the high 'Attempt' rates for the BISP reflect the general accessibility of the programme and the expectations people have from it.

Table 7

Rates of the Status of Receiving BISP Assistance by Socio-economic Characteristics of Households

Characteristics	Never Attempt	Received	Attempt	Total	p-value (chi-square)
Sex of the Head of the Household					
Male	76.7	6.8	16.5	100.0	0.005
Female	71.7	13.8	14.5	100.0	
Education of the Head of the Household					
Illiterate	74.4	7.9	17.6	100.0	0.000
1-5	70.5	9.7	19.8	100.0	
6-10	83.1	4.0	12.9	100.0	
11+	84.3	4.1	11.6	100.0	
Dependency Ratio by Category					
Low	78.7	6.9	14.4	100.0	0.003
Medium	76.7	7.0	16.3	100.0	
High	72.6	7.4	20.0	100.0	
Presence of Permanent Disabled Person in Home					
No	76.9	7.2	15.9	100.0	0.088
Yes	70.6	6.9	22.5	100.0	
Experienced Shock over Last 5 Years					
No	74.6	9.8	15.6	100.0	0.035
Yes	76.9	6.7	16.4	100.0	
Persons per Room					
Up to 2 person in a room	84.7	4.6	10.7	100.0	0.000
>2 to 3 person in a room	79.9	5.7	14.4	100.0	
>3 and above	70.7	8.8	20.5	100.0	
Debt Status					
No	80.4	6.2	13.4	100.0	0.000
Yes	68.4	8.8	22.7	100.0	
Land Ownership by Category					
No land	74.2	7.6	18.2	100.0	0.000
Up to 3 acres	78.9	6.8	14.3	100.0	
3< to 10 acres	81.7	5.7	12.6	100.0	
10< acres	84.8	4.9	10.4	100.0	
Livestock (Large Animals Only)					
No Animal	73.9	7.4	18.7	100.0	0.000
1/ 2 Animal	77.6	7.2	15.2	100.0	
3/ 5 Animal	84.4	6.1	9.5	100.0	
6 and above Animal	93.5	3.3	3.3	100.0	
Farm Households (Rural Area Only)					
Own land	81.2	6.0	12.8	100.0	0.000
Sharecropper	58.4	12.0	29.7	100.0	

Source: Authors' estimation from the micro-data of PPHS 2010.

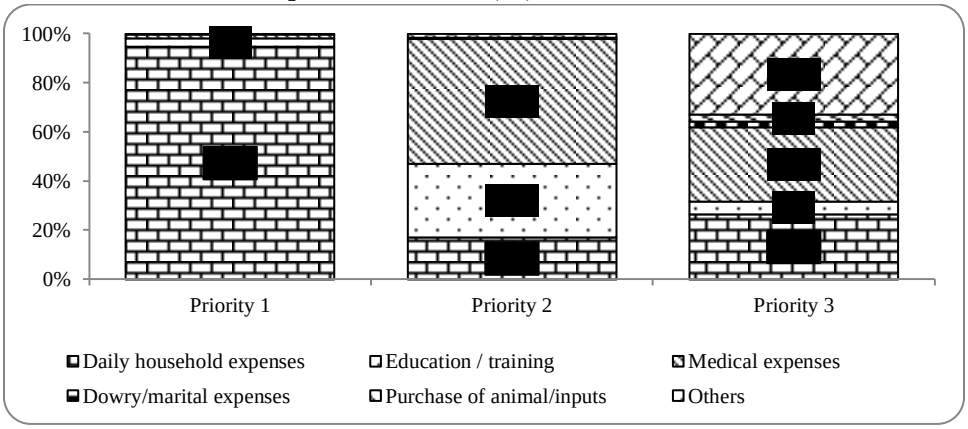
Land and livestock ownership also shows an expected trend in receiving and attempting to receive BISP (Table 7), with households having fewer animals and smaller landholdings more likely to benefit from the programme. Similarly, 'persons per room' also has a positive association with both the received and the attempt groups. In the rural areas, the sharecropping households have a much higher proportion of receiving and attempting to receive rates for the BISP cash assistance than those who own land, as can be seen from Table 7. Summing up the patterns found in Table 7, we see a clear relationship between the household's socio-economic characteristics and its status of received BISP assistance. Also worth noting is the similarity in the patterns between the received group and the attempt group. This supports the finding presented in Table 3 which also showed that the attempt group comprises vulnerable population as well, though in a slightly better position than the 'received group'. These findings hint towards a generally effective design formulation and targeting by the BISP initiative, which probably needs an even bigger coverage to include those eligible households that are in the "attempt" group found in this study.

BISP's Role in Household Budget

The BISP, as mentioned earlier, is the largest social safety net programme in Pakistan at present, covering more than two-thirds of the households, initiated to protect the poorest of the poor households from the rising inflation. The question of *adequacy* of the transferred amount to the recipient household is an important factor in evaluating the effectiveness of the BISP initiative. Needless to say, a cash assistance of Rs 1000 per household per month is not such a big amount that can change the life of the recipient but it is a reasonable enough amount to help a poor household to cover some of its vital needs. It would, therefore, be interesting to know where did the people spend the BISP cash transfers. The PPHS-2010 asks the households to report the top three priorities on which they spent the received cash transfers, the results of which are shown in Figure 2.

The figure below (Figure 2) shows that as their first priority, about 95 per cent of the households reported that they had spent the BISP amount to meet daily household expenses, followed by 3.5 percent of the households which spent this amount on education, 1.4 percent on medical and 0.35 percent on dowry. As their second priority, more than half of the households have spent the cash assistance on medical, followed by education with 30 percent and daily household expenditures with 17 percent. 33 percent of the households reported that their third priority was to spend the BISP money to meet the miscellaneous needs, followed by 30 percent on medical and 27 percent on daily household expenses. The first two priorities, as reported by the households, suggest that daily household expenditures and medical expenses are the main concerns of the poor households on which they have spent the BISP's assistance money. With the exception of some cash utilisation on education, it would not be wrong to infer that the BISP cash transfer is not primarily used to build assets for the households, be they soft assets like education and skill development, or the physical assets like purchase of livestock or agriculture inputs.

Fig. 2. Spending of BISP Cash by Priority and Purpose by Recipient Households (%)



Source: Authors' estimation from the micro-data of PPHS 2010.

BISP and Dynamics of Poverty

The PPHS-2010 dataset has detailed consumption modules covering all aspects of consumption including food and non-food items and also sufficient information to calculate the head count poverty. It is, therefore, possible to evaluate the relation between the BISP and other forms of assistances with households' consumption expenditures and poverty. For a detailed analysis, the per capita total expenditure is split into food and non-food expenditures. As can be seen in Table 8, the results are quite interesting. Both average per capita food and non-food expenditures are higher among the 'never attempt'

Table 8

Average per Capita Monthly Expenditures and Expenditures by Quintiles by Status of Received BISP Assistance

	Never Attempt	Received	Attempt
Per Capita Monthly Expenditure on (in Rs)			
Food	1752.3	1602.8	1534.1
Non-food	1312.2	991.8	931.4
Total	3105.2	2615.7	2478.5
Per Capita Monthly Expenditure by Quintiles (%)			
First	69.3	7.9	22.8
Second	74.7	7.6	17.8
Third	76.3	6.3	17.5
Fourth	77.4	8.4	14.2
Fifth	84.1	5.2	10.7
p-value (chi-square)= 0.000			
Poverty Level[1] (%)			
	18.2	25.2	27.2

Source: Authors' estimation from the micro-data of PPHS 2010.
Note: Measured through headcount method at Rs 1,671.89 per adult per month.

group as compared to the 'received' and 'attempt' group. The 'never attempt' group is, thus, comparatively better off and in no need to get assistance. However, the 'received' group has on average more per capita food and non-food expenditures as compared to the attempt group, which is trying to get the BISP assistance (Table 8). It may be inferred from these findings that the higher expenditures in the 'received' group as compared to the 'attempt' group is the result of the safety net intervention made to enhance the welfare level of the vulnerable population. Since the poor households spend a major proportion of their expenditures on essential items like food, as can be seen in Figure 2, the expenditure of the 'received' group on these commodities is higher than the 'attempt' group.

The quintiles' analysis in Table 8 suggests that as we move up the quintile ladder, fewer households are found receiving, or attempting to receive, any form of cash assistance or to have attempted to get one. It is, however, worth noting here a substantial proportion of the richer households receiving the BISP cash assistance is raising doubts about the efficiency in its targeting. Some of these initial issues in targeting are said to be dealt within the new criteria for selection of beneficiaries by the BISP (as given in the discussion above) and it would be interesting to see the effect it had on ground from a dataset post these amendments.

A somewhat similar picture emerges when we look at the figures for absolute poverty and receiving of the BISP cash in Table 8. As expected, poverty is at a lower level among the households, which have never attempted to receive the BISP cash assistance. However, if we look at the poverty levels of those who receive and those who attempt to get the BISP cash, we see a trend that begs explanation. Poverty levels among the BISP recipients are slightly lower than those non-BISP recipients who attempt to obtain it (see Table 8). Is the BISP cash assistance helping its recipients to move out of poverty in some cases? The answer can arguably be yes as if for nothing else it has helped improve the recipient households' food expenditure (see Figure 2), which eventually matters for the headcount measure of poverty.

As noted earlier, three waves of the PPHS dataset (2001, 2004 and 2010) are available, however, only for rural Punjab and Sindh. On the basis of these panel households, five categories of poverty dynamics are made to observe the association between the households' poverty movements and its status of received BISP cash transfers. The five categories are: poor in all three periods (chronic poor); moving out; falling in; and moving in and out of poverty. Table 9 presents the association between poverty dynamics and the status of received BISP assistance, as found in the PRHS/PPHS. As can be seen from Table 9, the never attempt group shows two features. First, two-thirds of the chronic poor and moving out households have never attempted to get BISP assistance and second, a substantial proportion of never poor are also receiving BISP cash transfers or attempting to receive it (Table 9). It is, however, significant to note that generally a bigger proportion of households is either receiving the BISP cash assistance or attempting to do so who have faced poverty at least once. Looking at the trends for poverty dynamics and the BISP in Table 9, the lower percentage of chronic poor households receiving BISP might be due to poor targeting or the structural exclusion of chronic poor households due to their socio-economic status. The behaviour of the 'attempt' group experiencing poverty especially chronic poverty, which tries hard to get assistance, hints towards both a need to expand the programme and an improved targeting strategy.

Table 9

Status of Current Received Cash Assistance and Poverty Dynamics: 2001, 2004 and 2010 (Rural Punjab and Sindh only)[1]

	Never Attempt	Received	Attempt	Total
Poor in Three Periods	66.7	6.7	26.7	100
Moving Out	67.4	11.5	21.2	100
Falling In	69.3	10.6	20.1	100
Moving Out and Falling In	72.3	8.7	19.0	100
Non Poor in Three Periods	83.0	7.6	9.5	100

Source: Authors' estimation from the micro-data of PRHS 2001, PRHS 2004 and PPHS 2010.

Note: 1- Only rural Punjab and Sindh are included in this part of the analysis as they are the only regions where all three rounds of the panel survey have been conducted.

Impact of the BISP: The Propensity Score Matching Analysis

As noted earlier in the methodology section, the PSM method is applied on the PPHS-2010 dataset to analyse the impact of the BISP on household welfare. The welfare impact of the BISP is estimated on five household indicators which are: household poverty level; per capita food expenditure; per capita health expenditure; school enrolment of children of age 5-14; and employment status of women of age 15-64[7]. As briefed in the methodology section, one has to estimate the propensity scores through logistic regression to calculate the Average *Treatment on the Treated* (ATT). There are two conditions that need to be met to estimate the ATT, which are of balancing property and of unconfoundedness property.

Table 10 presents the results for the determinants of the BISP programme by incorporating the correlates, which satisfy both of the above-mentioned conditions. The dependent variable is binary in nature, that is whether the household has received assistance or not. The small p-value from the LR test shows that at least one of the regression coefficients is not equal to zero. Although the Pseudo R^2 in logistic regression does not equate to R^2 of the OLS, the model shows a significant Pseudo R^2. As can be seen from Table 10, three sets of independent variables have been added to the model, related to household head; household; and the region. The results of the logistic regression show that the education of the head of the household has a significant negative association with receiving BISP cash transfer. Among the second set of characteristics, we see that higher the female-to-male ratio, and household size, the higher are the chances to get assistance from the BISP (Table 10).

[7] These five indicators were formed using the PPHS-2010 dataset. The headcount poverty was calculated by applying the official poverty line at Rs 1,671.89 per adult per month. Monthly per capita food and health expenditures were calculated from the consumption and health modules of the Survey, respectively. The education module in the PPHS has detailed information about the enrolment status of everyone in the household, from it the enrolment status of children aged 5-14 has been calculated. Regarding the last indicator of the socio-economic welfare, the working status of the sampled women has been taken from the PPHS question, "Did you work during the last week at least for one hour for any wage or profitable home activities?"

Table 10

Determinants of the BISP Cash Transfer: Logistic Regression

Covariates	Coefficients	Standard Error
Education of head (years)	–0.045*	0.017
Female to male ratio	0.213*	0.072
Household size (in numbers)	0.044**	0.020
Unexpected shock in last five years (yes=1)	0.513*	0.181
Presence of disabled person (yes=1)	–0.038	0.331
Number of room per person	–0.046	0.036
Land ownership (in acres)	–0.036**	0.015
Total large animals	–0.034	0.034
Total small animals	0.018	0.019
Region (urban=1)	–0.004	0.179
Sindh/Punjab	1.421*	0.182
KP/Punjab	0.535**	0.260
Balochistan/Punjab	0.940*	0.257
Constant	–3.160*	0.286
LR chi2	120.75 (14)	
Log likelihood	–792.70636	
Prob > chi2	0.0000	
Pseudo R^2	0.0708	
N	3,379	

Source: Authors' estimation from the micro-data of PRHS 2001, PRHS 2004 and PPHS 2010.

As can be seen from Table 10, the households that faced an unexpected shock over the five years preceding the survey are more likely to get BISP assistance as compared to those who did not face any such shock. Presence of a permanently disabled person in home and the characteristics related to loan obtained, rooms per person and assets ownership, including that of livestock, however, show no impact on getting cash assistance from the BISP while the land ownership has a significant negative impact on getting cash assistance (Table 10). Regarding the third set of the independent variables, the coefficient of region is not significant. On the contrary, however, a significant variation in the BISP cash transfer prevails across the provinces, with households in Sindh, KP and Balochistan more likely to receive BISP assistance as compared to the province of Punjab.

This brings us to the final stage of the PSM analysis, results for which are presented in Table 11. The Table shows the estimated welfare impact of the BISP by displaying the *Average Treatment Effect on the Treated* (ATT) against the five key indicators related to the household welfare. The bootstrapped standard error, as well as the number of matching cases treated and the size of the control group, are also given in Table 11. The results show that the impact of the BISP on headcount poverty, though statistically not significant, is negative for all the three measures of PSM. Despite having a reasonable targeting efficiency (as seen in the above discussion as well), the lack of statistically significant impact on poverty is not surprising as the rationale of the BISP initiative suggests that it has not been designed to reduce poverty per se, and

has its main objective to protect the poorest of the poor against the inflationary shocks. Second, the criterion of the BISP suggests that the recipient households should be among the marginalised segments of the society and far below the poverty line. Although these households are getting a monthly stipend of Rs. 1000, the amount is, however, too low to pull the households out of poverty. The fact that these poor households on average have: bigger household sizes; higher dependency ratios; tilted female-to-male ratios; and poor possession of liquid, soft and physical assets which make it difficult for these households to move out of poverty through a small cash transfer, as provided by BISP.

The impact of the BISP cash transfer on per capita food and health expenditure is statistically significant, as can be seen from Table 11. Under the various measures of PSM, the BISP-covered households are likely to spend more on food and health as

Table 11

Average Treatment Effects of BISP Under Various Measures of PSM and Socio-economic Indicators of Household

Method	Poverty (Yes=1)	Food Expenditure per Capita (Monthly)	Health Expenditure per Capita (Monthly)	School Enrolment of Children of Age 5-14 (Yes=1)	Employment Status of Women of Age 15-64 (Yes=1)
			Nearest Neighbour Method		
ATT	–0.015	48.36	88.16	0.03	0.013
N. Treated	235	235	235	517	568
N. Control	236	236	236	417	489
St. Error Bootstrap	0.042	24.25	41.11	0.05	0.038
t-stat	–0.359	**1.99**	**2.14**	0.52	0.34
			Kernel Method		
ATT	0.014	20.57	55.70	0.006	0.075
N. Treated	235	235	235	517	568
N. Control	2992	2992	2992	6430	6339
St. Error Bootstrap	0.028	12.38	20.54	0.019	0.080
t-stat	0.505	**1.66**	**2.71**	0.32	0.94
			Radius Method		
ATT	0.014	29.11	19.31	0.05	0.03
N. Treated	191	191	191	273	387
N. Control	730	730	730	684	753
St. Error Bootstrap	0.046	14.98	12.16	0.07	0.05
t-stat	0.296	**1.94**	1.59	0.714	0.60
			Stratification Method		
ATT	–0.012	22.92	62.36	0.048	0.075
N. Treated	235	235	235	517	568
N. Control	2992	2992	2992	6324	6376
St. Error Bootstrap	0.028	10.87	32.79	0.033	0.19
t-stat	–0.422	**2.11**	**1.90**	1.45	0.39

Source: Authors' estimation from the micro-data of PPHS 2010.

compared to those households which have not received the assistance but have similar socio-economic and demographic characteristics. The calculated welfare impact of the BISP transfer on food is Rs 20.6 by the Kernel method, Rs 22.9 by the Stratification method, 29.1 by Radius method and Rs 48.4 by the Nearest Neighbour method (Table 11). The welfare impact on health expenditure shows that the households, which have received assistance from the BISP are likely to spend Rs 62.4 more on health under the Stratification measure; Rs 88.2 under the Nearest Neighbour method and Rs 55.7 under the Kernal method as compared to those households which have not received assistance from the BISP (Table 11). These results support the finding presented in Figure 2, which shows that majority of the BISP-receiving households spend the cash transfer to meet daily household and medical expenses. These findings conform to the studies done in other parts of the world where such cash transfers have been found to improve the nutritional and health status of the recipients [Duflo (2003); Aguero, *et al*. (2007); Paxson and Shady (2007); Cunha (2010)].

The welfare impact of the BISP cash transfer on school enrolment of children and women's participation in the labour market is positive, though not statistically significant (Table 11). The households receiving BISP cash assistance are at the threshold level of their survival and are, thus, spending the received amount to fulfil their basic necessities, mainly food, and not investing it to better their physical or human capital. Other supplementary programmes of the BISP related to skill development, employment and education may have a positive impact on indicators other than food, whose analysis as mentioned earlier, is beyond the scope of this study.

CONCLUSIONS AND POLICY RECOMMENDATIONS

The BISP might not be the 'magic bullet' to alleviate poverty but findings of this study show that it has been able to provide some relief to the recipient households as far as food and health expenditures are concerned. In the Programme's defence it could, however, be said that the rationale behind the initiative was to provide assistance to the poorest of the poor households in the face of rising food and fuel prices and not alleviating poverty per se. In the four years since its inception, the Programme has shown the ability to evolve with time, adjusting to the changing needs and criticism. Changes in the recipient households' selection procedure and criteria by shifting from the parliamentarians' recommendation to PMT scores, adoption of technology in the delivery of cash through Smart Cards and phone to phone banking instead of manual transfer through post offices are two examples in this regard.

For any social protection programme to be effective it should have the ability to reach the poor and promote a permanent exit from poverty. The present study shows that although not all poor households were being covered by the Programme, like those which unsuccessfully attempted to get the BISP assistance, but the ones getting it were mostly poor (with a few exceptions where adherence to the set criteria was found wanting and consequently leakages to richer households were indicated). The ability of the programme to reach the poor, however, is not matched by its capacity to encourage a household's exit from poverty. The original BISP design, with its unconditional cash transfer, does not demand from the household to make an effort to invest in human or physical capital, which may help in its transition out of poverty. With the incorporation of

other schemes under the BISP banner later, including the *Waseela-e-Haq, Waseela-e-Taleem, Waseela-e-Sehat* and *Waseela-e-Rozgar,* this shortcoming in the Programme design may well have been addressed, analysis of these schemes is beyond the scope of this paper.

Political support at high levels is a prerequisite for the success of any such programme. As discussed earlier, reasons linked to the political economy may or may not encourage a government to invest in such social protection schemes. Allocation of Rs 122 billion for the BISP cash transfer is a huge promise which the future governments from the other side of the political divide may not be willing to make. The political nature of the name of the Programme, linking it to a particular political party,[8] might not be considered desirable to those belonging to other political parties. The slightly lower rates for the BISP beneficiaries in the opposition-ruled province of Punjab hint towards such issues that the Programme may face in case of a political change at the Federal level.

Despite getting a nod from the World Bank on its performance and being even labelled as, "An island of transparency" [Tahir (2012)], the BISP needs to take certain factors into account for the future. Foremost among these is the one related to fostering inter-agency/programme coordination. As we saw in Table 1, a number of safety net programmes exist in the country catering to different segments of the population. As noted by Heltberg and del Ninno (2006: 8), these programmes are, however, 'fragmented, duplicative and sometimes ceremonial' and are not able to fulfil the needs of the recipients. There is thus a need to streamline all the existing programmes and develop synergies between them for a more effective impact. The BISP with its extensive data gathered for the PMT scores can share the information with other programmes for a more efficient delivery. This would also help counter multiple payments to the same beneficiary under different programmes. A centralised system can also be considered to avoid duplication and ensure more stringent application of the eligibility criteria.

Proper monitoring and supervision need to be guaranteed to maintain credibility of the Programme. A well-defined assessment procedure should also be in place to judge the adequacy of the BISP cash transfer. Is the assistance amount sufficient enough to make a reasonable impact on the recipient household's budget? A cash transfer of Rs. 1000 per month per household may be enough in the year 2008 but would it suffice in years to come needs to be assessed periodically. Another factor ignored by the BISP design at present is the transitory nature of poverty. A household above the poverty line may move below it and *vice versa* in the face of changing circumstances. The BISP cash transfer should, therefore, take into account not just the poverty status of a household but its dynamics *vis-à-vis* poverty as well. A recipient household might become ineligible due to poverty dynamics while an ineligible household may become eligible. Such changes need to be taken into account by the BISP design for a more rational and equitable distribution of cash assistance. Last but not the least, the BISP needs to formally incorporate a mechanism for graduation out of poverty. Making a household exit from the poverty trap should be the aim of the Programme instead of continuously handing over cash assistance. Making households economically stable and sustainable should be any social protection programme's aim and the BISP should be no exception.

[8]The Benazir Income Support Programme is named after Benazir Bhutto, the twice prime minister of Pakistan and the chairperson of the Pakistan People's Party up until the day she was assassinated in December, 2007.

ANNEXURE

Table A-1 shows sample size of all the three rounds of panel survey and it also includes the split households covered in both 2004 and 2010 rounds, building on the basic sample selected in the 2001 round. The PPHS 2010 covered 2198 panel households from all the four provinces. With an addition of 602 split households, the rural sample comprises 2800 households and the urban sample comprises 1342 households, making a total sample size of 4142 households.

Table-A1

Households Covered during the Three Waves of the Panel Survey

		PRHS 2004			PPHS 2010				
	PRHS 2001	Panel House-holds	Split House-holds	Total	Panel House-holds	Split House-holds	Total Rural house-holds	Urban House-holds	Total Sample
Pakistan	2721	1614	293	1907	2198	602	2800	1342	4142
Punjab	1071	933	146	1079	893	328	1221	657	1878
Sindh	808	681	147	828	663	189	852	359	1211
KP	447	–	–	–	377	58	435	166	601
Balochistan	395	–	–	–	265	27	292	160	452

APPENDIX A

METHODOLOGY OF PROPENSITY SCORE MATCHING (PSM)

As noted earlier, two groups were identified in the PPHS on the basis of status of cash assistance: the receivers and the non-receivers. In the PSM analysis, the former are the 'treated units' while the later are 'non-treated units'. Treated units are matched to the non-treated units on the basis of the propensity score:

$$P(X_i) = \text{Prob}\,(D_i = 1 | X_i) = E(D | X_i) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Where

$P(X_i) = F(h(X_i))$
$F(h(X_i))$ can be the normal or the logistic cumulative distribution
$D_i = 1$ if the household has received assistance and 0 otherwise
X_i is a vector of pre-treatment characteristics

Before estimating the PSM, two conditions should be met to estimate the *Average Treatment on the Treated* (ATT) effect based on the propensity score [Rosenbaum and Rubin (1983)]. The first condition is the balancing of pre-treatment variables given the propensity score. If p(X) is the propensity score, then:

$$D_i = X_i \mid p(X_i) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

If the balancing hypothesis is satisfied, the pre-treatment characteristics must be the same for the target and the control groups. In other words, for a given propensity score, exposure to treatment is a randomised experiment and, therefore, treated and non-treated units should be on average observationally identical. The second condition is that

of the unconfoundedness given the propensity score. Suppose that assignment to treatment is unconfounded, i.e.:

$$Y_1, Y_0 = D_i \mid X_i$$
$$= D_i \mid p(X_i) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

If assignment to treatment is unconfounded conditional on the variables pretreatment, then assignment to treatment is unconfounded given the propensity score. Using Equation 1, first the propensity scores are calculated through logistic regression, and then the *Average Treatment on the Treated* (ATT) effect is estimated as:

$$\begin{aligned} \text{ATT} &= E\,(Y_{1i} - Y_{0i} \mid D_i = 1) \\ &= E\,(ATE \mid D_i = 1) \\ &= E\{E(Y_{1i} - Y_{0i} \mid D_i = 1, p(X_i))\} \\ &= E\{E(Y_{1i} \mid D_i = 1, p(X_i))\} - E[E\{Y_{0i} \mid D_i = 0, p(X_i))\} \mid D_i = 1\} \quad \ldots \quad (4) \end{aligned}$$

Where

Y_{1i} is the potential outcome if household is treated and
Y_{0i} is the potential outcome if household is not treated

In the sense that *ATT* parameters focus directly on actual treatment participants, they determine the realised gross gain from the welfare programme and can be compared with its costs, helping to decide whether the programme is successful or not [Heckman, *et al*. (1999)]. However, calculating the effect through *ATT* is not immediately obvious since the propensity score is a continuous variable. To overcome this problem, four different methods have been proposed in the literature: Nearest Neighbour Matching; Kernel Matching; Stratification Matching; and Radius Matching, [Becker and Ichino (2002)]. This study uses the first three methods.

Following Becker and Ichino (2002), the most straightforward matching method is the nearest neighbour (NN) method where initially each treated unit is matched with the controlled unit that has the closest propensity score. The method is usually applied with replacements in the control units. In the second step, the difference in each pair of the matched unit is computed, and finally the *ATT* is obtained as the average of all these differences. Let *T* be the set of treated units and C the set of control units, and Y^T_i and Y^c_j the observed outcome of the treated and control units, respectively. If $C(i)$ is a set of treated units matched to the control treated unit *i* with an estimated PSM value p_i then:

$$C(i) = min_j \parallel pi - pj \parallel \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

The NN method may face the risk of bad matches if the closest neighbour is far away. Such risk can be avoided by imposing a tolerance level on the maximum propensity score distance (radius). Hence, radius matching (RM) method is one form of imposing a common support condition where bad matches can be avoided and the matching quality rises. However, if fewer matches can be performed, the variance of the estimates increases [Caliendo and Kopeining (2008); Smith and Todd (2005)]. Radius matching can be shown as:

$$C(i) = \{p_j \mid \parallel pi - pj \mid < r \} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

where the entire control units with estimated scores fall within a radius r from treated matched p_i. In both *NN* and *RM* measure, the weights w_{ij} are defined as:

$$w_{ij} = \frac{1}{N_i^C} if..j \in C(i) and..w_{ij} = 0. otherwise$$

The ATT for both *NN* and *RM* methods is, thus, as follows:

$$ATT^N = \frac{1}{N^T}\sum_{i\in T}\left[Y_i^Y \sum_{j\in C(i)} w_{ij}Y_j^C\right]$$

$$ATT^N = \frac{1}{N^T}\left[\sum_{i\in T} Y_i^T - \sum_{i\in T}\sum_{j\in C(i)} w_{ij}Y_j^C\right]$$

$$= \frac{1}{N^T}\sum_{i\in T} Y_i^T - \frac{1}{N^T}\sum_{j\in C} w_j Y_j^C \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

The weights w_j here are defined by $w_j = \Sigma_i w_{ij}$. Similarly, variances can be estimated by assuming that weights are fixed and the outcome is assumed to be independent across units.

$$= \frac{1}{(N^T)^2}\left[\sum_{i\in T} Var(Y_i^T) + \sum_{j\in C} (wj)^2 Var(Y_J^C)\right]$$

$$\text{Variance } (ATT^N) = \frac{1}{(N^T)^2}\left[N^T Var(Y_i^T) + \sum_{j\in C} (wj)^2 Var(Y_J^C)\right]$$

$$= \frac{1}{N^T} Var(Y_i^T) + \frac{1}{(N^T)^2}\sum_{j\in C} (wj)^2 Var(Y_J^C) \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

In the third method, that is the Kernel method, all the treated units are matched with a weighted average of all non-treated units using the weights which are inversely proportional to the distance between the propensity scores of treated and non-treated units. The *ATT* here can be calculated as:

$$ATT^K = \frac{1}{N^T}\sum_{i\in T}\left\{Y_i^T \frac{\sum_{j\in C} Y_j^C G\left(\frac{p_j - p_i}{}\right)}{\sum_{k\in C} G\left(\frac{p_k - p_i}{h_n}\right)}\right\}$$

$$= \frac{\sum_{j\in C} Y_j^C G\left(\frac{p_j - p_i}{h_n}\right)}{\sum_{k\in C} G\left(\frac{p_k - p_i}{h_n}\right)} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

Where $G(\cdot)$ is a kernel function and h_n is a bandwidth parameter. The fourth method, the Stratification Matching method, consists of dividing the range of variation of the propensity score in a set of intervals (strata) such that, within each interval, the treated and non-treated units have the same propensity score on average. The method is also known as interval matching, blocking and sub-classification method [Rosenbaum and Rubin (1983)]. Hence, the q index defines the blocks over intervals of the propensity score, within each block the programme computed as:

$$ATT_q^S = \frac{\sum_{i \in I(q)} Y_i^T}{N_q^T} - \frac{\sum_{j \in I(q)} Y_j^C}{N_q^C} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

Where $I(q)$ is the set of units in block q while $N^T q$ and $N^C q$ are the numbers of treated and control units in block q. The *ATT* in the Stratification Matching method is, thus, as follows:

$$ATT^S = \sum_{q=1}^{Q} \tau_q^S = \frac{\sum_{i \in I(q)} D^i}{\sum_{\forall i} D_i}$$

Where the weight for each block is given by the corresponding fraction of treated units and Q is the number of blocks.

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Intergenerational Mobility: Evidence from Pakistan Panel Household Survey

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This paper, using data from Pakistan Panel Household Survey 2010, finds evidence for higher (lower) intergenerational immobility (mobility) for Pakistan. The results from transition matrix and regression analysis suggest that the educational, occupational and income status of the son is mostly determined by the socio-economic position of the father.

I. INTRODUCTION

Pakistan over the years, since its independence in 1947, had a rather erratic growth profile but on average GDP growth rate hovered around 5 percent per annum with per capita income growth ranging between 2 to 3 percent. The structure of the economy graduated from being predominantly agriculture in 1950s to being service sector orientated since the turn of the century. The manufacturing sector grew from almost insignificance in 1947 to a reasonable level accounting for around one third of the GDP.

The demographic inertia associated with unchecked population growth and emergence of job opportunities in urban areas led to massive rural to urban migration, which resulted in a rather high level of urbanisation. Concomitant changes in both the urban and rural labour markets are visible too. Not only did average years of schooling of the labour force rise but also changes in occupational classification suggest a relative rise in white collar jobs and a substantial shift from self-employment to wage employment.

An examination of the appropriation of the evolving mixes of opportunities by people from different sections of the society is a challenging task. Foremost among the challenges is the fact that Pakistan encountered several structural breaks- one at the time of partition when a massive shift of population took place between India and Pakistan. Pakistan emerged as the net gainer in terms of population shift. Simultaneously a vacuum among the government services was created due to scarcity of educated people, which also influenced the acquisition potential of the future generations. Similarly, the independence of Bangladesh in 1971 and influx of Afghan refugees in 1980s could be treated as structural breaks bearing upon the participation pattern of people from the different sections of the economy. This paper is an attempt to understand rather partially

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the achievements made by people belonging to various walks of life through a scrutiny of Intergenerational mobility.

Intergenerational mobility dynamics have long been bewildering social scientists. The slogan of equality of opportunity underlies the very motivation to understand intergenerational education, occupational or earning (im) mobility. In particular income mobility has been explored extensively. Leaving educational and occupational mobility behind in terms of the empirical expeditions undertaken. A handful of literature is available documenting the extent to which the economic position of the father determines the income of the son rather than his own education and skill.[1]

Currently improved econometric techniques have also resulted in generating a volume of empirical studies. In contrast to emphasis on the description of the shifts in ranking and positions and the descriptive aspect of intergenerational mobility not much has been done to explore the process underlying it. It needs to be kept in mind that the allocative process depicting hierarchies and positions is a by-product of the overall socio-economic and political set up. It is in this sense that the study of intergenerational mobility becomes complex in nature and demands a great deal of information.

It may, however, be noted that in this study the authors are confined to a descriptive analysis of intergenerational mobility which refers to the changes in the positions and ranking of individuals using the transition matrix as a summary measure. The analysis is further subjected to estimation of elasticity of intergenerational mobility by applying Ordinary Least Squares (OLS) and Two Stages Least Square (2SLS). The normative aspects such as degree of inequalities in opportunities can hardly be inferred from such an exercise.

The rest of the paper is structured as follows: this section is followed by section II furnishing a brief review of the literature. Section III details the empirical illustrations while results and discussion are presented in Section IV. Section V concludes the study.

II. LITERATURE REVIEW

Research studies have highlighted that those who are born rich are likely to remain rich since, along with other factors, a higher investment in education precludes the chances of zero intergenerational earnings correlations, as rewards/returns are higher on higher education [Solon (2004)]. Income distribution can also be persistent because of genetic differences. The intergenerational income mobility has outcomes similar to those of income distribution but there are different reasons underlying intergenerational income mobility in terms of policy implications. The intergenerational mobility assigns an active role to public sector to reduce the intergenerational differentials through increased educational opportunities whereas the income distribution leaves very narrow space for public policy [Black and Devereux (2010)].

Intergenerational income elasticity and correlation stand as the most widely used measures. Intergenerational elasticity, the coefficient of the father's log income in standard regressions, is preferred over correlation, because it is unbiased to any measurement errors in the son's income (the dependent variable). Intergenerational

[1]See Bjorklund and Jantti (2009), Blanden (2009), Corak (2006), Grawe (2004), and Solon (2002) for excellent survey.

income elasticity is also sensitive to the data period (T) used in the analysis where it is an increasing function of *T* [Mazumder (2005)]. Also the sensitivity of intergenerational income elasticity to the point in time at which the income of the son and the father is observed, is a revealing fact known as life cycle bias.[2] Nilsen, *et al.* (2008) also provide evidence on the life cycle bias for Norwegian data.

Coming to the empirical studies in the field with respect to time and region, Jantti, *et al.* (2006), studying six countries including USA and UK, find the highest persistence or immobility for USA for the earnings of the son. Bratsberg, *et al.* (2007) confirm the non-linearity of the son-father income nexus using data for USA, UK, Denmark, Finland and Norway. The intergenerational elasticity estimates for Italy and France are estimated to be 0.5 [Piraino (2007); Mocetti (2007)] and 0.4 [LeFranc and Trannoy (2005)] respectively. Leigh (2007), Corak and Heisz(1999) and Vogel (2008) report much lower intergenerational income elasticity for Australia, Canada and Germany. This difference in intergenerational elasticity estimates may stem, along with other factors, from the public education system[3], political participation [Ichino, *et al.* (2009)] and different labour market dynamics [Blanden (2009)]. Credit constraints, as proposed by Solon (2004) can determine the size of intergenerational income elasticities. Han and Mulligan (2001), Grawe and Mulligan (2002), and Grawe (2004) provide the theoretical underpinnings for the effect of credit constraints on intergenerational elasticity.[4] The bulk of the empirical literature on intergenerational income mobility, based on US data, especially in the 1970s and 80s, reports intergenerational elasticity of 0.2 [Sewell and Hauser (1975); Bielby and Hauser (1977); Behrman and Taubman(1985)].[5] The intergenerational mobility estimates, confined to USA for a certain period, can now be traced across the globe including UK [Nicoletti and Ermisch(2007); Dearden, *et al.*(1997)]; Brazil [Dunn (2007)], Malaysia [Lillard and Kilburn (1995)], Chile [Nunez and Miranada (2010)]; Finland [Österbacka (2001)] along with many others.[6]

To conclude the section, the literature was scanned to find relevant studies on Pakistan in respect of intergenerational income mobility indicators. The available studies examine the role of parental characteristics on school enrolment of children in a choice theoretic framework primarily focusing on parental capacity to invest in education of children [Burney and Irfan (1991)][7] and the rate of return on education reporting the dependence of individual wages on his/her father's wage and parental education [Shahrukh and Irfan(1985)]. Havinga, *et al.* (1986) deal with income and wealth intergenerational mobility and social change in Pakistan at individual and family level. Based on the findings emerging from a pilot survey, the authors found upward intergenerational income and wealth mobility. A recent study by Shehzadi, *et al.* (2012), based on a small survey, provides intergenerational social mobility and

[2]Refer to Haider and Solon (2006), Grawe (2006) for details.

[3]See Davies, Zhang, and Zeng (2005) for theoretical exposition. Pekkarinen, *et al*. (2009) gives evidence on the issue.

[4]Grawe (2004) outlines the approaches to empirical analysis of the argument. Mulligan (1997) provides empirical evidence for budget constraint hypothesis.

[5]Solon (1992) and Zimmerman (1992) criticise these studies on account of ignoring measurement errors and sample bias.

[6]All these studies have similar findings and reach the same conclusion that USA has severe income inequality issues compared to other countries.

[7]Shahrukh and Irfan (1985) also examine determinants of child school enrolment in Pakistan.

child development link for Faisalabad. The study at hand is different from the above studies on Pakistan in nature and scope. First, none of these studies explores intergenerational income mobility explicitly. Second, we improve on methodology and estimation techniques through controlling the life cycle bias and endogeniety involved in estimation of intergenerational income mobility.

III. DATA AND METHODOLOGY

Data are taken from Pakistan Panel Household Survey (PPHS) 2010; a survey administrated by Pakistan Institute of Development Economics (PIDE) since 2001.[8] The PPHS, providing rich information on socio-economic characteristics of households, covers 4246 households divided into 2746 urban and 1500 rural units respectively.[9] Separate modules for males and females were administrated to collect the information at household level [for more detail, see Nayab and Arif (2012)]. Data were extracted from the household roster and the education and employment sections of the questionnaires and merged on the basis of their common household identification codes. In the male module, the data include the characteristics of sons and fathers respectively. All information on daughters is excluded because of smaller number of observations for working daughters. This paper focuses on co-resident[10]sons and fathers reporting positive income . The study deals with the sons falling in the following age brackets (1) less than 21 years, (2) more than 20 years, (3) 25-39 years, and (4) 30-50 years for cohort analysis.[11] The detail of sample size against different filters imposed for analysis is given below:

Table1

Sample Size Details

Sample	Numbers
Non '0' income sons	2508
Non '0' income sons of working fathers	1398
Working fathers	1398
Working fathers (Urban)	392
Working fathers (Rural)	974
Fathers having non '0' income	1367
Sons having non '0' income and less than 20 years of age	608
Sons having non '0' income and more than 20 years of age	1900
Sons of working fathers less than 21 years of age	477
Sons of working fathers more than 20 years of age	921
Sons of working fathers more than 20 years of age (Urban)	227
Sons of working fathers more than 20 years of age (Rural)	694
Sons of working fathers having age between 25-39 years	550
Sons of working fathers having age between 30-50 years	247

[8]PPHS 2010 is 3rd round of the series with 2001 and 2004 completed previously.

[9]Urban sample is covered first time in PPHS 2010 while rural panel comprises 3 cross-sections of 2001, 2004 and 2010.

[10]The exclusion of sons not living with fathers due to unavailability of income and other characteristics, is a major limitation of the data for this study.

[11]See Appendix I and II for variable construction and data description respectively.

Methodology

This study applies two methodologies for empirical analysis, namely the construction of transition matrix and regression analysis, wherein the former gives the relative position of the child as compared to the father while the latter provides the extent to which the father's economic status impacts the economic status of the son. Regression analysis in its different variants is widely applied in intergenerational mobility literature.[12] Ordinary Least Square (OLS) remains the frequently used technique along with the instrumental variable (IV) approach. This study applies both OLS and IV approach.[13] The analysis starts with the OLS analysis by regressing the son's log income on the father's log income in the first model while in the second model other socio economic characteristics of the son are introduced. OLS regression is performed on the fathers' reported and estimated income.[14] We begin the methodological illustrations with the following equation:

$$\bar{Y}_{iS} = \alpha + \beta_1 \bar{Y}_{iF} + \varepsilon_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Where $\bar{Y}_{iS}$ and $\bar{Y}_{iF}$ are lifelong log incomes of i^{th} son and father respectively and ε_i is error term assumed to be distributed as $N(0,\sigma^2)$. The constant term α comprises the environment that the generation of the sons enjoys while β_1 is the measure of intergenerational persistence or immobility. Conversely $1-\beta_1$ gives intergenerational mobility. Generally β_1 takes the value between zero (0) and one (1) where a higher value indicates the higher chances that a son will hold the same socio-economic status as his father did. $\beta_1 = 0$ means perfect mobility where all sons are independent of the father's status, suggesting equality of opportunities or merit based system while $\beta_1 = 1$, indicates perfect immobility and suggests that the son, subtracting any random errors, will exactly inherit the position of the father. β_1, the elasticity measure by construction in Equation (1), indicates the percent difference in the sons' income observed for each 1 percent difference across the incomes of the fathers. A negative value for β_1 would be indicative of lower economic status of the sons in their own generation compared to the position of their fathers who ranked high in income distribution.

In reality, however, the lifelong incomes of the son and father are captured by the short run measure of income i.e. income measured at a certain point of time (generally past one month or year) so;

$$Y_{iS}(t) = \bar{Y}_{iS} + \beta_i A_{iS}(t) + \upsilon_{iS} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

$$Y_{iF}(t) = \bar{Y}_{iF} + \beta_i A_{iF}(t) + \upsilon_{iF} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

Both υ_{iS} and υ_{iF} are assumed to be homoscedastic distributed zero mean. $Y_{iS}(t)$ and $Y_{iF}(t)$ are short run measures of income of i^{th} son and father, while $A_{iS}(t)$ and $A_{iF}(t)$ are their ages respectively. Solving Equations (2) and (3) for $\bar{Y}_{iS}$ and $\bar{Y}_{iF}$ and substituting in Equation (1) gives the standard intergenerational income mobility specification as

[12]Mulligan (1997), Solon (1992), and Zimmerman (1992) are some examples of studies using models as given in Equation (1) and its variants.

[13]The regression analysis adopted in this study is similar to I-Hsin Li (2011).

[14]Income of father adjusted for age, occupation and education of father as given in Equation (8) in methodology section.

$$Y_{iS}(t) = \alpha + \beta_1 Y_{iF}(t) + \beta_2 A_{iS}(t) + \beta_3 A_{iF}(t) + \upsilon_i \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Where $\upsilon_i = \varepsilon_i + \upsilon_{iS} - \beta_1 \upsilon_{iF}$

To gauge the net effect of the father's economic status on the son's income, and to avoid omitted variable bias, we, in the second step, add in Equation (1) additional characteristics of sons and fathers, which gives rise to Equation (5) below.

$$Y_{iS} = \alpha + \beta_1 Y_{iF} + \beta_i X_i + \varepsilon_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

Where X_i is a set of control variables specifically including the age of the son, the age of the father, the square of the ages of the father and son, the occupation and education of the son etc. What is worth mentioning, however, is that both the ages of the son and father are incorporated simultaneously to account for the life cycle bias as the income for both is not observed at the same point of age. A homogenous income growth is, however, assumed across the individuals in order to tackle the life cycle bias.

The education and occupation of the father are not included in this specification purposefully as the father's income already simulates their effect. The issue is dealt by introducing the estimated income of the father in Equations (1) and (4) resulting in Equations (6) and (7).

$$Y_{iS} = \alpha + \beta_1 \hat{Y}_{iF} + \varepsilon_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

$$Y_{iS} = \alpha + \beta_1 \hat{Y}_{iF} + \beta_i X_i + \varepsilon_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

Where $\hat{Y}_{iF}$ is the estimated income of the i^{th} father. The rest of the notations are as explained above. $\hat{Y}_{iF}$ is estimated using the following equation:

$$\hat{Y}_{iF} = \propto + \beta_1 Age_F + \beta_2 Age^2{}_F + \beta_2 Edu_F + \beta_3 Occu_F + \varepsilon_i \quad \ldots \quad \ldots \quad (8)$$

Equation (8), gives the income of the father adjusted for his age, occupation and education. This estimated income is then placed in Equations (1) and (5) to calculate the intergenerational income mobility. The approach is very similar to the instrumental variable approach though it operates indirectly.

Instrumental Variable Approach

The instrumental variable approach appears to be an important tool in recent literature to tackle measurement biases. Different sets of instruments for the father's income are used in the empirical literature such as occupational status [Zimmerman (1992); Nicoletti and Ermisch (2007); Nunez and Miranada (2010)], city of residence of the sons [Björklund and Jantti (1997)] and state (province) of birth [Aaronson and Mazumder (2008)].[15]OLS will produce consistent results only if both the sons' and fathers' income are distributed normally as elaborated in Equation (9).

$$\beta_{OLS} = \frac{\{cov(Y_{iS}, Y_{iF})\}}{var(Y_{iF})} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

As we are studying some selective pairs of sons and fathers, OLS will generate inconsistent results [Fertig (2001); Nicoletti (2008)]. Further the bias in OLS estimations is induced because of short run (one year) estimate of incomes of the father resulting in

[15]We use education of father, occupation of father and province of residence of a son as instruments.

downward bias in intergenerational elasticity estimates (attenuation bias) [Solon (1992); Zimmerman (1992)].

Most importantly the correlation between υ_{iF} and Y_{iF} causes endogeniety in Equation (4) referred to as the attenuation bias. The attenuation bias can be minimised by averaging the earnings over a certain period of time (generally 5 years). The alternative, and the preferred way, to reduce downward estimation of intergenerational elasticity is to use the IV approach wherein the fathers' income is instrumented by different variables of which the father's educational status and occupation remain most commonly used.

Equation (3) can be expressed as

$$Y_{iF}(t) = \delta q_{iF} + \beta_i A_{iF}(t) + \upsilon_{\mathrm{iF}} = \theta Z_{iF} + \upsilon_{iF} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

Where $\mathrm{Z_{iF}} = \mathrm{q_{iF}}$, $\mathrm{A_{iF}(t)}$ and q_{iF} denote instruments.

This estimation methodology is superior to the OLS, in order to control the measurement error effect. The measurement errors in the instrument do not create any nuisance in results as far as these errors are uncorrelated to the error term of regression. Further, education, used as instrument for the father's life time earnings, is free of transitory errors hence the IV approach gives consistent estimates for β_1 in Equations (1) and (5).

We estimate Equations (1) and (5) by applying the Two Stage Least Squares (2SLS) approach. The education and occupation of the father, along with some other variables, are used as instruments. The set of instruments, other than the father's education and occupation, varies with the specification depending upon the explanatory variables used. The 2SLS estimations are performed only for the reported income as the estimations based on estimated income are the indirect mode of 2SLS.

IV. RESULTS AND DISCUSSION

The percentage occupational and educational distribution of the fathers and sons is reported in Table 2 where, quite interestingly, 48.6 percent of the sons of working fathers reported working in elementary professions while 33.3 percent fathers worked in elementary professions.[16] It is also evident from the information that 94.3 percent of the sons and 95.2 percent of the fathers work in elementary services and agriculture etc. respectively and a very small number join blue collar professions like technicians.[17]

The situation improves with regards to education, because only 33.9 percent of the sons (though a big number in absolute terms) never attended school as compared to 56.3 percent[18] fathers suggesting improved status of school enrolments. The sons who completed the matriculation were 17.1 percent compared to 9.6 percent fathers; while 10.7 percent of the sons completed graduation (14 years of education in Pakistan) as against only 3.9 percent of the fathers. Table 2, in general, indicates a better education attainment for the sons' generation as compared to that of the fathers.

[16]The occupational classification used in this study is based on the United Nations Standard Classification of Occupations (ISCO-1998).

[17]Given the fact that all major urban centres were not covered in PPHS 2010, the occupational, educational and income distribution could diverge from that reported in the surveys like PSLM and LFS.

[18]The number is 65.9 percent for sample of fathers when no condition of working status is imposed. This figure may be an indicator of lower enrolments for the old generation of fathers as the fathers aged between 89-105 years get excluded under this condition.

Table 2

Percentage Distribution of Respondents with Respect to Occupation and Education

Indicators	All Sons	Sons of Working Fathers	All Fathers	Working Fathers Only[c]
Occupation				
Elementary[a]	46.8	48.6	33.3	
Services/Agriculture[b]	47.1	45.7	61.9	
Technicians/Associate Professionals	3.6	3.7	2.4	
Mangers/Professionals	2.5	2.1	2.3	
Total	***2494***	***1391***	***1398***	
EDUCATION				
Never Attended School	33.9	33.9	65.9	56.3
Up-to Primary	18.1	20.5	15.6	20.5
Middle	15.9	16.3	7.4	8.7
Matriculation	18.1	17.1	7.4	9.6
Graduate and Above	13.9	12.1	3.6	4.5
Others	0.2	0.1	0.2	0.4
Total	***2508***	***1398***	***2508***	***1398***

[a]Elementary category includes armed forces also in which 2.9 percent sons and 0.2 percent fathers are employed respectively.

[b]Clerks, Services, Skilled Agriculture Workers, Crafts and related and Operators

[c]In occupational distribution, working fathers are unit of the analysis so "all fathers" are exactly "working fathers only".

Transition Matrix

Educational Mobility

This section improves on the previous one as it provides results based on the son-father (son of the same father) relationship. The transition matrix details the "*chance opportunity open to each dynasty in the passage from one generation to the following*". The intergenerational educational, occupational and income mobility is reported in Tables 3, 4 and 5 respectively. The order of ranking is from 1st (lowest) to the last (highest).

Table 3

Sons' Education against their Father's Education (%)

	Education of Sons					
Full Sample Education of Fathers	Never Attended School	Upto Primary	Middle	Matric	Graduation and Above	% (N)
Never Attended School	42.4	17.3	14.6	16.5	9.0	100 (1650)
Up to Primary	23.6	31.3	15.9	16.7	12.6	100 (390)
Middle	14.1	14.6	27.0	26.5	17.8	100 (185)
Matriculation	9.2	9.2	21.1	25.9	34.6	100 (185)
Graduation and above	11.2	2.2	5.6	22.5	58.4	100 (89)
		URBAN				
Never Attended School	42.2	19.3	13.3	14.7	10.5	100 (353)
Up to Primary	29.0	26.2	13.1	16.8	14.9	100 (107)
Middle	15.1	6.8	30.1	24.7	23.3	100 (73)
Matriculation	10.4	5.2	24.7	27.3	32.5	100 (77)
Graduation and above	14.6	4.2	8.3	27.1	45.8	100 (48)
		RURAL				
Never Attended School	42.6	16.8	15.0	17.0	8.8	100 (1287)
Up to Primary	21.6	33.2	17.0	16.6	11.7	100 (283)
Middle	13.4	19.6	25.0	27.7	14.3	100 (112)
Matriculation	8.3	12.0	18.5	25.0	36.2	100 (108)
Graduation and above	7.0	0.0	2.0	17.0	74.0	100 (41)

Table 3 (a)

Sons' Education against their Father's Education by Cohort

Full Sample Education of Fathers		Education of Son (Less than 31 Years Aged Sons) (%) Never Attended School	Up to Primary	Middle	Matric	Graduation and above	% (N)
Never Attended School	<31[a]	43.20	19.90	15.10	14.50	7.20	100 (1157)
	>31	40.80	11.40	13.60	21.10	13.20	100 (493)
Up to Primary	<31	26.10	30.30	17.30	14.70	11.70	100 (307)
	>31	14.50	34.90	10.80	24.10	15.70	100 (83)
Middle	<31	15.60	16.30	27.20	26.50	14.20	100 (147)
	>31	7.90	7.90	26.30	26.30	31.60	100 (38)
Matriculation	<31	7.90	9.30	24.50	22.50	35.80	100 (151)
	>31	14.70	8.80	5.90	41.20	29.40	100 (34)
Graduation and above	<31	11.0	3.0	6.0	23.0	58.00	100 (71)
	>31	11.0	0.0	6.0	22.0	71.00	100 (18)
URBAN							
Never Attended School		44.70	21.80	13.80	14.20	5.45	100 (275)
Up to Primary		31.20	26.90	12.90	16.10	4.36	100 (93)
RURAL							
Never Attended School		42.70	19.30	15.50	14.60	7.9	100 (882)
Up to Primary		23.80	31.80	19.20	14	11.2	100 (214)

[a]<31 and >31 denotes sons of age less than or equal to 30 and sons older than or equal to 31 years of age respectively.

Table 4

Son's Occupation against his Father's Occupation (%)

Full Sample Occupation of Fathers	Occupation of Sons Elementary	Services/ Agriculture	Technicians/ Associate Professionals	Mangers/ Professionals	**%** (N)
Elementary	71.6	25.8	1.1	1.5	100 (465)
Services/Agriculture	37.4	56.9	3.7	2.0	100 (860)
Technicians/Associate Professionals	47.1	38.2	14.7	0.0	100 (34)
Mangers/Professionals	15.6	40.6	28.1	15.6	100 (32)
URBAN					
Elementary	64.8	31.0	2.1	2.1	100 (142)
Services/Agriculture	26.8	65.9	5.0	2.3	100 (220)
Technicians/Associate Professionals	62.5	31.3	6.3	0.0	100 (16)
Mangers/Professionals	25.0	31.3	25.0	18.8	100 (16)
RURAL					
Elementary	74.6	23.5	0.6	1.2	100 (323)
Services/Agriculture	41.1	53.8	3.3	1.9	100 (640)
Technicians/Associate Professionals	33.3	44.4	22.2	0.0	100 (18)
Mangers/Professionals	6.3	50.0	31.3	12.5	100 (16)

Table 4(a)

Son's Occupation against his Father's Occupation—
Sons Aged Less than 31 Years (%)

	Occupation of Sons				
Occupation of Fathers	Elementary	Services/ Agriculture	Technicians/ Associate Professionals	Mangers/ Professionals	**% (N)**
Elementary	72.3	25.4	1.2	1.2	100 (422)
Services/Agriculture	38.8	55.8	3.3	2.1	100 (724)
Technicians/Associate Professionals	48.4	38.7	12.9	0.0	100 (31)
Mangers/Professionals	17.2	37.9	27.6	17.2	100 (29)
Elementary	64.9	31.3	2.2	1.5	100 (134)
Services/Agriculture	27.6	65.0	4.9	2.5	100 (203)
Technicians/Associate Professionals	66.7	33.3	0.0	0.0	100 (15)
Mangers/Professionals	26.7	33.3	20.0	20.0	100 (15)
Elementary	75.7	22.6	0.7	1.0	100 (288)
Services/Agriculture	43.2	52.2	2.7	1.9	100 (521)
Technicians/Associate Professionals	31.3	43.8	25.0	0.0	100 (16)
Mangers/Professionals	7.1	42.9	35.7	14.3	100 (14)

Table 4(b)

Son's Occupation against his Father's Occupation—
Sons Aged More than 30 Years

	Occupation of Sons				
Occupation of Fathers	Elementary	Services/ Agriculture	Technicians/ Associate Professionals	Mangers/ Professionals	**% (N)[19]**
Elementary	72.3	25.4	1.2	1.2	100 (422)
Services/Agriculture	38.8	55.8	3.3	2.1	100 (724)
Technicians/Associate Professionals	48.4	38.7	12.9	0.0	100 (31)
Mangers/Professionals	17.2	37.9	27.6	17.2	100 (29)

Elementary category includes armed forces also in which 2.9 percent sons and 0.2 percent fathers are employed respectively.

Table 5

Income Quintile Transition Matrix (%)

Full Sample	Quintiles of Annual Incomes of Sons					
Quintiles of Annual Incomes of Fathers	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile	% (N)
1st Quintile	43.5	25.3	16.6	8.1	6.5	100 (308)
2nd Quintile	31.3	33.8	17.9	11.7	5.4	100 (240)
3rd Quintile	20.7	30.4	22.1	16.7	10.1	100 (276)
4th Quintile	21.3	24.5	23.1	20.2	10.8	100 (277)
5th Quintile	18.5	14.0	18.5	26.0	23.0	100 (265)
RURAL						
1st Quintile	53.7	27.8	9.3	7.4	1.9	100 (54)
2nd Quintile	30.4	32.9	24.1	8.9	3.8	100 (79)
3rd Quintile	22.9	28.1	21.9	17.7	9.4	100 (96)
4th Quintile	22.4	37.8	21.4	16.3	2.0	100 (98)
5th Quintile	18.5	15.4	20.0	21.5	24.6	100 (65)
URBAN						
1st Quintile	41.3	24.8	18.1	8.3	7.5	100 (254)
2nd Quintile	31.7	34.2	14.9	13.0	6.2	100 (161)
3rd Quintile	19.4	31.7	22.2	16.1	10.6	100 (180)
4th Quintile	20.7	17.3	24.0	22.3	15.6	100 (179)
5th Quintile	18.5	13.5	18.0	27.5	22.5	100 (200)

[19]The smaller sample size against occupation 3 and 4 (Table 4(b)) leaves us unable to undertake rural-urban analysis.

Tables 3 and 3(a) provide information on the educational mobility from the fathers' generation to the sons'. A "Vicious circle trap" is clearly visible from the Table and there is high probability that the educational status of the father will pass on to the sons' generation. "Inheritance" seems to be playing an important role in determining the final educational attainment outcome. Those whose fathers never went to school have a 42 percent probability of never getting enrolled in schools. The probability of reaching to primary level for the sons of father s who never attended school is 17 percent while the probability of earning a graduate degree is only 7.2 percent. The chances of the sons of remaining under primary and middle fade away as the father's education reaches to graduation and above and their probability of earning at least graduation or higher degree is 71 percent. The probability of acquiring the highest degree increases along with the increase in inherited educational status of the father as is evident from the 2nd last column of Table 3. Similar results were observed when the sample was split into rural-urban strata. These results show the intergenerational persistence of educational attainment suggesting unequal participation in the opportunities available in attaining education. This may, partly, be an outcome of different educational systems prevailing in Pakistan.[20] Another probable reason might be poverty driven "earning hand" concept leaving the majority of sons of uneducated fathers uneducated or unable to reach higher levels of education.

Table 3(a) furnishes the educational transition matrix for the cohort of sons with ages <31 and ≥31 years respectively. The results indicate that ultimately the probability of the sons meeting the same fate as that of their fathers is higher for cohorts in age≥ 31 years. The probability of attaining the highest degree for a son, having a father who never attended school, is as low as 0.5 percent. A son, older than 31 years of age, whose father has primary education has a 30 percent probability of reaching to the primary level while the probability that he remains un-enrolled in school is 26.1 percent; while the sons in cohort <31 years of age, with the fathers having primary education, are 34.9 percent likely to reach to the same level of education; their chances of never attending school are 14.5 percent however, which is much lower for the son with the same background but falling in cohort ≥31 years of age, indicating higher enrolment for children born after 1980.[21] Similar patterns of persistence are observed for both cohorts for all categories of education. It may be added that inferences regarding the vintage effect are difficult to be traced from a one-year cross-sectional data. This study however suggests that despite the rise in educational enrolments, a father in the poverty ridden elementary occupation could not get his son to have a perceptible upward mobility in education.

Occupational Mobility

Occupational mobility, which is classified somewhat differently than under Labour Force Survey (LFS), from one generation to the following is depicted in Tables 4 and 4(a) respectively where the latter provides the transition probabilities against different cohorts of sons with the same back ground. The numbers 1-4, in column and rows, rank

[20] Different educational systems here refer to public and private schooling.

[21] Any child of 30 years of age or younger in 2010 must be born in 1980 or thereafter.

the occupations in increasing order and 4 is preferred over 1.[22] "In the name of father" situation is evident from the results and there is 71.6 percent probability that sons of fathers working in elementary occupation will end up with the same fate while the probability of their reaching to higher professions declines with the order of the occupation and falls to 1.5 percent for the highest ranked occupations, indicating that a son born to a father working in elementary sector has only 1.5 percent probability to be a manager or a professional.

The sons of fathers working in the services or agriculture sector (occupation ranked as 2) have a probability of 56.9 percent to fall in the same occupation. But more importantly, these sons have a probability of 37.4 percent of joining a profession lower than their fathers. A similar situation is observed for the sons whose fathers were technicians and associate professionals (occupation 3) where the probability for these sons to reach to the same occupational status is only 14.7 percent, while the probability that these sons end up joining occupations lower than their fathers' is 85.3 percent.

Floor and ceiling effects, a potential disadvantage of the transition matrix, suggest that the movement below and above the bottom and top groups respectively are not possible so the middle groups portray a good picture of the intergenerational mobility. For the sons of the fathers who are managers and professionals (the highest ranked occupation, 4), the probability to reach to the same profession is only 15.6 percent while the probabilities of their falling in occupation 1, 2 and 3 (lower than their father's occupational status) are 15.6 percent, 40.6 percent and 20.1 percent respectively. These figures suggest an alarming situation of regression in occupational status where the sons' generation is falling behind their fathers. This may be a reflection partly of the ceiling effect but seems to be primarily emerging from the ongoing meltdown in the labour market of the country characterised by excessive labour supply due to high level of population growth and poor performance of the economy on the labour demand side. Similar patterns are observed for rural and urban samples and the cohort of sons with ages <30 and >30 years respectively.

Income Mobility

Table 5, based on income quintiles, draws the information about probability of moving from one income group to the other group where 1 stands for the lowest income group (poorest) while 5 indicates the highest income group (richest).[23] The probability for a son to move to the highest quintile from the lowest one is only 6.5 percent while the probability of retaining the economic status equal to that of the father is 43.5 percent, given that the father falls in the 1st quintile. The sons born to fathers belonging to the middle income group (quintile 3) have a 10.1 percent probability of reaching the top quintile. As is obvious from the 2nd last column of Table 5, the probability of a sons reaching higher income groups is generally a positive function of the economic status of his father.

[22]This classification, based on (ISCO-1998), though not common in Pakistan, is adopted purposefully to get concise picture of intergenerational occupational mobility where the reader can make easy comparisons.

[23]Pakistan Demographic and Health Survey (PDHS) 2006-07, though based on wealth rather than income, titles these quintiles as poorest, poor, middle, rich and richest ranked from 1-5 respectively.

Sons born to fathers at the tail end of income distribution are more likely to be at the tail end of income distribution of their own generation. In the rural sample the persistence is high with the probability of 53.7 percent sons falling in the lowest income quintile, given the fact that their fathers were in the same quintile. More importantly, the probability of reaching to the highest quintile from the lowest is 1.9 percent for a son born in rural Pakistan as compared to 7.5 percent to the son born in an urban area, which is suggestive of comparatively better opportunities available in urban areas.

Regression Analysis

The vulnerability of the transition matrix analysis of intergenerational mobility to floor and ceiling effect is a reason to use regression analysis. Starting from a simple linear regression, we incorporate non-linearity involved in the analysis. Further, the instrumental variable approach is used to tackle the potential endogeniety stemming from correlation between the father's income and the error term.[24] Sensitivity analysis is adopted wherein the base model is run by regressing the sons' log income on the log income of their father only and then, in the second step, the nexus is controlled for other characteristics of the son and the father. Regression analysis is also undertaken for rural and urban samples and for different cohorts of sons separately and the results are reported in Tables 6 and 7.[25]

Table 6 details the Ordinary Least Square (OLS) regression estimates against the fathers' reported and estimated income.[26] The first column of Table 6, reporting the estimates against the fathers reported income, shows that the father's income, without any other controls, has a positive and statistically significant impact on the son's income. The results suggest that, in Pakistan, slightly more than one quarter (0.269) of economic advantage of the fathers' passes on to the sons. The pass on ratio declines to one-fifth (0.207) when the relation is controlled for the sons' own education, age and age square.

The results, after decomposing the estimation into rural (N=974) and urban (N=392) samples are suggestive of the higher persistence in urban areas (column 2 Table 6) where 40 percent (0.394) of the earnings are determined by the economic status of the father when no controls are added in the regression, while this share declines to 25 percent after adding the control variables. The coefficient of the father's log income in the rural sample is somewhat similar to that of the full sample.

The last half of Table 6 reports regression estimates against estimated log income of the father which is adjusted for his age, occupation and education. Broadly speaking, the reported income of the father indicates the economic status while the estimated income is a combined indicator of the socio-economic status of the father. The β in reported income is different from that against estimated income as the latter explains the variation in the son's income adjusted for age, education and father's occupation. The results show that against one unit increase in the father's estimated income, the son's income increases by 0.33 percent as compared to 0.269 in case of reported income

[24]As discussed in section on methodology.

[25]Smaller sample for provinces, especially Balochistan limits the analysis only to rural-urban clusters.

[26]Income of father adjusted for age, occupation and education of father as given in Equation (8) in methodology section.

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Table 6

Ordinary Least Square Estimates of Son's Income

	Reported Income						Estimated Income[+]					
	Full Sample		Urban		Rural		Full Sample		Urban		Rural	
Indicators	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2
Father's Log Income	0.269 ***	0.207 ***	0.393 ***	0.257 ***	0.244 ***	0.199 ***	0.330 ***	0.166	0.293 *	–0.172	0.378 ***	0.310 **
	(0.029)	(0.027)	(0.062)	(0.058)	(0.034)	(0.031)	(0.105)	(0.103)	(0.171)	(0.187)	(0.134)	(0.131)
Age of Son		0.238 ***		0.265 ***		0.245 ***		0.239 ***		0.266 ***		0.243 ***
		(0.018)		(0.038)		(0.021)		(0.018)		(0.039)		(0.021)
Age Square of Son		–0.003 ***		–0.004 ***		–0.003 ***		–0.003 ***		–0.004 ***		–0.003 ***
		(0.000)		(0.001)		(0.000)		(0.000)		(0.001)		(0.000)
Education of Son		0.010 *		0.017 *		0.006		0.015 **		0.030 ***		0.008
		(0.006)		(0.010)		(0.007)		(0.006)		(0.010)		(0.007)
Occupation of Son		0.070 *		0.087		0.058		0.078 **		0.126 **		0.052
		(0.038)		(0.061)		(0.048)		(0.039)		(0.063)		(0.049)
Province		0.087 ***		0.130 ***		0.073 **		0.135 ***		0.165 ***		0.124 ***
		(0.026)		(0.042)		(0.032)		(0.025)		(0.043)		(0.031)
Age of Father		0.007 **		0.007		0.006 *						
		(0.003)		(0.005)		(0.004)						
Constant	7.899 ***	4.341 ***	6.460 ***	3.537 ***	8.194	4.365 ***	7.221 ***	4.971 ***	7.586 ***	8.456 ***	6.702 ***	3.306 **
Prob.(F-statistics)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.087	0.000	0.005	0.000
Adjusted R-Square	0.058	0.296	0.092	0.316	0.050	0.292	0.006	0.269	0.005	0.282	0.007	0.271
Total	***1366***	***1358***	***392***	***392***	***974***	***966***	***1393***	***1385***	***392***	***392***	***1001***	***993***

*; **; *** stand for significant at 10 percent, 5 percent and 1 percent respectively.

In parenthesis are reported standard errors.

[+]Estimated Income of Father = Constant +Father's Age+Father'sEducation+Father's Age^2 +Father's Occupation.

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suggesting that the intergenerational mobility also depends, to some extent, on the age, occupation and educational status of the fathers, which may connote the social status of the father too. Interestingly, however, the pass on ratio of the fathers' status to the son's income falls by a half when the son's own age, education and occupation are introduced, implying that the extent of intergenerational mobility is also sensitive to the education and cohort of the sons' generation.[27] The coefficient for the father's log estimated income is higher (0.378) for the rural sample (0.293 for urban sample) indicating relatively lower intergenerational income mobility in rural areas when both the social and economic status of the father is accounted for. Sons born in rural areas will inherit most of their economic status from their fathers and their own characteristics have not much to add as is evident from a very marginal decline in the coefficient of the father's log estimated income in the rural sample when controls are added (from 0.378 to 0.310). The negative sign on the coefficient of the fathers' log income, though insignificant statistically, indicates that the sons, in their own generation, are lower in economic status than their fathers were in their generation.

The age of sons has statistical significance in all regressions and the value of the coefficient varies between 0.239-0.266, indicating that age is a significant determinant of the intergenerational mobility estimates.[28] The square of the age of the son carries a negative sign across the specifications and is significant at 1 percent level suggesting the non-linear nature of income-age relationship, implying a fall in income against increased age after a certain limit. The son's education and occupation register mixed result across the specifications but retain positive sign with smaller coefficients, leading us to conclude that in Pakistan the bulk of income of the son's generation depends on the economic position of the previous generation, which means lower mobility. The results confirm and highlight the ground situation of the country where the poor are poor because they were born poor. The provincial background determines the income of the son's generation, significantly pointing towards different dynamics embodied in the social set up of the respondents. The adjusted R^2 for specifications with controls included ranges between 0.269-0.316 across the specifications given in Table 6. Further the probability of F-statistic in all cases is <0.001 across the regression models as reported in the bottom row of Table 6.

Cohort Analysis

Life earnings are sensitive to the point in time (age of father and son) at which these earnings are observed. This presumed heterogeneity of earnings' growth across the age groups may lead to different levels of intergenerational mobility trends. The intergenerational mobility estimates are conceived to be downward biased for young sons and old fathers [Grawe (2006); Reville (1995)]. This work, building on the life cycle bias hypothesis, undertakes cohort analysis and performs regression analysis for all sons (more than 21 years of age), sons of age 25-39 and 30-50 years of age. Cohort analysis based on the results from Table 6 is undertaken. Table 7 reports the OLS estimates for sons who are older than 20 years, 25-39, and 30-50 years of age.

[27]It may however be kept in mind that education of son itself is an outcome of fathers economic and educational position.

[28]Suggesting cohort analysis of intergenerational mobility.

The cutoff point of 20 years is imposed to preclude the potential inclusion of sons who are involved in studies. Also the income reported at lower ages is not truly representative of lifelong earnings.

A continuous decline for the coefficient of log income of fathers is observed along the cohort and the higher the age of the son at which income is observed, the lower the persistence. Conversely, higher intergenerational income mobility is recorded when the earnings are observed at the later stages of life, confirming the life cycle bias. Slightly more than one tenth (0.113) of the economic status of fathers is passed on to the sons when income is observed at the ages between 30-50 years (later stages of life) as compared to one-fifth when the lower age limit is relaxed to 21 years, suggesting that immobility is higher for sons observed in early stages of life. For a cohort of sons at least 21 years old, the persistence is higher (0.381) in urban areas as compared to those born in rural areas (0.179). Model 2 in Table 7 reports the OLS estimates when the controls are added to control the son-father income status nexus, exhibiting similar patterns, but with lower values of the coefficient for the fathers' log income.

Models 3 and 4 in Table 7 detail the regression estimates for intergenerational mobility when the reported income of the father is replaced with his estimated income for the cohorts as mentioned above. The father's socio-economic status (income of father adjusted for age, education and occupation) becomes an insignificant predictor of the son's income when the earnings are observed at a point of time when the son's age is between 30-50 years (column 4 Table 9). Opposite patterns of mobility are observed for rural and urban samples with and without age restrictions on the son. Excluding sons younger than 21 years of age, a higher immobility (0.391) is observed for sons residing in urban areas, while it is the other way round when no age brackets are imposed. In this case immobility is higher (0.378) in the rural sample as compared to 0.239 for sons residing in urban areas. When the son-father income nexus is controlled for the characteristics of the son, lower values of pass on ratio of the father's economic status are observed.

Instrumental Variable Estimations

To tackle the perceived endogeniety of the variables, the intergenerational income mobility was estimated by applying Two Stages Least Square (2SLS) and the results are reported in Table 8.[30] Father's education and occupation are used as instruments for the father's income.[31] The results confirm the argument that OLS estimates of intergenerational mobility, by construction, are downward biased as is evident from Table 8.

[30]Detailed results are available in Appendix V. and VI.

[31]The 2SLSestimates are undertaken only for the reported income of the father as instrumenting the fathers income by education and occupation is similar to the OLS estimates based on the estimated income of the father

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Table 7

Ordinary Least Square Estimates of Son's Log Income- Cohort Analysis[†]

Models	Independent Variables		Full Sample	Full Sample Cohort Analysis			Urban Sample	Urban Sample Cohort Analysis	Rural Sample	Rural Sample Cohort Analysis
			All Sons	>20	25–39	30–50	All Sons	>20	All Sons	>20
			REPORTED INCOME							
1	Father's Log Income	B	0.269 ***	0.209 ***	0.178 ***	0.113 **	0.393 ***	0.381 ***	0.244 ***	0.179 ***
			(0.029)	(0.028)	(0.033)	(0.052)	(0.062)	(0.064)	(0.034)	(0.031)
		Prob.(F)	0.000	0.000	0.000	0.030	0.000	0.000	0.000	0.000
		N	***1366***	***892***	***533***	***236***	***392***	***225***	***974***	***667***
2	Fathers Log income, Education of son, age of son, age square of son, occupation of son and province	β	0.207 ***	0.180 ***	0.133 ***	0.100 *	0.257 ***	0.288 ***	0.199 ***	0.163 ***
		(S.E)	(0.027)	(0.029)	(0.035)	(0.052)	(0.058)	(0.068)	(0.031)	(0.033)
		Prob.(F)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	***1358***	***884***	***533***	***234***	***392***	***225***	***966***	***659***
			ESTIMATED INCOME[a]							
3	Father's Log Income	β	0.330 ***	0.298 ***	0.089 ***	0.155	0.293 *	0.391 ***	0.378 ***	0.276 ***
		(S.E)	(0.105)	(0.098)	(0.011)	(0.182)	(0.171)	(0.183)	(0.134)	(0.119)
		Prob.(F)	0.002	0.000	0.000	0.394	0.087	0.033	0.005	0.021
		N	***1393***	***917***	***530***	***245***	***393***	***225***	***1001***	***692***
4	Fathers Log income, Education of son, age of son, age square of son, occupation of son and province	β	0.166	0.271 ***	0.282 **	–0.009	–0.172	0.048	0.310 **	0.347 ***
		(S.E)	(0.103)	(0.111)	(0.141)	(0.197)	(0.187)	(0.211)	(0.131)	(0.134)
		Prob.(F)	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000
		N	***1385***	***909***	***543***	***243***	***392***	***225***	***993***	***684***

*; *; **; *** stand for significant at 10 percent, 5 percent and 1 percent respectively.
In parentheses are reported standard errors.
[a]Estimated Income of Father = Constant +Father's Age + Father's Education + Father's Age^2 + Father's Occupation.

[†]This table, presented in this way for brevity, reports only coefficient of father's log income. Detailed results are available in Appendix III and IV.

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Table 8

Two Stage Least Square Regression Estimates

Models	Independent Variables		Cohort Analysis >20	Cohort Analysis 25-39	Cohort Analysis 30-50	>20 Years Urban	>20 Years Rural
1	Father's Log Income	β	0.438 ***	0.408 ***	0.383	0.404 **	0.459 ***
		(S.E)	(0.108)	(0.125)	(0.237)	(0.202)	(0.128)
		Prob (F)	0.000	0.001	0.107	0.000	0.000
		N	***921***	***550***	***247***	***227***	***694***
2	Fathers Log Income, Education of Son, Age of Son	β	0.467 ***	0.418	0.531 ***	0.508 **	0.461 ***
		(S.E)	(0.126)	(0.298)	(0.168)	(0.219)	(0.160)
		Prob (F)	0.000	0.126	0.000	0.004	0.000
		N	***921***	***247***	***550***	***227***	***694***

*; **; *** stand for significant at 10 percent, 5 percent and 1 percent respectively.
In parenthesis are reported standard errors.

The coefficients for the father's log income are consistently higher for all cohorts of the sons both with and without controls. Interestingly, when controls are added, the highest of the coefficients is for the father's log income as is obvious from model 2 of Table 8 where, at least, nearly half of the economic status of the son is governed by the economic position of the father. The highest value is observed when the son's income is observed at the later stages of life (30-50 years).These results confirm the downward bias of OLS estimates and suggest that the complexities of the intergenerational mobility, if ignored, can give erroneous estimates by producing lower elasticity estimates of intergenerational mobility.

V. CONCLUDING REMARKS

Drawing inferences from intergenerational mobility, involving a complex interaction of processes, based on estimates generated from a single cross-section of data, may not suffice. Nonetheless, some findings emerge from this study. First and foremost, despite all controls, the father's socio-economic status remains the most crucial determinant of the economic position of the son.[32] The rich are rich because they are born rich while the fate of the poor by birth is to stay poor. The inheritance burden is not easy to get rid of. A plausible explanation can be the lower investment in education on the one hand while, on the other hand, the inability of a poor father to buy good quality education available to the rich in private sector schools and failure of the public sector to provide quality education. In addition, job allocation, to the extent it is driven by considerations emanating from constituency built up[33] could be a major impediment to intergenerational mobility because the poor have no influence. Further, the mounting population pressure generating massive labour supply and resultant unemployment poses a major challenge to an economically stagnating country like Pakistan. The regression analysis of this study, to some extent, seems to indicate that the situation in Pakistan is very similar to Latin American countries where a high

[32]Saima and Sajid (2011) provide evidence on non-inclusiveness of economic growth and inequalities of opportunities in education and employment sector of Pakistan over a period of 1990-2008.

[33]Constituency built up here refers to the relation-based job findings i.e. political motivated appointments both at higher and lower job levels.

intergenerational persistence is documented. It is worth reminding, however, that the analysis of this study is confined only to wage earners, as unavailability of data precludes the inclusion of the self-employed segment of the working class. It is imperative to highlight that data limitations as discussed in the paper must be kept in view while interpreting the results. It may further be added that information from one year data (cross-section) are insufficient to address the totality of the factors bearing upon the mobility (simultaneously determining education, occupation and income) where the each is intrinsically generated by multiple factors across generations over the time. Limited by data availability we tried to compensate by doing cohort analysis. Worth mentioning also is that this study primarily explores income mobility and only a slight description of educational and occupational mobility is provided just as a recap for the reader. This study, while exploring income mobility, denies in no way the totality of the inextricably entangled mobility and interlinkages between all three types of mobility namely educational, occupational and income. These interlinkages rest on a number of assumptions. For instance a non-merit based system, as it can be the case in many developing countries, ruptures the association between educational and income mobility as well as bears upon the occupational upward mobility. It must be kept in mind that not only the labour market has expanded in size but also has undergone compositional changes which can influence the above mentioned interlinkages in the three facets mobility.

APPENDIX-I

Variables

Annual Income: Annual income, the continuous variable, is constructed using information reported in Section 3 of PPHS (employment) and is a sum of all types of income. The log income of the son is used as a dependent variable in regression analysis.

Age: The completed years of age as reported by the respondents at the time of interview makes the variable "age". The age of the sons and fathers is categorised separately into different categories based on minimum and maximum values and the frequency distribution against each category. The sons' age is recoded into 9 categories, as those having 14 years fall at the most in the less than 15 years' category. Those who are older than 14 years are grouped together into 8 distinct groups with 5 years' interval. Similarly, the fathers having the age of up to 34 years are categorised into less than 35, and those having more than 34 are grouped together into 8 distinct groups with 5 years interval.

Education: The completed years of education**,** excluding all information on school going individuals, originally consisting of 16 discrete and 6 nominal categories, is recoded into 6 categories. Those who have no education are defined as *never attended school*; those who have availed 1 to 5 years of schooling as *up-to primary*, 6 to 8 as *middle*, 9 to 10 years as *matriculation*, up to 14 as *graduation* and those who have education equivalent to at least 15 years of schooling are categorised as *post graduates and merged into graduates*.

Occupation: The respondent was asked about the type of profession he/she is employed at the time of interview. Initially, occupation of respondent is coded into 10 different categories according to the nature and type of profession and then it is further recoded into 4 major categories to be used in descriptive analysis and transition matrices.

These variables along with their categorical coding are illustrated below

Variable	Coding Categories
Age (Son)	(1)Less than 15, (2)15-19, (3)20-24, (4)25-29, (5)30-34, (6)35-39, (7)40-44, (8)45-49 & (9)50 and above.
Age (Father)	(1) Less than 35, (2)35-40, (3)41-45, (4)46-50, (5)51-55, (6)56-60, (7)61-65, (8)66-70 & (9)71 and above.
Education	(0)Never attended school, (1)Up-to Primary, (2)Middle, (3)Matriculation, (4)Graduation *, (5)
Occupation (original coding)	(1)Armed Forces, (2)Professionals, (3)Managers, (4)Technical and Associate Professionals, (5)Clerks, (6)Services, (7)Skilled Agri-Workers, (8)Crafts and Related, (9)Operators & (10)Elementary
Occupation-2 (recoded)	(1)Armed Forces/Elementary, (2) Clerks/Services/Skilled Agri-workers/ Crafts and Related/ Operators, (3)Technical and Associate Professionals & (4)Managers/ Professionals

*Also includes poly-technique, FA, CT, BA and B.Ed, MA, M.Sc., M.Ed., Engineering, Medical and Degree in Law.

APPENDEX-II

DESCRIPTIVE ANALYSIS

This appendix details the information on age, education and income of fathers and sons. The unit of analysis is working fathers and sons reporting positive income. The age limit (> 20 years) for sons' sample was put to exclude sons who were still studying. The mean age of the fathers is 54.81 years while that of the sons is 30.07 years. The minimum age for the fathers was observed to be 25 years while the maximum age of 88 and 80 years were registered for fathers and sons respectively.

DESCRIPTIVE STATISTICS

Working Fathers Reporting Positive Income					
Fathers	Mean	Min	Max	St.dev	N
Full Sample					
Age	54.81	25.00	88.00	9.71	1367
Education	3.07	0.00	16.00	4.02	1362
Annual Income	116881.45	11.00	3070000.00	175955.00	1367
Urban Sample					
Age	53.19	27.00	76.00	8.71	393
Education	4.19	0.00	16.00	4.39	391
Annual Income	104098.73	11.00	967152.00	105101.00	393
Rural Sample					
Age	55.46	25.00	88.00	10.02	974
Education	2.61	0.00	16.00	3.77	971
Annual Income	122039.16	132.00	3070000.00	197287.00	974
Punjab					
Age	54.27	28.00	88.00	9.53	659
Education	3.24	0.00	16.00	4.02	655
Annual Income	101561.16	11.00	3070000.00	180782.00	659
Sindh					
Age	54.27	25.00	79.00	10.11	388
Education	2.90	0.00	16.00	3.58	388
Annual Income	104048.53	132.00	1872500.00	165343.00	388
KPK					
Age	56.46	34.00	81.00	9.00	211
Education	3.69	0.00	16.00	4.73	211
Annual Income	167763.03	7000.00	1000000.00	145365.00	211
Balochistan					
Age	56.75	38.00	82.00	10.26	109
Education	1.41	0.00	16.00	3.59	108
Annual Income	156690.86	10000.00	1296000.00	211513.00	109
Sons>21 Years Reporting Positive Income					
Full Sample					
Age	30.07	21.00	80.00	7.72	1900
Education	6.28	0.00	16.00	4.85	1896
Annual Income	134943.60	5.00	4200000.00	210265.00	1900
Urban Sample					
Age	28.66	21.00	62.00	6.77	460
Education	7.11	0.00	16.00	5.03	457
Annual Income	126564.61	5.00	4200000.00	247584.00	460
Rural Sample					
Age	30.52	21.00	80.00	7.95	1440
Education	6.02	0.00	16.00	4.76	1439
Annual Income	137620.23	2000.00	2200000.00	196882.00	1440
Punjab					
Age	29.92	21.00	64.00	8.07	722
Education	6.27	0.00	16.00	4.45	719
Annual Income	128885.22	5.00	2200000.00	205599.00	722
Sindh					
Age	30.01	21.00	80.00	7.74	500
Education	5.07	0.00	16.00	4.87	500
Annual Income	111179.38	2400.00	4200000.00	254622.00	500
KPK					
Age	30.42	21.00	59.00	7.44	525
Education	8.08	0.00	16.00	4.64	524
Annual Income	161022.04	6000.00	1560000.00	147971.00	525
Balochistan					
Age	29.74	21.00	57.00	6.91	153
Education	4.20	0.00	16.00	5.23	153
Annual Income	151708.87	10000.00	2400000.00	242613.00	153

It is important to note that the maximum age reported for the father was 105 years under no restriction but limiting the sample to fathers who are currently working gave 88 years as the maximum age for fathers. The condition of "working fathers' was set as the reported income was to be used in analysis for which both fathers and sons must be working at the time of survey. No major differences were observed for the mean age of the father across the provinces of Pakistan, but the minimum age of fathers varied across the provinces and was 38 years for fathers residing in Balochistan. Similar variations for maximum age were observed for sons across the sample.

The minimum average education of 1.4 years is observed for fathers residing in Balochistan. A clear divide is visible in rural and urban areas where fathers have an average education of 2.6 and 4.2 years respectively. Following the fathers, sons residing in Balochistan recorded a minimum (4.2) average educational years while the situation is, though surprisingly, much better in KPK where the sons' generation has, on average, 8 years education. The rural urban divide, in the son's generation, seems to be minimised and no major differences in educational years are observed. Sons earn, on average, more than the fathers as is evident from the mean incomes. But interestingly, the sons' generation in KPK and Balochistan, though the difference is negligible, earns less than the earnings of the fathers. Fathers belonging to Punjab and sons belonging to Sindh reported the highest amount of annual earnings respectively. A detailed analysis of earnings will be offered in the next section of this paper.

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APPENDIX-III

Ordinary Least Square Estimates of Son's Log Income

	Reported						Estimated					
	Full Sample		Urban		Rural		Full Sample		Urban		Rural	
Indicators	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2
Father's Log Income	0.209 ***	0.180 ***	0.381 ***	0.288 ***	0.179 ***	0.163 ***	0.298 ***	0.271 **	0.391 ***	0.048	0.276 ***	0.347 ***
	(0.028)	(0.029)	(0.064)	(0.068)	(0.031)	(0.033)	(0.098)	(0.111)	(0.183)	(0.211)	(0.119)	(0.134)
Age of Son		0.062 *		–0.007		0.081 **		0.057 *		0.001		0.073
		(0.032)		(0.083)		(0.036)		(0.032)		(0.088)		(0.036)
Age Square of Son		–0.001		0.0001		–0.001 *		–0.001		0.0001		–0.001
		(0.000)		(0.001)		(0.001)		(0.000)		(0.001)		(0.001)
Education of Son		0.019 ***		0.025 **		0.015 **		0.0991 ***		0.033 **		0.015 **
		(0.006)		(0.011)		(0.007)		(0.007)		(0.013)		(0.008)
Occupation of Son		0.090 **		0.193 ***		0.047		0.088 **		0.224 ***		0.033
		(0.040)		(0.069)		(0.050)		(0.042)		(0.073)		(0.051)
Province		0.070 **		0.043		0.076 **		0.123 ***		0.103 *		0.129 ***
		(0.028)		(0.051)		(0.034)		(0.028)		(0.053)		(0.033)
Age of Father		0.005		0.009		0.003						
		(0.003)		(0.007)		(0.004)						
Constant	8.826 ***	7.325 ***	6.869 ***	6.932 ***	9.175 ***	7.334 ***	6.884 ***	6.478 ***	6.767 ***	9.726	8.009 ***	5.426 ***
Prob (F-statistics)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.033	0.000	0.021	0.000
Adjusted R-Square	0.058	0.111	0.134	0.195	0.045	0.092	0.009	0.078	0.016	0.122	0.006	0.070
N	***892***	***884***	***225***	***225***	***667***	***659***	***917***	***909***	***225***	***225***	***692***	***684***

*; **; *** stand for significant at 10 percent, 5 percent and 1 percent respectively.

In parenthesis are reported standard errors.

Estimated Income of Father = Constant + Father's Age + Father's Education + Father's Age^2 +Father's Occupation.

APPENDEX-IV

Ordinary Least Square Estimates of Son's Log Income

	Reported				Indicators			
	25–39		30–50		25–39		30–50	
Indicators	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2
Father's Log Income	0.178 ***	0.133 ***	0.113 **	0.100 *	0.089 ***	0.282 **	0.155	–0.009
	(0.033)	(0.035)	(0.052)	(0.052)	(0.011)	(0.141)	(0.182)	(0.197)
Age of Son		–0.174		0.066		–0.180		–0.019
		(0.157)		(0.178)		(0.153)		(0.171)
Age Square of Son		0.003		–0.001		0.003		0.001
		(0.003)		(0.002)		(0.003)		(0.002)
Education of Son		0.024 ***		0.027 **		0.022 ***		0.028 **
		(0.008)		(0.012)		(0.008)		(0.012)
Occupation of Son		0.094 *		0.265 ***		0.089 *		0.286 ***
		(0.051)		(0.086)		(0.053)		(0.088)
Province		0.098 ***		0.081		0.138 ***		0.104 **
		(0.037)		(0.058)		(0.036)		(0.056)
Age of Father		0.003		0.011				
		(0.005)		(0.007)				
Constant	9.262 ***	11.658 ***	10.030 ***	7.349 **	10.223 ***	10.136 ***	9.575 ***	10.507 ***
Prob(F-statistics)	0.000	0.000	0.030	0.000	0.000	0.000	0.394	0.000
Adjusted R-Square		0.086		0.097		0.064		0.086
N	***533***	***529***	***236***	***234***	***530***	***543***	***245***	***243***

*; **; *** stand for significant at 10 percent, 5 percent and 1 percent respectively.

In parenthesis are reported standard errors.

Estimated Income of Father = Constant +Father's Age+Father'sEducation+Father's Age^2 +Father's Occupation.

APPENDEX-V

Two Stage Least Square Estimates of Son's Log Income

	No Age Restrictions						More Than 20 Years Old Sons					
	Full Sample		Urban		Rural		Full Sample		Urban		Rural	
Indicators	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2
Father's Log Income	0.575 ***	0.699 ***	0.394	0.890 ***	0.672 ***	0.632 ***	0.438 ***	0.467 ***	0.404 **	0.508 **	0.459 ***	0.461 ***
	(0.123)	(0.137)	(0.255)	(0.287)	(0.144)	(0.158)	(0.108)	(0.126)	(0.202)	(0.219)	(0.128)	(0.16)
Age of Son		0.085***		0.080 ***		0.084 ***		0.045 ***		0.034		0.047 ***
		(0.01)		(0.02)		(0.013)		(0.012)		(0.023)		(0.015)
Education of Son		–0.040 *		–0.070 **		–0.026		0.005		–0.005		0.007
		(0.024)		(0.034)		(0.033)		(0.021)		(0.028)		(0.03)
Constant	4.470	1.262	6.443	–0.548	3.407	1.923	6.245 ***	4.661 ***	6.608 ***	4.582 *	0.017 ***	4.641 **
Prob(F-statistics)	0.000	0.000	0.122	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000
R-Square	0.016	0.085	0.006	0.076	0.022	0.093	0.018	0.044	0.018	0.058	0.019	0.041
N	***1398***	***1398***	***394***	***394***	***1004***	***1004***	***921***	***921***	***227***	***227***	***694***	***694***

*; **; *** stand for significant at 10 percent, 5 percent and 1 percent respectively.

In parenthesis are reported standard errors.

APPENDEX-VI

Two Stage Least Square Estimates of Son's Log Income

Indicators	Cohort Analysis			
	30–50		25–39	
Father's Log Income	0.383	0.418	0.408 ***	0.531 ***
	(0.237)	(0.298)	(0.125)	(0.168)
Age of Son		0.105 *		0.075
		(0.053)		(0.051)
Education of Son		0.024		–0.004
		(0.063)		(0.026)
Constant	7.012 ***	2.841	6.669 ***	3.136
Prob (F-statistics)	0.107	0.126	0.001	0.000
R-Square	0.011	0.024	0.020	0.039
N	***247***	***247***	***550***	***550***

*; **; *** stand for significant at 10 percent, 5 percent and 1 percent respectively.
In parenthesis are reported standard errors.

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Income Growth, School Enrolment and the Gender Gap in Schooling: Evidence from Rural Pakistan

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Household panel data document a remarkable closing of the gender gap in school enrolment in rural Pakistan between 2001 and 2004. During this 3-year period, there was an 8 point increase in the percentage of girls entering school, while the corresponding increase for boys was less than 2 percentage points. More than half of the rise for girls can be explained by the substantial increase in household incomes, whereas comparatively little is accounted for by increased school availability. Unpacking these enrolment trends and their determinants requires solving the classic period-age-cohort identification problem. The paper shows how to do so using auxiliary information on the distribution of school entry ages.

JEL Classification: O15, O40, I 25, I21
Keywords: School Enrolment, Gender, Income Growth, Gender Gap

1. INTRODUCTION

Large gender gaps in schooling persist in much of South Asia and yet are still not well understood. How much of the lower female enrolment and attainment relative to males can be explained by differences in the gender-specific returns to education [e.g., Behrman, *et al*. (1999)], by poverty, or by other barriers to schooling that differentially affect girls is the central question in formulating and targeting policies to address the gender gap in educational outcomes.

Pakistan, historically, has had one of the largest education gender gaps in the world, being especially pronounced in rural areas [Alderman, *et al*. (1996)]. While this gap has been closing over time, it remains high. Moreover, there is substantial variation in the gender gap within the country, with the two largest provinces providing a dramatic contrast. Girls' enrolment has been substantially higher in Punjab than in Sindh, even though the difference in boy's enrolment across these two provinces has been slight. How much of this cross-sectional variation in the gender gap in schooling can be attributed to the greater poverty in Sindh relative to Punjab?

Recent economic trends in Pakistan can help answer this question. Rural incomes grew robustly from 2001-04, largely due to external factors, such as the easing of drought and increased remittances in the aftermath of 9/11. This income growth was thus not driven by

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technical progress that might have also altered the relative returns to education or the shadow price of child (or adult) time. Furthermore, the percentage growth in rural incomes between 2001 and 2004 was of the same order of magnitude as the baseline cross-sectional income differential between rural Punjab and Sindh. Our principal objective is to estimate the extent to which household income explains gender-specific enrolment patterns in rural Pakistan.

To be sure, there were other salient developments over this same period, notably the continuing construction of rural schools. Alderman, *et al.* (1996), in their analysis of a cohort of rural Pakistanis born in the 1960's, find that lack of local schools for girls was the main source of the gender gap in cognitive skills. To assess the relevance of this conclusion for recent cohorts, we also consider the role of school availability. Of course, new school construction may reflect increasing local demand for education, which itself could be a function of income growth. Given the lag in school construction, however, the establishment of schools after 2001 should largely reflect income growth (or other trends) *prior* to 2001.

A large and expanding literature examines the impact of income *shocks* on transitory (year-to-year or season-to-season) changes in school enrolment or attendance [e.g., Duryea, *et al*. (2007); Jacoby and Soufias (1997)]. Less empirical attention has been paid, however, to longer-run processes underlying trends in school entry decisions (i.e., ever enrolled). Glewwe and Jacoby (2004) use household panel data to show that income growth led to a rise in school enrolment in Vietnam in the mid-1990s. Their paper does not focus on school entry, but rather conflates entry and dropout behaviour, nor does it consider gender differentials in enrolment trends. By contrast, our interest is in whether a child was ever enrolled in school, an important decision margin in a setting where a large fraction of children, particularly girls, never go to school.

In order to unpack enrolment trends and their determinants using data on cohorts of young children one must first solve the classic period-age-cohort effect identification problem. Because of the linear relationship between year, age, and cohort, it is generally impossible to separate their independent effects, even with panel data. Our approach uses auxiliary information on the distribution of the age of school entrants to back out the change in probability of ever enrolling in school during childhood. Once this age effect is 'purged', period and cohort effects can be separately estimated without having to make any *ad hoc* identifying assumptions.

Using this method, we find an 8 percentage point increase in the proportion of girls who ever enrolled in school between 2001 and 2004. This is an average increase *across all cohorts among children aged 5-12 in 2001 that could potentially have enrolled in school in response to changing economic conditions*; i.e., The corresponding figure for boys is between 1 and 2 percentage points and is not statistically significant. Important cohort effects are also found for girls, but not for boys. Practically all of the movement in girls' school enrolment over the sample period occurred in Sindh; the 2001-04 cross-cohort enrolment increase for girls is 13 percentage points there, but only 2 percentage points in Punjab. Thus, in rural Sindh, the gender gap in school entry fell by about 9 percentage points in just 3 years. Increases in household income explain around sixty percent of the overall increase in girls' school enrolment, whereas the establishment of new schools plays only a minor role. It is possible that policy efforts to increase enrolment among girls such as Tawana Pakistan or the middle school stipends program for girls may account for some of the increased enrolment. Male work migration rates

from Sindh also rose in the post 2001 period. Mansuri (2006) has shown a substantial impact of migration on school enrolment, particularly for girls.

The paper presents in Section I a simple description of enrolment trends in rural Pakistan, followed in Section II with a more sophisticated decomposition into period, age, and cohort effects. Section III then analyses the underlying determinants of the observed enrolment trends.

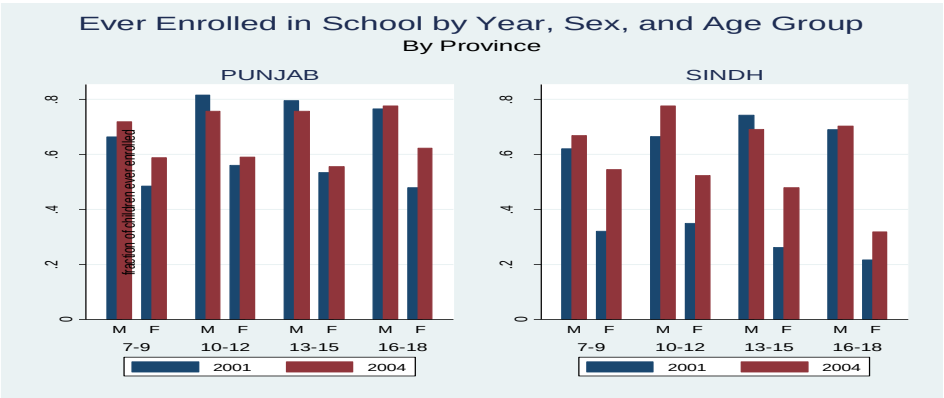
2. DATA AND TRENDS IN SCHOOL ENROLMENT

The data for this analysis is sourced from the Pakistan Rural Household Surveys (PRHS) of 2001 and 2004. PRHS-01 is a representative survey of rural Pakistan, consisting of around 2800 households in all four provinces (Punjab, Sindh, NWFP, and Balochistan). PRHS-04 follows up households in the two most populous provinces, Punjab and Sindh, to form a panel of about 1600 households.

For the purposes of obtaining descriptive statistics that are comparable across years, we treat the panel sample as a repeated cross-section, selecting all individuals aged between 7-18 years in each year. This leaves us with 1374 households contributing 3495 children in 2001 and 3734 children in 2004 (households need not contribute children in both years). Note that, for now, our sample is not restricted to children of household members. Doing so would exclude quite a few married women under the age of 19. For example, in 2001, 24 percent of 17 year old girls and 34 percent of 18 year-olds were already married; the corresponding figures in 2004 are 17 percent and 27 percent. Since girls who marry early are much less likely to have ever been enrolled in school, excluding them would overstate the proportion of 16-18 year-old girls ever enrolled. Selective marriage is not a concern in the subsequent econometric analysis where we focus on a sample of younger children.

Figure 1 shows the proportion of children by age-gender group ever enrolled in school (including pre-school) in 2001 and 2004. There appear to have been substantial gains for girls, both absolutely and relative to boys. A provincial breakdown of the same numbers in Figure 2 reveals that the biggest changes occurred in Sindh province, which also had far lower base (i.e., 2001) in girls' school enrolment than Punjab. As we discuss next, however, comparisons of proportions ever enrolled, even for a given age, confound year and cohort effects and hence must be interpreted carefully.

Fig. 2. Proportion of Children Ever Enrolled in School by Province



3. DECOMPOSING ENROLMENT TRENDS

In examining trends in proportions of children ever enrolled in school, one faces the classic period-cohort-age effect identification problem [see, e.g., Hall, *et al*. (2005) for a recent discussion]. The problem arises from the need to focus on children who are young enough to still be entering school over the relevant period. To fix ideas, we first describe the three effects in question:

Period effect: The change in enrolment of a given cohort over time captures shifts in the economic and policy environment. Period effects are only relevant for cohorts that could potentially have entered primary school in response to these shifts, which means for children no older than 12 in the base year.

Cohort effect: Differences in enrolment across cohorts in a given year may reflect longer-term secular trends in enrolment. For example, since we know that period effects and age effects (see below) are zero for children 13 and older, we can infer from figure 1 that there has been a sizeable cohort trend in girls' enrolment, which may have resulted in higher likelihood of later cohorts to be enrolled.

Age effect: As a child ages the odds of ever enrolling in school increase, or, at least, cannot decrease. In the context we study, most children enter school by age 9, with a very small percentage enrolling between age 10 and 12. Thus, age effects are only relevant for children up to age 12.

Consider, now, the unrestricted dummy variable regression (linear probability model), using two rounds of data from 2001 and 2004,

$$e_{it} = p \cdot I(year = 2004) + \sum_j c_j \cdot I(cohort = j) + \sum_k a_k \cdot I(age = k) + u_{it} \qquad \ldots \qquad (1)$$

where e_{it} is an indicator for whether the child was ever enrolled in school. Since $cohort = age - 3 \cdot I(year = 2004)$, it is evident that the period effect (p), cohort effects (c), and age effects (a) are not separately identified. This identification problem cannot be avoided by selecting a single age group, since in this case it would be impossible to estimate the cohort effect (a given cohort consists of children at two different ages in the two rounds of the survey).

Generally speaking, without further *ad hoc* restrictions on the coefficients in (1), little can be said about the period effect [see Hall, *et al*. (2005)]. We propose an identification strategy that makes use of auxiliary information, possibly even from a different data set. The advantage of our strategy is that it eschews arbitrary parameter restrictions.

3.1. Purging the Age Effect

Consider a sample consisting of children age $k = 5, ..., K$. Given the innocuous normalisation $a_5 = 0$, we may write the age effects (the coefficients in Equation (1)) as

$$a_k = E(e_{it} \mid age = k) - E(e_{it} \mid age = 5) \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (2)$$

Suppose now that we have information on the age of school entrant AE for a (possibly different) sample of children. Since $\Pr(e_{it}=1 \mid age) = \Pr(AE \le age)$, age effects may be written as

$$a_k = \Pr(AE \le k) - \Pr(AE \le 5) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

Thus an estimator for a_k is simply the difference in proportions of children who entered school at or before age *k* and those who entered at or before age 5. This calculation is best performed on a sample of older children to avoid the censoring problem. In particular, for children younger than 10 there is still a nontrivial probability that those not yet enrolled in school may enter at a later date. We also estimate the $\hat{a}_k$ separately for boys and girls, but, with enough data, one could do so with respect to other characteristics, such as province.

Given the $\hat{a}_k$, one can calculate $\hat{\phi}_{it} = \sum_{k=5}^{K} \hat{a}_k I(age = k)$ and replace the dependent variable in (1) by $\tilde{e}_{it} = e_{it} - \hat{\phi}_{it}$, proceeding from there as though age effects were identically zero. In other words, the regression

$$\tilde{e}_{it} = p \cdot I(year = 2004) + \sum c_j \cdot I(cohort_{it} = j) + u_{it} \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

is equivalent to (1). Clearly, the parameters *p* and $\boldsymbol{c}$ are now separately identified.

It may not be immediately obvious why the procedure just outlined 'works'? One might think that, if there are indeed cohort effects in e_{it}, these should be present in $\Pr(AE \le k)$ as well, and thus our age effects correction cannot be applied uniformly across cohorts. Note, however, that the estimate of a_k essentially 'differences out' $\Pr(e_{it}=1)$. To see this, observe that, if no child ever enrols in school beyond age 12, then $\Pr(AE > 12) = \Pr(e_{it} = 0)$, implying $\Pr(AE \le k) = \Pr(e_{it}=1) - \Pr(12 \ge AE > k)$. Consequently, $a_k = \Pr(12 \ge AE > 5) - \Pr(12 \ge AE > k)$ contains no information on the overall probability of ever enrolling in school.

What *is* being assumed, however, is that the distribution of school entry ages *conditional* on eventual enrolment is stationary, or at least changes slowly. In other words, we are assuming that it is reasonable to impute the a_k estimated retrospectively using a sample of 11-15 year olds in 2004 to 8 year-olds in 2004.[1] Though it seems unlikely that the distribution of *AE* would change substantially within such a short time, cohort effects in $\hat{a}_k$ can be investigated formally.

In Table 1, we calculate the gender-specific $\hat{a}_k$ separately for 11–14 year-olds and for 15–18 year-olds and then test whether the differences are significantly different from zero across the two cohorts. The bootstrap t-tests reveal no significant differences at any enrolment age. Thus, there is no noticeable shift in the distribution of enrolment ages across cohorts. This is true even though (as Figure 1 shows), there is a very substantial cohort effect in enrolment for girls.

[1]There is no way to calculate the $\hat{a}_k$ directly for cohorts just entering school in 2004 precisely because many have yet to enrol. It is also worth noting that age of school entrants was only asked in PRHS-04, not in the 2001 survey. This, however, is of little relevance for our procedure.

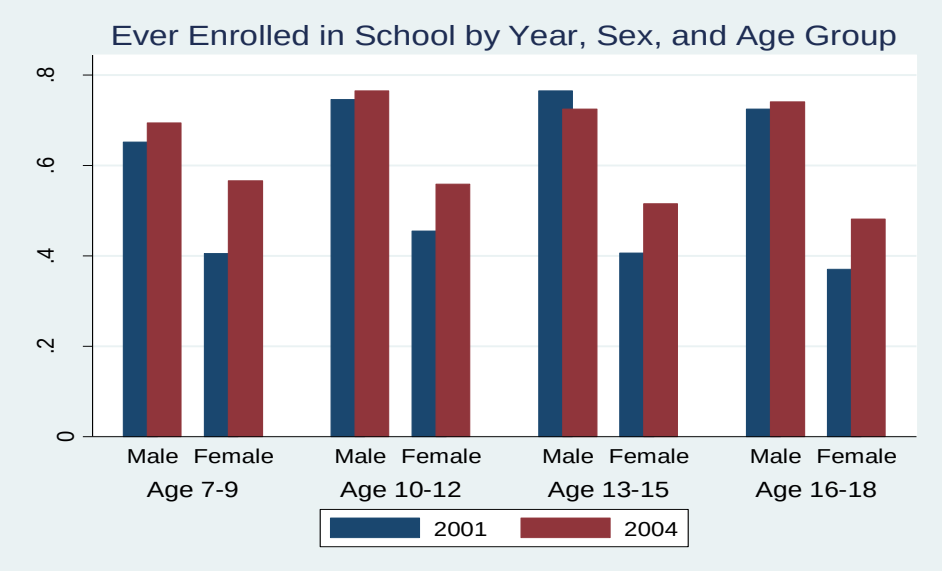
Table 1

Changes in Age of Enrolment Distribution by Cohort

	$\hat{a}_k$			Bootstrap
	11-14	15-18		*t*-test
k	cohort	cohort	Difference	(p-value)
			Boys	
6	0.177	0.206	-0.029	0.219
7	0.279	0.314	-0.035	0.206
8	0.325	0.372	-0.047	0.104
9	0.355	0.390	-0.034	0.238
10	0.374	0.407	-0.033	0.260
11	0.391	0.409	-0.018	0.544
12	0.395	0.411	-0.016	0.583
Sample Size	588	567		
			Girls	
6	0.114	0.101	0.013	0.525
7	0.183	0.190	-0.006	0.800
8	0.231	0.228	0.003	0.916
9	0.250	0.236	0.014	0.611
10	0.268	0.248	0.020	0.469
11	0.279	0.248	0.031	0.266
12	0.292	0.250	0.042	0.142
Sample Size	545	416		

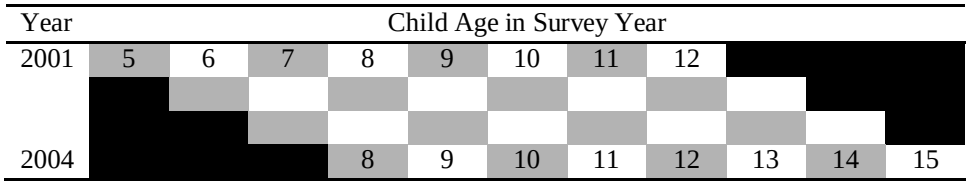
Notes: See text for definition of $\hat{a}_k$. Bootstraps use 1000 replications each.

Fig. 1. Proportion of Children Ever Enrolled in School.



3.2. Estimating the Period Effect

Having dealt with the age effect, we now consider the period effect in greater detail. In order to distinguish period and cohort effects, we must follow the same cohorts over calendar time. Our empirical analysis thus utilises the following sample structure:



In principle, one can use data from such a sample to estimate a full set of interactions between cohort and year; i.e.,

$$\tilde{e}_{it} = \sum_t \sum_j \alpha_{jt} \cdot I(cohort = j) \cdot I(year = t) + u_{it}$$

$$= \sum_j (\alpha_{j04} - \alpha_{j01}) \cdot I(cohort = j) \cdot I(year = 2004) + \sum_j \alpha_{j01} \cdot I(cohort = j) + u_{it} \qquad (5)$$

Equation (5) provides for a separate period effect for each cohort, $\alpha_{j04} - \alpha_{j01}$. Imposing the (testable) restriction of a common period effectdelivers the Equation (4).

Identification of period and cohort effects from Equations (4) (or (5)) does not require panel data. The decomposition could just as well be done using repeated cross sectional data and estimated using ordinary least squares. However, for comparability with the subsequent analysis (which does require household panel data), we estimate Equation (4) using household fixed effects. The choice between OLS and household fixed effects, at any rate, is of little consequence for the decomposition of year and cohort effects.

Note, finally, that, although we could do so in principle, we do not follow individual children over time; we only follow households. Thus, a given household might contribute a completely different set of children to the sample each round. Given our interest in the cumulative outcome "ever been enrolled", following individuals is not particularly useful. Since we do not, therefore, we remove *individual* fixed effects, the cohort effects do not drop out from Equation (4) as they otherwise would [see, e.g., Hall, *et al.* (2005)] and thus they can still be identified.

3.3. Results of the Decomposition

Given the imperative to maximise the number of cohorts followed over time, our sample for the decomposition differs from that underlying Figures 1 and 2. As already mentioned, we select only 5-12 year-olds in 2001 and 8-15 year-olds in 2004, giving a total estimation sample of 4705 (child-year) observations contributed by 1001 panel households. Two additional restrictions underlie this sample: First, we only choose children of household members, although for the age range we consider this is of little import since very few girls have yet married. Second, our sample excludes households that do not contribute at least one child in each survey round.

Table 2 reports the decomposition of enrolment trends into period and cohort effects, after netting out age effects. All coefficients are allowed to differ by sex. For purposes of comparison, specifications (1) and (2) use the 'raw' enrolment variable, e_{it}, and do not control for cohort, allowing only gender-specific period effects and intercepts. The difference between the two regressions is that the first is estimated by OLS, and the second by household fixed effects. As already indicated, including household fixed effects is of practically no consequence at this stage of the analysis.

Table 2

Decomposition of Enrolment Trend into Period and Cohort Effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Male x 2004	**0.114**	**0.115**	**0.017**	**0.017**	**0.017**	**0.014**	**0.013**
	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
	[0.000]	[0.000]	[0.231]	[0.220]	[0.223]	[0.339]	[0.353]
Female x 2004	**0.156**	**0.152**	**0.080**	**0.080**	**0.080**	**0.077**	**0.077**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Female	**–0.237**	**–0.234**	**–0.134**	**–0.055**	**0.002**	–	–
	(0.022)	(0.021)	(0.020)	(0.039)	(0.057)		
	[0.000]	[0.000]	[0.000]	[0.158]	[0.965]		
Male x Cohort					**-0.001**		**-0.003**
					(0.005)		(0.005)
					[0.860]		[0.605]
Female x Cohort					**–0.017**		**-0.019**
					(0.005)		(0.005)
					[0.000]		[0.000]
Fixed Effects	No	HH	HH	HH	HH	HH-sex	HH-sex
Age Effects (Adjusted)	No	No	Yes	Yes	Yes	Yes	Yes
Cohort Effects	No	No	No	Unres.	Linear	Unres.	Linear
F-test *p*-value *				0.779	0.218	0.375	0.405
Total Sample (Households)	4705	4705	4705	4705	4705	4587	4587
	(1001)	(1001)	(1001)	(1001)	(1001)	(985)	(985)

Notes: Standard errors adjusted for clustering on household in parentheses; *p*-values in square brackets.

* In specifications (4) and (6) the 14 restrictions tested are: all period effects are equal across cohorts for males and females; In specifications (5) and (7) the 12 restrictions tested are: gender-specific cohort dummies, which can be collapsed into gender-specific linear cohort trends.

Our adjustment for age effects, starting with specification (3), has a big impact on the estimated coefficients. This should be expected, given our sample structure. Children are 3 years younger on average in 2001 than in 2004 and for this reason alone are less likely to have enrolled in school. Not correcting for age effects thus greatly exaggerates the period effect. In specification (3) the period effect for boys essentially vanishes, while that for girls falls by about half as compared to specification (2).

Specifications (4) and (5) add cohort effects, in the first case by including an unrestricted set of cohort dummies, and in the second case, with a linear cohort trend. The linear trend cannot be rejected in favour of the unrestricted dummies. While there is no

significant cohort trend for boys, there is a negative trend for girls. That is, the later a girl was born the more likely she was to have been enrolled in school. The inclusion of cohort trends, however, does not affect the estimated period effect for either boys or girls. The insignificant *F*-test in Table 2 also indicates that a completely unrestricted model (cohort-year interaction dummies) fits the data no better than a restricted (common) period effect.

Looking at the behaviour of the female dummy coefficient across specifications (3)-(5), there are signs of a co-linearity problem. The female dummy and its interaction with the cohort trend are highly correlated with each other. So, it might be difficult to distinguish the effect of being a girl *per se* versus the effect of being a girl of successively later vintage. One way to avoid this problem is not to estimate the female effect in the first place. This can be accomplished by replacing household fixed effects with household-sex fixed effects, which absorb the female dummy (effective sample size falls a bit because there are some households contributing only a single girl or boy that must be dropped). Specifications (6) and (7) thus include household-sex fixed effects, while allowing for unrestricted and linear cohort trends. Once again, the linear trend cannot be rejected, while the remaining coefficients are virtually unaffected by the inclusion of household-sex fixed effects. Later we use specification (7) to deal with a similar, but even more severe, co-linearity problem.

4. EXPLAINING THE PERIOD EFFECT

The next step is to quantitatively assess the contribution of different economic factors to the period effects in enrolment. Our empirical approach is to re-estimate Equation (4), replacing the year dummy with a vector of time-varying regressors. Specifically, we focus on income growth and school construction.

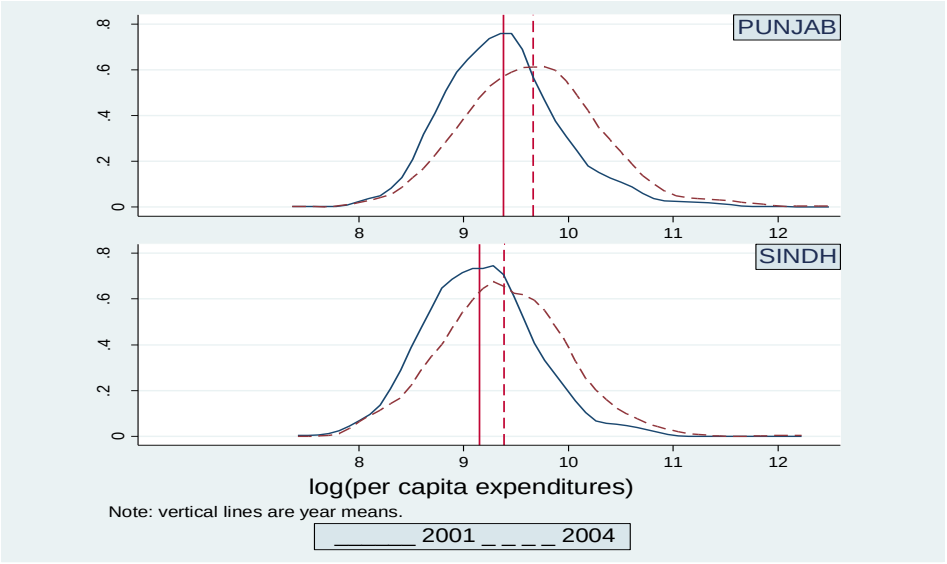
4.1. Income Growth

Our measure of income is per capita household expenditures.[2] The 2001 and 2004 PRHS surveys have essentially identical household expenditure modules, so the resulting expenditure aggregates are perfectly comparable across years after controlling for inflation. Figure 3 displays the distributions of log per capita expenditures by year and province based on the panel sample.[3] Household consumption grew substantially in both provinces; by around 28 percent on average in Punjab and by 23 percent in Sindh. As of 2004, the average household in Sindh had achieved almost the same income level as the average household in Punjab in 2001.

[2]Glewwe and Jacoby (2004) rationalise the use of household expenditures as a measure of the shadow value of wealth in the context of a dynamic model of human capital accumulation wherein child school enrolment and consumption are household decision variables. Thus, after properly accounting for endogeneity, the partial correlation between enrolment and consumption reflects a well-defined wealth effect on the demand for schooling.

[3]The panel sample may not be adequately representative of the rural population of the two provinces. In particular, 260 households from whom expenditure data were gathered in 2001 were not followed up in 2004. This sample loss was mainly due to administrative problems. A regression of 2001 log per capita expenditures on a province dummy and a dummy for whether the household does not appear in PRHS-04 reveals that, on average, base-year expenditures are 10 percent lower for households lost in 2004. However, this entire effect is due to 71 households from 4 villages (3 in Punjab, 1 in Sindh) that could not be revisited due to security concerns. Otherwise, the lost households are no different in terms of baseline wealth than those that were followed-up.

Fig. 3. Household Expenditure Distributions by Province



In a cross-section, household expenditures and child school enrolment are likely to be jointly determined and may thus be positively correlated for reasons having little to do with the increased affordability of schooling as income rises. Specifically, given positive schooling costs, any change (shock) in school enrolment independent of changes in wealth will be associated with a change in consumption. Having no direct way to handle such feedback,[4] we argue next that it should not cause significant bias.

Consider the stripped down regression model

$$e_{it} = \beta \log(C_{it}) + u_{it} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

with cohort effects suppressed and the period effect captured only by C_{it}, per-capita expenditures on all goods other than schooling. Conceptually, we would like C_{it} to represent *ex-ante* consumption; i.e., to reflect the resources available to the household *prior* to any change in enrolment. However, what we observe is *ex-post* consumption (or changes therein), which we denote by C'_{it}. It is reasonable to suppose that $C'_{it} = C_{it} - \gamma e_{it}$, where $\gamma > 0$, since enrolling a child in school reduces the resources that could otherwise be spent on the consumption of other goods, either because of direct education costs or the forgone income from the child's labour.

Assume now that total annualised per-child enrolment costs are proportional to ex-ante consumption; i.e. $\gamma = \delta C_{it}$. Thus, wealthier households pay proportionally more for tuition, books, uniforms, etc. and/or their children's time has a higher opportunity cost.

[4]In principle, it might be possible to instrument consumption changes with household characteristics that predict whether income grew over the relevant time period. For example, households with relatively more un-irrigated land would have been more affected by the 2001 drought, or households with more migrants in 2001 would have benefited more from the post-9/11 increase in foreign remittances. In practice, however, such instruments performed poorly in our data. This approach would also require a first-difference specification in household means of the enrolment variable as in Glewwe and Jacoby (2004).

Given this, the relationship between ex-post (observed) consumption and ex-ante consumption is $\ln(C'_{it}) = \ln(C_{it}) + \ln(1-\delta e_{it})$. Substituting into (6) gives

$$e_{it} = \beta \ln(C'_{it}) - \beta \ln(1-\delta) e_{it} + u_{it} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

The least squares estimate of β thus converges in probability to $\frac{\beta_0}{1+\beta_0 \ln(1-\delta)}$, which for δ not too large and $0 < \beta_0 < 1$ is approximately $\beta_0(1 + \beta_0\delta)$. So,

$$\frac{\hat{\beta}_{OLS} - \beta_0}{\beta_0} \cong \beta_0 \delta \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

which indicates that the bias in the least squares estimate is positive and, in percentage terms, is roughly equal to the true value of β times δ. In all of the empirical specifications below, none of which correct for feedback, the (over) estimates of β never exceed 0.3. We can be assured, therefore, that $\beta_0 < 0.3$. Thus, in order for the feedback bias in these estimates to exceed 10 percent, the value of δ would have to be greater than 0.33; in other words, enrolment costs per child would have to account for at least a third of ex-ante consumption! More realistic values of δ imply a negligible bias in $\hat{\beta}_{OLS}$.

Household expenditures may also be endogenous with respect to school enrolment decisions due to measurement error in expenditures. Noise in household expenditure data will result in the usual attenuation bias, which, in contrast to the case of feedback bias just discussed, can be quite substantial. To correct for this, we need an instrument correlated with household consumption expenditures, but not with the measurement error in this variable. A natural candidate is the village-year (leave-one-out) mean of expenditures as calculated from the full sample (i.e., including households that do not contribute children to the panel sample). As we will see, this instrument performs extremely well in terms of first-stage explanatory power.

4.2. School Construction

The 2004 PRHS includes a census of schools within each village. In addition to knowing the type of school (primary, middle or boys only, girls only, or mixed), we also have the date the school was established. Using this information, we can construct indicators for whether a girls' (boys') primary (middle) school was present in the village at the time of each survey. The same can be done for schools of given type within the *settlement* where the household resides, since most villages have multiple settlements. Due to mobility constraints, especially for girls, it may matter more that the appropriate school is located in the same settlement rather than merely in the same village.[5] On the other hand, establishing the very first girls' school in an entire village may have a greater effect on enrolment than adding the tenth school, even though that school happens to be in the same settlement.

[5]On mobility constraints for girls see Khan (1998), Jacoby and Mansuri (2010) and Jacoby and Mansuri (2013).

Because we include household fixed effects, identification of the impact of school availability on enrolment comes from schools that were established since 2001. Given that the panel sample covers only 93 villages with 274 settlements, there may not be enough new schools in the data to estimate the effects of interest. Indeed, this is a particular problem for boys' schools, as Table 3 indicates. For example, not a single one of our sample villages that did not have a boys' primary school prior to 2001 received one in the subsequent 3 years, although two settlements within these villages did get a new school. Likewise, there was a paucity of new middle school construction in these villages. Thus, the percentage of boy observations in our sample for which there is a change in school availability between 2001 and 2004 never exceeds one. For girls' schools the situation is somewhat better, so there may be hope of identifying school availability effects for girls.[6]

Table 3

Changes in School Availability 2001-2004

	Primary Schools	Middle Schools
Boys		
No. of Villages	0 (0.0)	1 (1.0)
No. of Settlements	2 (0.7)	1 (1.0)
Girls		
No. of Villages	2 (1.6)	2 (3.6)
No. of Settlements	6 (2.6)	3 (3.2)

Note: Percent of sample observations for that gender residing in relevant village or settlement in parentheses. There are a total of 93 villages and 274 settlements.

4.3. Main Results

Table 4 displays the determinants of the period effects. In other words, the gender-specific period effects in specification (5) of Table 2 are replaced here with log per capita expenditures interacted with a male and female dummy, as well as with girls' primary school availability in the village interacted with a female dummy. Given the lack of variation (see Table 3), we do not attempt to estimate school availability effects for boys.

The first specification is estimated using household fixed effects; the second deals with measurement error in expenditures using as instruments village leave-out means interacted with the gender dummies. Shea partial R^2s for the two first-stage regressions are quite high; 0.19 for the boy-expenditure interaction and 0.16 for the girl interaction. The second-stage expenditure coefficients behave exactly as one would expect with measurement error. The female coefficient, already positive and significant in the OLS, increases substantially in magnitude. The male income effect, meanwhile, remains insignificant across specifications. There is also some evidence that, for girls, the addition of a girls' primary school in the village increases enrolment.

[6]Primary school availability changes little in part because by 2001 nearly every village, and indeed many settlements, already had one. Specifically, in 2001, 99 (75) percent of the boys and 94 (69) percent of the girls in our sample had a primary school for their respective gender in their village (settlement).

Table 4

Determinants of Period Effects in School Enrolment

	(1)	(2)	(3)	(4)	(5)	(6)
Male x log(pcexp)	**0.017**	**–0.003**	**0.013**	**0.042**	**0.042**	**0.042**
	(0.019)	(0.046)	(0.021)	(0.050)	(0.050)	(0.050)
	[0.356]	[0.954]	[0.527]	[0.406]	[0.406]	[0.406]
Female x log(pcexp)	**0.072**	**0.262**	**0.068**	**0.185**	**0.170**	**0.186**
	(0.021)	(0.061)	(0.023)	(0.068)	(0.068)	(0.067)
	[0.001]	[0.000]	[0.003]	[0.006]	[0.012]	[0.006]
Female x girl's primary school	**0.183**	**0.158**	**0.385**	**0.366**	**0.368**	**0.289**
	(0.077)	(0.081)	(0.135)	(0.132)	(0.132)	(0.097)
	[0.018]	[0.052]	[0.004]	[0.005]	[0.005]	[0.003]
Female x girl's middle school	–	–	–	–	**0.132**	–
					(0.093)	
					[0.157]	
Female	**–0.633**	**–2.538**	–	–	–	–
	(0.244)	(0.637)				
	[0.010]	[0.000]				
Male x cohort	**0.000**	**–0.001**	**–0.002**	**–0.002**	**–0.002**	**–0.002**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	[0.953]	[0.869]	[0.685]	[0.685]	[0.685]	[0.685]
Female x cohort	**–0.018**	**–0.019**	**–0.019**	**–0.019**	**–0.019**	**–0.019**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Fixed effects	HH	HH	HH-sex	HH-sex	HH-sex	HH-sex
Total sample (households)	4628 (987)	4628 (987)	4508 (970)	4508 (970)	4508 (970)	4508 (970)
% period effect (female) explained by growth in						
Income + schools	26	84	30	67	68	68
Income only	22	81	22	59	55	60

Notes: Standard errors adjusted for clustering on household in parentheses; *p*-values in square brackets. Specifications (1) and (3) are estimated by fixed effects. Specifications (2), (4)-(6) are estimated by fixed effects-IV using interactions with the village-year leave-one-out mean of log (pcexp) as instruments. Specifications (1)-(5) define school availability at the village level, whereas specification (6) does so at the settlement level.

One worry, however, is the alarming increase in the female dummy variable coefficient, becoming unrealistically large in specification (2). The problem, again, is colinearity; this time between the female dummy and the female dummy interaction with log per capita expenditures. Mechanically, these two variables must be highly correlated, which they are, and instrumenting expenditures only exacerbates the problem. As before, our solution is to purge the female dummy altogether by including household-sex fixed

effects. Comparing specifications (3) and (4), then, yields a similar conclusion about the influence of measurement error in the expenditure coefficient, except that the estimated income effect is only about two-thirds as large as before (0.185 vs. 0.262). The primary school availability effect for girls more than doubles in magnitude, however.

The last two columns in Table 4 explore alternative specifications of the school availability effect for girls. In specification (5), we control for the presence of a middle school for girls in the village. While greater middle school availability does increase the likelihood of ever enrolling a girl, the effect is not significant and the coefficient is far less than the corresponding one for girls' primary schools. Specification (6) replicates specification (4) using girls' primary school availability at the settlement level. Recall from Table 3 that under this second definition of primary school availability somewhat more girls in our sample experience a change in availability over the 2001-04 period (2.6 percent versus 1.6 percent). The resulting primary school coefficient, however, is little changed.

By way of summary, we calculate the fraction of the period effect explained by changes in the time-varying covariates. This exercise is only relevant for girls, since period effects are negligible for boys. The second to last row in Table 4 shows that, for the preferred specifications (household-sex fixed effects with correction for measurement error), we can explain more than two-thirds of the period effect in girls' enrolment. The figures in the last row show that almost all of this is due to income growth; very little of the period effect is explained by growth in school availability, which is not surprising given that there is hardly any change in school availability in our sample.

4.4. Provincial Differences

We now turn to the question raised at the beginning: As we have seen, between 2001 and 2004, average income in Sindh rose to about the level of Punjab in 2001. Girls' school enrolment in Sindh followed a similar pattern, also rising to about the level observed in Punjab in 2001. Of course, this may just be coincidence; the fact that these trends line up by no means implies that the income rise in Sindh was entirely responsible for the increase in girls' enrolment.

To investigate the question, we present a province-level analysis in Table 5. By far the largest period effect for girls is in Sindh: In 2004, the proportion of girls who had ever enrolled in school was 13 percentage points higher than in 2001. Looking at province-specific results in specification (2), we see that the income effect is also by far the largest (and only significant) for girls in Sindh. The primary school availability effect, by contrast, is important only in Punjab; more precisely, it is only *estimable* in Punjab, because there was no change in school presence in any of the Sindh villages in our sample.

Even though girls' school enrolment in Sindh appears much more responsive to income changes than in Punjab, income growth explains less than half of the period effect in Sindh (see bottom of Table 5). This suggests that factors other than income must be responsible for at least half the convergence in girls' enrolment between Pakistan's two largest provinces. By the same token, it is unlikely that the 2001 gap in girls' enrolment between Punjab and Sindh can be mostly explained by Punjab's greater wealth.

Table 5

Province-level Decomposition of Enrolment Trends

	Punjab		**Sindh**		
	(1)	(2)	(1)	(2)	(3)
Male x 2004	**–0.009**	**–**	**0.040**	–	–
	(0.019)		(0.021)		
	[0.624]		[0.057]		
Female x 2004	**0.020**	**–**	**0.133**	–	–
	(0.019)		(0.024)		
	[0.306]		[0.000]		
Male x log(pcexp)	–	**0.005**	**–**	**0.071**	**0.071**
		(0.070)		(0.071)	(0.071)
		[0.942]		[0.314]	[0.314]
Female x log(pcexp)	–	**0.061**	**–**	**0.261**	**0.287**
		(0.082)		(0.098)	(0.104)
		[0.457]		[0.008]	[0.006]
Female x log(pcexp) x					**–0.521**
No girl's primary school in 2001					(0.194)
					[0.007]
Female x girl's primary	–	**0.386**	–	–	–
school (in village)		(0.136)			
		[0.004]			
Male x cohort	**0.003**	**0.004**	**–0.010**	**–0.010**	**–0.010**
	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
	[0.603]	[0.550]	[0.206]	[0.230]	[0.230]
Female x cohort	**–0.016**	**–0.016**	**–0.021**	**–0.022**	**–0.022**
	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
	[0.022]	[0.024]	[0.008]	[0.005]	[0.004]
Total sample	2374	2329	2213	2179	2179
(households)	(524)	(514)	(461)	(456)	(456)
% period effect (female) explained by growth in					
Income + schools		147		44	40
Income only		77		44	40

Notes: Standard errors adjusted for clustering on household in parentheses; *p*-values in square brackets. All specifications include household-gender fixed effects. Specifications with log (pcexp) interactions, are estimated by IV to correct for measurement error.

A final question to consider, as far as Sindh is concerned, is whether the response of girls' enrolment to income growth depends on school availability? In particular, for around 6 percent of girls in the Sindh subsample, no (girls') primary school existed in their village in 2001. Since they would have had no school to go to, it would be very surprising if the enrolment of these girls rose with household income. That this indeed did not happen is confirmed by the results in the final column of Table 5. The response

of enrolment to income growth for girls without a primary school in 2001 is not significantly different from zero (p-value = 0.15), whereas it remains significantly positive for girls who did have access to a village primary school.[7]

5. CONCLUSIONS

Recent years have seen a marked closing of the gender gap in school enrolment in rural Pakistan. This paper has shown how to use panel data to isolate changes in school entry attributable to shifting economic conditions. Using this approach, we have established that income growth has played an important role in drawing an increasing number of girls into school. Meanwhile, very little of the observed enrolment changes can be explained by new school construction.

Despite the enrolment gains observed in the 2001-2004 period, the overall gender gap in schooling remained significant and the findings of this paper suggest that the much lower girls' school enrolment observed in Sindh as compared to Punjab cannot be attributed entirely to the large income differences between the two provinces. A recent paper that focuses specifically on this residual gender gap [Jacoby and Mansuri (2013)], finds that much of the residual gender gap can be explained by social constraints. In particular, it finds that social stigma greatly discourages school enrolment among low-caste children, with low-caste girls, the most educationally disadvantaged group, being the worst affected. However, it also shows that low-caste households who can escape stigma invest at least as much in schooling as high caste households, indicating similar returns to schooling across caste groups. These results suggest that, from a policy perspective, it may be important to deliberately target gender specific social barriers to schooling in addition to any policies that target schooling demand through transfers.

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[7]The same exercise for primary schools within the *settlement* in 2001 yields similar, but statistically weaker, results. In this case, 26 percent of girls in the sample had no primary school in their settlement in 2001.

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Data Note

Pakistan Panel Household Survey: Sample Size and Attrition

DURR-E-NAYAB and G. M. ARIF

1. INTRODUCTION AND BACKGROUND

The socio-economic databases in Pakistan, as in most countries, can be classified into three broad categories, namely registration-based statistics, data produced by different population censuses and household survey-based data. The registration system of births and deaths in Pakistan has historically been inadequate [Afzal and Ahmed (1974)] and the population censuses have not been carried out regularly. The household surveys such as Pakistan Demographic Survey (PDS), Labour Force Survey (LFS) and Household Income Expenditure Survey (HIES) have been periodically conducted since the 1960s. These surveys have filled the data gaps created by the weak registration system and the irregularity in conducting censuses. The data generated by the household surveys have also enabled social scientists to examine a wide range of issues, including natural increase in population, education, employment, poverty, health, nutrition, and housing. All these surveys are, however, cross-sectional in nature so it is not possible to gauge the dynamics of these social and economic processes, for example the transition from school to labour market, movement into or out of poverty, movement of labour from one state of employment to another. A proper understanding of such dynamics requires longitudinal or panel datasets where the same households are visited over time. Since panel surveys are complex and expensive to carry out, they are not as commonly conducted as the cross-sectional surveys anywhere in the world and in Pakistan they are even rarer.

One of the available panel surveys in Pakistan has been conducted by International Food Policy Research Institute (IFPRI) over a period of five years from 1986 to 1991 covering 800 households. The IFPRI sample comprised rural areas of only four districts with no representation from Balochistan and urban areas of the country. In these five years the sampled households were almost visited biannually. Another two-round panel data available in the country is that of the Pakistan Socio-Economic Survey (PSES) carried out by the Pakistan Institute of Development Economics (PIDE) in 1998-99 and

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2001 in the rural as well as urban areas of Pakistan. Both the IFPRI and the PSES panels could not be continued after the above-mentioned rounds.

In 2001, the PIDE took a major initiative, with the financial assistance of the World Bank, to revisit the IFPRI panel households after a gap of 10 years. The sample was expanded from four to 16 districts, adding districts from all four provinces. Continuing to be a rural survey, it was named the Pakistan Rural Household Survey (PRHS). The second round of the PRHS was carried out in 2004 while the third round was completed in 2010. The third round marked the addition of the urban sample to the existing survey design of the PRHS, as a result—the Survey was named as the Pakistan Panel Household Survey (PPHS).

Attrition bias can affect the findings of the subsequent rounds of a panel survey, so it is important to examine the extent of sample attrition and determine whether it is random or has affected the representativeness of the panel sample. After conducting three rounds of the PRHS-PPHS there is a need to evaluate the panel dataset for attrition bias. The present paper looks into the socio-demographic profile of the sample over the three rounds and evaluates the presence, or otherwise, of an attrition bias. The paper, thus, has three major objectives, which are to:

(a) Describe the sample size of three rounds of the panel survey
(b) Analyse the extent of sample attrition and analyse whether it is random, and
(c) Examine the socio-demographic dynamics of household covered in three rounds.

2. SELECTION OF DISTRICTS AND PRIMARY SAMPLING UNITS (PSUs)

As noted earlier, the IFPRI panel (1986-1991) was limited to the rural areas of four districts, namely Dir in Khyber Pakhtunkhwa (KP), Attock and Faisalabad in Punjab and Badin in Sindh. A rural sample based on these districts cannot be considered representative of the rural areas spread across more than 100 districts of the country. To give more representation to the uncovered areas 12 new districts were added to the PRHS-I round carried out in 2001. From KP two new districts, Mardan and Lakki Marwat, were added to give representation to the Peshawar-Mardan valley and the Kohat-Dera Ismail Khan belt, respectively. The Hazara belt of KP still needs to be added for an even better representation. Three districts from south Punjab (Bahawalpur, Vehari and Muzaffargarh) and one district from central Punjab (Hafizabad) were also included in the PRHS-I. By this addition, all the three broad regions of Punjab, north, central and south, have their representation in the panel survey (Table 1). The three added districts from Sindh were Mirpurkhas, Nawabshah and Larkana. Balochistan was not part of the IFPRI panel so the PRHS included three districts from Balochistan, namely Loralai, Khuzdar and Gawadar (Table 1).

For the rural sample a village or deh is considered as the PSU. Table 1 presents the number of rural PSUs by district. It is noteworthy that there were 43 PSUs (or village/deh) in four districts of the IFPRI panel (Attock, Dir, Badin and Faisalabad). From the 12 new districts, PRHS selected 98 more PSUs (villages/deh) randomly. The total rural PSUs, after all the additions and inclusions, now stand at 141 as can be seen in Table 1. For details regarding each selected PSU, their respective tehsils, districts and provinces see Table A1, A2, A3 and A4 in the Annexure.

Table 1

Primary Sampling Units (PSUs) by Province and District

Province	Districts	Number of PSUs	
		Rural	Urban[c]
Punjab	Faisalabad[a]	6	16
	Attock[a]	7	4
	Hafizabad[b]	10	4
	Vehari[b]	10	4
	Muzaffargarh[b]	9	4
	Bahawalpur[b]	9	7
Sindh	Badin[a]	19	3
	Nawab Shah[b]	8	4
	Mirpur Khas[b]	8	4
	Larkana[b]	11	7
KP	Dir[a]	11	2
	Mardan[b]	7	6
	Lakki Marwat[b]	5	2
Balochistan	Loralai[b]	7	2
	Khuzdar[b]	7	3
	Gwadar[b]	7	3
	Total	141	75

Note: PRHS-I (2001) and PPHS (2010) covered all districts. PRHS-II (2004) was limited to 10 districts of Punjab and Sindh.

a. Districts included in the IFPRI panel.

b. New districts added since 2001.

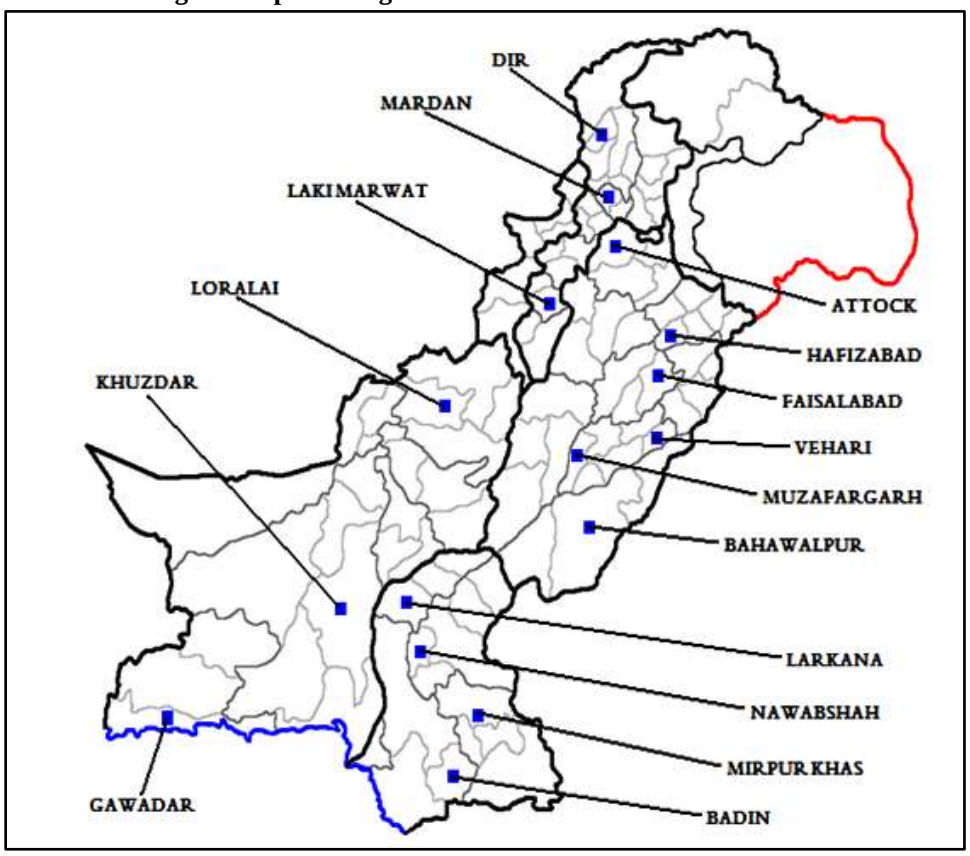
c. Included only in PPHS-2010.

It is worth mentioning here that the second round of the panel survey, PRHS-II, was carried out only in the rural areas of Punjab and Sindh. Because of security concerns the other two provinces, KP and Balochistan, could not be covered in this round.

The urban sample was added in the third round (PPHS) carried out in 2010 in all 16 districts. A selected district was the stratum for the urban sample. All the urban localities in each district were divided into enumeration blocks, consisting of 200 to 250 households in each block. In total, 75 urban enumeration blocks (PSUs) were selected randomly for the third round (PPHS-2010).

The scatter of the selected districts, as can be seen from Figure 1, is a good indicator of the geographical coverage of the districts covered under the PPHS. The sample covers the whole of the country, strengthening its representativeness.

Fig. 1. Map Showing Selected Districts for the PPHS-2010



3. HANDLING THE SPLIT HOUSEHOLDS

Before discussing the sample size, it is important to understand how the split households have been dealt with in the panel survey. A split household is defined as a new household where at least one member of an original panel household has moved in and is living permanently. This movement of a member from a panel household to a new household could be due to his/her decision to live separately with his/her family or due to marriage of a female member. If split households are not handled properly, the demographic composition of the sampled households is likely to change over time.

In the rounds two and three of the PRHS-PPHS split households were also interviewed. They, however, were only those households that were residing in the same village as the original panel household. In other words, movement of panel households or their members residing out of the sampled villages were not followed because of the high costs involved in this type of follow-up.

4. SAMPLE SIZE OVER THE DIFFERENT ROUNDS

The size of the sample for each round of the panel survey is shown in Table 2. The total size varies from 2721 households in 2001 to 4142 households in 2010. These variations, as discussed earlier, are for three reasons. First, the PRHS-II carried out in 2004 was limited to

two provinces, Punjab and Sindh, while the other two rounds covered all four provinces. Second, in the PRHS-II as well as the PPHS-2010, split households were also interviewed (Table 2). Third, urban sample was added in the third round, PPHS, 2010.

As can be seen from Table 2, in the PRHS-I, carried out in 2001, the total sample consisted of 2721 rural households. The sample size decreased to 1614 households in PRHS-II (2004) because of the non-coverage of two provinces. However, 293 split households were interviewed in PRHS-II to raise the total sample size to 1907 households. Table 2 shows that in the PPHS-2010 the total rural households interviewed in four provinces were 2800, out of which 2198 were panel households and the remaining 602 were split households. With the addition of 1342 urban households, the total sample size of the PPHS 2010 accounted for a total of 4142 households (Table 2).

Table 2

Households Covered during the Three Waves of the Panel Survey

		PRHS-II 2004			PPHS-2010				
	PRHS-I 2001	Panel House-holds	Split House-holds	Total	Panel House-holds	Split House-holds	Total Rural house-holds	Urban House-holds	Total Sample
Pakistan	2721	1614	293	1907	2198	602	2800	1342	4142
Punjab	1071	933	146	1079	893	328	1221	657	1878
Sindh	808	681	147	828	663	189	852	359	1211
KP	447	–	–	–	377	58	435	166	601
Balochistan	395	–	–	–	265	27	292	160	452

Source: PRHS 2001, 2004 and PPHS 2010 micro-datasets.

Four features of the three rounds of the panel data are noteworthy, which are as follows:

(i) Urban households, which have been included for the first time in the sample in the third round (PPHS) held in 2010, are not panel households. Essentially, the urban sample can be analysed as a cross-sectional dataset at present and after their coverage in the next round of the survey they can be treated as panel households.

(ii) Split households are not strictly panel households, particularly those where a female has moved due to her marriage. Thus, the matching of split households with the original panel households is not a straightforward exercise. While doing any analysis the split households need to be handled carefully.

(iii) Only the rural sampled households in Punjab and Sindh are covered in all three rounds, so the analysis of the three-wave data is restricted to these two provinces.

(iv) For the analysis of all rural areas covering four provinces, panel data are available for the 2001 and 2010 rounds.

5. SCOPE OF THE PANEL SURVEY

The scope of the panel survey is examined in terms of the types of information (modules) gathered through the structured questionnaires. In all three rounds, two separate questionnaires for male and female respondents were prepared and different modules were included in these questionnaires (Table 3). A two-member team of

enumerators, one male and one female, visited each sampled household to gather information. Female enumerators were responsible to fill the household roster and pass it immediately to her male counterpart. Education and employment modules were included in both male and female questionnaires but the relevant information regarding children (under 5 years old), both male and female, was recorded in the female questionnaire. One major objective of the PRHS-PPHS panel survey has been to examine the movement into or out of poverty therefore a detailed consumption expenditure module has been a part of the female questionnaire in all the three rounds. Expenditures on durable items, however, were recorded in the male questionnaire. Health and migration modules were included in PRHS-I and PPHS 2010 rounds. A module on household-run businesses and enterprises was part of the latter two rounds as well.

Each round of the survey has had certain specific areas of focus. Agriculture, for example, was the main focus of the PRHS-I when information even at the plot level was collected from the land operating households. In the other two rounds only a brief agriculture module was included. The main focus of the PRHS-II was mental health, dowry, inheritance and marriage-related transfers. The PPHS-2010 was conducted at a time when inflation was high and the nation had also faced some natural disasters including droughts and floods. In the latest round modules on shocks, food security, subjective wellbeing and overall security were specially included in the questionnaire.

In short, the scope of the three rounds of the panel survey is wide. A variety of social, demographic and economic issues can be explored from these rounds. While some core modules are common to all rounds, there are others that are specific to a certain round. Some of the information is, thus, cross-sectional in nature but can be linked to the household socio-demographic dynamics made available through the core modules.

Table 3

Scope of the Panel Survey: Modules included in Household Questionnaires

	PRHS-1 (2001)		PRHS-II (2004)		PPHS (2010)	
Modules	Male	Female	Male	Female	Male	Female
Household Roster	√	√	√	√	√	√
Education	√	√	√	√	√	√
Agriculture	√	×	√	×	√	×
Non-Farm Enterprises	√	×	×	×	√	×
Employment	√	√	√	√	√	√
Migration	√	×	√	×	√	×
Consumption	√	√	√	√	√	√
Credit	√	×	√	×	√	×
Livestock Ownership	×	√	×	√	×	√
Housing	×	√	×	×	×	√
Health	×	√	×	√	×	√
Dowry and Inheritance	×	√	×	√	×	×
Mental Health	×	×	×	√	×	×
Marital History and Marriage Related Transfers	×	×	×	√	×	×
Shocks and Coping Strategies	×	×	×	×	×	√
Household Assets	×	×	×	×	×	√
Household Food Security	×	×	×	×	×	√
Security	×	×	×	×	√	√
Subjective Welfare	×	×	×	×	√	√
Business and Enterprises	×	×	×	×	√	×
Transfer/Assistance from Programme and Individuals	×	×	×	×	√	×

6. AN ANALYSIS OF THE SAMPLE ATTRITION

As shown earlier, in the PRHS-PPHS data have been collected from the same households over three points of time- 2001, 2004 and 2010. It is common in such surveys that some participants (households) drop out from the original sample for a variety of reasons including geographical movement and refusal to continue being part of the panel. This attrition of the original sample represents a potential threat of bias if the attritors are systematically different from the non-attritors. It can lead to 'attrition bias' because the remaining sample becomes different from the original sample [Miller and Hollist (2007)]. If the participating units, however, are not dropped out systematically, meaning that there are no distinctive characteristics among the attriting units, then there is no attrition bias even though the sample has decreased between waves. It is, therefore, important to examine the attrition bias in our panel survey.

6.1. Theoretical Considerations[1]

Attrition in panel surveys is one type of non-response. At a conceptual level, many of the insights regarding the non-response in cross-sections carry over to panels. According to Fitzgerald, *et al.* (1998), attrition bias is associated with models of selection bias. Their statistical framework for the analysis of attrition bias, which has been used by several other studies [see for example, Alderman, *et al.* (20000; Thomas, *et al.* (2001); Aughinbaugh (2004)], makes a distinction between selection of variables observed in the data and variables that are unobserved. Alderman, *et al.* (2000) believe that, 'if there is sample attrition, then it has to be seen whether or not there is selection of observables. Selection of observables includes selection based on endogenous observables, which occurs prior to attrition (e.g. in the first round of the survey). Even if there is selection of observables, this does not necessarily bias the estimates of interest. Thus, one needs to test for possible attrition bias in the estimates of interest as well' [Alderman, *et al.* (2000)].

Assume that the object of interest is a conditional population density $f(y|x)$ where y is scalar dependent variable and x is a scalar independent variable (for illustration, but in practice making x a vector is straightforward):

$$y = \beta_0 + \beta_1 + \varepsilon, \; y \text{ observed if } A=0 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

where A is an attrition indicator equal to 1 if an observation is missing its value y because of attrition, and equal to zero if an observation is not missing its value y. Since (1) can be estimated only if $A=0$ that is, one can only determine $g(y|x, (A=0))$, one needs additional information or restrictions to infer $f(.)$ from $g(.)$, which can be derived from the probability of attrition, $PR(A=0|y, x, z)$, where z is an auxiliary variable (or vector) that is assumed to be observable for all units but not included in x. This leads us to the estimation of the following form:

$$A^* = \delta_0 + \delta_1 x + \delta_2 z + V \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

$$A = I \text{ if } A^* \geq 0 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$
$$= 0 \text{ if } A^* < 0$$

[1]This sub-section depends heavily on Arif and Biquees (2006) who have examined the attrition bias between two rounds of the Pakistan Socio-Economic Survey (PSES) carried out in 1998-99 and 2001 by the Pakistan Institute of Development Economics.

If there is selection of observables, the critical variable is *z*, a variable that affects attrition propensities and is also related to the density of *y* conditional on *x*. In this sense, *z* is "endogenous to y". Indeed, a lagged value of *y* can play the role of *z* if it does not have structural relationship with attrition. Two sufficient conditions for the absence of attrition bias due to attrition of observables are either (1) *z* does not affect *A* or (2) *z* is independent of *y* conditional on *x*. Specification test can be carried out of either of these two conditions. One test is simply to determine whether candidates for *z* (for example, lagged value of *y*) significantly affect *A*. Another test is based on Beketti, *et al.* (1988), and is known as BGLW test. It has been applied by Fitzgerald, *et al.* (1998) and Alderman, *et al.* (2000). In the BGLW test, the value of *y* at the initial wave of the survey (y_0) is regressed on *x* and on *A*. This test is closely related to the test based on regressing *A* and *x* and y_0 (which is *z* in this case); in fact, two equations are simply inverses of one another [Fitzgerald, *et al.* (1998)]. Clearly, if there is no evidence of attrition bias from these specification tests, then one has the desired information on $f(y|x)$.

6.2. Extent of Attrition

Table 4 presents the attrition rate for different rounds. Between 2001 and 2010, the attrition rate was around 20 percent while the rate for the 2004 to 2010 period was 25 percent, suggesting some households had dropped in 2004 and re-entered the panel in 2010. For the 2004-10 period, the highest attrition rate is found in Balochistan hinting towards more movement of sampled households than in other provinces.

Table 4

Sample Attrition Rates of Panel Households—Rural

(%)

	2001-2004	2001-2010	2004-2010
Pakistan	14.1	19.6	24.9
Punjab	12.9	17.1	23.8
Sindh	15.7	18.3	26.2
KPK	–	16.1	–
Balochistan	–	33.2	–

Source: Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.

6.3. Attrition Bias

As stated earlier, the urban sample was included in the panel survey in 2010 for the first time and hence the attrition issue is related to the rural sample. It has also been noted that the PRHS-II was limited to two large provinces, Punjab and Sindh. All the rural areas were covered in round I (2001) and round III (2010). The attrition bias is examined between the two waves 2001 and 2010. Five models have been estimated where the dependent variable is whether attrition occurred between these two rounds (1= yes; 0 = no), results for which are presented in Table 5. The sample used in these models consists of all 2001 households and all regressors are measured in 2001.

Table 5

Determinants of Attrition through Logit Regression

Correlates (2001/02)	Model 1	Model 2	Model 3	Model 4	Model 5
Log per capita consumption	–0.286*	–0.342*	–0.353*	–0.214**	–0.152***
Log household size		–0.257*	–0.177***	–0.014	0.056
Households with 1 or 2 family members only (yes=1)			0.416***	0.426***	0.353
Age of head of household (years)				0.001	0.003
Age-square of head of household				0.000	0.000
Female headed households (yes=1)				0.378	0.493***
Literacy of the head (literate=1)				–0.138	0.010
Livestock owned (yes=1)				–0.443*	–0.451*
land owned (yes=1)				–0.280*	–0.377*
Provinces (Punjab as ref.)					
Sindh					–0.009
KPK					–0.021
Balochistan					0.910*
Constant	0.580	1.458**	1.36**	0.926	0.222
LR chi-square	11.93 (1)	19.35(2)	21.63(3)	53.71 (9)	102.63 (12)
Log likelihood	–1353.789	–1350.079	–1348.941	–1332.229	–1307.268
Observations	2,714	2,714	2,714	2,711	2,711

Source: Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.
Note: ***P<0.01; ** P<0.05, * P<0.10.

Following Thomas, *et al*. (2001) and Arif and Bilquees (2006), the first model of attrition includes the only one covariate, ln(PCE), where per capita consumption (PCE) is used as a measure of households' economic status. Table 5 presents coefficient estimates from the logit regressions. The first model indicates that there is a statistically significant negative relationship between PCE and the probability of leaving the panel. On average, lower economic status households were more likely to attrite between the two waves, so without weighting, the PPHS-2010 would be lesser representative of lower economic status households than would be a random household survey.

In model 2, two variables, ln(PCE) and ln(household size) have been included. Both PCE and family size (in 2001) are positively and significantly associated with a household staying part of the subsequent round of the panel survey. The third model in Table 5 adds one dummy, that of a household consisting of only one or two members. The association between attrition and PCE and household size still remains negatively significant. On the other hand, small size households (with 1 or 2 members) show a significant association with attrition.

Model 4 included measures related to three characteristics of the head of the household, which are age, sex and literacy. None of these variables turned out to be statistically significant. Two economic variables, ownership of livestock and land, and provincial dummies are added in model 5. Both the economic variables are significantly associated with keeping households part of the panel and maintaining them as non-attritors (see Table 5). Among the provinces, households in Balochistan are more likely to leave the sample than households located in other provinces. It is evident from the multivariate analyses that there is a positive association between leaving the panel and small household size. Improving economic status of the household is statistically significant to keep the household in the sample, so it is mainly the poorer households that are attriting.

As discussed in the beginning of this section, BGLW test, introduced and used initially by Becketti, *et al.* (1988), is the other method of testing the attrition bias. This test examines whether those who subsequently leave the sample are systematically different from those who stay in terms of their initial behavioural relationships. We estimate the consumption (lnPCE) equations as well as poverty equations, dividing the survey participants into two subsets—all 2001 households, and those still in the sample in 2010, labelled as 'Always in' or non-attritors.

Tables 6 and 7 present estimates of OLS regression for consumption equations and logit estimates for poverty equations respectively. A standard set of household and the head of the household characteristics, including age, and literacy of the head of the household, family size, and ownership of dwelling unit and livestock have been entered as independent variables into these equations. All the estimates are significant, as can be seen from Table 6 and Table 7. These estimates indicate a number of associations that are consistent with widely-held perceptions about consumption behaviour and poverty. For example, age and literacy of the head of the households have a positive impact on consumption while they are negatively associated with poverty. A similar pattern of association was also found for family size as it has a positive association with poverty but a negative relation with the per capita consumption expenditure. The ownership of both livestock and land has a positive association with per capita expenditure, but a negative relation with the incidence of poverty.

Table 6

Household Expenditure: OLS Regression Model 2001-2010

	Full Sample		'Always in'(Non-attrition)		t-difference
Variables	Coefficients	St. Error	Coefficients	St. Error	test
Age (years)	–0.001	0.004	0.001	0.004	–0.500
Age^2	0.000	0.000	0.000	0.000	0.000
Literacy (literate=1)	0.196*	0.023	0.190*	0.025	0.251
Family Size	–0.032*	0.003	–0.036*	0.003	1.333
Land Ownership (yes=1)	0.255*	0.023	0.252*	0.025	0.125
Livestock	0.142*	0.025	0.133*	0.028	0.341
Own House (yes=1)	–0.104**	0.047	–0.134**	0.055	0.592
Constant	6.838*	0.105	6.870*	0.117	–0.290
F-stat	56.46		47.66		–
R-square	0.1305		0.1367		–
Observations	2,642		2,115		–

Source: Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.

***P<0.01; ** P<0.05, * P<0.10.

Table 7

Correlates of Poverty: Logistic Regression Model 2001-2010

	Full Sample		'Always in'(Non-attritors)		t-difference
Correlates	Coefficients	St. Error	Coefficients	St. Error	test
Age (years)	0.025	0.019	0.022	0.022	0.147
Age^2	0.000***	0.000	0.000	0.000	0.000
Literacy (literate=1)	–0.545*	0.102	–0.504*	0.117	–0.376
Family Size	0.093*	0.011	0.108*	0.013	–1.257
Land Ownership (yes=1)	–0.827*	0.102	–0.840*	0.116	0.120
Livestock (yes=1)	–0.592*	0.105	–0.504*	0.122	–0.780
Own House (yes=1)	0.538**	0.210	0.639**	0.263	–0.430
Constant	–1.817*	0.483	–1.994*	0.568	0.339
LR chi-square	206.39		160.22		–
Log likelihood	–1374.198		–1058.706		–
Observations	2,642		2,115		–

Source: Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.
*** P<0.01; **P<0.05; * P<0.1.

Our interest here, however, is more in the difference that the attritors might have made to the sample. To ascertain this we apply the t-difference test with the following hypotheses and assumption:

H_0: No significant difference between attritor and non-attritor.
H_1: Significant difference exists between attritor and non-attritor.
Assumption: unequal sample size, unequal variance.

The t-difference test results (see last columns of Table 6 and 7) show that there are no significant differences between the set of coefficients for the sub-sample of those missing in the follow-up versus the sub-sample of those re-interviewed for indicators of either consumption or poverty. These estimates, therefore, suggest that the coefficient estimates of standard background variables are not affected by sample attrition.

7. CONCLUSION

The PRHS-PPHS panel is a rich source of information regarding a range of socio-economic and demographic processes, and a means to understand their dynamics over time. Along with having a few core modules the panel questionnaire is flexible enough to accommodate any particular area of interest in a specific round without affecting the overall efficiency of the survey design. Addition of the urban sample in 2010 to the previously all rural sample has made the panel design even more comprehensive. With three rounds having been carried out so far, in 2001, 2004 and 2010, the panel sample retains its qualities despite all the attritions and the phenomenon of split households.

ANNEXURES

Table A1

Sample list for Pakistan Panel Household Survey 2010: Punjab

Province	Code	District	Code	Tehsil	Code	Village	Code
Punjab	1	Faisalabad	1	Faisalabad	1	Saddon 206RB	1
				Jaranawala	2	Sing Pura	2
				Gojra	3	Jarwanwala Chak	3
				Summandri	4	Subdarawala 363JB	4
						Khalishabad 356JB	5
						Summandri	6
		Attock	2	Feth Jang	5	Khirala Kalan	7
				Pindi Ghaip	6	Thathi Gogra	8
						Kareema	9
						Hattar	10
						Makyal	11
						Gulyal	13
						Dhock Qazi	14
		Hafizabad	5	Pindi Bhatian	11	Khatteshah	53
						Nasowal	54
						Khidde	55
						Bahoman	56
						Daulu Kalan	57
						Bagh Khona	58
						Shah Behlol	59
						Purniki	60
						Thata Karam Dad	61
						Mona	62
		Vehari	6	Mailsi	12	Chak No 118–WB	63
						Chak No 190 WB	64
						Kot Soro	65
						Chak No 195 WB	66
						Mandan	67
						Kot Muzzfar	68
						Muradabad	69
						Chak No 109 WB	70
						Chak No 166- WB	71
						Maqsooda	72
Punjab	1	Muzafar Garh	7	Ali Pur	13	Mail Manjeeth	73
						Makhan Bela	74
						Tibbah Barrah	75
						Malik Arain	76
						Kohar Faqiran	77
						NauAbad	78
						Kundi	79
						Nabi Pur	81
						Kotla Afghan	82
		Bahawalpur	8	Ahmed Pur East	14	Ghunia	83
						Chak No 157- N.P.	84
						Haji Jhabali	85
						Mad Rashid	87
						Mukhawara	88
						Pipli Rajan	89
						Qadir Pur	90
						Ladpan Wali	91
						Chak Dawancha	92

Table A2

Sample list for Pakistan Panel Household Survey 2010: Sindh

Province	Code	District	Code	Tehsil	Code	Village	Code
Sindh	2	Badin	3	Badin	7	Kerandi	21
				Golarchi	8	Kalhorki	22
						Shaikhpur	23
						Khoro	24
						Khirdi	25
						Bhameri	26
						Walhar	27
						Parharki	28
						Golarchi	29
						Lucky	30
						Nurlut	31
						Mitho Debo	32
						Sorahdi	33
						Chakri	34
						Fatehpur	35
						Mari Wasayo	36
						Bajhshan	37
						Khirion	39
						Kandiari	40
		Nawab Shah	9	Daulat Pur	15	Jagpal	93
						Kandhari	94
						Khar	95
						Sindal Kamal	96
						Kaka	97
						Bogri	98
						Manhro	99
						Uttar Sawri	100
		Mir Pur Khas	10	Kot G. Mohammad	16	Deh 277	101
						Deh 320	102
						Deh 346	103
						Deh 339A	104
						Deh 306	105
						Deh 302	106
						Deh 285	107
						Deh 257	108
		Larkana	11	Qamber Ali	17	Chacha	109
				Rato Dero	18	Dera	112
						Laktia	113
						Do-Abo	114
						Nather	115
						Haslla	116
						Sanjar Abro	117
						Khan Wah	118
						Khuda Bux	120
						Naudero	121
						Saidu Dero	122

Table A3

Sample list for Pakistan Panel Household Survey 2010: Khyber Pakhtunkhwa

Province	Code	District	Code	Tehsil	Code	Village	Code
KP	3	Dir	4	Blambut Adenzal	9	Katigram	41
						Batam	42
						Shah Alam Baba	43
						Bakandi	44
						Khanpur	45
						Kamangara	46
						Malakand	47
						Khema	48
						Khazana	49
						Shehzadi	50
						Munjal	51
		Mardan	12	Takht Bhai	19	Khan Killi	125
						Dagal	126
						Jangirabad	127
						Saidabad	129
						Mian Killi	130
						Fethabad	131
						Seri Behial	133
		L. Marwat	13	L. Marwat	20	Nar Akbar	135
						Nar Langar	136
						Alwal Khel	138
						Gorka	141
						Ghazi Khel	142

Table A4

Sample list for Pakistan Panel Household Survey 2010: Balochistan

Province	Code	District	Code	Tehsil	Code	Village	Code
Balochistan	4	Loralai	14	Loralai	21	Sanghri	145
						Urd Shahboza	146
						Sor Ghand	147
						Nigang	148
						Marah Khurd	149
						Mekhtar	150
						Tor	151
		Khuzdar	15	Khuzdar	22	Bajori Kalan	153
						Ghorawah	154
						Bhat	155
						Khat Kapper	156
						Sabzal Khan	157
						Khorri	159
						Par Pakdari	160
		Gawadar	16	Gawadar	23	Ankra	161
						Chibab Rekhani	162
						Dhorgati	163
						Grandani	164
						Nigar Sharif	165
						Shinkani Dar	167
						Sur Bandar	168

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