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# Decomposing Distributional Changes in Pakistan

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## Abstract

This paper quantifies the contributions to distributional changes observed in Pakistan over the last decade. In contrast to methods that focus on aggregate summary statistics, the method adopted in this paper generates entire counterfactual distributions to account for the contributions of demographics, labor and non-labor incomes in explaining poverty reduction. The results show that the most important contributor was the growth in income. Moreover, this growth in income seems to be driven by returns to individual and household endowments, pointing to productivity increases as the driving force behind poverty reduction. Lower dependency ratios, transfers and remittances also contributed to poverty reduction, albeit to a smaller extent. Growth in productivity, particularly between 2001-02 and 2005-06 is consistent with estimates from aggregate accounts, which points to productivity growth led by movements of labor force away from agriculture and into industry and services. If the objective is to reach similar or accelerated poverty reduction and productivity growth going forward, increased investment in rural areas will be needed.

# Decomposing Distributional Changes in Pakistan

**Gabriela Inchauste and Hernan Winkler**

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## Summary

1. Despite volatile growth, poverty declined in Pakistan over the last decade. The objective of this paper is to quantify the contributions of different factors towards poverty reduction and distributional changes over the last decade.

2. Poverty headcount fell from 34.7% in 2001-02 to 21.9% in 2005-06, and recent analysis has shown that this trend continued through 2007-08. Despite these improvements, it should be noted that inequality increased during this period, as consumption grew fastest at the top of the distribution. The decline in poverty relied on growth, while redistribution worked against it.

3. The most important contributor to poverty reduction was growth in labor income. In particular, increases in returns to workers' characteristics explain most of the poverty decline between 2001-02 and 2007-08. In particular, returns to nonfarm work were the most important factor in reducing poverty, accounting for 34% of the reduction in poverty during the first half of the decade. In other words, the relative price of labor increased, consistent with an increase in productivity. Second, population growth has slowed down resulting in an increase in share of economically active population. At the same time, there was significant migration from rural to urban areas. These demographic changes explain 13% of the observed poverty reduction between 2001-02 and 2005-06. Third, even though overall labor force participation declined, there was an increase in share of salaried workers, while the share of unpaid family workers declined. This occupational shift contributed 6% to poverty reduction. Fourth, the increase in educational levels of labor force contributed to 6% of poverty reduction. Finally, pensions, social assistance, donations and remittances explain 13% of poverty reduction in the first half of the decade.

4. The paper complements this analysis by investigating the factors that contributed to increase in per capita GDP during this period using aggregate data. First, we find that the increase in employment and productivity helps explain most of the increase in growth during the first half of the decade. Although growth in output-per-worker was highest in services sector, and movements away from agriculture also contributed to higher productivity, it is important to note that agriculture still accounted for 19% of the total increase in output-per-worker, which was as large as the contribution made by industry.

5. To ensure these positive trends continue going forward, it will be important to spur investment that can raise employment and continue to increase output-per-worker through investments in capital stock. The focus should be in rural areas, spurring movements from farm to nonfarm work, thereby improving productivity throughout the economy and generating the virtuous cycle observed in the first half of the 2000s.

## Introduction

6. Despite volatile growth, poverty declined in Pakistan over the last decade. What are the factors behind the observed poverty and distributional changes? Was the observed reduction in poverty a result of higher employment, higher productivity, higher remittances, or higher transfers? Was it the result of changes in sectoral composition of employment? To what extent were these changes the result of improved human capital characteristics? Can we learn what worked in the past decade to improve outcomes going forward?

7. The objective of this paper is to quantify, based on a series of counterfactual simulations, the contributions of different factors towards poverty reduction and distributional changes in Pakistan over the last decade. The paper focuses attention on the period of highest growth, between 2001-02 and 2005-06, for which representative household surveys are available, but complements with estimates for 2007-08. In contrast to methods that focus on aggregate summary statistics, the methods adopted in this paper generate entire counterfactual distributions, allowing decomposition of contributions of the changes in different sources of income and in individual and household characteristics to the observed distributional changes. The paper complements this micro approach with a standard decomposition of per-capita income growth based on national accounts data. This effort is made to ensure consistency between the results coming from aggregate data and what we learn from decomposing household survey data.

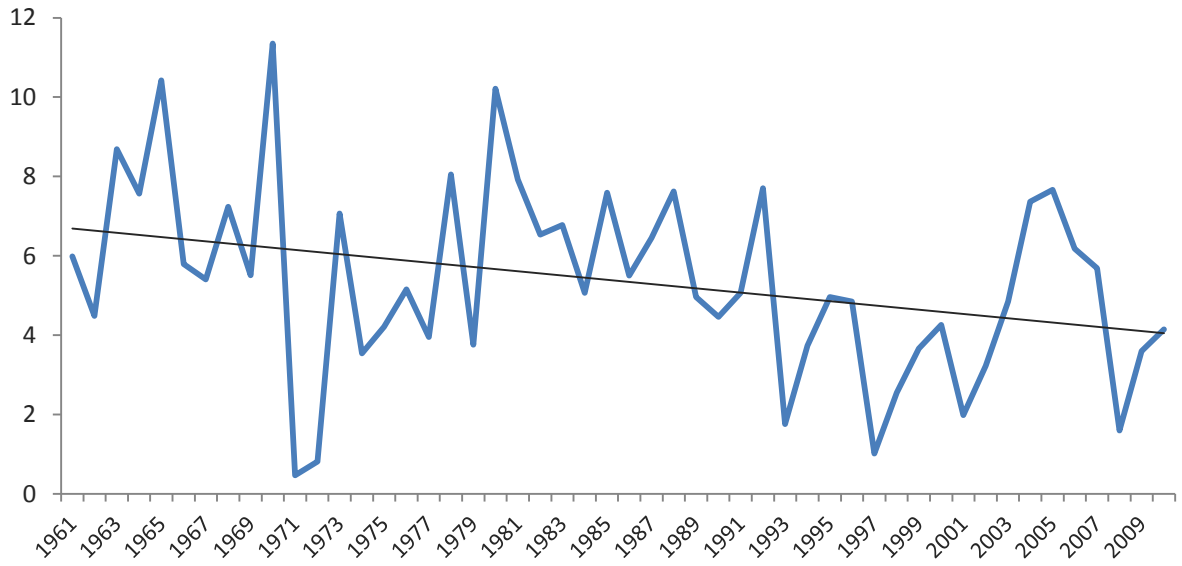
8. The results suggest that the most important contributor to poverty reduction was the growth in income, driven by labor market returns to individual and household endowments, pointing to an increase in relative price of labor and an increase in productivity. In particular, returns to nonfarm work were the most important factor in reducing poverty. Lower dependency ratios, transfers and remittances also contributed to poverty reduction, albeit to a smaller extent. Growth in productivity, particularly between 2001-02 and 2005-06 is consistent with estimates from aggregate accounts, which points to productivity growth led by a higher capital-to-labor ratio. If the objective is to reach similar or accelerated poverty reduction and productivity growth going forward, continued efforts to spur private investment, particularly in rural areas will be needed.

9. Subsequent to this introduction the paper describes the evolution of poverty and economic growth in Pakistan, highlighting similarities and differences in the initial and end period outcomes. It then presents a simple approach, the results of which serve as a basis for the in-depth approach, presented subsequently. The paper concludes by identifying the growth in income of households as been driven by higher returns to individual characteristics and household endowments.

## Country Context

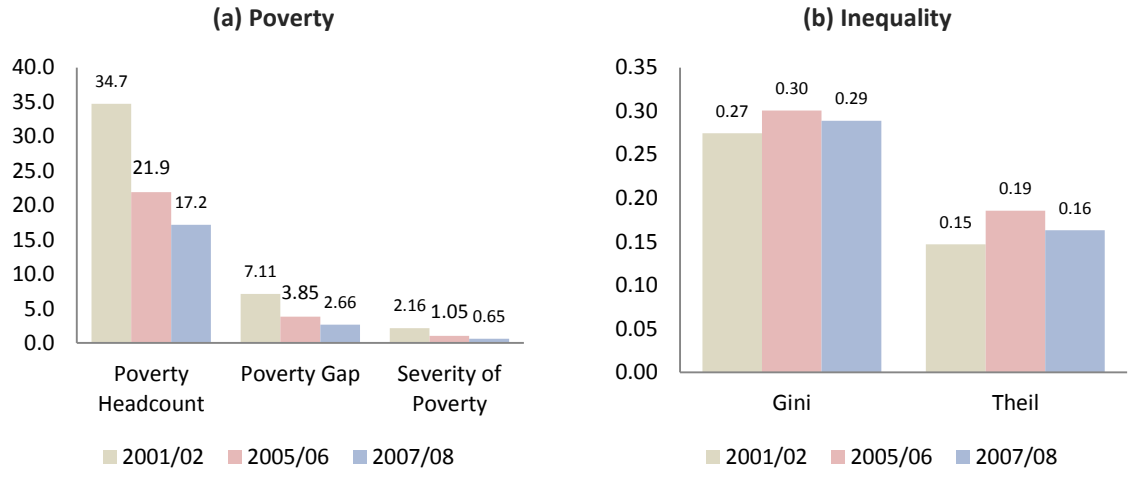
10. GDP growth over the last decade averaged 4.5% a year, marked by high volatility, representing a continued decline from the 1980s when growth averaged nearly 7% a year (Figure 1). Overall growth performance has been disappointing, especially when compared to other regional economies. However, there was an important growth spurt in GDP during 2004-07 when annual growth averaged over 7%.

**Figure 1** Pakistan: Real GDP Growth (Annual Percentage Change)




11. During this growth spurt, growth was accompanied by a decline in poverty, particularly in early part of the decade. Poverty headcount fell from 34.7% in 2001-02 to 21.9% in 2005-06 (Figure 2a). Both the poverty gap, as well as the severity also declined, and recent analysis has shown that this trend continued through 2007-08. Despite these improvements, it should be noted that inequality increased during this period, as consumption grew fastest at the top of the distribution (Figure 2b).

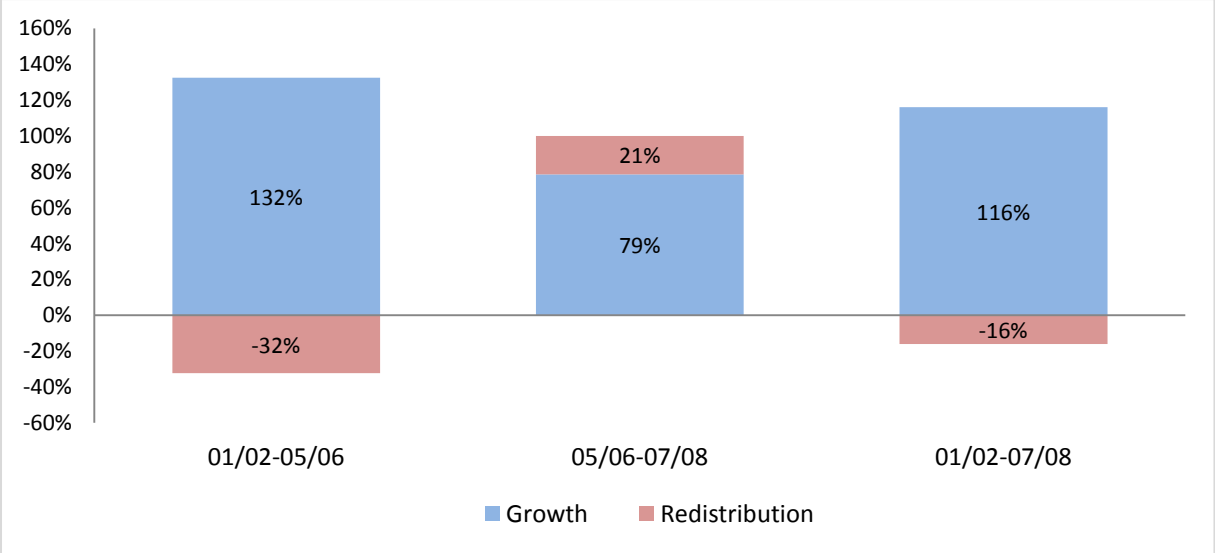
**Figure 2** Pakistan: Poverty and Inequality




*Source: PSLM 2001-02, 2005-06 and 2007-08*

12. Was the observed reduction in poverty due to growth or redistribution? There is considerable evidence that economic growth is strongly and negatively correlated with changes in poverty (Ravallion and Chen, 2007). Using the standard Datt-Ravallion decomposition, growth does explain all of the observed reduction in poverty (Figure 3). The decline in poverty relied on growth, while redistribution worked against it. Note that these are estimates of the reduced-form relationships between economic growth, inequality and poverty. Although these decompositions have been useful to identify empirical regularities, they focus on changes in poverty on basis of changes in summary statistics that come from observed distribution. As such, they are unable to make explicit the links between growth and poverty reduction (Ferreira, 2010).

**Figure 3** **Datt-Ravallion Decomposition of Poverty Changes** (Contributions to Poverty Reduction)




*Source: Own estimates based on PSLM 2001-02, 2005-06 and 2007-08*

13. In order to capture the heterogeneity of impacts throughout the distribution, and account for the contributions to poverty reduction stemming from changes in demographics, the sectoral, occupational, regional structure of employment and other labor and non-labor changes, a richer method is required.[1] This paper aims to make the link between poverty reduction and growth in Pakistan more explicit using micro decomposition methods.[2] At the micro level, there are several factors that could have led to poverty reduction both through observed changes in the labor market, as well as through the effects of government transfers and international remittances. The next section highlights each of these effects.

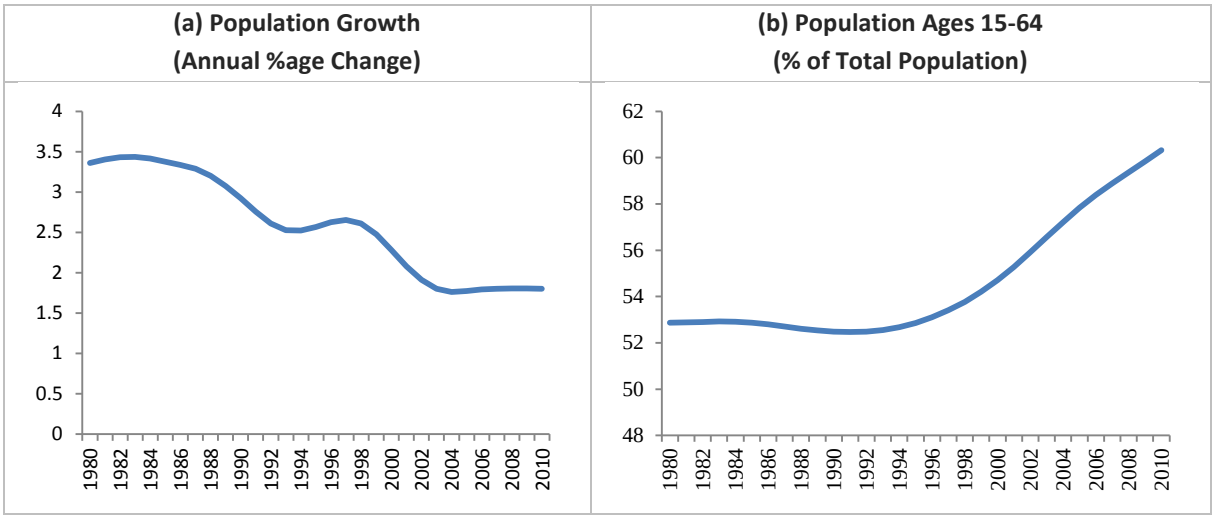
[1] Panel data that can track the life and labor histories of households over time can be used to answer questions about economic mobility and poverty dynamics. However, panels are often not available with the frequency required. Moreover, panel data are often not representative of the population as a whole; and if they initially are, it is unlikely that over the course of a decade the panel would remain representative of the population. Alternative methods using repeated cross sections have been used. One approach is to construct pseudo panels, which can delve into some issues of economic mobility (Lanjouw et.al. 2011).However these models are often troubled by their lack of precision and the fact that they often do not measure the contributions of different factors to poverty reduction.

[2] For a full review of micro-decomposition methods see Essama-Nssah (2012).

## Elements That Could Impact Poverty Reduction

14. First, demographics could have played a role in reducing poverty. As shown in Figure 4, population growth slowed down at the beginning of the decade, resulting in an increase in the share of economically active population. This is evident by the slight decrease in the average household size, with a slight increase in the number of adults in each household (Table 1). One would expect that a higher number of adults per household would imply lower dependency rates and therefore potentially higher consumption per capita and lower poverty rates. The question is how important this effect was in the observed changes in poverty during the past decade.

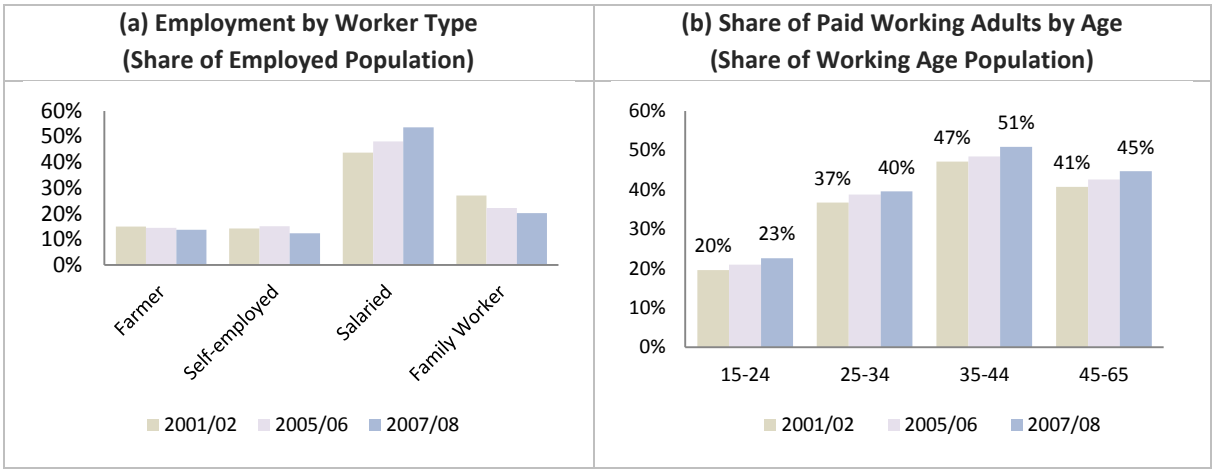
**Figure 4** Demographic Changes




*Source: United Nations World Population Prospects*

15. Second, simple summary statistics show that overall labor force participation declined, mostly because female labor force participation declined, as did the share of employed women (Table 1). However, this masks the fact that there was an increase in the share of salaried workers, while the share of unpaid family workers declined. This change in occupation could have important poverty reducing effects, as the share of adults with paid jobs increased throughout the distribution (Figure 5).

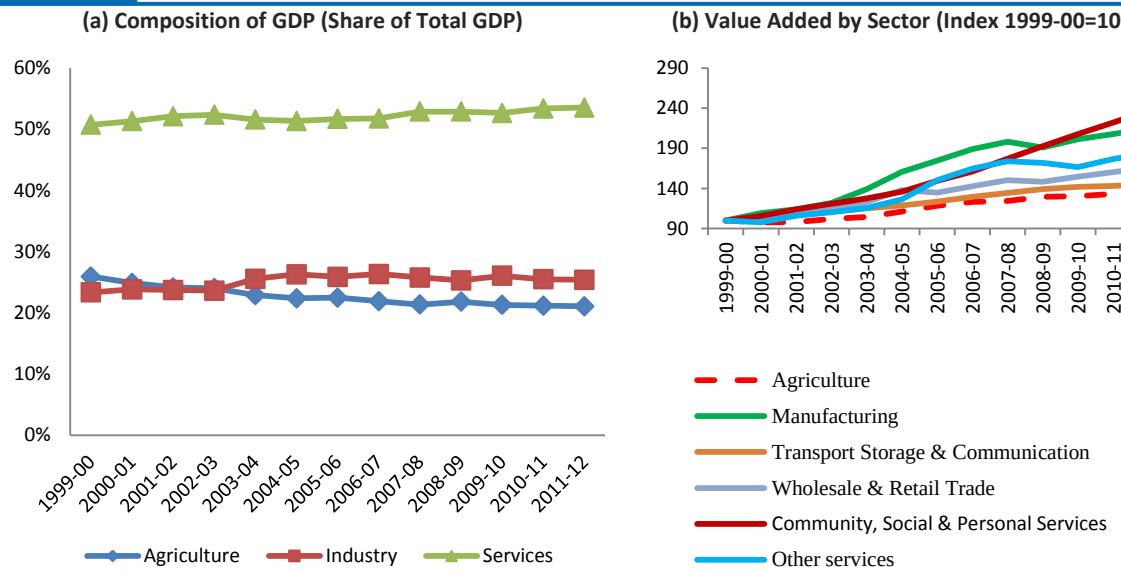
**Figure 5** Employment




*Source: PSLM 2001-02, 2005-06 and 2007-08*

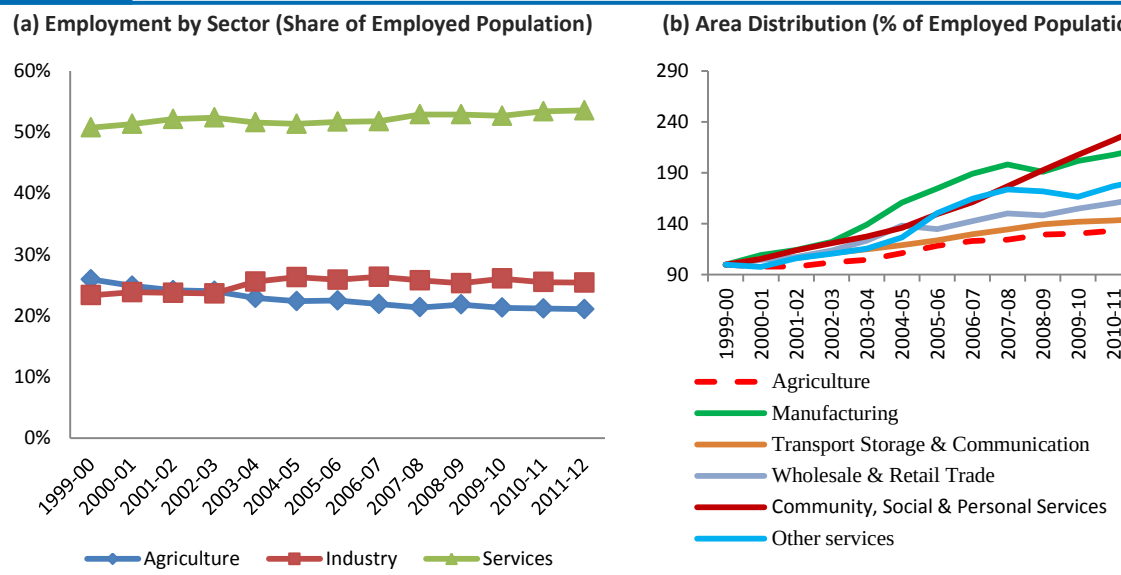
16. A third factor that could be behind the observed reductions in poverty is the composition of employment. As shown in Figure 6, there was a sectoral shift towards industry and services, as growth in these sectors was slightly higher than in agriculture. This shift was reflected in a decline in share of employment in agriculture, and an increase in the share of employment in the service sector in urban centers across all regions of the country (Table 1 and Figure 7). The question is to what extent these sectoral shifts in employment accounted for the observed reduction in poverty and slight increase in inequality.

**Figure 6** Changes in Structure of Employed Population




*Source: Pakistan Bureau of Statistics,Government of Pakistan*

**Figure 7** Changes in Structure of Employed Population

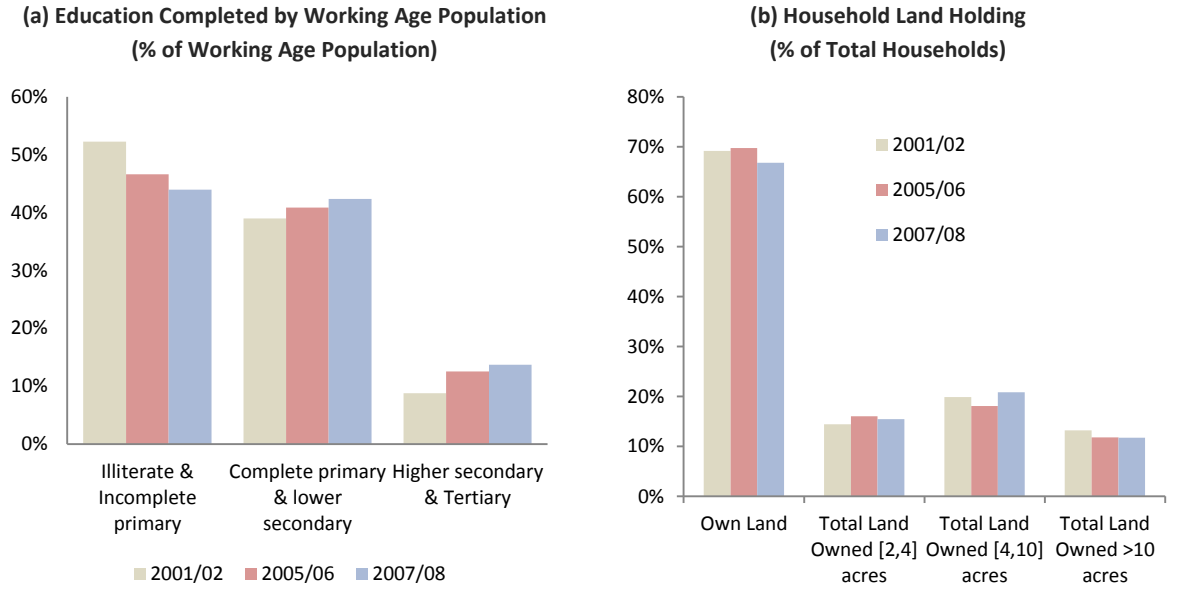



*Source: Pakistan Bureau of Statistics,Government of Pakistan*

17. A fourth contender for explaining the observed distributional changes are changes in endowments, including human capital characteristics such as education and experience, as well as physical endowments, such as land holdings. As shown in Figure 8a, the level of education improved over the last decade, with a smaller share of the population being

illiterate at the end of the decade, and a higher share of the work-force having completed primary and lower secondary school. In terms of physical endowments, we find that land holdings remained relatively stable (Figure 8b), however, the returns to land could have increased, potentially reducing poverty.

**Figure 8** Changes in Structure of Working Age Population

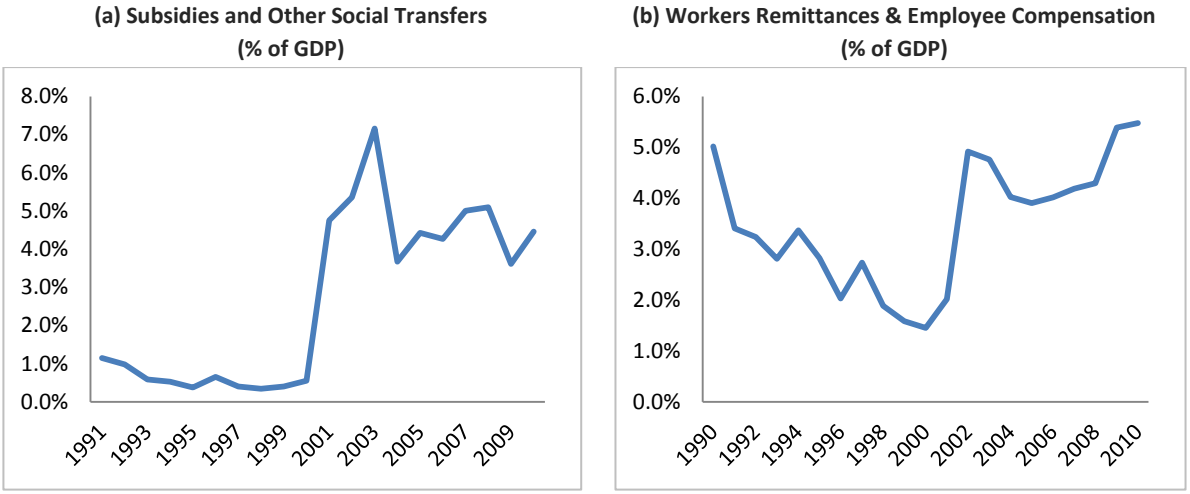



*Source: PSLM 2001-02, 2005-06 and 2007-08*

18. Finally, growth in non-labor income could have also led to reduction of poverty. Figure 9 shows that transfers and remittances increased substantially over the last decade. Subsidies and transfers increased from an average of 0.6% of GDP in the 1990s to an average of 4.4% of GDP in the 2000s. Although the impact of public transfers in explaining poverty reduction depends on how well targeted and effective spending is, it could have potentially made a large difference for the poor. With regard to private transfers, recorded remittances increased by nearly 50% over the last decade, growing from 2.7% of GDP on average in the 1990s to 3.9% of GDP in the 2000s. The question is how important these changes have been to poverty reduction.

19. The result of this analysis is interesting from a policy perspective for various reasons. First, if demographic trends and declining dependency ratios were largely responsible for changes in poverty, then population projections can help to distinguish whether this is likely to continue going forward. Second, to the extent that poverty reduction has had more to do with higher labor incomes rather than with public social transfers, this may highlight the type of economic growth that is necessary to ensure continued poverty reduction going forward. Additionally, one might question the effectiveness of transfers to redistribute and increase the incomes of the poorest.

**Figure 9** Non-Labor Income Growth




*Source: World Development Indicator 2012*

Note: Subsidies and transfers include subsidies, grants and other social benefits including all unrequited, non-repayable transfers on current account to private and public enterprises; grants to foreign governments, international organizations and other government units; and social security, social assistance benefits and employer social benefits in cash and in kind.

Workers' remittances and compensation of employees comprise current transfers by migrant workers and wages and salaries earned by nonresident workers. Data are the sum of three items defined in the fifth edition of the IMF's Balance of Payments Manual: Workers' Remittances, Compensation of Employees and Migrants' Transfers

## Micro-Decomposition Approach

20. In order to quantify the relative importance of each of the factors described above, a model that allows for simulations of each of the factors described above is needed in order to construct counterfactual scenarios in which each of the factors are modified sequentially. We begin by describing the underlying model, and then report on how the estimates of these models are used to form counterfactual distributions, and the respective measures of poverty and inequality. Finally, we present the results of decompositions that use these counterfactual distributions.

### *Model*

21. Let consumption per capita in household *h* be defined by:

$$C_h = \frac{1}{n}[\theta_h y_h] \qquad (1)$$

where n is the number of people in household h, $\theta_h$ is the consumption to income ratio, which includes the propensity to consume in household h, and measurement error or underreporting of household income. If we further disaggregate income by its sources, we can rewrite (1) as:

$$C_h = \frac{\theta_h}{n}\left[y_h^w + y_h^{se} + \pi_h^F + y_h^{NL}\right] \qquad (2)$$

where $y_h^w$, and $y_h^{SE}$ are household salaried labor, and self-employed (nonfarm) labor income respectively, $\pi_h^F$ is the farm household net revenue function, and $y_h^{NL}$ is household non-labor income. We slightly modify the Bourguignon and Ferreira (2005) approach and model the household income generating function as:

$$y_h = \left[\sum_{i=1}^{n} I_{hi}^w y_{hi}^w(X_{hi}, \Omega^w) + \sum_{i=1}^{n} I_{hi}^{se} y_{hi}^{se}(X_{hi}, \Omega^{se}) + \pi_h^F(W_h, \Omega^F) + y_h^{NL}\right] \qquad (3)$$

where $I_{hi}^w$, and $I_{hi}^{se}$ are indicator variables which are equal to one if individual i in household h is a salaried or self-employed worker; $y_{hi}^w$, and $y_{hi}^{se}$ are the corresponding earnings of individual i in household h which depend on individual and household endowments ($X_{hi}$) and returns to those endowments ($\Omega$); $\pi_h^F$ is household net revenue in farm activities, which depends on household endowments ($W_{hi}$) and returns to those endowments; and $y_h^{NL}$ is household non-labor income.

22. The allocation of individuals across occupations is represented through a multinomial logit model (McFadden 1974a, 1974b), specified as follows:

$$I_{hi}^s = 1 \text{ if } Z_{hi}\Psi^s + v_i^s > Max\left(0, Z_{hi}\Psi^j + v_i^j\right), j = 1, \dots, J, \forall j \neq s \qquad (4)$$
$$I_{hi}^s = 0 \text{ for all } s = 1, \dots, J \text{ if } Z_{hi}\Psi^s + v_i^s \leq 0 \text{ for all } s = 1, \dots, J$$

where $Z_{hi}$ is a vector of characteristics specific to individual i and household h, $\Psi^s$ are vectors of coefficients, for the following activities j={salaried, self-employed, not employed}, and $v_i^s$ are random variables identically and independently distributed across individuals and activities according to the law of extreme values. Within a discrete utility-maximizing framework, $Z_{hi}\Psi^s + v_i^s$ is interpreted as the utility associated with activity s, with $v_i^s$ being the unobserved utility determinants of activity s and the utility of inactivity being arbitrarily set to 0. Similarly, following

Bourguignon, Ferreira and Leite (2008) we estimate a multinomial logit model for the educational choice and sector in which individuals are employed. This allows for a representation of the occupational, sectoral and educational composition of the work force.

23. We model the heterogeneity in individual earnings in each occupation type j by a log-linear Mincer model:

$$\log(y_{hi}^{j}) = X_{hi}\Omega^{j} + \varepsilon_{hi}^{j} \text{ for } i = 1, \dots, n_h \quad (5)$$

where $X_{hi}$ is a vector of individual characteristics, $\Omega^{j}$ a vector of coefficients, and $\varepsilon_{hi}^{j}$ a random variable supposed to be distributed identically and independently across individuals, according to the standard normal law. Farm net revenue is modeled as:

$$\log \pi_h^F = W_h\Omega^F + \varepsilon_h^F \quad (6)$$

Where $W_h = (K_h, X_h)$ include endowments and household characteristics. As before, $\Omega^F$are vectors of coefficients, and $\varepsilon_h^F$ are random variables distributed as a standard normal.

## Estimation and Counterfactual Distributions

24. Given the model described above, we implement the decomposition in four stages. First, we estimate the determinants of occupational choice, sectoral choice and level of education for two periods during the last decade.[3] Tables 2 and 3 presents simulations for the educational structure, occupation and economic sectors using these regressions compared to the actual structures during the early and late part of the decade for household heads and other family members, respectively.[4] Overall, the simulated structures are close to the true structures, which gives us confidence that we can use the results of the specifications of these models to simulate shifts in the labor force structure.[5]

25. Second, we estimate the earnings regressions for each period for household heads and other household members, distinguishing between salaried and self-employed workers. Similarly, we estimate a net farm revenue regression for farm households. Table 4 presents the results for individuals engaged in non-farm activities. The results show that the models fit the data relatively well, with coefficients being statistically significant and of the right sign. In all cases, higher individual earnings are associated with being male, having higher education and experience, living in urban areas, and belonging to the services sector. Table 5 presents results of net revenue for farm households. As expected, net revenue for farmers increases with experience, land acres, the household size and the share of adult members.

26. Next, we use the coefficients from these regressions to simulate counterfactual distributions by changing one element at a time. For instance, since we estimated the returns to education in two periods, we can take the estimated parameters in the first period and evaluate the earnings equations with the second period's levels of education. This generates counterfactual earnings at the individual level, which can then be aggregated to get the corresponding household income, and through equation (1) a counterfactual distribution of consumption from which we can estimate the poverty rate. In this way, changing one set of parameters at a time or one characteristic at a time, we obtain multiple counterfactual distributions and counterfactual poverty rates. The methodology for estimating each counterfactual distribution and the associated counterfactual poverty rate is detailed in Annexure 1.

27. Finally, we compare these counterfactual distributions to the observed changes in distribution in order to identify each factor's contribution to changes in poverty. Since replacing the first period parameters into last period data will yield results that are different from doing it the other way around, we calculate the counterfactual both ways and then take the average (in line with the literature). Since each change in endowment or characteristic is likely to be related with every other characteristic, we compute the cumulative effects of each of these endowments in order to capture the interactions between each of the endowments. For this purpose, we follow Bourguignon, Ferreira and Leite (2008), and begin by calculating

[3] Note that the occupational choice model does not allow the change in occupation between the agricultural self-employment and others because agricultural income is captured at the household level, given the difficulty in separating the individual incomes which would allow for this change. Given the large movement in employment between the agricultural sector and others the contribution to poverty reduction stemming from this change is not captured, and will be part of the unexplained component in the overall change in poverty.

[4] Tables A1, A2 and A3 in Annexure 1 present the multinomial logit regression results for occupational choice for household heads, spouses and other members respectively.

[5] P-values of Pearson Chi-squared tests confirm that each simulated distribution is not statistically different from the actual distribution.

the effects of changes in the characteristics of the population, beginning with age and gender, followed by changes in geographical, educational, occupational and sectoral structure of the population. With these results we then calculate changes in farm and nonfarm earnings, on account of changes in the returns to these characteristics, followed by changes in nonlabor incomes, and finally, changes in the consumption to income ratio.[6]

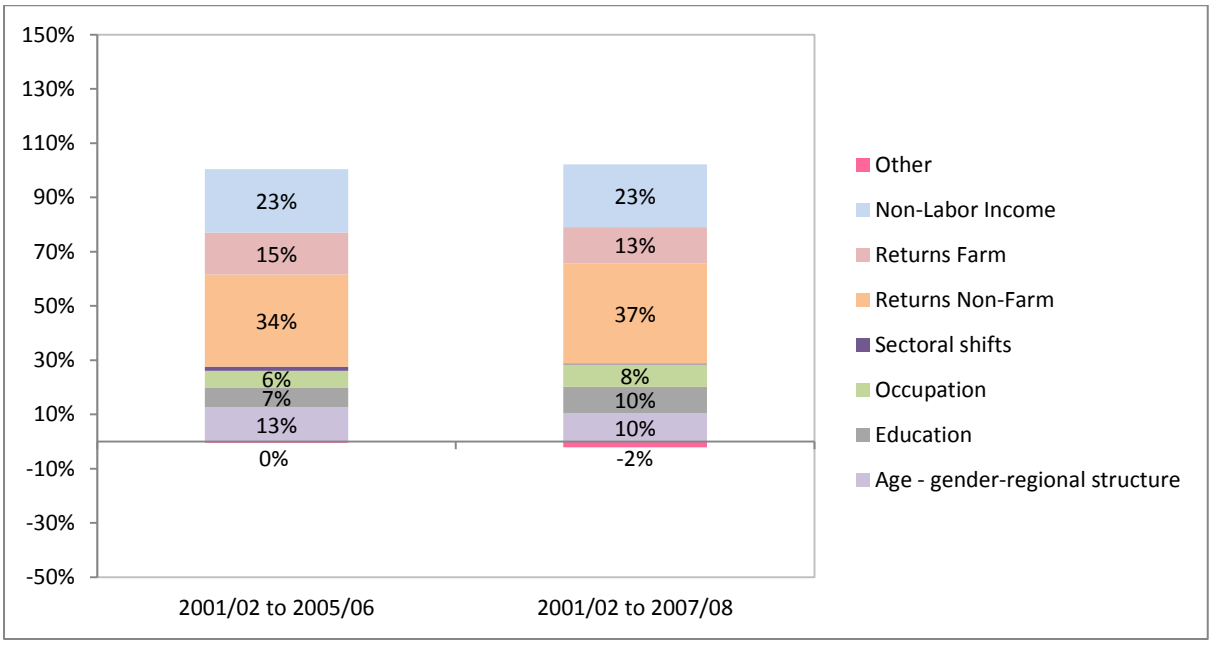
[6] In order to simplify the exposition of results, in what follows we do not report the impact of changes in the consumption-to-income ratio. Including this analysis does not change the substance of the results; however they are included for completion in Annexure 2.

## Decomposition Results

28. Table 6 shows that the largest contribution to poverty reduction was the increase in returns to endowments or characteristics. The returns to endowments in the nonfarm sector account for 34% and 37% of the reduction in poverty between 2001-02 and 2005-06 and between 2001-02 and 2007-08 respectively, while the returns to endowments in the farm sector account for 15% and 13% of the reduction in poverty between 2001-02 and 2005-06 and between 2001-02 and 2007-08 respectively. These results point to an increase in relative price of labor, consistent with an increase in productivity, particularly in the nonfarm sector (Figure 10).

29. Although changes in educational, regional, occupational and sectoral composition of employment contributed to reduction in poverty, this effect was smaller. For instance, the move away from agriculture only accounted for 1% of reduction in poverty between 2001-02 and 2005-06. Similarly, the shift in occupations towards salaried workers accounted for 6% and 8% of the reduction in poverty between 2001-02 and 2005-06 and between 2001-02 and 2007-08 respectively. The improvement in average education of nonfarm workforce contributed by 6% and 7%, respectively to the decline in poverty, but the contribution of this effect from farm households was much smaller. Finally, although non-labor income growth in the form of transfers and remittances helped to reduce poverty, these were relatively smaller contributors to poverty reduction. In particular, domestic remittances contributed 9% to poverty reduction between 2001-02 and 2005-06, while international remittances contributed 5% over the same period. This relative small size of this effect should not be surprising, given that recipients of international remittances are generally not poor. Finally, the results highlight the relative strength of demographics to poverty reduction, accounting for 13% of reduction in poverty between 2001-02 and 2005-06.

**Figure 10** Contributions to Poverty Reduction: % Total Reduction in Poverty Head Count



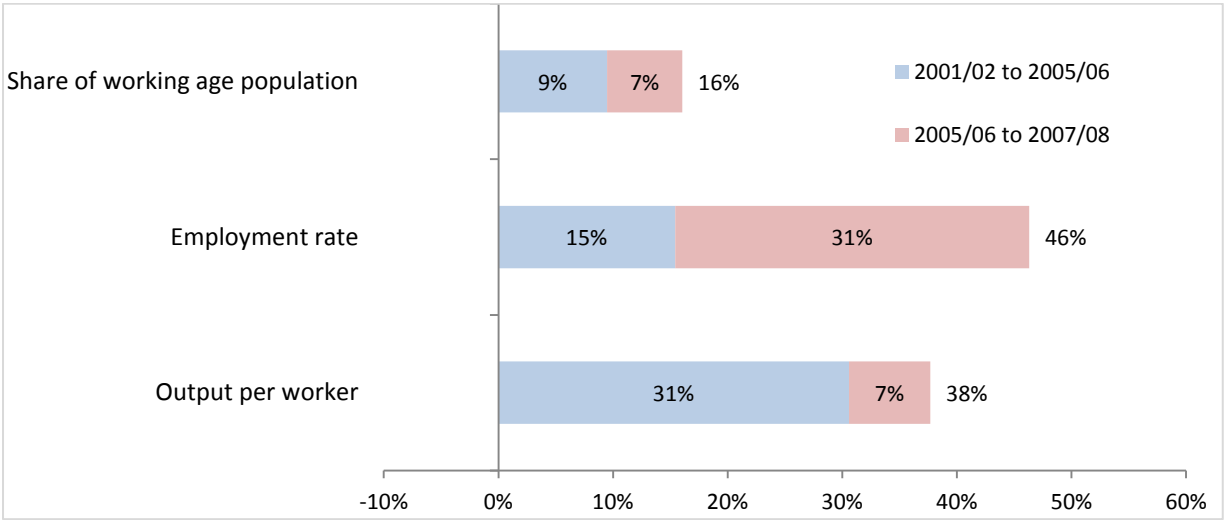

*Source: Own Estimates Based on PSLM 2001-02, 2005-06 and 2007-08*
Note: Decompositions following Bourguignon, Ferreira and Lustig (2006). See Annexure for details.

30. In terms of increase in inequality, we find that changes in educational, regional, occupational and sectoral composition of employment contributed to higher inequality, but it was the change in age and regional distribution of the population that contributed the most to the increase in inequality (Table 7). Since youth entering the workforce derive substantially lower incomes than older workforce, as the share of young workers increased substantially, these differences in earnings seem to have increased inequality. Similarly, non-labor income growth tended to benefit the top of the distribution, with most of the non-labor contribution to poverty reduction coming from growing housing values. Finally, note that both domestic and international remittances also contributed to higher income inequality, particularly for the 2001-02 to 2007-08 period. However, these findings should be taken with some caution since changes in inequality are very small so that these effects may be statistically insignificant.

## Alternate Methods

31. The result from the microdecompositions is that the relative price of labor increased, however it is difficult to disentangle the share of this effect that is due to an increase in productivity, as opposed to an increase in relative prices. To check the extent to which this may reflect improvements in productivity, we complement the micro-decomposition approach with a decomposition of growth in GDP per capita into its employment, productivity and demographic components, both at the aggregate and sectoral levels based on national accounts and employment data from the PSLM (Table 8).[7]

**Figure 11** Aggregate Employment, Productivity & Demographic Profile of Growth, 2001-02 to 2007-08




*Source: Pakistan Bureau of Statistics and PSLM 2001-02, 2005-06 and 2007-08*

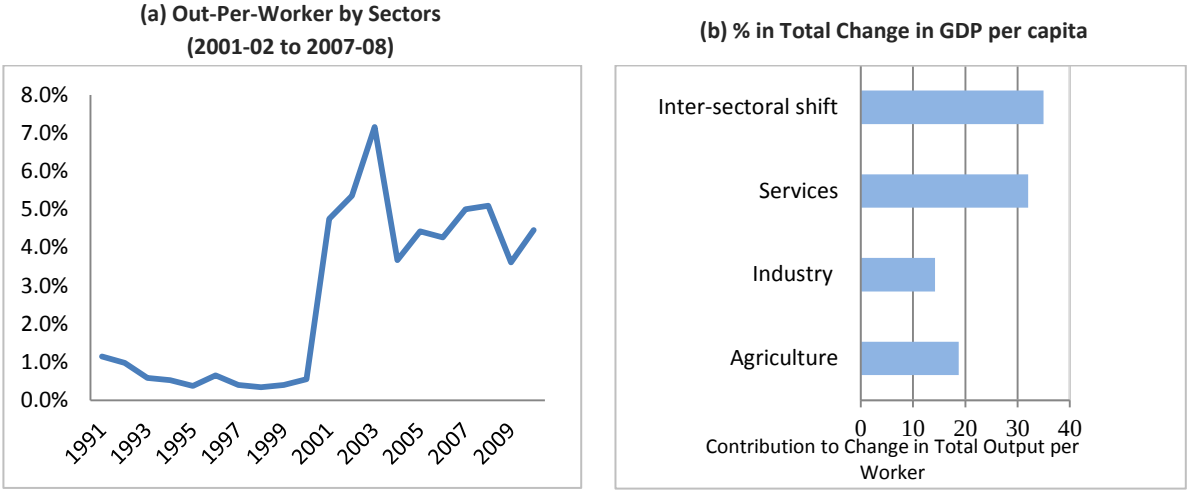
32. Figure 11 illustrates the results of decomposition of aggregate per capita growth into its main components. The results suggest that 16% of change in per capita Value Added between 2001-02 and 2007-08 can be linked to changes in structure of the population. In contrast, 46% of the change in per capita Value Added during this period can be linked to higher employment. Had everything else stayed the same, the sole change in employment would have generated a growth equivalent to 46% of the actual observed growth. Note that most of this increase in employment occurred between 2005-06 and 2007-08. Finally, higher productivity accounted for 38% of the increase in growth, most of which happened in the first half of the decade.

33. Once we have decomposed aggregate employment growth we can go further and decompose total output per worker, to understand the relative importance of productivity increases within sectors, as well as the role of inter-sectoral employment shifts. The increase in output per worker for the period is accounted for by an increase in output per worker in each sector (Table 9 and Figure 12), and a positive effect of inter-sectoral labor relocation. Note that agriculture accounted for 19% of the total increase in output per worker, which was more important than the contribution made by higher productivity in industry, given its relative size. The fact that inter-sectoral shifts made the largest contribution towards increases in output per worker means that on average labor moved from lower than average

[7] For a full description of the methodology used for this section, see World Bank. Job Generation and Growth Decomposition Tool. <http://go.worldbank.org/3XZAQ4SATo>

productivity sectors to above average productivity sectors. Thus we can conclude that an important share of growth in output per worker was due to movements of the labor force away from agriculture and into industry and services.

**Figure 12** **Decomposition of Growth in Output-Per-Worker, 2001-02 to 2007-08**




*Source: Pakistan Bureau of Statistics and PSLM 2001-02, 2005-06 and 2007-08*

## Final Remarks

34. This paper has sought to account for the contribution of demographics, labor and non-labor income in the observed distributional changes that occurred in Pakistan between 2001-02 and 2007-08. In contrast to methods that focus on aggregate summary statistics, the methods adopted in this paper generate entire counterfactual distributions, allowing to identify contributions to the observed distributional changes and in particular, to poverty.

35. The results show that the most important contributor to poverty reduction over the last decade has been the growth in income of households, driven by higher returns to individual characteristics and household endowments. This result points to an increase in the marginal value of work, either due to increases in productivity or higher relative prices of labor. In particular, returns to nonfarm work were the most important factor in reducing poverty.

36. Lower dependency rates also contributed to poverty reduction given that a growing share of the population is of working age. However, this change in the demographic profile of the labor force led to higher inequality, as the youth has relatively smaller incomes when compared to older workers. Higher levels of education also helped to reduce poverty, particularly in nonfarm work. Moreover, there was a helpful move toward paid employment (away from unpaid family work), into industry and services, and away from agriculture that also contributed to lower poverty reduction. However, these effects are very small compared to the overall increase in returns to labor which is evident both in the farm and nonfarm sectors. Similarly, transfers and remittances also contributed to poverty reduction, albeit to a much smaller extent than is typically ascribed, particularly since these transfers are largest at the top of the distribution.

37. Complementary analysis using national accounts data shows that most of the increase in income growth during the early part of the decade was due to improvements in productivity. Given the relative size of agriculture sector, improvements in productivity within that sector were as important to overall increase in output-per-worker as the industrial sector. Given that most of the population resides in rural areas, to ensure these positive trends continue going forward, it will be important to spur investment in rural areas, and allow for a move from farm to nonfarm work, which would improve productivity throughout the economy and generate the virtuous cycle observed in the first half of the 2000s.

**Table 1** Pakistan: Summary Statistics

| | 2001/02 | 2005/06 | 2007/08 |
|---|---|---|---|
| Total (millions) | 158,532,000 | 170,830,500 | 176,987,000 |
| Men (percent of total) | 50.5% | 50.1% | 50.0% |
| Women (percent of total) | 49.5% | 49.9% | 50.0% |
| Urban (percent of total) | 28.9% | 33.6% | 32.8% |
| Rural (percent of total) | 71.1% | 66.4% | 67.2% |
| Average household size | 6.88 | 6.77 | 6.53 |
| Number of adults per household | 3.45 | 3.50 | 3.43 |
| Share of adults per household | 54.8% | 56.2% | 56.9% |
| Occupied adults (as a share of number of adults) | 53.4% | 52.2% | 51.8% |
| **Labor force participation (percent of working age population)** | | | |
| All | 54.7% | 52.5% | 50.9% |
| Men | 81.8% | 82.1% | 80.9% |
| Women | 28.0% | 24.2% | 21.7% |
| **Employment (percent of working age population)** | | | |
| All | 51.3% | 49.3% | 49.1% |
| Men | 78.7% | 78.6% | 78.9% |
| Women | 24.3% | 21.3% | 20.1% |
| **Unemployment (percent of labor force)** | | | |
| All | 6.3% | 6.1% | 3.5% |
| Men | 3.9% | 4.3% | 2.5% |
| Women | 13.3% | 12.0% | 7.3% |
| **Education levels (percent of working age population)** | | | |
| Illiterate & Incomplete primary | 52.2% | 46.6% | 43.9% |
| Complete primary & lower secondary | 39.0% | 40.8% | 42.4% |
| Higher secondary & Tertiary | 8.8% | 12.6% | 13.7% |
| **Labor relation (percent of employed population)** | | | |
| Farmer | 15.0% | 14.5% | 13.7% |
| Self-employed | 14.2% | 15.1% | 12.4% |
| Salaried | 43.7% | 48.2% | 53.6% |
| Family Worker | 27.1% | 22.3% | 20.3% |
| **Economic Sector (percent of employed population)** | | | |
| Agriculture | 45.7% | 39.2% | 37.2% |
| Industry | 11.4% | 11.5% | 12.1% |
| Services | 40.3% | 46.9% | 48.3% |
| Public Sector | 2.6% | 2.3% | 2.4% |
| **Area (percent of employed population)** | | | |
| Rural | 72.8% | 67.5% | 67.9% |
| Urban | 27.2% | 32.5% | 32.1% |
| **Income Shares** | | | |
| Farm Income | 25.7% | 24.0% | 21.5% |
| Wage Earnings | 36.4% | 37.8% | 42.0% |
| Non-Farm Family Business | 13.0% | 13.8% | 12.8% |
| Pensions | 1.5% | 1.1% | 1.5% |
| Assistance | 0.1% | 0.2% | 0.1% |
| Donations | 4.2% | 2.9% | 2.5% |
| Domestic Remittances | 4.8% | 4.8% | 4.1% |
| International Remittances | 1.9% | 2.6% | 2.7% |
| Implicit Rent | 12.3% | 12.9% | 12.7% |

Source: PSLM 2001/02, 2005/06, and 2007/08.

**Table 2** Stimulating the Characteristics of Household Heads

| | 2001/02 | | | 2005/06 | | 2007/08 | |
|---|---|---|---|---|---|---|---|
| | Actual | Simulated 1/ | | Actual | Simulated 1/ | Actual | Simulated 1/ |
| | | 2005/06 | 2007/08 | | 2001/02 | | 2001/02 |
| **Education Structure** | | | | | | | |
| Less than Primary Education | 0.50 | 0.49 | 0.49 | 0.45 | 0.45 | 0.42 | 0.42 |
| Primary Education | 0.41 | 0.40 | 0.41 | 0.42 | 0.43 | 0.45 | 0.45 |
| Secondary Education and Above | 0.10 | 0.10 | 0.10 | 0.13 | 0.12 | 0.14 | 0.13 |
| *P-value of Pearson chi-square* | | *1.00* | *1.00* | | *1.00* | | *1.00* |
| **Occupation** | | | | | | | |
| Salaried | 0.73 | 0.74 | 0.73 | 0.73 | 0.72 | 0.76 | 0.76 |
| Self-employed - Non Agriculture | 0.27 | 0.26 | 0.27 | 0.27 | 0.28 | 0.24 | 0.24 |
| *P-value of Pearson chi-square* | | *1.00* | *0.99* | | *0.99* | | *1.00* |
| **Economic Sectors** | | | | | | | |
| **Salaried** | | | | | | | |
| -Agriculture | 0.21 | 0.19 | 0.19 | 0.17 | 0.18 | 0.17 | 0.18 |
| -Industry | 0.14 | 0.14 | 0.13 | 0.14 | 0.15 | 0.15 | 0.15 |
| -Services | 0.58 | 0.59 | 0.59 | 0.62 | 0.61 | 0.62 | 0.62 |
| -Public Sector | 0.08 | 0.08 | 0.09 | 0.07 | 0.06 | 0.06 | 0.05 |
| *P-value of Pearson chi-square* | | *1.00* | *1.00* | | *1.00* | *0.00* | *1.00* |

1/ Indicates the year from which parameters are being taken to perform the simulation.
Source: Own estimates based on PSLM 2001/02, 2005/06, and 2007/

**Table 3** Stimulating the Characteristics of Other Household Members

| | 2001/02 | | | 2005/06 | | 2007/08 | |
|---|---|---|---|---|---|---|---|
| | Actual | Simulated 1/ | | Actual | Simulated 1/ | Actual | Simulated 1/ |
| | | 2005/0 | 2007/0 | | 2001/02 | | 2001/02 |
| **Education Structure** | | | | | | | |
| Less than Primary Education | 0.53 | 0.52 | 0.52 | 0.47 | 0.49 | 0.45 | 0.46 |
| Primary Education | 0.38 | 0.39 | 0.39 | 0.40 | 0.40 | 0.42 | 0.41 |
| Secondary Education and Above | 0.08 | 0.09 | 0.09 | 0.12 | 0.11 | 0.14 | 0.13 |
| *P-value of Pearson chi-square* | | *1.00* | *1.00* | | *1.00* | | *1.00* |
| **Occupation** | 0.55 | 0.52 | 0.51 | 0.46 | 0.48 | 0.42 | 0.45 |
| Salaried | 0.42 | 0.45 | 0.46 | 0.50 | 0.48 | 0.55 | 0.52 |
| Self-employed - Non Agriculture | 0.03 | 0.03 | 0.03 | 0.04 | 0.03 | 0.03 | 0.03 |
| *P-value of Pearson chi-square* | | *0.97* | *0.95* | | *0.98* | | *0.96* |
| **Economic Sectors** | | | | | | | |
| **Salaried** | | | | | | | |
| -Agriculture | 0.17 | 0.13 | 0.13 | 0.18 | 0.14 | 0.15 | 0.14 |
| -Industry | 0.23 | 0.23 | 0.22 | 0.21 | 0.22 | 0.20 | 0.20 |
| -Services | 0.56 | 0.60 | 0.60 | 0.58 | 0.61 | 0.62 | 0.63 |
| -Public Sector | 0.04 | 0.04 | 0.05 | 0.03 | 0.03 | 0.03 | 0.03 |
| *P-value of Pearson chi-square* | | *1.00* | *1.00* | | *1.00* | | *1.00* |

1/ Indicates the year from which parameters are being taken to perform the simulation.
Source: Own estimates based on PSLM 2001/02, 2005/06,

## Table 4 Non Farm Earnings

| | 2001/02 | | | | | 2005/06 | | | | | 2007/08 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Head | | Spouse | Others | | Head | | Spouse | Others | | Head | | Spouse | Others | |
| | Wage Worker | Self-Employed | Wage Worker | Wage Worker | Self-Employed | Wage Worker | Self-Employed | Wage Worker | Wage Worker | Self-Employed | Wage Worker | Self-Employed | Wage Worker | Wage Worker | Self-Employed |
| Head Completed Primary Education | | 0.347*** | | | 0.128 | | 0.263*** | | | 0.0534 | | 0.285*** | | | 0.117 |
| | | (0.0403) | | | (0.0885) | | (0.0450) | | | (0.0938) | | (0.0384) | | | (0.0788) |
| Head Completed Secondary Education | | 0.647*** | | | -0.0519 | | 0.677*** | | | -0.112 | | 0.629*** | | | 0.163 |
| | | (0.0789) | | | (0.150) | | (0.0761) | | | (0.159) | | (0.0647) | | | (0.132) |
| Spouse Completed Primary Education | | 0.225*** | | | 0.293** | | 0.299*** | | | 0.359*** | | 0.231*** | | | 0.0151 |
| | | (0.0483) | | | (0.138) | | (0.0503) | | | (0.128) | | (0.0405) | | | (0.112) |
| Spouse Completed Secondary Education | | 0.344*** | | | -0.578 | | 0.473*** | | | 0.565* | | 0.567*** | | | 0.555* |
| | | (0.114) | | | (0.813) | | (0.0947) | | | (0.325) | | (0.0707) | | | (0.297) |
| Age group 25 to 34 | 0.197*** | 0.156 | 0.251* | 0.466*** | 0.393*** | 0.309*** | -0.00255 | 0.0750 | 0.349*** | 0.240** | 0.195*** | 0.217** | 0.128 | 0.320*** | 0.194** |
| | (0.0337) | (0.104) | (0.142) | (0.0231) | (0.0913) | (0.0407) | (0.122) | (0.114) | (0.0196) | (0.0944) | (0.0390) | (0.111) | (0.127) | (0.0180) | (0.0805) |
| Age group 35 to 44 | 0.343*** | 0.237** | 0.342** | 0.620*** | 0.735*** | 0.436*** | 0.226* | 0.271** | 0.548*** | 0.650*** | 0.370*** | 0.346*** | 0.320*** | 0.553*** | 0.626*** |
| | (0.0329) | (0.102) | (0.140) | (0.0400) | (0.117) | (0.0396) | (0.119) | (0.112) | (0.0324) | (0.126) | (0.0381) | (0.109) | (0.124) | (0.0308) | (0.108) |
| Age group 45 to 54 | 0.348*** | 0.182* | 0.465*** | 0.636*** | 0.435** | 0.494*** | 0.213* | 0.440*** | 0.470*** | 0.437** | 0.410*** | 0.449*** | 0.388*** | 0.549*** | 0.543** |
| | (0.0339) | (0.102) | (0.152) | (0.0666) | (0.199) | (0.0404) | (0.120) | (0.123) | (0.0565) | (0.220) | (0.0388) | (0.109) | (0.131) | (0.0533) | (0.217) |
| Age group 55 and above | 0.242*** | 0.242** | 0.467** | 0.330*** | 0.308 | 0.333*** | 0.204* | 0.00675 | 0.195*** | -0.345 | 0.258*** | 0.295*** | 0.344** | 0.306*** | 0.335 |
| | (0.0365) | (0.106) | (0.199) | (0.0738) | (0.247) | (0.0431) | (0.124) | (0.147) | (0.0725) | (0.257) | (0.0407) | (0.112) | (0.164) | (0.0640) | (0.246) |
| Services | 0.232*** | -0.0650 | 0.511*** | 0.238*** | -0.0909 | 0.235*** | -0.0152 | 0.441*** | 0.308*** | 0.112 | 0.252*** | -0.251*** | 0.365*** | 0.234*** | -0.445*** |
| | (0.0205) | (0.0584) | (0.104) | (0.0325) | (0.127) | (0.0237) | (0.0730) | (0.0809) | (0.0285) | (0.141) | (0.0209) | (0.0569) | (0.0753) | (0.0272) | (0.122) |
| NWFP | -0.0298 | 0.128** | 0.297 | -0.101*** | 0.268** | 0.0122 | 0.130** | 0.0920 | -0.0238 | -0.0712 | -0.0825*** | 0.0921* | 0.477*** | -0.0202 | 0.123 |
| | (0.0245) | (0.0583) | (0.226) | (0.0366) | (0.110) | (0.0259) | (0.0608) | (0.180) | (0.0302) | (0.121) | (0.0236) | (0.0512) | (0.170) | (0.0267) | (0.0918) |
| Sindh | 0.0403*** | 0.241*** | 0.202** | 0.0795*** | 0.110 | 0.0216 | 0.231*** | 0.237*** | 0.0982*** | 0.119 | -0.112*** | 0.0309 | 0.0609 | -0.0746*** | 0.0230 |
| | (0.0156) | (0.0529) | (0.0835) | (0.0227) | (0.106) | (0.0166) | (0.0554) | (0.0683) | (0.0198) | (0.118) | (0.0148) | (0.0533) | (0.0655) | (0.0188) | (0.124) |
| Balochistan | 0.138*** | 0.593*** | 0.129 | 0.292*** | 0.689*** | -0.0563* | 0.189 | 0.372 | 0.0121 | 0.484 | -0.146*** | 0.0900 | 0.380 | -0.0396 | 0.316 |
| | (0.0322) | (0.118) | (0.279) | (0.0480) | (0.264) | (0.0319) | (0.139) | (0.345) | (0.0409) | (0.344) | (0.0299) | (0.109) | (0.262) | (0.0402) | (0.225) |
| Urban | 0.146*** | 0.353*** | 0.263*** | 0.104*** | 0.164* | 0.154*** | 0.262*** | 0.291*** | 0.1000*** | 0.126 | 0.0947*** | 0.304*** | 0.197*** | 0.128*** | 0.305*** |
| | (0.0157) | (0.0398) | (0.0960) | (0.0235) | (0.0854) | (0.0168) | (0.0441) | (0.0752) | (0.0207) | (0.0903) | (0.0146) | (0.0351) | (0.0695) | (0.0185) | (0.0762) |
| Head Married | | 0.177** | | | -0.156* | | 0.305*** | | | -0.108 | | 0.240*** | | | 0.115 |
| | | (0.0791) | | | (0.0943) | | (0.0906) | | | (0.110) | | (0.0848) | | | (0.100) |
| Farm Household | -0.141*** | 0.00963 | -0.144 | -0.0671** | -0.304 | -0.0302 | -0.0889 | 0.0183 | -0.0675*** | -0.144 | -0.116*** | -0.00847 | 0.0166 | -0.128*** | 0.0256 |
| | (0.0357) | (0.0887) | (0.103) | (0.0286) | (0.194) | (0.0339) | (0.0932) | (0.0787) | (0.0234) | (0.206) | (0.0303) | (0.0744) | (0.0762) | (0.0214) | (0.149) |
| Completed Primary Education | 0.235*** | | 0.630*** | 0.242*** | 0.186* | 0.241*** | | 0.639*** | 0.204*** | 0.189* | 0.264*** | | 0.665*** | 0.196*** | 0.252*** |
| | (0.0157) | | (0.112) | (0.0236) | (0.105) | (0.0171) | | (0.0927) | (0.0208) | (0.113) | (0.0152) | | (0.0813) | (0.0195) | (0.0915) |
| Completed Secondary Education | 0.759*** | | 1.993*** | 0.829*** | 0.768*** | 0.880*** | | 1.822*** | 0.767*** | 0.405*** | 0.833*** | | 1.927*** | 0.804*** | 0.468*** |
| | (0.0218) | | (0.146) | (0.0340) | (0.145) | (0.0223) | | (0.117) | (0.0282) | (0.153) | (0.0199) | | (0.0933) | (0.0259) | (0.124) |
| Industry | 0.252*** | | -0.148 | 0.217*** | | 0.185*** | | -0.0812 | 0.282*** | | 0.213*** | | -0.348*** | 0.161*** | |
| | (0.0260) | | (0.104) | (0.0362) | | (0.0293) | | (0.0856) | (0.0322) | | (0.0256) | | (0.0848) | (0.0309) | |
| Public Sector | 0.359*** | | | 0.412*** | | 0.463*** | | | 0.637*** | | 0.507*** | | | 0.592*** | |
| | (0.0316) | | | (0.0579) | | (0.0357) | | | (0.0572) | | (0.0331) | | | (0.0523) | |
| Female | | | | -1.296*** | -1.734*** | | | | -1.264*** | -1.417*** | | | | -1.233*** | -1.856*** |
| | | | | (0.0276) | (0.154) | | | | (0.0233) | (0.158) | | | | (0.0219) | (0.174) |
| Constant | 7.706*** | 7.795*** | 5.666*** | 7.193*** | 7.989*** | 7.688*** | 7.963*** | 6.085*** | 7.347*** | 8.186*** | 7.915*** | 8.099*** | 6.188*** | 7.555*** | 8.355*** |
| | (0.0352) | (0.127) | (0.136) | (0.0331) | (0.179) | (0.0431) | (0.144) | (0.109) | (0.0304) | (0.195) | (0.0405) | (0.133) | (0.125) | (0.0283) | (0.184) |
| Observations | 5,866 | 1,981 | 944 | 6,026 | 476 | 6,266 | 2,172 | 1,032 | 6,967 | 578 | 7,078 | 2,065 | 1,083 | 7,392 | 515 |
| R-squared | 0.308 | 0.185 | 0.365 | 0.441 | 0.411 | 0.336 | 0.169 | 0.403 | 0.476 | 0.302 | 0.332 | 0.226 | 0.471 | 0.468 | 0.331 |
| Sigma | 0.511 | 0.837 | 1.105 | 0.752 | 0.877 | 0.584 | 0.917 | 0.961 | 0.726 | 1.008 | 0.543 | 0.791 | 0.896 | 0.677 | 0.859 |

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: Own estimates based on PSLM 2001/02, 2005/06, and 2007/08.

**Table 5** Farm Earnings

| | 2001/02 | 2005/06 | 2007/08 |
|---|---|---|---|
| Head Completed Primary Education | 0.133*** | 0.126*** | 0.153*** |
| | (0.0131) | (0.0131) | (0.0132) |
| Head Completed Secondary Education | 0.244*** | 0.388*** | 0.339*** |
| | (0.0364) | (0.0299) | (0.0308) |
| Spouse Completed Primary Education | 0.215*** | 0.199*** | 0.158*** |
| | (0.0263) | (0.0216) | (0.0206) |
| Spouse Completed Secondary Education | 0.399*** | 0.460*** | 0.392*** |
| | (0.109) | (0.0671) | (0.0546) |
| Age group 25 to 34 | 0.0538 | -0.0371 | 0.0344 |
| | (0.0337) | (0.0354) | (0.0404) |
| Age group 35 to 44 | 0.129*** | 0.0154 | 0.112*** |
| | (0.0333) | (0.0350) | (0.0393) |
| Age group 45 to 54 | 0.182*** | 0.0675* | 0.193*** |
| | (0.0334) | (0.0347) | (0.0391) |
| Age group 55 and above | 0.182*** | 0.104*** | 0.181*** |
| | (0.0330) | (0.0340) | (0.0387) |
| Female | 0.0790** | 0.0660** | 0.143*** |
| | (0.0326) | (0.0264) | (0.0269) |
| NWFP | -0.0797*** | -0.0294 | 0.0390* |
| | (0.0187) | (0.0189) | (0.0201) |
| Sindh | -0.121*** | -0.121*** | -0.122*** |
| | (0.0155) | (0.0164) | (0.0161) |
| Balochistan | -0.123*** | -0.309*** | -0.323*** |
| | (0.0310) | (0.0307) | (0.0321) |
| HH owns land | 0.0476*** | 0.0147 | 0.0277 |
| | (0.0175) | (0.0167) | (0.0176) |
| HH owns 2 to 4 acres | 0.0369* | 0.118*** | 0.0738*** |
| | (0.0202) | (0.0189) | (0.0205) |
| HH owns 5 to 10 acres | 0.139*** | 0.197*** | 0.170*** |
| | (0.0189) | (0.0187) | (0.0194) |
| HH owns more than 10 acres | 0.337*** | 0.352*** | 0.327*** |
| | (0.0219) | (0.0218) | (0.0228) |
| Share of Adult Members | 0.118*** | 0.130*** | 0.279*** |
| | (0.0317) | (0.0312) | (0.0320) |
| Household Size | 0.0750*** | 0.0750*** | 0.0752*** |
| | (0.00189) | (0.00182) | (0.00201) |
| Head Married | 0.0568** | -0.0360* | 0.0113 |
| | (0.0232) | (0.0217) | (0.0240) |
| Constant | 8.149*** | 8.460*** | 8.267*** |
| | (0.0463) | (0.0445) | (0.0506) |
| Observations | 3,477 | 3,727 | 3,452 |
| R-squared | 0.485 | 0.493 | 0.470 |
| Sigma | 0.333 | 0.356 | 0.346 |

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: Own estimates based on PSLM 2001/02, 2005/06, and 2007/08.

**Table 6** Cumulative Contributions to Change in Poverty Head Count Ratio

| | 2001/02-2005/06 | | 2001/02-2007/08 | |
|---|---|---|---|---|
| | Percent point change | Share of total change | Percent point change | Share of total change |
| Non-Farm labor income | | | | |
| Returns to characteristics | -4.4 | 34% | -6.5 | 37% |
| Occupational-choice | -0.8 | 6% | -1.5 | 8% |
| Economic Sector | -0.2 | 1% | 0.0 | 0% |
| Education | -0.8 | 6% | -1.3 | 7% |
| Unobservables factors | -0.1 | 1% | 0.3 | -2% |
| Farm income | | | | |
| Returns to characteristics | -2.0 | 15% | -2.3 | 13% |
| Education | -0.2 | 1% | -0.4 | 2% |
| Unobservables factors | 0.1 | -1% | 0.1 | 0% |
| Non-Labor Income | | | | |
| Pensions | 0.0 | 0% | -0.3 | 2% |
| Assistance | -0.1 | 1% | -0.1 | 1% |
| Donations | 0.3 | -2% | 0.3 | -2% |
| Domestic Remittances | -1.1 | 9% | -0.7 | 4% |
| International Remittances | -0.7 | 5% | -0.9 | 5% |
| Implicit Rent | -1.4 | 11% | -2.4 | 13% |
| Other | | | | |
| Age - gender-regional structure | -1.6 | 13% | -1.8 | 10% |
| Total | -12.8 | 100% | -17.5 | 100% |

Source: World Bank estimates based on the PSLM 2001/02, 2005/06, and 2007/08.

**Table 7** Cumulative Contributions to Change in Gini Coefficient

| | 2001/02-2005/06 | | 2001/02-2007/08 | |
|---|---|---|---|---|
| | Percent point change | Share of total change | Percent point change | Share of total change |
| Non-Farm labor income | | | | |
| Returns to characteristics | 0.002 | 9% | -0.001 | -8% |
| Occupational-choice | -0.001 | -5% | 0.004 | 25% |
| Economic Sector | -0.002 | -7% | -0.001 | -5% |
| Education | 0.003 | 10% | 0.002 | 14% |
| Unobservables factors | 0.005 | 18% | 0.000 | -3% |
| Farm income | | | | |
| Returns to characteristics | -0.001 | -5% | -0.001 | -9% |
| Education | 0.001 | 2% | 0.000 | 1% |
| Unobservables factors | 0.002 | 9% | 0.001 | 10% |
| Non-Labor Income | | | | |
| Pensions | -0.012 | -46% | -0.010 | -72% |
| Assistance | 0.001 | 4% | 0.001 | 8% |
| Donations | 0.000 | -1% | -0.001 | -5% |
| Domestic Remittances | -0.001 | -3% | 0.002 | 16% |
| International Remittances | 0.005 | 19% | 0.003 | 22% |
| Implicit Rent | 0.010 | 40% | 0.001 | 5% |
| Other | | | | |
| Age - gender-regional structure | 0.013 | 53% | 0.015 | 103% |
| Total | 0.025 | 100% | 0.014 | 100% |

Source: World Bank estimates based on the PSLM 2001/02, 2005/06, and 2007/08.

**Table 8** Employment, Output, Productivity and Population

| | 2001-02 | 2005-06 | 2007-08 | % change 2001 to 2007 |
|---|---|---|---|---|
| GDP (value added) | 3,632 | 4,593 | 5,192 | 42.9 |
| Total population millions | 124 | 130 | 130 | 4.6 |
| Total population of working age | 66 | 72 | 73 | 9.9 |
| Total number of employed | 37,480 | 42,795 | 47,626 | 27.1 |
| GDP (value added) per capita | 29,317 | 35,284 | 40,070 | 36.68 |
| Output per worker | 97 | 107 | 109 | 12.49 |
| Employment rate | 56,427.35 | 59,405.59 | 65,215.45 | 15.57 |
| Share of population of working age | 53.61 | 55.34 | 56.36 | 2.75 |

*Source: Pakistan Bureau of Statistics and PSLM 2001-02, 2005-06 and 2007-08.*

**Table 9** Decomposition of Out-per-Worker into Within Sector Changes and Inter Sectoral Shifts

| | Contribution to Change in Total Output per Worker | Contribution to Change in Total Output per Worker (%) |
|---|---|---|
| Agriculture | 2.3 | 18.8 |
| Industry | 1.7 | 14.2 |
| Services | 3.9 | 32.0 |
| Inter-Sectoral shift | 4.2 | 35.0 |
| Total change in output per worker | 12.1 | 100.0 |

*Source: Pakistan Bureau of Statistics and PSLM 2001/02 and 2007/08.*

# Annexure 1 – Decomposing Changes in Poverty

Given the model presented in the paper, there are two important steps to get results for the decompositions. The first consists on defining the estimation strategy with the purpose of obtaining a set of parameters for the reduced-form model. The second is the decomposition based on the construction of approximated counterfactual distributions.

## *Estimation Strategy*

The reduced-form models established earlier require the estimation of different sets of parameters, ranging from the occupational choice model, the educational and economic sectors conditional distributions, and (random) estimates of residual terms. This Annexure presents the estimation strategy which has been applied.

### 1–Occupational Choice Models for Nonfarm Workers

As described earlier, the allocation of individuals across occupations is represented through a multinomial logit model (McFadden 1974a, 1974b), specified as follows:

$$I_{hi}^{s} = 1 \text{ if } Z_{hi}\Psi^{s} + v_{i}^{s} > Max\left(0, Z_{hi}\Psi^{j} + v_{i}^{j}\right), j = 1, \ldots, J, \forall j \neq s$$
$$I_{hi}^{s} = 0 \text{ for all } s = 1, \ldots, J \text{ if } Z_{hi}\Psi^{s} + v_{i}^{s} \leq 0 \text{ for all } s = 1, \ldots, J$$

where $Z_{hi}$ is a vector of characteristics specific to individual i and household h, $\Psi^{s}$ are vectors of coefficients, for the following activities j={salaried, self-employed, not employed}, and $v_{i}^{s}$ are random variables identically and independently distributed across individuals and activities according to the law of extreme values.[8] Separate models are estimated for household heads, spouses and other members.[9] The vector of characteristics is given by a set of individual and household characteristics such as age, or a range of ages, education level, dependency rates, region and area, among others. Within a discrete utility-maximizing framework, $Z_{hi}\Psi^{s} + v_{i}^{s}$ is interpreted as the utility associated with activity s, with $v_{i}^{s}$ being the unobserved utility determinants of activity s and utility of inactivity being arbitrarily set to 0.

In order to calculate the utility of activity s and therefore allow for people to change occupations in the simulation exercise when either $Z_{hi}$ or $\Psi^{s}$ change, we must estimate the residual terms of occupational choice model, which are unobserved. They must be drawn from extreme values distributions in a way that is consistent with observed occupational choices. Train and Wilson (2008) define the distribution functions of extreme value errors conditional on the chosen alternative. In particular, assume that the alternative zero is chosen ($j = 0$) and denote $Z_{hi}\hat{\Psi}^{j} = V_{hi}^{j}$ for $j = 0\ldots, J$. Define $\hat{V}_{hi}^{0j} = V_{hi}^{0} - V_{hi}^{j}$ and $D_{hi}^{0} = \sum_{j=0}^{J} \exp(-\hat{V}_{hi}^{0j})$ where $P_{hi}^{0} = 1/D_{hi}^{0}$ is the logit choice probability. Then the cdf for the alternative chosen $v_{hi}^{0}$ is:

$$F(v_{hi}^{0} \mid alternative\ 0\ is\ chosen) = \exp(-D_{hi}^{0}\exp(v_{hi}^{0}))$$

[8] We don't model the occupational decision if the household head is self-employed in agriculture.

[9] Since the number of household heads with zero earnings is very low, we assume that their occupational choices are being salaried worker or self-employed. In the multinomial logit, the omitted category is being self employed. Accordingly, since the number of spouses working as self-employed is very low, we assume that their occupational choices are not working or working as salaried worker. In the multinomial logit model, the omitted category is not working.

Calculating the inverse of this distribution:

$$\hat{v}_{hi}^{0} = \ln(D_{hi}^{0}) - \ln(-\ln(\mu)) \qquad \text{(a)}$$

where $\mu$ is a draw from a uniform distribution between 0 and 1. Error terms for other alternatives $(v_{hi}^{j} \; with \; j \neq 0)$ must be calculated conditioned on the error terms of the alternative chosen ($\hat{v}_{hi}^{0}$). The distribution for these errors is:

$$F(v_{hi}^{j} \mid alternative\ 0\ is\ chosen, j \geq 1) = \frac{\exp(-\exp(-v_{hi}^{j}))}{\exp(-\exp(-(\hat{V}_{hi}^{0j} + \hat{v}_{hi}^{0})))} \; for v_{hi}^{j} < (\hat{V}_{hi}^{0j} + v_{hi}^{0})$$

The inverse of this distribution is:

$$\hat{v}_{hi}^{j} = -\ln(-\ln(m(\hat{v}_{hi}^{0})\mu)), where\ m(\hat{v}_{hi}^{0}) = \exp(-\exp(-(\hat{V}_{hi}^{0j} + \hat{v}_{hi}^{0})) \qquad \text{(b)}$$

where $\mu$ is a draw from a uniform distribution between 0 and 1. We repeat this same method when alternative other than zero are chosen and using expressions (a) and (b).

**2—Earning Equations: Nonfarm and Farm workers**

Turning to the labor market determination of earnings, we separate the sample into two different groups attending to the kind of activities that these individuals perform: non-farm and farm workers. Individual earnings equations for the first group are estimated separately for household heads, spouses and other members if they are performing as self-employed or salaried.[10] The set of characteristics considered in the specification includes individual characteristics such as age, education level, among others as well as characteristics of other members of the household. For instance, in the case of spouses and other members, characteristics of the household head i.e. his level of education; if she is employed or not; etc, were included in the specification. The second step corresponds to estimating the residual terms as random numbers normally distributed and their variances.

As mentioned before, farm net revenues are modeled at the household level and parameters are estimated using ordinary least squared. The vector of characteristics includes endowments such as land and individual and household characteristics of the household head, for instance, educational level, gender, civil status and number of members involved in the farm activity among others. Random estimates of the residual terms are drawn under a normal standard distribution.

[10] We do not model self-employment earnings for spouses because of the low number of observations.

### 3—Other Characteristics: Educational Structure & Economic Sectors for Main Occupation

Since we do not have panel data, we do not observe the same individuals in both years. Hence, for the estimation of endowments and demographic effects it is necessary to simulate the distribution of these characteristics in year s on year t population. We estimate conditional distributions of levels of education and economic sectors by occupation categories on individual age group, gender, region and area. Following Bourguignon, Ferreira and Leite (2008), this is done using a multinomial model for both distributions. These models are estimated separately for household heads, spouses and other members within the working age population.

### 4—Non-labor income and Consumption-income ratio

We estimate non-parametrically the conditional distribution of the total and different components of non-labor incomes such as remittances, public transfers and other private transfers by household quantiles on gender, education level and area. In particular, we create cells of household heads with the same level of education, gender and region (urban-rural). Inside each cell, we create quantiles of non-labor income. A similar approach is employed for estimating the conditional distribution of the consumption-income ratio.

## *Decomposition Approach*

After each of these reduced-form models has been estimated for two years *t* and *s*, we decompose distributional changes by formulating the appropriate counterfactual distribution of income and consumption. We first estimate the following components of household income at time *t* and *s* as:

$$\log(y_h)^t_\Omega = \sum_{i=1}^{n_h} I^L_{hi}\left(X_{hi}\Omega^L + \varepsilon^L_{hi}\right) + \sum_{i=1}^{n_h} I^{se}_{hi}\left(X_{hi}\Omega^{se} + \varepsilon^{se}_{hi}\right) + \left(W_h\Omega^F + \varepsilon^F_h\right) + \log(y^{NL}_h) \qquad (7)$$

Which for simplicity we express as:

$$\log(y_h)^t_\Omega = f(\Omega, \Psi, X_{hi}, W_h, Z_{hi}, \varepsilon, v) \qquad (8)$$

where $X^t_{hi}$ and $Z^t_{hi}$: are exogenous variables such as age, gender, region and area that are used for earnings and occupational choice models for the non-farm sector;

$W^t_h$: are exogenous variables such as age, gender, region and area for net revenues for farm sector;

$H^t_{hi} = H\left(X^t_{hi}, \widehat{\Theta}^t_{hi}, \hat{\phi}^t_{hi}\right)$ are endogenous variables including education level $(X1^t_{hi})$ and economic sector choice $(X2^t_{hi})$ with $\widehat{\Theta 1}^t_{hi}$ and $\widehat{\Theta 2}^t_{hi}$ being the respective set of estimated parameters;

$NF(\cdot)$ = non-farm earning equations and $\hat{\Omega}^t_{NF}$ refers to the set of estimated parameters;
$O(\cdot)$ = occupation choice equations and $\hat{\Psi}^t$ refers to the set of estimated parameters;
$F(\cdot)$ = net farm revenue equations and $\hat{\Omega}^t_F$ are the set of estimated parameters;

$\hat{\varepsilon}_{hi}^{t}, \hat{\varepsilon}_{h}^{t}, \hat{v}_{hi}^{t}, \hat{\phi}_{hi}^{t}$ = error terms for earning equations for non-farm and farm sector, occupational choice and endogenous variables: education structure and economic sector;

$y_h^{NL}|^t$ = non-labor income distribution.

We describe first the marginal decomposition technique which consists in changing one component of the distribution at a time, keeping everything else constant. Lastly, we briefly discuss the cumulative approach.

**1—Changes in distribution due to changes in returns to endowments**

We can simulate the counterfactual household income distribution by computing the earnings of every household at time t with the estimated returns to individual and household characteristics (Ω) computed for period s.[11]

$$\log(y_h)_{\Omega}^{t\to s} = f(NF(\hat{\Omega}_{NF}^{t}, X_{hi}^{t}, H_{hi}^{t}, \hat{\varepsilon}_{hi}^{t}), O(\hat{\Psi}^{t}, Z_{hi}^{t}, H_{hi}^{t}, \hat{v}_{hi}^{t}), F(\hat{\Omega}_{F}^{t}, W_{h}^{t}, H_{h}^{t}, \hat{\varepsilon}_{h}^{t}), y_h^{NL}|^t) \qquad (9)$$

This simulation yields the earnings of each household in the sample if the returns to each observed characteristic had been those observed at time s rather than the actual returns observed at time t, keeping everything else constant.[12] The contribution to the overall change in the distribution assigned to a change in returns ($\Omega^{t\to s}$) between t and s, leaving everything else constant, can be obtained by comparing (8) with (9). However, in this paper we focus on comparing poverty indicators P{f(·)}. Therefore, the effect of a change in returns on poverty change is:

$$\Delta P_{\Omega}^{t\to s} = P\{{y_h}^t\}_h - P\{(y_h)_{\Omega}^{t\to s}\}_h$$

The difference between this simulated distribution of household incomes $\{y_i\}_{\Omega}^{t\to s}$ and the actual distribution is equivalent to the price effect in the Oaxaca-Blinder calculation.

**2—Changes in Distribution Due to Changes in Unobservable Factors**

To simulate the effect of changes in unobservable factors between *s* and *t*, we rescale the estimated residuals of the earning and net revenue equations for non-farm and farm workers of time *t* by the ratio of standard deviations at time *s* and *t*. This counterfactual is defined as:

$$\log(y_h)_{\varepsilon}^{t\to s} = f\left(NF\left(\hat{\Omega}_{NF}^{t}, X_{hi}^{t}, H_{hi}^{t}, \hat{\varepsilon}_{hi}^{t}\left(\frac{\hat{\sigma}_{\varepsilon}^{s}}{\hat{\sigma}_{\varepsilon}^{t}}\right)\right), O\left(\widehat{\Psi}^{t}, Z_{hi}^{t}, H_{hi}^{t}, \hat{v}_{hi}^{t}\right), F(\hat{\Omega}_{F}^{t}, W_{h}^{t}, H_{h}^{t}, \hat{\varepsilon}_{h}^{t}\left(\frac{\hat{\sigma}_{\varepsilon}^{s}}{\hat{\sigma}_{\varepsilon}^{t}}\right)), y_h^{NL}|^t\right) \ldots (10)$$

Again the contribution to the change in poverty assigned to a change in unobservable factors ($\varepsilon^{t\to s}$) between t and s, leaving everything else constant, can be obtained by comparing the actual distribution (8) with the counterfactual (10).

$$\Delta P_{\varepsilon}^{t\to s} = P\{{y_h}^t\}_h - P\{(y_h)_{\varepsilon}^{t\to s}\}_h$$

[11] The notation $t \to s$ refers to estimating earnings in period *t* using the returns to characteristics, Ω estimated at time *s*.

[12] The returns to the unobserved characteristics behind the residual term $\hat{\varepsilon}^t$ are assumed to be unchanged.

## 3—Changes in Distribution Due to Changes in Occupation, Education Structure and Economic Sectors

Whenever the coefficients of the occupational, educational or sectoral multinomial logit model of year *t* are replaced for those of year *s*, individuals may be reallocated into different occupations, education levels or economic sectors.[13] Labor income is imputed to account for these changes using the earnings equations as a linear projection with the relevant vector of parameters and the residuals drawn from a standard normal distribution.

For instance, the contribution to the change in poverty between *t* and *s* is calculated by first exchanging parameters $\widehat{\Psi}^t$ for $\widehat{\Psi}^s$ in the occupational choice model, maintaining everything else constant, and then obtaining the following counterfactual distribution:

$$\log(y_h)_{\Psi}^{t\to s} = f\left(NF\left(\hat{\Omega}_{NF}^t, X_{hi}^t, H_{hi}^t, \hat{\varepsilon}_{hi}^t\right), O\left(\widehat{\Psi}^s, Z_{hi}^t, H_{hi}^t, \hat{v}_{hi}^t\right), F(\hat{\Omega}_F^t, W_h^t, H_h^t, \hat{\varepsilon}_h^t), y_h^{NL}|^t\right) \quad (11)$$

This result can be compared to the actual distribution in (9). We calculate poverty indices for both distributions and take the difference between them to find the contribution to poverty reduction:

$$\Delta P_{\Psi}^{t\to s} = P\{{y_h}^t\}_h - P\{(y_h)_{\Psi}^{t\to s})\}_h$$

Note this example refers to the main occupation structure for individuals in the non-farm sector.

In the case of the education structure we change $\widehat{\Theta 1}_{\mathrm{hi}}^{\mathrm{t}}$ parameters with $\widehat{\Theta 1}_{\mathrm{hi}}^{\mathrm{s}}$ in the H function. However, since education has effects on occupation and earnings, it affects each of these functions (NF, O and F) and we obtain a counterfactual distribution such as:

$$log(y_h)_{\theta 1}^{t\to s} = f\left(NF\left(\hat{\Omega}_{NF}^t, X_{hi}^t, H_{hi}^s(\widehat{\Theta 1}_{hi}^s), \hat{\varepsilon}_{hi}^t\right), O\left(\widehat{\Psi}^s, Z_{hi}^t, H_{hi}^s(\hat{\theta} 1_{hi}^s), \hat{v}_{hi}^t\right), F(\hat{\Omega}_F^t, W_h^t, H_h^s(\widehat{\Theta 1}_h^s), \hat{\varepsilon}_h^t), y_h^{NL}|^t\right) \quad (12)$$

Once again, the contribution of change in education structure to the change in poverty between t and s can be estimated by the difference between poverty indices of actual [equation (9)] and counterfactual distribution [equation (12)]:

$$\Delta P_{\Theta 1}^{t\to s} = P\{{y_h}^t\}_h - P\{(y_h)_{\theta 1}^{t\to s}\}_h$$

For sector of work, we change $\widehat{\Theta 2}_{hi}^t$ parameters with $\widehat{\Theta 2}_{hi}^s$ in the *H* function. Since sector has effects only on earnings, if affects only the NF and F equations. We obtain the counterfactual distribution as follows:

$$log(y_h)_{\theta 2}^{t\to s} = f\left(NF\left(\hat{\Omega}_{NF}^t, X_{hi}^t, H_{hi}^s(\widehat{\Theta 2}_{hi}^s), \hat{\varepsilon}_{hi}^t\right), O\left(\widehat{\Psi}^s, Z_{hi}^t, H_{hi}^t, \hat{v}_{hi}^t\right), F(\hat{\Omega}_F^t, W_h^t, H_h^s(\widehat{\Theta 2}_h^s), \hat{\varepsilon}_h^t), y_h^{NL}|^t\right) \quad (13)$$

The difference between the distribution of this set of simulated incomes $\{\mathrm{y_i}\}_{\Psi,\Theta}^{\mathrm{t}\to\mathrm{s}}$ and the actual set of incomes of period t is comparable to the endowment effect in the Oaxaca-Blinder decomposition.

[13] The estimated error terms for each reduced-from equation of occupation, education and economic sector, are kept constant in each decomposition exercise.

## 4—Changes in Distribution Due to Changes in Demographics

The next decomposition consists of altering the joint distribution of exogenous household characteristics such as age, gender, region and area of each individual in the household. These variables do not depend on other exogenous variables in the model; the simulation is performed simply by recalibrating the population by the weights corresponding to the joint distribution of these attributes in the target year. Formally:

$$\log(y_h)^{t\to s}_{X.Z,W} = f\left(NF\left(\hat{\Omega}^t_{NF}, X^s_{hi}, H^t_{hi}, \hat{\varepsilon}^t_{hi}\right), O\left(\hat{\Psi}^t, Z^s_{hi}, H^t_{hi}, \hat{v}^t_{hi}\right), F(\hat{\Omega}^t_F, W^s_h, H^t_h, \hat{\varepsilon}^t_h), y^{NL}_h|^t\right) \quad (14)$$

and the contribution to poverty change will be:

$$\Delta P^{t\to s}_{X,Z,W} = P\{{y_h}^t\}_h - P\left\{(y_h)^{t\to s}_{X.Z,W}\right\}_h$$

## 5—Changes in Distribution Due to Changes in Non-Labor Income & Consumption-Income Ratio

The conditional distributions estimated in the previous step are used for the rank-preserving transformation of the observed distribution of non-labor income in each year. In particular, we created cells of household heads with the same level of education, gender and region (urban-rural). Inside of each cell, we created quantiles of non-labor income. We estimate the counterfactual distribution of non-labor income in year *t* by assigning the mean value of non-labor income of quantile q in cell c in year *s*, to the same quantile and cell in year *t*. In other words, we ranked the two distributions by per capita household non-labor income and if *q* was the rank of household with income $y_h^{NL}$ at time *t*, we replace it with the non-labor income of the household with the same rank at time *s*. We apply the same decomposition methodology for the case of the consumption-income ratio.

For the non-labor income, the counterfactual distribution could be expressed formally as:

$$\log(y_h)^{t\to s}_{y_h^{NL}} = f\left(NF\left(\hat{\Omega}^t_{NF}, X^s_{hi}, H^t_{hi}, \hat{\varepsilon}^t_{hi}\right), O\left(\hat{\Psi}^t, Z^s_{hi}, H^t_{hi}, \hat{v}^t_{hi}\right), F(\hat{\Omega}^t_F, W^s_h, H^t_h, \hat{\varepsilon}^t_h), y^{NL}_h|^s_q\right) \quad (15)$$

As before, we can compare with the actual distribution described in equation (9), calculate poverty indices and obtain the contribution of non-labor income to poverty change between years *t* and *s*:

$$\Delta P^{t\to s}_{y_h^{NL}} = P\{{y_h}^t\}_h - P\left\{(y_h)^{t\to s}_{y_h^{NL}}\right\}_h$$

It is important to note that all previous decompositions are also performed both considering *s* as the initial year and then considering *t* as base year. The average of these marginal effects decompositions is the final result reported in the analysis.[14]

[14] Bear in mind that this does not solve all path-dependence problems. Shapley values are necessary to estimate in order to tackle this difficulty.

### *The Cumulative Decomposition Technique*

As mentioned before, there could be interaction effects between each of the marginal effects considered above. The cumulative decomposition technique allows us to account for these interactions by calculating each effect successively and cumulating into counterfactuals that contain the cumulative effects of multiple changes. We attribute all of the additional contribution to poverty change to each specific factor being added. However, the magnitude of that contribution will depend on the path chosen for the decomposition.[15] We follow the Bourguignon, Ferreira and Leite (2008) approach by first calculating the effects of changes in the characteristics of the population, beginning with exogenous variables such as age, gender, region and area ($X_{hi}^{s}, Z_{hi}^{s}, W_{h}^{s}$). Formally,

$$\Delta P^{t\to s}$$
$$= P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{t}, X_{hi}^{t}, H_{hi}^{t}, \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{t}, Z_{hi}^{t}, H_{hi}^{t}, \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{t}, W_{h}^{t}, H_{h}^{t}, \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$
$$- P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{t}, X_{hi}^{s}, H_{hi}^{t}, \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{t}, Z_{hi}^{s}, H_{hi}^{t}, \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{t}, W_{h}^{s}, H_{h}^{t}, \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$

Second, keeping the demographic effects, we add the education structure change ($\widehat{\Theta 1}_{hi}^{s}$):

$$= P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{t}, X_{hi}^{s}, H_{hi}^{t}, \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{t}, Z_{hi}^{s}, H_{hi}^{t}, \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{t}, W_{h}^{s}, H_{h}^{t}, \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$
$$- P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{t}, X_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}, \widehat{\Theta 2}_{hi}^{t}\right), \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{t}, Z_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}\right), \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{t}, W_{h}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}, \widehat{\Theta 2}_{hi}^{t}\right), \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$

Third, preserving the previous changes, we include the change in occupation structure ($\hat{\Psi}^{s}$):

$$= P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{t}, X_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}, \widehat{\Theta 2}_{hi}^{t}\right), \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{t}, Z_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}\right), \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{t}, W_{h}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}, \widehat{\Theta 2}_{hi}^{t}\right), \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$
$$- P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{t}, X_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}, \widehat{\Theta 2}_{hi}^{t}\right), \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{s}, Z_{hi}^{s}, H_{hi}^{s}\left(\hat{\Theta 1}_{hi}^{s}\right), \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{t}, W_{h}^{s}, H_{hi}^{s}\left(\hat{\Theta 1}_{hi}^{s}, \widehat{\Theta 2}_{hi}^{t}\right), \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$

Fourth, we add the change in the structure of economic sectors ($\widehat{\Theta 2}_{hi}^{s}$):

$$= P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{t}, X_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}, \widehat{\Theta 2}_{hi}^{t}\right), \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{s}, Z_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}\right), \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{t}, W_{h}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}, \widehat{\Theta 2}_{hi}^{t}\right), \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$
$$- P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{t}, X_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}, \widehat{\Theta 2}_{hi}^{s}\right), \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{s}, Z_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}\right), \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{t}, W_{h}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}, \widehat{\Theta 2}_{hi}^{s}\right), \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$

Fifth, we include the returns to non-farm sector ($\hat{\Omega}_{NF}^{s}$):

$$= P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{t}, X_{hi}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{s}, Z_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}\right), \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{t}, W_{h}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$
$$- P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{s}, X_{hi}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{s}, Z_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}\right), \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{t}, W_{h}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$

Then we change the returns to farm sector ($\hat{\Omega}_{F}^{s}$):

$$= P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{s}, X_{hi}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{s}, Z_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}\right), \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{t}, W_{h}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$
$$- P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{s}, X_{hi}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{s}, Z_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}\right), \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{s}, W_{h}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$

Next, we change residuals of earnings and net revenues equations:

$$= P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{s}, X_{hi}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{hi}^{t}\right), O\left(\hat{\Psi}^{s}, Z_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}\right), \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{s}, W_{h}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{h}^{t}\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$
$$- P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{s}, X_{hi}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{hi}^{t}\left(\frac{\hat{\sigma}_{\varepsilon}^{s}}{\hat{\sigma}_{\varepsilon}^{t}}\right)\right), O\left(\hat{\Psi}^{s}, Z_{hi}^{s}, H_{hi}^{s}\left(\widehat{\Theta 1}_{hi}^{s}\right), \hat{v}_{hi}^{t}\right), F\left(\hat{\Omega}_{F}^{s}, W_{h}^{s}, H_{hi}^{s}\left(\hat{\Theta}_{hi}^{s}\right), \hat{\varepsilon}_{h}^{t}\left(\frac{\hat{\sigma}_{\varepsilon}^{s}}{\hat{\sigma}_{\varepsilon}^{t}}\right)\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$

[15] Given the large number of factors, calculating Shapley values from $t$ to $s$ and vice versa is beyond the scope of this paper.

Finally, we add the change in non-labor income components and the consumption ratio. The latter is not formally displayed in this example:

$$= P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{s}, X_{hi}^{s}, H_{hi}^{s}(\hat{\theta}_{hi}^{s}), \hat{\varepsilon}_{hi}^{t}(\frac{\hat{\sigma}_{\varepsilon}^{s}}{\hat{\sigma}_{\varepsilon}^{t}})\right), O(\hat{\Psi}^{s}, Z_{hi}^{s}, H_{hi}^{s}(\widehat{\Theta 1}_{hi}^{s}), \hat{v}_{hi}^{t}), F\left(\hat{\Omega}_{F}^{s}, W_{h}^{s}, H_{hi}^{s}(\hat{\theta}_{hi}^{s}), \hat{\varepsilon}_{h}^{t}(\frac{\hat{\sigma}_{\varepsilon}^{s}}{\hat{\sigma}_{\varepsilon}^{t}})\right), y_{h}^{NL}|_{q}^{t}\right)\right\}_{h}$$
$$- P\left\{f\left(NF\left(\hat{\Omega}_{NF}^{s}, X_{hi}^{s}, H_{hi}^{s}(\hat{\theta}_{hi}^{s}), \hat{\varepsilon}_{hi}^{t}\frac{\hat{\sigma}_{\varepsilon}^{s}}{\hat{\sigma}_{\varepsilon}^{t}}\right), O(\hat{\Psi}^{s}, Z_{hi}^{s}, H_{hi}^{s}(\widehat{\Theta 1}_{hi}^{s}), \hat{v}_{hi}^{t}), F\left(\hat{\Omega}_{F}^{s}, W_{h}^{s}, H_{hi}^{s}(\hat{\theta}_{hi}^{s}), \hat{\varepsilon}_{h}^{t}\frac{\hat{\sigma}_{\varepsilon}^{s}}{\hat{\sigma}_{\varepsilon}^{t}}\right), y_{h}^{NL}|_{q}^{s}\right)\right\}_{h}$$

Again, this cumulative decomposition technique is also performed considering *s* as the initial year and then *t* as the initial year. The average of these decomposition effects is the final result reported in the analysis.

Lastly, it is relevant to clarify that even we decompose these changes sequentially; it is still possible to have an unexplained portion, both because the sum of average contributions does not necessarily lead to the total change in distribution and because there may be other factors that contributed to distributional changes that were not considered in the analysis. This residual term is relatively small, implying that either the factors not included are not extremely important or they tend to compensate for each other.

**Table A1** Multinomial Logit on Occupational Choice—Household Heads

| | 2001/02 Wage Worker | 2005/06 Wage Worker | 2007/08 Wage Worker |
|---|---|---|---|
| Head Completed Primary Education | -0.341*** | -0.147** | -0.316*** |
| | (0.0737) | (0.0741) | (0.0791) |
| Head Completed Secondary Education | 0.638*** | 0.594*** | 0.510*** |
| | (0.138) | (0.124) | (0.130) |
| Spouse Completed Primary Education | -0.162* | -0.176** | -0.173* |
| | (0.0903) | (0.0846) | (0.0943) |
| Spouse Completed Secondary Education | -0.0800 | -0.372** | -0.364* |
| | (0.185) | (0.160) | (0.198) |
| Age group 25 to 34 | -0.0320 | 0.101 | 0.0718 |
| | (0.183) | (0.190) | (0.220) |
| Age group 35 to 44 | -0.156 | 0.0669 | 0.00266 |
| | (0.178) | (0.187) | (0.218) |
| Age group 45 to 54 | -0.392** | -0.0383 | -0.259 |
| | (0.180) | (0.188) | (0.220) |
| Age group 55 and above | -0.677*** | -0.384** | -0.301 |
| | (0.186) | (0.195) | (0.224) |
| Urban | -0.293*** | -0.268*** | -0.229** |
| | (0.0921) | (0.0910) | (0.103) |
| Balochistan | 1.101*** | 1.534*** | 1.225*** |
| | (0.141) | (0.166) | (0.154) |
| NWFP | 0.0902 | -0.0949 | 0.148 |
| | (0.110) | (0.110) | (0.109) |
| Sindh | 1.237*** | 1.212*** | 1.493*** |
| | (0.116) | (0.119) | (0.139) |
| Balochistan * Urban | -0.661*** | -0.784*** | -0.370* |
| | (0.191) | (0.214) | (0.208) |
| NWFP * Urban | -0.135 | 0.164 | -0.451*** |
| | (0.164) | (0.159) | (0.158) |
| Sindh * Urban | -0.288* | -0.295* | -0.0885 |
| | (0.156) | (0.158) | (0.177) |
| No. of Children under 5 years | -0.0525* | -0.0499 | -0.0897** |
| | (0.0317) | (0.0316) | (0.0356) |
| Head Married | -0.142 | -0.278* | -0.578*** |
| | (0.143) | (0.143) | (0.161) |
| HH receives remittances | -0.0220 | -0.592*** | -0.315 |
| | (0.236) | (0.188) | (0.203) |
| Share of Adult Members | 0.0816 | 0.0211 | -0.307 |
| | (0.179) | (0.175) | (0.188) |
| Farm Household | -0.152 | 0.0679 | 0.0468 |
| | (0.163) | (0.152) | (0.151) |
| HH owns land | 0.0234 | 0.0375 | -0.189 |
| | (0.137) | (0.130) | (0.139) |
| HH owns 2 to 4 acres | -0.501** | -0.335 | 0.0711 |
| | (0.226) | (0.214) | (0.225) |
| HH owns 5 to 10 acres | -0.148 | -0.209 | -0.305 |
| | (0.236) | (0.233) | (0.235) |
| HH owns more than 10 acres | -0.462* | -0.451* | 0.0861 |
| | (0.281) | (0.257) | (0.294) |
| Constant | 1.427*** | 1.212*** | 2.005*** |
| | (0.240) | (0.238) | (0.285) |
| Observations | 7,849 | 8,440 | 9,150 |
| Pseudo R-squared | 0.0614 | 0.0572 | 0.0774 |

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Ommitted category: Self Employed
Source: Own estimates based on PSLM 2001/02, 2005/06, and 2007/08.

**Table A2** Multinomial Logit on Occupational Choice—Spouse

| | 2001/02 Wage Worker | 2005/06 Wage Worker | 2007/08 Wage Worker |
|---|---|---|---|
| Head Completed Primary Education | 0.147 | -0.0615 | -0.0359 |
| | (0.125) | (0.144) | (0.140) |
| Head Completed Secondary Education | 0.426 | 0.194 | 0.0798 |
| | (0.355) | (0.285) | (0.312) |
| Spouse Completed Primary Education | 0.598*** | 0.160 | 0.572** |
| | (0.215) | (0.231) | (0.237) |
| Spouse Completed Secondary Education | 2.200*** | 1.963*** | 2.227*** |
| | (0.531) | (0.459) | (0.665) |
| Age group 25 to 34 | -0.201 | -0.363 | -0.147 |
| | (0.211) | (0.255) | (0.308) |
| Age group 35 to 44 | 0.0905 | -0.459* | 0.0668 |
| | (0.212) | (0.259) | (0.308) |
| Age group 45 to 54 | -0.0569 | -0.693*** | -0.0179 |
| | (0.219) | (0.262) | (0.314) |
| Age group 55 and above | -0.213 | -0.732** | -0.515 |
| | (0.284) | (0.354) | (0.373) |
| Urban | 0.438** | 0.146 | 0.726*** |
| | (0.202) | (0.210) | (0.253) |
| Balochistan | -0.344 | -1.394*** | -0.128 |
| | (0.237) | (0.361) | (0.343) |
| NWFP | -1.919*** | -1.843*** | -1.951*** |
| | (0.281) | (0.254) | (0.263) |
| Sindh | 0.211 | -0.0829 | 0.00537 |
| | (0.135) | (0.140) | (0.140) |
| Balochistan * Urban | 2.168*** | 0.530 | 0.260 |
| | (0.592) | (0.784) | (0.909) |
| NWFP * Urban | 1.735*** | 1.221*** | 1.332** |
| | (0.429) | (0.458) | (0.520) |
| Sindh * Urban | 0.317 | 1.036*** | 0.820** |
| | (0.300) | (0.349) | (0.403) |
| Head Employed | -1.019*** | -1.021*** | -1.338*** |
| | (0.233) | (0.255) | (0.312) |
| No. of Children under 5 years | -0.0716 | -0.0633 | -0.0587 |
| | (0.0552) | (0.0629) | (0.0605) |
| HH receives remittances | -0.630 | -0.527 | 0.178 |
| | (0.730) | (0.572) | (0.641) |
| Share of Adult Members | -0.127 | -0.198 | -0.0910 |
| | (0.345) | (0.348) | (0.376) |
| Farm Household | -1.541*** | -1.823*** | -2.118*** |
| | (0.137) | (0.152) | (0.148) |
| HH owns land | -0.443** | -0.487** | -0.834*** |
| | (0.212) | (0.204) | (0.234) |
| HH owns 2 to 4 acres | -0.0829 | -0.348 | 0.819*** |
| | (0.306) | (0.347) | (0.309) |
| HH owns 5 to 10 acres | -0.420 | -0.195 | 0.381 |
| | (0.308) | (0.339) | (0.310) |
| HH owns more than 10 acres | -0.523 | -0.0438 | 0.324 |
| | (0.345) | (0.423) | (0.338) |
| Constant | 1.050*** | 2.442*** | 2.296*** |
| | (0.405) | (0.441) | (0.527) |
| | 2,696 | 2,396 | 2,279 |
| Pseudo R-squared | 0.256 | 0.272 | 0.334 |

Standard errors in parentheses. *** p<0.0
Ommited category: Zero earnings
Source: Own estimates based on PSLM 2001/02, 2005/06, and 2007/08.

## Table A3 Multinomial Logit on Occupational Choice—Other Members

| | 2001/02 | | 2005/06 | | 2007/08 | |
|---|---|---|---|---|---|---|
| | Wage Worker | Self-Employed | Wage Worker | Self-Employed | Wage Worker | Self-Employed |
| Completed Primary Education | 0.205*** | 0.519*** | 0.147** | 0.394** | 0.116* | 0.135 |
| | (0.0610) | (0.159) | (0.0644) | (0.153) | (0.0642) | (0.174) |
| Completed Secondary Education | 0.802*** | 0.721*** | 0.714*** | 0.485** | 0.999*** | 0.801*** |
| | (0.110) | (0.235) | (0.110) | (0.230) | (0.113) | (0.259) |
| Head Completed Primary Education | 0.0782 | 0.0928 | -0.101* | 0.0119 | -0.0695 | 0.227 |
| | (0.0596) | (0.149) | (0.0602) | (0.140) | (0.0624) | (0.154) |
| Head Completed Secondary Education | 0.248* | 0.774*** | -0.0588 | 0.176 | -0.325** | 0.313 |
| | (0.132) | (0.272) | (0.119) | (0.246) | (0.129) | (0.278) |
| Spouse Completed Primary Education | -0.285*** | -0.333 | -0.145 | -0.0456 | -0.269*** | -0.391* |
| | (0.0998) | (0.205) | (0.0955) | (0.195) | (0.0948) | (0.203) |
| Spouse Completed Secondary Education | -0.653*** | -2.397** | -0.323 | -0.554 | -0.714*** | -1.437* |
| | (0.213) | (1.086) | (0.208) | (0.452) | (0.251) | (0.776) |
| Age group 25 to 34 | 0.196*** | 0.386** | 0.161** | 0.499*** | 0.168** | 0.526*** |
| | (0.0689) | (0.182) | (0.0698) | (0.159) | (0.0726) | (0.170) |
| Age group 35 to 44 | 0.0704 | 0.659*** | 0.126 | 0.697*** | 0.341*** | 0.915*** |
| | (0.109) | (0.242) | (0.111) | (0.218) | (0.114) | (0.247) |
| Age group 45 to 54 | -0.0290 | 0.750** | -0.0649 | 0.884*** | 0.213 | 0.696 |
| | (0.164) | (0.346) | (0.162) | (0.312) | (0.163) | (0.435) |
| Age group 55 and above | -0.169 | 1.038** | -0.477** | 1.012*** | -0.162 | 0.939** |
| | (0.152) | (0.424) | (0.209) | (0.376) | (0.160) | (0.445) |
| Female | -0.467*** | -1.326*** | -0.188*** | -0.832*** | -0.251*** | -1.812*** |
| | (0.0693) | (0.229) | (0.0706) | (0.203) | (0.0714) | (0.308) |
| Urban | 0.0294 | 0.154 | -0.288*** | -0.299* | -0.358*** | -0.456** |
| | (0.0854) | (0.195) | (0.0906) | (0.181) | (0.0916) | (0.189) |
| Balochistan | 0.381*** | -1.115*** | 0.147 | -1.925*** | 0.132 | -1.233*** |
| | (0.0892) | (0.333) | (0.131) | (0.376) | (0.105) | (0.321) |
| NWFP | -0.122 | 0.117 | -0.161* | -0.0314 | -0.182** | -0.212 |
| | (0.0902) | (0.204) | (0.0856) | (0.194) | (0.0902) | (0.200) |
| Sindh | 0.125* | -0.879*** | 0.260*** | -0.957*** | 0.0455 | -1.719*** |
| | (0.0721) | (0.259) | (0.0719) | (0.243) | (0.0732) | (0.308) |
| Balochistan * Urban | -0.194 | 0.805* | 0.377** | 1.199*** | 0.0474 | 0.630 |
| | (0.153) | (0.416) | (0.183) | (0.460) | (0.180) | (0.467) |
| NWFP * Urban | -0.0428 | -0.0489 | 0.254* | -0.123 | 0.209 | 0.0780 |
| | (0.148) | (0.290) | (0.144) | (0.283) | (0.150) | (0.281) |
| Sindh * Urban | 0.462*** | 0.897*** | 0.462*** | 0.680** | 0.705*** | 1.131*** |
| | (0.120) | (0.324) | (0.121) | (0.312) | (0.130) | (0.393) |
| Head Employed | -0.839*** | -2.209*** | -0.529*** | -1.592*** | -0.601*** | -1.837*** |
| | (0.0664) | (0.142) | (0.0712) | (0.137) | (0.0776) | (0.151) |
| Spouse Employed | -0.430*** | -0.667*** | -0.286*** | -0.561*** | -0.473*** | -0.187 |
| | (0.0651) | (0.227) | (0.0657) | (0.209) | (0.0706) | (0.228) |
| Married | -0.0542 | 0.206 | -0.168** | -0.143 | -0.201*** | 0.230 |
| | (0.0645) | (0.174) | (0.0700) | (0.149) | (0.0705) | (0.174) |
| Attends School | -0.972*** | -0.195 | -0.994*** | -0.536 | -1.234*** | -0.747* |
| | (0.167) | (0.342) | (0.148) | (0.362) | (0.160) | (0.408) |
| Head Married | -0.0283 | 0.114 | -0.0555 | -0.0884 | 0.0707 | 0.335* |
| | (0.0771) | (0.168) | (0.0908) | (0.171) | (0.0877) | (0.176) |
| No. of Children under 5 years | -0.0661*** | -0.0672 | -0.0563*** | -0.105* | -0.146*** | -0.141*** |
| | (0.0192) | (0.0472) | (0.0201) | (0.0539) | (0.0213) | (0.0476) |
| HH receives remittances | 0.00472 | -0.236 | -0.606*** | 0.0247 | -0.321** | 0.140 |
| | (0.168) | (0.278) | (0.135) | (0.235) | (0.133) | (0.232) |
| Share of Adult Members | -0.418*** | -0.912** | 0.142 | -0.469 | -0.246 | -0.143 |
| | (0.152) | (0.380) | (0.158) | (0.377) | (0.158) | (0.399) |
| Farm Household | -1.498*** | -2.788*** | -1.489*** | -2.879*** | -1.573*** | -2.858*** |
| | (0.0661) | (0.309) | (0.0672) | (0.276) | (0.0709) | (0.257) |
| HH owns land | -0.385*** | 0.124 | -0.200** | -0.295 | -0.0707 | 0.436* |
| | (0.0972) | (0.229) | (0.0932) | (0.249) | (0.102) | (0.248) |
| HH owns 2 to 4 acres | -0.110 | -0.833* | -0.284** | -0.350 | -0.337** | -0.956** |
| | (0.147) | (0.453) | (0.123) | (0.373) | (0.134) | (0.395) |
| HH owns 5 to 10 acres | -0.430*** | -0.256 | -0.542*** | -0.584 | -0.663*** | -1.085*** |
| | (0.127) | (0.332) | (0.130) | (0.375) | (0.123) | (0.352) |
| HH owns more than 10 acres | -0.792*** | -0.998** | -0.883*** | -0.716** | -1.243*** | -1.130*** |
| | (0.137) | (0.443) | (0.132) | (0.364) | (0.144) | (0.402) |
| Constant | 1.683*** | -0.182 | 1.499*** | 0.271 | 2.187*** | -0.0443 |
| | (0.150) | (0.336) | (0.158) | (0.347) | (0.164) | (0.371) |
| Observations | 12,497 | 12,497 | 13,126 | 13,126 | 12,625 | 12,625 |
| R-squared | | | | | | |
| Pseudo R-squared | 0.238 | 0.238 | 0.194 | 0.194 | 0.221 | 0.221 |

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: Own estimates based on PSLM 2001/02, 2005/06, and 2007/08.

## Annexure 2 – Decomposing Changes in Poverty

Figure A4 shows that the consumption-to-income ratio has fallen over the course of the decade. As a result, the observed changes in consumption may be less dramatic than what we would have otherwise expected had the consumption-to-income ratio remained constant. Since poverty is measured by consumption, actual poverty rates are higher in the final period than they would have been had the consumption-to-income ratio remained constant. For example, when we undertake this counterfactual simulation the decrease in consumption-to-income ratio between 2001-02 and 2005-06 raised poverty by 6 percentage points. Tables A1 and A2 report the results of this exercise.

**Figure A4** Change in Average Consumption to Income Ratio


However, since income is often affected by measurement error, the interpretation of this result and its policy implications are not straightforward. If measurement error depends on income levels (with low-income households being less likely to under-report income than high-income ones), income growth may affect the consumption-to-income ratio if the degree of under-reporting changes over time. Since under-reporting is unobservable to the researcher, it is difficult to interpret the effect of a changing consumption-to-income ratio on poverty reduction.

For this reason, in the main text we report the results excluding the effect of consumption-to-income ratio and prorate the remaining effects such that they add up to the observed poverty change.

**Table A1** Contributions to Change in Poverty Head Count Ratio

| | 2001/02-2005/06 | | 2001/02-2007/08 | |
|---|---|---|---|---|
| | Percent point change | Share of total change | Percent point change | Share of total change |
| Non-Farm labor income | | | | |
| Returns to characteristics | -6.2 | 48% | -8.8 | 50% |
| Occupational-choice | -1.1 | 9% | -2.0 | 11% |
| Economic Sector | -0.3 | 2% | -0.1 | 0% |
| Education | -1.1 | 9% | -1.8 | 10% |
| Unobservables factors | -0.1 | 1% | 0.4 | -2% |
| Farm income | | | | |
| Returns to characteristics | -2.8 | 22% | -3.2 | 18% |
| Education | -0.2 | 2% | -0.6 | 3% |
| Unobservables factors | 0.2 | -1% | 0.1 | 0% |
| Non-Labor Income | | | | |
| Pensions | 0.1 | 0% | -0.4 | 3% |
| Assistance | -0.1 | 1% | -0.2 | 1% |
| Donations | 0.4 | -3% | 0.4 | -2% |
| Domestic Remittances | -1.6 | 13% | -0.9 | 5% |
| International Remittances | -0.9 | 7% | -1.2 | 7% |
| Implicit Rent | -2.0 | 16% | -3.2 | 18% |
| Other | | | | |
| Age - gender-regional structure | -2.3 | 18% | -2.5 | 14% |
| Consumption to income ratio | 6.0 | -47% | 8.0 | -45% |
| Unexplained | -0.6 | 4% | -1.6 | 9% |
| Total | -12.8 | 100% | -17.5 | 100% |

Source: World Bank estimates based on the PSLM 2001/02, 2005/06, and 2007/08.

**Table A2** Contributions to Change in Gini Coefficient

| | 2001/02-2005/06 | | 2001/02-2007/08 | |
|---|---|---|---|---|
| | Percent point change | Share of total change | Percent point change | Share of total change |
| Non-Farm labor income | | | | |
| Returns to characteristics | 0.002 | 8% | -0.001 | -6% |
| Occupational-choice | -0.001 | -4% | 0.003 | 20% |
| Economic Sector | -0.002 | -6% | -0.001 | -4% |
| Education | 0.002 | 9% | 0.002 | 11% |
| Unobservables factors | 0.004 | 17% | 0.000 | -2% |
| Farm income | | | | |
| Returns to characteristics | -0.001 | -5% | -0.001 | -8% |
| Education | 0.001 | 2% | 0.000 | 1% |
| Unobservables factors | 0.002 | 8% | 0.001 | 8% |
| Non-Labor Income | | | | |
| Pensions | -0.011 | -42% | -0.008 | -58% |
| Assistance | 0.001 | 4% | 0.001 | 6% |
| Donations | 0.000 | -1% | -0.001 | -4% |
| Domestic Remittances | -0.001 | -3% | 0.002 | 12% |
| International Remittances | 0.005 | 18% | 0.003 | 18% |
| Implicit Rent | 0.009 | 36% | 0.001 | 4% |
| Other | | | | |
| Age - gender-regional structure | 0.012 | 48% | 0.012 | 82% |
| Consumption to income ratio | -0.004 | -16% | -0.004 | -30% |
| Unexplained | 0.006 | 25% | 0.007 | 50% |
| Total | 0.025 | 100% | 0.014 | 100% |

Source: World Bank estimates based on the PSLM 2001/02, 2005/06, and 2007/08.

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