

**DISTRIBUTIONAL EFFECTS OF PUBLIC EXPENDITURES USING QUINTILE
REGRESSIONS**

BY

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With thanks

To

All those

Who made

It

Happen

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Table of Contents

	ACKNOWLEDGMENTS	ii
	Table of Contents	iii
	LIST OF TABLES AND FIGURES	v
	Abstract	vi
CHAPTER	Title	PAGE
CHAPTER 1:	INTRODUCTION	1
1.1	Objectives and Hypothesis	3
1.2	Significance of the Thesis	4
1.3	Organization of the Thesis	5
CHAPTER 2:	REVIEW OF LITERATURE	6
2.1	Gap in the Literature	11
CHAPTER 3:	METHODOLOGY AND DATA SET	12
3.1	Methods used in the Study	12
3.1.1	Valuation of In-kind Income Transfers	13
3.1.2	Imputation of In-kind Income Transfers	13
3.1.3	Structural Quintile Treatment Effect Regression	21
3.2	Gini Coefficient Analyses	29

3.3	Variables Construction and Definition	29
3.4	Data and Sample Selection	35
3.5	Statistical Packages Used	37
3.6	Summary Stats	38
CHAPTER 4:	ESTIMATION AND RESULTS	41
CHAPTER 5:	CONCLUSION	50
	Bibliography	52

LIST OF TABLES AND FIGURES

Table No.	Title	Page No.
3.1	Descriptive Statistics	39
3.2	Descriptive Statistics by Quintiles and Province	40
4.1	Instrument Effect on Education Transfers	42
4.2	Redistributive Effect of In-Kind Income Transfers on Gross Income Quintiles	44
4.3	Elasticities for the In-Kind Income Transfers	46
4.4	Inter Quintile Test for In-Kind Income Transfers	48
Figure		
4.1	Marginal Effects of Public Expenditures for In-Kind Income Transfers	42

Abstract

This study analyzes the redistributive effects of public expenditures in Pakistan by employing the recent information from PSLM survey data provided by Pakistan Bureau of Statistics for the year of 2010-11. The analysis is done at the household level by using the econometric method of structural quintile treatment effect regression. The proposed method allows us to look at the complete picture of the effect of the public expenditures on households with different income and abilities. The study compares the households with different needs by means of adult equivalence scale. We considered the in-kind income transfers which related to health care services and educational services. The results reveal that the redistributive power of in-kind income transfers are heterogeneous but are limited. Hence it has been suggested that policy makers should be conscious regarding the composition and magnitude of government expenditures on provision of education and health care expenditures benefit to lower income quintiles.

Key words: Income redistribution, quintile regression, in-kind transfers

Chapter 1

INTRODUCTION

In order to evaluate the public expenditures on provision of education and health expenditures which are devoted to household benefits one has to distinguish between equality of inputs and equality of output. The benefit obtained by households from a given amount of public expenditures on education and health largely depend upon some other characteristics of that household. Therefore, the dictum that the government ought to treat its citizens equally becomes ambiguous; equality of public expenditures on the provision of in-kind income transfers to different households does not necessarily produce equality of benefits to them.

One of the most important goals of government policy is to address inequalities in the distribution of income and to try to improve the welfare of poor (Martinez-Vazquez, 2004). An important part of public finance is to examine how government expenditures affect the distribution of income among household, particularly how government expenditures actually help the poor.

The prevailing inequality in income distribution is a fundamental hurdle to the economic and social development in developed and developing world. The unfair income distribution is more pronounced in developing countries. These countries spend a large amount of resources on reducing inequality in income distribution. The purpose of government expenditures is to bring about a fair society. For this purpose government is required to have an effective public policy measure.

This thesis analyzes the income distribution effect of public expenditures on in-kind income transfers¹. The in-kind income transfers provision is important in two respects. First, the transfers promote human capital development through education and health provision. Secondly, the transfers also directly affect the existing inequality in income distribution (Soneeda and Turati, 2005).

The in-kind income transfer components are selected for imputation in this thesis. The in-kind income transfers are selected due to its significant effect on the household gross incomes. The conceptually acceptable but quantitatively insignificant in-kind income transfer components are ignored deliberately from the analysis.

Do in-kind income transfers reduce the conditional inequality in gross income distribution? It is an important policy question regarding the distribution of public resources among households. If the publically provided in-kind income transfers reduce the inequality in income distribution and equality in income distribution is mainly the objective of public policy, then additional spending on provision of in-kind income transfers can be helpful to improve the income distribution situation.

For the above stated reason it is interesting to study whether the share of lower income quintiles² is proportionally higher, equal or lower to get benefits from public expenditures or whether the higher and middle income quintiles receive most of the shares of the public

¹ The in-kind income transfers are related to education and health. The government is not the only source of non-cash income to private households. The goods and services from which non-cash income is derived may also be provided by private third parties such as employers or charitable organizations, or by the households themselves in the form of home-grown food or implicit rent on owner-occupied housing. These items may be delivered and subsidized directly or, in the case of government provisions, indirectly via tax exemption or regulatory policies.

² To capture the variation in gross income per adult equivalent, we take into account quintiles in the analysis. There should take into account deciles for future analysis.

expenditures on the provision of in-kind income transfers. The in-kind income transfers especially of secondary and tertiary level are of more important elements in improving the income distribution (Adelman and Morris 1971, Siddiqui and Malik, 2003).

If an individual's ability affects his/her prospects of availing the in-kind income transfers then high ability individuals stand to attain higher benefits from publically provided in-kind income transfers. The individuals' ability is affected by genetic and environmental factors (Cunha and Heckman, 2007). This thesis attempts to link the behavioral response of households in terms of their ability to obtain the in-kind income transfers. For the stated reason, the study uses the proposed methodology of structural quintile treatment effect regression method proposed by Ma and Koenker (2006) instead of using the simple linear regression model.

1.1 Objectives and Hypothesis

The purpose of the thesis is to evaluate the distributive effects of public expenditures for in-kind income transfers on the inequality in income distribution in Pakistan³. In particular, the study explores how public expenditures for the provision of in-kind income transfers are associated with different quintiles of gross income per adult equivalent. From these differential effects it is possible to measure the effects of in-kind income transfers on the distribution of income.

The public expenditures on in-kind income transfers are considered regressive if more shares go to the higher income households. The in-kind income transfer benefits vary across different income groups. It is due to differences in household ability to benefit from in-kind

³ The non-cash income transfers are progressive if these result in more equal post transfer distributive of gross income. So a progressive non-cash income transfers is the distribution from rich to poor.

income transfers. Thus, the household ability to benefit from in-kind income transfers is crucial in analyzing the distributional effects of public expenditures.

The research work is expected to indicate the relationship between the extent of achieved equality after incorporating the effects of public expenditures in the pre-fiscal incomes and the corresponding effect on the income redistribution. The study aims at suggesting policy measures for the government on the basis of empirical results.

Our working hypotheses are as under.

- ❖ Incidence of public expenditures on income distribution is progressive/ pro poor.
- ❖ The public spending response results in reduction in income inequality.

1.2 Significance of the Thesis

Pakistan is an interesting case to study the redistributive effects of public expenditures. It is because of its characteristics of having high inequality in the income distribution. This high inequality in income distribution is measured by gross income and disposable income.

Obviously, a world with large inequality is neither socially nor economically acceptable. The central motivation to work on this issue is an unresolved inequality problem of Pakistan. Therefore, useful results can be produced by analyzing the available data set on Pakistan to show the causes of inequality in income distribution. Ascertaining the strength of different determinants of income inequality can help in establishing appropriate policy recommendations.

There are several empirical as well as theoretical contributions on income distribution which shed light on the importance of government intervention in the market with the objective to bring about economically fair society. Most of the studies conducted for the case of Pakistan use old

data set to evaluate the distributional effect of public expenditures on provision of in-kind income transfers. These studies do not also incorporate the distribution of the dependent variable and just look at the mean effects of the proposed policy intervention. These studies do not also take into considered the differences in household characteristics such as household ability to avail the in-kind income transfers.

The aim of the thesis is to make contribution to literature of distributional effect of public expenditures on in-kind income transfers provision. To fulfill the objective an attempt is made to link the behavioral response of households in terms of their ability to obtain the in-kind income transfers.

1.3 Organization of the Thesis

The thesis is organized in the following way. Chapter 2 presents the literature relevant to income distribution as a result of public expenditures through budget on the case studies of different countries. Chapter 3 describes the methodology and data set. The empirical analysis on the distributional role of non-cash income transfers in Pakistan is given in chapter 4. Chapter 5 presents conclusion of the study.

CHAPTER 2

REVIEW OF LITERATURE

In this chapter various studies on the distributive effect of public expenditures which are most relevant to the objective of this research work, are reviewed. The research work is done for the case of different countries. These reviewed studies have found favorable and unfavorable impact of public expenditures on income distribution.

The present study falls into the category of fiscal policy and its impact on the prevailing income distribution situation in the country. In case of Pakistan a number of studies have been conducted on the role of public expenditures in affecting incomes of the households. Most of the studies used “benefit incidence” approach (Hakro and Akram, 2007; Asghar and Zahra, 2012) or “linear regression” analysis (Ilyas, 2004).

It is found that the public expenditures incidence can be progressive or regressive. The results of these studies show that the share of different income groups varies depending upon the distribution of the benefits of government expenditures across different regions and income groups. The studies which show that government expenditures are progressive such as Wolff and Ajit (2007) and Smeeding *et al.* (1993) mainly focus on education and health. These studies find that the lower quintile of income group receive more public expenditures on education and health. The findings demonstrate that government expenditures have highly progressive structure.

The theoretical analysis conducted by Ulph (1977) found that there is progressive structure of educational and health policy, which positively affect income level of the lower income quintiles and decreasing income of top quintile. In another theoretical framework Arrow (1971) and Hare

and Ulph (1979) found that both education and ability are productive which affect the earning of households differently assuming that households differ in their ability levels. The results show that the ablest households attain the highest benefits from education which result in substantial increase in income level. Households with higher ability attain more benefits marginally from any given amount of educational transfers.

A study conducted for the case of Ecuador by Younger (1999) found that the government expenditures on in-kind income transfers improve the social indicators in the country. There is a favorable impact on income distribution situation in both rural and urban areas due to government intervention with the objective to improve equality in income distribution situation (Ilyas, 2004). Hyun (2006) found that in Thailand government subsidies on provision of the in-kind income transfers mainly benefit the poor which result in reducing the poverty level. Using income inequality indices, Awan (2007) showed that in Pakistan education, health and housing have less unequal distribution existence while in case of durable goods there exists more inequality in the country. The cross country data set used by Gupta *et al.* (2002) show that an increase in government expenditures on in-kind income transfers improves the social indicators with reduced infant mortality rate and increased enrollment rate. The study conducted by Brunello *et al.* (2009) and Asghar and Zahra (2012) found that education affects the income level positively. The compulsory years of schooling have a favorable impact on improving the income distribution situation.

Thus, those who have higher ability will have greater earnings and hence have greater consumption level (Bruno, 1976). Hence, if government assigns sufficiently high weight to equality, then the optimal policy measure is to give more weight to education for those with lower ability than those with higher ability. The point of the finding is that people of higher

ability gain proportionally more than those who have less ability in education but still the education has an effect on the redistribution of resources from the rich to the poor if the allocation of resources is on the ground of efficiency.

There are studies which find that public expenditures on in-kind income transfers are regressive in its nature. For example, Norman (1985) found that public expenditures on the provision of education and health care facilities mainly benefits upper income groups the most relative to the lower income groups. Another study of Castro-leal *et al.* (2000) found that public expenditures on health care facility mainly benefit the better off households than the poor households. There is another study conducted by Casalone and Sonedda (2013), which challenged the hypothesis of progressivity by employing the Italian data. The study found that government expenditures on in-kind income transfers play a limited role in income redistribution due to more regressive public expenditures on provision of in-kind income transfers.

The public expenditures are found to have heterogeneous effect in its nature. The effects on education are either progressive or regressive in nature. The public expenditures on education are found progressive at the lower level of education but regressive at higher level education (Hamid *et al.* 2003). The study conducted by Asghar and Zahra (2012) found that government expenditures on primary and secondary level are progressive at both national and provisional levels while these are regressive at tertiary level. It is due to higher income households avail more of public expenditures on education. By using data on New Zealand, Azaz *et al.* (2012) found that public expenditures on education and health have progressive impact for the poor deciles of one to six while there is regressive impact on the remaining deciles. The study by Hakro and Akram (2007) stated that education expenditures are progressive while health expenditures are partially progressive.

It is argued that the provision of education has favorable impact on the human capital formation. This increase in human capital leads to increase in earnings of the households. For this reason, to achieve the efficient income distribution the role of investment in human capital cannot be ignored as it works forcefully on income distribution situation (Dur and Teulings 2001).

In human capital formulation education and health are important determinants. To increase the human capital the role of government expenditures on education and health is crucial. The increased level of human capital leads to improve living standards of the masses through higher earning abilities. For this reason the subsidization of the provision of education and health facilities will provide a forceful argument to improve the prevailing income distribution situation in a country.

The literature on the incidence of public expenditures on income distribution is available in both the developed and developing countries. However, the available literature for the case of Pakistan has been conducted on old data sets of household surveys. The studies done in this area are not updated or done afresh. Secondly, the impact of different quintiles or population groups is taken considered only in few studies. Third the literature on the incidence of public expenditures and its distribution in Pakistan is scarce. The studies also suffer from a number of problems. For example, the study conducted by Ilyas (2004) which is the most comprehensive study conducted for the case of Pakistan suffers from the use of linear regression model with old data set. The study does not incorporate the heterogeneity of the potential effect of public expenditures on income redistribution. It is due to the fact that without analyzing the potential heterogeneous effects of in-kind income transfers on income distribution, the income redistribution could not be attained.

Some other studies for the case of Pakistan mostly use the benefit incidence approach (Asghar and Zahra, 2012, Hakro and Akram, 2007). These studies also do not incorporate the heterogeneity of the potential effect of in-kind income transfers on the distribution of gross income. It is because without heterogeneity it is not possible to capture the distributional effects of any policy intervention. Besides, these studies are also based on the old data sets.

The present study analyzes the distributional effect of public expenditures by employing the quintile regression. The quintile regression method is an appropriate method in order to analyze the structural relationship of the proposed public expenditures effect on the income distribution. Why it is important to study the structural relationship is explained by an influential paper of Mosteller and Tukey (1977) which states as:

“What the regression curve does is give a grand summary for the averages of the distribution corresponding to the set of explanatory variable. We could go further and compute several different regression curves corresponding to the various percentage points of the distribution and thus get a more complete picture of the set. Ordinarily this is not done, and so regression often gives a rather incomplete picture. Just as the mean gives an incomplete picture of a single distribution, so the regression curve gives a correspondingly incomplete picture for a set of distributions”

The empirical methodology adopted in this thesis is the structural quintile treatment effect regression method borrowed from Ma and Koenker (2006). The proposed methodology enables the complete picture of the effect of public expenditures on different quintiles of the gross income distribution.

The proposed methodology is adopted in order to evaluate the heterogeneity in the potential effect of public expenditures on different quintiles of income distribution. Another

advantage of the proposed methodology is that it explores the potential heterogeneity in the effect of public expenditures on the dependent variable of gross income distribution as well as the distribution of the public expenditures. In this way the structural quintile treatment effect regression method allows us to evaluate the broadest possible view of the distributive effect of in-kind income transfers. This is a positive contribution to the existing literature in Pakistan.

2.1 Gap in the Literature

In case of Pakistan most of the studies use benefit-incidence approach (Hakro and Akram, 2007) or look at the mean effect of a policy intervention by using the linear regression model (Ilyas 2004, Naseem Shirazi, 1994). The empirical methodology employed in this thesis is the structural quintile treatment effects regression method. The proposed empirical methodology is borrowed from Ma and Koenker (2006) and Chesher (2003). The proposed methodology enables a complete picture of the effect of in-kind income transfers on different quintiles of gross income distribution.

The structural quintile treatment effect regression method explores the potential heterogeneity in in-kind income transfers. The research work identifies the causal effects of in-kind income transfers on gross income distribution. This is done by using the data on those households that avail the in-kind income transfers. The proposed empirical strategy emphasizes on the distribution of gross income as well as the distribution of in-kind income transfers.

CHAPTER 3

METHODOLOGY AND DATA SET

The research work falls in the category of income distribution. The study tries to analyze the distributive effect of public expenditures for education and health on the size distribution of in Pakistan for the year of 2010-11. The study mainly focuses on those households which obtain benefits from public expenditures on education and health care facilities by utilizing them. The information on the households which obtain the in-kind income transfers is available at *Pakistan Social and Living Standard Measurement* survey.

3.1 Methods used in the study

The present study tries to analyze the impact of public expenditures for provision of non-cash income transfers on the income distribution. The empirical method applied in this thesis is borrowed from Ma and Koenker (2006), which consists of the structural quintile treatment effects regression method. The method used in this thesis would evaluate the effects of availed in-kind income transfers from public expenditures on different quintiles of the distribution of gross income per adult equivalent.

However, the problem is adherent with measurement, valuation and imputation of in-kind income transfers to the *individual* households. It is a difficult task because it is based on micro data files. There are some good attempts made (Ilyas 2004; Nawaz and Hakro, 2007; and Zahid and Zahra, 2012) to do this task in case of Pakistan. Due to the use of the survey data, the information on individual utilization of publically provided education and health care services is not available. Therefore in-kind income transfers associated with education and health care services are attributed to households.

These in-kind income transfers associated with health and education monetary values are both net of costs borne by the households. The gross health benefits are considered net of co-payments and education benefits are considered net of enrollment fee paid to access the services provided by the government. It is assumed that the gross value for the transfer's recipients is equal to the amount of government expenditures on provision of the education and health care facilities.

3.1.1 Valuation of In-kind Income Transfers

The value of non-cash income transfers is assumed equal to the market value of these services. In other words, transfers are valued according to the cost born by the government on the provision of in-kind income transfers. So it is assumed that 5000 rupee of education benefits for a household with one child is equal to transfers of 5000 rupee in cash amount.

Low income household with few cash resources might choose to spend non cash income transfers differently if they were given in cash instead of in education outlays. Similar is the case for the cost of medical outlays. The decision to account them in income at their government cost or market value may lead to an overestimation of the true level of well-being of such household (Smeeding *et al.* 1993). It is assumed that the publically provided education is perfectly substituted for the private education. That is, there is no difference of quality of education between public and private education.

3.1.2 Imputation of In-kind Income Transfers

The public subsidies on education are made at the primary, secondary and tertiary school levels. In the health care sector, the government subsidizes on health care through hospitals and

primary health care system. Government may also subsidize through health care, training and communicable disease control.

In case of health care subsidies, the imputation is based on risk related insurance premier approach. That is, the health care services are viewed as insurance benefits received by all coverers independently of their actual use of health care benefits. The obtained benefits differ by age and gender in line with differences in need.

The implementation of the approach requires the calculation of per unit cost for various education and public health facilities. We start by estimating the average cost of hospital, basic health unit and lady health unit treatment due to illness or injury of the household's members, for each region of Pakistan. This allows us to impute the value of health care facility on the basis of hospitalization, basic health unit or lady health worker visits on per capita basis for different categories. The estimated value of health care facility varies across individual's age, gender, and region of residence of the household.

It is also assumed that if a household member is ill then he/she must go for a health care facility for the treatment. Different treatments are required in case of different illnesses. The required treatment is according to the illness condition of the patient like ill, injured or hospitalized. It is known that the need of drug prescription depends upon the duration of illness period but it is not possible to identify the individual users of health facility. Therefore the value of health facility is imputed on the bases of household level.

Similarly, the average expenditures on education facility are calculated. The average expenditures on education vary across tiers of education as well as across the regions. The average expenditures per student are calculated from data on total expenditures at each tier of

education and total students enrolled in each tier of education. The value zero is assigned to those household with no children enrolled in any public sector institutions and/or children dropped out from school or no school age children⁴.

To attend a public school implies to face a negligible fee paying in each grade of education. The results are not significantly affected if this cost is not taking into consideration. The net value of tertiary education facility is imputed to those households with children enrolled in undergraduate and higher levels of education. However, it is assumed that there is no difference in the quality of education received by the households across the regions (Smeeding, 1999).

The education benefits are attributed only to those households with children enrolled in public school. The analysis is restricted to publically provided primary, secondary and tertiary levels of schooling. The educational transfers for technical education are not included in this analysis. It is because only few observations are available in the survey data. The benefits of operating and capital outlays have been allocated to those households with children enrolled in public sector education institutions.

Although, the estimated average cost per student is heterogeneous across each tier of education (primary, secondary and tertiary level) and across the region of residence of the households but it is assumed that the value of education transfers corresponding to the estimated average cost per student is same for each household for a given tier and within a given region.

⁴ The availing of cash equivalent valuation is an ideal approach. The marketed value on average overstated the value of in-kind income transfers for the case of lower income households. It may found false for the case of poor health status. A low income household may term the value of health insurance subsidies above the marketed value.

The in-kind transfers are the sum of monetary values of education and health care services provided by public institutions. Although the availed monetary values change over time due to getting of education or health care facilities from public sector institutions. However, due to the use of cross sectional dataset we take it for only one time availed monetary value by the households. In short four principles are followed in identification and valuation of the in-kind income transfers for imputation

- 1) The total value of non-cash benefits is assumed to be equal to the amount that government spends on education and health transfers.
- 2) The households that receive the non-cash benefits of government spending are assumed to be the only beneficiaries. It implies that there is no positive or negative externality of education or health spending of government.
- 3) Both the operating and capital outlays are considered when allocating public non-cash benefits for education and health.

The household size and structure have a considerable impact on the welfare of *individual* household. So the differences in household needs and requirements are taken into account in order to derive the account of well-being of individual in the household. This is accomplished by applying an “adult equivalence scale” which expresses relative household needs and requirements. Adult equivalent income is a preferable measure of individual well-being than the per capita income. It is because the latter makes no allowance for economies of scale in household financial arrangements and the age composition of households. Now the question is that which equivalence scale should be used among different available scales. The weights proposed by Haq (1998) are used to calculate the number of adult equivalents in a household as follows

$$N = X_1 + 0.7X_2 + 0.6X_3 \quad (3.1)$$

N is the number of adult equivalents, X_1 is the number of income earners in household, X_2 is the number of non-earning adults and X_3 is the number of children (aged less than 16 year).

The public support to household has been calculated by imputing public expenditures on the provision of services. Gini index is calculated to analyze the nature of the incidence of public expenditures on the provision of in-kind income transfers. If Gini index of disposable income⁵ is lower than the Gini index of gross income then it will indicate that public expenditures are progressive in their nature as the greater value of Gini index shows greater inequality. The lower Gini index value of disposable income shows that more of in-kind income transfers are availed by lower income quintiles and less is availed by higher income quintiles.

In case of Pakistan there are generally three approaches namely benefit incidence approach, money flow approach and simple linear regression method to analyze the distributional role of government budget expenditures on provision of in-kind income transfers. The “money flow approach” takes into account the direct recipients of public expenditures without considering the final recipients of these expenditures. The “benefit/incidence approach” focuses on the final recipient of the public expenditures. The simple linear regression model gives the mean effect of the proposed policy intervention on gross income.

The first two approaches are of statistical nature of work while the last approach looks at the relationship providing only the mean effect of the proposed policy intervention. The problem is that it does not take into account the distribution of the dependent variable and it just offers the mean effect of the proposed policy intervention.

⁵ The disposable income is obtained by adding the availed in-kind income transfers and subtracting the paid direct taxes by the households.

The standard simple linear regression model looks the relationship between one or more independent variables of in-kind transfers on the conditional mean of dependent variable of gross equivalent consumption expenditures and we get one coefficient beta for this effect. To overcome this problem one proposed solution is the quintile regression method. The problem with this approach is that it does not consider the possible endogeneity issue of the independent variable. The solution of the problem is offered with employing the newly proposed methodology of structural quintile treatment effect method (Ma and Koenker, 2006).

We would use the structural quintile treatment effects method proposed by (Ma and Koenker, 2006) instead of using the simple quintile regression method in our analysis due to the reason of spurious correlation between the variables of interest and second due to reverse causality which results in endogeneity of the policy variables.

The endogeneity problem occurs when the independent variable is correlated with the error term in a regression model. This implies that the estimated regression coefficient in the simple linear regression model is biased. However, if the correlation is not contemporaneous then the estimated parameters may still be consistent. There are many methods of overcoming this, which involve the endogeneity problem, which all employ instrumental variable.

Now notice one practical consideration that the distribution of the dependent variable needs to be continuous (Chesier, 2003). We want a nice continuous distribution where the value changes from one observation to the next. This is the situation where quintile regression does work the best.

In order to measure the effect of in-kind transfers on gross income per adult equivalent, we have evaluated the gross income per adult equivalent at different quintiles of the distribution

of dependent variable. In this proposed specification, we would not alter the value of in-kind income transfers exogenously but here we would change the distribution of the in-kind income transfers variable.

In quintile regression the coefficients are indeed the marginal effects. So in this case we have very similar marginal effects as is in the simple linear regression model. In each of these proposed parameters we would estimate the change in specified quintile of the dependent variable produced by one unit change in the independent variable. At each time we interpret these marginal affects, we have to say at this quintile like the 25th quintile we have an effect and report the magnitude. So when we talk about simple linear regression model estimate there is the average or mean of dependent variable so we do not report any quintile but here we have to.

It may be noted that the coefficients are the marginal effects in the model. It implies that a quintile regression parameter (β_q) estimates the change in the gross income per adult equivalent in the specified quintile q of the gross income per adult equivalent produced by a unit change in the in-kind income transfers. Another point is that the marginal effects are the infinitesimal changes in the in-kind transfers, assuming that the dependent variable remains in the same quintile. It means that we don't want to jump from one quintile to a completely different quintile for the distribution of the dependent variable. Unlike the simple linear regression model, the interpretation of quintile regression results need to specify which quintile of the dependent variable they refer to.

In contrast to simple linear regression model, the quintile regression uses the linear programming method whereas the former uses the maximum likelihood method to find out the coefficient. The quintile regression model has also the advantage of flexibility of modeling of data which is heterogeneous on the conditional distribution. This data could be having non-

normal distribution. The quintile regression has the advantage to address the issue in a much better way as compared to the ordinary least linear regression model.

The quintile regression is more robust to outliers than the simple linear regression model. Rich characterization and description of the data can show different effects of independent variable on the dependent variable depending across the spectrum of the dependent variable.

We take into considered the households with respect to unobservable abilities and needs. The study addresses the issue of whether a marginal change in public expenditures on the provision of health and education improves the income distribution or not? In other words, to analyze whether public expenditures are progressive or regressive in their nature.

It is assumed that the increase in public expenditures is pro-poor in its nature and, hence, improve the income distribution situation at overall level in the country. It implies that the in-kind income transfers improve a household's relative position in the gross income distribution if the households share in in-kind income transfers is higher than the household's gross income share in the entire population.

For the stated purpose we would investigate empirically whether the change in non-cash income transfers improve household's relative position or not. The empirical investigation is done by regressing for each quintile. The regression is run of the ratio between the pre non-cash income transfers and its mean value over the whole population, on the corresponding ratio of in-kind income.

In order to evaluate whether the proposed fiscal policy measure is progressive or regressive, it is suggested to estimate the elasticity's. The statistical table can also help us to assess whether the non-cash income transfers are redistributive by comparing the estimated gross

income and the estimated gross income plus in-kind income transfers after netting out the tax paid.

Whether the non-cash income transfers are pro poor or pro rich can be determined by comparison of the winner and loser quintiles. This is done by comparing the pre and post in-kind income transfers quintiles.

3.1.3 Structural quintile treatment effect regression

The following quintile regression model is defined where yg_i and $inkind_i$ are the gross income and non-cash income transfer of household i , respectively. The mean values of gross income and in-kind income transfers over the whole population are denoted by μ_{yg} and μ_{inkind} respectively. According to the proposed methodology the following empirical model would be estimated to analyze the distributional effect of public expenditures on income distribution.

$$\frac{yg_i}{\mu_{yg}} = \beta(A_i, F_i) \frac{inkind_i}{\mu_{inkind}} + A_i + F_i + \gamma X_i \quad (3.2)$$

Where

Yg_i = Gross income⁶ per adult equivalent for household i .

In-kind _{i} = Sum of monetary value of availed education and health care facility for household i .

A_i = Characteristic variable of ability to avail in-kind income transfers for household i .

F_i = Characteristic variable of peculiar income shock faced by household i .

⁶ The household income is taken as is given by the Federal Bureau of Statistics (FBS).

X_i = Set of control variables used in the regression for household i .

μ_{yg} = Population mean value of gross income per adult equivalent.

μ_{inkind} = Population mean value of in-kind income transfers.

As stated above, the proposed methodology also takes into considered different household characteristic variables with $A_i \sim G_A(0, \sigma_A^2)$ and $F_i \sim G_F(0, \sigma_F^2)$ representing household characteristics affect the likelihood to avail in-kind transfers and peculiar income shock, respectively. It is assumed that A_i and F_i are orthogonal⁷ with each other and G stands for the respective distribution. The X variable is the control used in the study which could effects the gross income per adult equivalent.

It is assumed that the proposed public budget expenditures for in-kind income transfers have their progressive effect on income redistribution as it leaves different effects on different quintiles of household gross income distribution. Due to the assumption of differential effects of the proposed mechanism on different gross income quintiles the quintile regression model shows its superiority over the ordinary linear regression model. The latter technique estimates the effect of in-kind income transfers on the average of the gross income redistribution. This is a necessary condition for income redistribution of the investigated mechanism. This is not a sufficient condition for the redistribution of the proposed mechanism.

The sufficient condition for income redistribution of the proposed public expenditures it is assumed that there is heterogeneity in the potential effect of proposed public expenditures for in-kind income transfers on the gross income distribution.

⁷ It is assume that A_i and F_i are independent from each other.

Another problem is adherent to the reverse causality. The reverse causality is running from the gross income share to the non-cash income transfers, which results in endogeneity problem. The structural quintile treatment effect method would ensure that the estimate of the parameters of interest is consistent. It also allows us to evaluate the potential endogeneity of the in-kind income transfers by testing of the estimated coefficients of residuals of the auxiliary regressions (equation 3.3) and their interaction with the in-kind income. The auxiliary regressions of in-kind income transfers to be estimated are as follows, where Z_i denotes instrumental variables and A_i represents abilities of household which in turn leads to receipt of in-kind benefits provided by government in the form of higher education facilities.

$$\frac{inkind_i}{\mu_{inkind}} = \gamma_{inkind}X_i + \emptyset Z_i + \varepsilon A_i \quad (3.3)$$

In order to measure the unobservable component of A_i we assume that higher the abilities of a household are, the higher would be the benefits availed in terms of non-compulsory schooling. So if a household has any member with qualification of grade nine or more we assume that particular household has a higher ability in term of non-compulsory education.

The sensitivity of outcomes as a result of change in the conditioning and other variables has random variation. In the micro econometric context this is how to measure the public expenditures for the provision of in-kind income transfers have effects on gross income distribution that vary across households. The public expenditures on provision of in-kind income transfers are useful if the features of the distribution of in-kind income transfers can be identified. For this purpose the latent random variables A and F and the in-kind income transfers should be independently distributed.

By following conditional quintile function τ_A and τ_F are the particular quintiles with $\tau_A = G_A(A_{\tau_A})$ and $\tau_F = G_F(F_{\tau_F})$ where A_{τ_A} and F_{τ_F} are the τ -quintiles of the distributions of A_i and F_i respectively. By recursively conditioning, a sequence of conditional quintile functions is available to characterize the model and identify the structural effects. Ma and Koenker (2006) show that the recursive conditioning yields the following model with conditional quintile equations of the gross income and in-kind income transfers as $Q_y[\tau_F/inkind, X]$ and $Q_{inkind}[\tau_A/X, Z]$ corresponding to equation (3.2) and (3.3)

$$Q_y[\tau_F/Q_{inkind}(\tau_A/X, Z), X] = Q_{inkind}(\tau_A/X, Z)\pi_1(\tau_F, \tau_A) + \gamma_y X + G_A^{-1}(\tau_A) + G_F^{-1} \quad (3.4)$$

$$Q_{inkind}(\tau_A/X, Z) = \gamma_{inkind} X + \pi_2 Z + \varphi G_A^{-1}(\tau_A) \quad (3.5)$$

The distribution of in-kind income transfers conditional on controls X and instrument Z (compulsory education and higher education supply) are also affected by the distribution of ability (A_i). Equations (3.4) and (3.5) show the effects of the unobservable characteristics on the various quintiles of the distribution of gross income.

It shows that how various quintiles of distribution Q_y of the gross income distribution are affected by endogenously determined quintiles of in-kind income transfers Q_{inkind} . In this way we can evaluate the perturbation of the prevailing distribution of in-kind income transfers on the distribution of various quintiles of gross income distribution.

The function $\pi_1(\tau_F, \tau_A)$ is the quintile treatment effect of in-kind income transfers on gross income. The quintile treatment effect describes the impact of a perturbation in-kind income transfers on the gross income distribution. The structural quintile treatment effect is representing

the deconstruction of the mean effect into its elementary components. Rather than altering exogenously the value of in-kind provision we alter its various quintiles $Q_{\text{in-kind}}$ and thus study how the quintiles Q_y of the distribution of gross income are affected (Ma and Koenker, 2006).

The proposed method allows us to evaluate the role played by different factors of household unobservable needs and abilities pertaining to avail in-kind income transfers and the interaction between the unobservable and in-kind income transfers.

According to the proposed methodology, for in-kind income transfers the auxiliary regressions are run for each proposed quintile. The quintile regression includes the exogenous variables plus the proposed instrument of compulsory education and higher education (equation 3.3). In next stage the residuals from these auxiliary regressions are estimated. The quintile regressions for gross income by adding the τ quintile estimated residuals in the first step and its interaction with the in-kind income transfers are estimated in the final stage. Thus we can estimate the effect of in-kind income transfers on the gross income at each quintile.

Assume we considered the 10th quintile of gross income distribution $\tau_F = G_F(F_{\tau_F}) = 10$, so F is fixed at its τ_F -quintile, changes of τ_A in $\pi_1(\tau_F, \tau_A)$ reflect how the distribution of τ_A affects the 10th-quintile of the response of gross income. On the other hand if we fix τ_A and allow τ_F to vary, we can throw light on how the τ_A -quintile of in-kind effects on the entire distribution of gross consumption expenditures (Ma and Koenker, 2006).

The unobservable component of A_i is the sum of individual abilities where ability could be measured by capacity to benefit from the public expenditures for in-kind income transfers in the above model. Here the ability is measured for only educational expenditures because benefits from health expenditures are not on the base of ability but individual's probability to receive

them. The household ability is measured by gaining benefit only from the non-compulsory schooling. So an individual of certain ability receives an amount of educational expenditures, which will indicate a household's ability to benefit from public expenditures on in-kind income transfers (Ulph, 1977).

The derivative of a response variable, gross income per adult equivalent, with respect to a potentially endogenous variable, the in-kind income transfers, with covariates and instrumental variables held fixed and with unobservable variables (A_i, F_i) set equal to specified quintiles of their marginal distributions as is given the distributions of household characteristic variables. Thus if this is applied to a structural model we term it as the exogenous impact function.

The approach relies on existence of the instrumental variables that satisfy the local quintile independence conditions which required that the conditional quintile, median or percentile, of a random variable does not depend on values of the conditioning variables.

The identification conditions are such that when these conditions apply then exogenous impact function can be identified with the well-defined functional of conditional quintile function about which data are principally informative. The condition is that for the exogenous impact function to be applied is there must exist at least one instrumental variable Z . The instrumental variable should also possess the quintile independence properties, namely the τ_A -quintile and τ_F -quintile of unobservable A and F are independent of Z , and such that Z is excluded a priori from the function of equation (3.2) which relates gross income to the endogenous variable of in-kind income transfers (Cheshier, 2001). The instrumental variables Z have a role in determining the in-kind income through auxiliary function in the sense that change $Q_{inkind}(\tau_A/X, Z) \neq 0$ at the chosen values of X and Z .

If such an instrumental variable does not exist in the exogenous impact function then it is not possible to identify at the chosen values of X , Z , τ_A , and τ_F using the defined exogenous impact function. If there exist greater than one such instrumental variable then the defined exogenous impact function for each choice of Z_i and thus the exogenous impact function is in principle over identified at the chosen values of X and Z .

The proposed conditions are local in a sense that quintile independence conditions are required to hold only at the chosen values of τ_A and τ_F that appear in the exogenous impact function. Secondly, the condition of none zero derivative of instrumental variable is only required to hold at the chosen values of X , Z and τ values (Cheshier, 2001).

Let us assume the negative sign of the exogenous impact function $\pi_1(\tau_F, \tau_A)$. This negative sign indicates that higher the benefits obtain by the household, the lower the corresponding gross income. We argue that for any given τ_A the estimated $\pi_1(\tau_F, \tau_A)$ increases in absolute value along the distribution of τ_F . It indicates that income reduction associated with a unit increase of transfers grows with household income.

In order to make the coefficients to be comparable we use the estimated elasticities. The calculation of corresponding elasticities of the estimated parameters is one percent increase in the non-cash income transfers would allow us to make comparison of income changes as a result of policy intervention.

The elasticity of gross income with respect to in-kind income transfers is equal to ratio of average and marginal transfers. It explains the progressive or regressive structure of the proposed mechanism on in-kind income transfers. If the ratio is greater than one than, then it indicates that

non-cash income transfers are progressive. Similarly, if the ratio is less than one than it explains that non-cash income transfers have regressive structure.

The elasticity is estimated for each τ_F quintile, the result of the study provide the evidence of the redistributive power of the non-cash income transfers along the gross income distribution. We can explain it in a different perspective by explaining that a decrease of $\pi_1(\tau_F, \tau_A)$ along the distribution of τ_A for any τ_F suggests that the allocation of government budget expenditures is carried out on efficiency grounds. It suggests that the household who are more able to take advantage of non-cash income transfers incur smaller income contractions. However, the increase of $\pi_1(\tau_F, \tau_A)$ along τ_A would suggest that households that are less able to obtain in-kind transfers, experience smaller trade-offs between income and in-kind benefits.

The elasticity is defined for the gross income with respect to in-kind income transfers. The elasticity is calculated for an easy comparison of the possible effect of in-kind income transfers on gross income. This is done because it is not easy to compare the coefficients of the marginal effect of in-kind income transfers in the quintile regression model. The elasticity is calculated as follows

$$\epsilon_{yg_i \text{ inkind}_i} = \frac{\partial \left(\frac{yg_i}{\mu_{yg}} \right) \frac{\text{inkind}_i}{\mu_{\text{inkind}}}}{\partial \left(\frac{\text{inkind}_i}{\mu_{\text{inkind}}} \right) \frac{yg_i}{\mu_{yg}}} \quad (3.6)$$

$$\epsilon_{yg_i \text{ inkind}_i} = \frac{\mu_{\text{inkind}}}{\mu_{yg}} \frac{\partial yg_i}{\partial \text{inkind}_i} \frac{\text{inkind}_i}{yg_i} \frac{\mu_{yg}}{\mu_{\text{inkind}}}$$

$$\epsilon_{yg_i \text{ inkind}_i} = \frac{\frac{\text{inkind}_i}{yg_i}}{\frac{\partial \text{inkind}_i}{\partial yg_i}}$$

The stated resulting equation depicts the ratio of average and marginal in-kind income transfers. The Gini coefficient is also employed in order to measure the redistributive impact of non-cash transfers.

3.2 Gini coefficient analysis

The Gini coefficient is the mean distance between cumulated population shares and accumulated shares in income which implies the mean distance between the 45 degree line and the Lorenz curve. The value of Gini coefficient lies between zero and one where zero indicates perfect equality and one implies perfect inequality in income distribution. The value equal to one implies that all the income accrue to a single household in the society.

3.3 Variables construction and Definitions

Before considering the variables, it is relevant to mention that a household comprises of a single individual or a group of individuals living in a single house. A single household comprises of individuals which make possible the provision of own food items and basic needs of living.

A multi person household consists of two or more persons living for common provision of own food items and basic needs of living. To some extent the income earners of multi person household's also share their incomes in the pool. In order to identify the multi person household's the members of household live and eat together under one roof (PSLM, 2010-11).

3.3.1 Gross Income per Adult Equivalent

The gross income per adult equivalent is the dependent variable in this analysis. The income of household includes market earned income of members of the households who are engaged in earnings from first occupation, second occupation, other work, wages in-kind

received and pension income received during one year. In order to arrive at the gross income per adult equivalent, transfer payments from public sector are also included and all income figures are adjusted by employing adult equivalence scale (equation 3.1).

The household income is divided into two components, those who are economically active and those who are not economically active. All those who are employed or currently working for earnings are called economically active and those who are not economically active but have incomes in terms of pension or rent out of buildings are non-active members. Gross income includes earnings of spouse or any other member of the household from agricultural or non-agricultural establishment of household.

The market income also includes rent value received through renting out of any agricultural equipment like tube well, tractor, plaque, thresher etc. In addition the other market earning we include are the interest received on savings of household during the last one year. Another component in our analysis is market earnings of household on profits received from securities during the last one year.

The unilateral transfers are net of zakat and usher and transfer from Pakistan bait-al-mall fund (PBM). These include only those unilateral transfers which are made by public sector organizations such as provisional, federal or district governments during the last one year to households who are poor and needy. We exclude unilateral transfers from the private sector such as unilateral transfers received from relative, neighbors or NGOs.

3.3.2 Education transfers

The education monetary transfers are the transfers to households with children enrolled in public sector institutions. In order to estimate the per capita expenditures made by government

on each child enrolled in government institutions we divide the total expenditures made by government (current and development expenditures) at each level of education by total enrolled number of children in government institutions. These transfers vary across grade and regional level.

The per capita expenditures are calculated by dividing the total expenditures on primary, secondary and tertiary level across each of the four provinces. The per capita expenditures on each tier of education found different for each tier of education as well as across the province. After the estimation of the per capita expenditures at each tier of education in the first stage, the next step is to assign these estimated monetary values to those households with children enrolled only in public sector institutions as is reported in the PSLM survey information.

3.3.3 Health care transfers

The assigned per capita expenditures on health care facility are obtained by dividing the total expenditures made by public sector on provision of health care facility by the *estimated* population. The estimated cost varies across the regions. The health transfers are assigned to those households that avail health care facility (ill, injury, consultation, medicine or diarrhea) from public sector institutions. The households with children or aged members are more likely to avail more health care facilities. The availing health care facility includes hospitalization, consultation from disease or injuries, etc. of any member of the household.

3.3.4 In-kind transfers

The in-kind income transfers are related to education and health care transfers. Hence, it is the sum of assigned monetary values of either education or health or both from public institutions to those households who avail the facility. These assigned monetary values vary

across the region as well as households. The assigned monetary values vary due to different needs of health care facilities as well as education requirement among household. It is assume that a household with more school age children avail more benefits⁸.

3.3.5 Number of income earners in household

It includes all those persons in the household who are engaged in work for material return which consist of cash or in-kind earnings⁹. We derive the earnings from two different source of incomes which mainly consist of agricultural incomes and the earnings from non-agricultural establishment. We account the number of income earners in household as those who are engaged in earnings from agricultural or non-agricultural establishment for one hour on any day for the sack of earning or profits during the last one year.

3.3.6 Residential status

The residential status of the household is indicated by rural and urban dwellings. To construct dummy variable we assign value equal to one to those households who live in urban area and value equal to zero to those who live in rural area.

3.3.7 Household head

In selection of head of the household, if there is a single person household then that person is considered as the head of household. If there are more than one persons living in the house then we considered that person as the head of household as given by the *Pakistan Social and Living Standard Measurement Survey (2010-11)*.

⁸ To visit a public health care or hospital is a facility. The more you visit a public health care facility result in more you avail the health care benefits in monetary terms.

⁹ All those persons are considered as the employed persons who work for at-least one hour during the preceding period or have own work for profit.

3.3.8 Household Ability

We measure the ability level of households by non-compulsory schooling. A household with children enrolled in non-compulsory schooling are considered as higher ability households. The estimated monetary value is assigned to those households with children enrolled in non-compulsory schooling. The data on those households with children enrolled in non-compulsory schooling are available in *Pakistan Social and Living Standard Measurement (2010-11) Survey*. We impute a value equal to zero to those household with no child enrolled in non-compulsory education.

3.3.9 Income Shock

The shock is classified as idiosyncrasy and covariate. Household's idiosyncrasy shock consists of family specific shocks such as illness, injury, and death. It consists of total medical expenditures born by the households on consultation fee, purchase of medicine and loses of income due to illness, injuries, etc.

3.3.10 Compulsory schooling

In order to derive the efficient estimates of the parameters of interest, there is a need of instruments which are correlated with the explanatory fiscal policy variables but uncorrelated with the household gross income per adult equivalent. In relations to gross income per adult equivalent and in-kind transfers, high school is compulsory¹⁰. Thus, in order to obtain the instrument which is related to non-cash benefits while having no relation with the gross consumption expenditures, we consider in-kind transfers related to tertiary education as potentially endogenous variable.

¹⁰ The non-cash benefits related to health also depend upon the members of household age, gender, and region of residence.

To measure the instrumental variable we use the proposed instrument of Harmon and walker (1995) according to which the return to education among households heads using changes in the legal minimum school leaving age serves as an instrument for completed education.

The compulsory schooling is an instrumental variable. It is assigned value equal to five for household heads born on or before 1962 for completed education where minimum school leaving age is 11 years, while it is assigned value equal to eight for those household heads where minimum school leaving age was 14 or born on or after 1963 (Card, 2001).

3.3.11 Higher education

The higher education is another instrumental variable. The monetary value is assigned to those households with children enrolled in higher education institutions. The estimated cost per student of higher education is imputed for those households, which vary across households as well as across province level, with children enrolled in higher education. A value equal to zero is assigned to those households with no household member is enrolled in higher educational institution.

According to the traditional economic categories, higher education cannot be defined as a public good since it is a service that can be excludable and often competing. However, public regulation is still necessary for both efficiency and equity reasons. However, we do not find such a high correlation between disposable income and benefits from higher education (Pacífico, 2009).

It is found that there is no such high correlation between disposable income and the benefits derived from higher education and it is a good approximation of the average cost per receipt. In the first stage we estimate the mean expenditures made by government on provision of

higher education for each region of the country and then impute this estimated monetary value to each household who identified himself as potentially enrolled to the university¹¹. More importantly the benefit derived from this procedure has to be seen as gross transfers (Pacifico, 2009).

The higher education instrument is constructed by considering those households with children enrolled in higher education. A value equal to zero is assigned to those households with no household member enrolled in any educational institution.

3.3.12 Job status of household head

The employment status is disaggregated in the survey information. We divide the information on the status of job into two broad categories of employed in agricultural or non-agricultural establishment. The available information consists of those household members who are doing work for pay or profit in any agricultural or non-agricultural establishment during the last one year. Those members of households who are not engaged in any work for pay or profit during the last one year are excluded. Thus the information is available on the members of households who either work in agricultural or nonagricultural sector for pay or profit.

3.4 Data and Sample Selection

The aim of the thesis is to analyze the incidence of public expenditures on income distribution in Pakistan. This is done by using the latest household survey information. The data used in this analysis are taken from the *Pakistan Social and Living Standard Measurement survey* (PSLM) for the year 2010-11. The information is collected by *Pakistan Bureau of Statistics*. The survey is a nationally representative household survey. The data is collected at

¹¹ It is worth noting that this approach considers neither the differences in quality, nor the phenomenon of the regional mobility.

different time intervals with the objective of gathering information on income and expenditures of households. The household is the unit of analysis.

The survey conducted in the early years was not as comprehensive as it is now a day. The previous surveys are conducted with irregular intervals in data collection. The first survey was conducted for the year in 1963-64. In order to fulfill the needs of national accounting, survey questionnaire was revised in 1990. The survey provides information on different social indicators as well as income and expenditures of households.

The individual level data are collapsed into household income, which providing a sample of 16341 households; 6589 in urban and 9752 in rural areas. After the cleaning of data, a sample of 10889 households was left for in the final analysis¹². The individual level information is available in SPSS form.

For the analysis we use different government sources in our data set. The basic information on the use of the publically provided health care services, education facility and income of the household is taken from the *Pakistan Social and Living Standard Measurement Survey* for the period of 2010-11.

To apply the idea first of all we estimate per capita expenditures made by public sector on imparting education. For this purpose the information on the enrollment in different educational institution has been taken from *Pakistan Education Statistics 2010-11*, Ministry of Education, Pakistan. The information is available for primary, secondary and tertiary level of education on enrolled children in public sector institutions across regions of Pakistan. The information on

¹² The observations are deleted from the analysis during the estimation. It is due to reason that with missing or non-availability of information the regression produced singular matrix. The outlier observations are also deleted from the analysis.

expenditures at different tiers of education as well as across regions is obtained from Pakistan Rural Support Secretariat (PRSP), Ministry of Finance, Pakistan (2010-11).

In order to estimate the per capita expenditures on health care facilities we got information on *estimated* population across regions from *Economic Survey of Pakistan* (2011-12), Ministry of Finance, Pakistan. The public expenditures on the provision of health care services are available in *National Health Accounts*, Pakistan Bureau of Statistics (2011-12).

3.5 Statistical Packages Used

The study uses different statistical packages to analysis the marginal impact of fiscal policy on income distribution. To accomplish the task some of the useful and well-known statistical packages are Microsoft Excel 2010, SPSS 17 and R language. The computational results report in this thesis was carried out in the R language. The use of SPSS has its importance in analyzing the micro data files handling provided by PSLM¹³. The R language is more helpful in conducting the estimation and graphics. The Excel had its importance in series computations.

3.6 Summary Stats

In summary statistics the coefficient of variation, defined by distribution's standard deviation divided by average value, is estimated. The coefficient of variation has its pros and cons. First of all it is easy to understand and if data are weighted then it is free to outliers. It also takes into account all available data. This implies that it does not miss any data in the model and it is free from influence of unit. On the other hand the cons are that it required a very comprehensive data set and no standard is set for an accepted level of inequality measure.

¹³Pakistan Bureau of Statistics (2010-11).

The descriptive statistics at national level reveals that the direct taxation is almost 3.4% of the gross income per adult equivalent in Pakistan on average (Table 3.1). It also reveals that the net public expenditures non-favorable impact on the disposable income relative to the gross income per adult equivalent. By comparing the Gini coefficient of gross income per adult equivalent with the disposable income, the public expenditures effect on income distribution has non-favorable impact as Gini coefficient value increase which indicates that the income inequality situation worsens in Pakistan.

Table 3.1: Descriptive Statistics Arrange by Gross Income per Adult Equivalent

	Mean	Median	SD	Gini	P90/P10	CoV	Obs.
Gross equivalent income	28836.21	23026.32	24818.13	0.3577	4.303	0.86	10889
Net personal tax	981.9141	0	13102.25	0.9189	-	-	10889
In-kind transfers	38541.58	20172.23	51769.66	0.6156	76.065	1.34	10889
Disposable income	66395.88	46177.39	61768.23	0.4363	7.476	0.93	10889

Source: Authors calculation based on survey data (PSLM 2010-11).

The coefficient of variation also confirms that public expenditures for the provision of in-kind income transfers increase inequality in the society. The inequality is confirmed by comparing the gross income per adult equivalent with the disposable income. The disposable income has high value of coefficient of variation than the gross income per adult equivalent value in Pakistan. The government expenditures for the provision of in-kind income transfers leave negative impact on reducing inequality in income distribution.

The quintile distribution is done according to the gross income per adult equivalent distribution. Below the median level the low income people paying relatively low taxes as

compared to high income people where above to the median level high income people paying higher taxes on earned income. The first quintile receives proportionally less income as compared to the higher income quintiles. The quintiles description reveals that the higher income quintiles receive proportionally higher in-kind income transfers provided by the public institutions across all the provinces.

Table 3.2: Descriptive Statistics by Quintiles and Province

Province of residence								
	Punjab		Sindh		KPK		Baluchistan	
Quintile	Mean	Share	Mean	Share	Mean	Share	Mean	Share
Q1	25612.85	15.58	25101.74	10.10	26722.62	15.27	20681.9	10.47
Q2	23539.25	14.32	28603.41	11.49	26350.72	15.02	29022.9	14.69
Q3	28046.07	17.06	38568.28	15.49	27187.35	15.47	36000.08	18.22
Q4	35551.6	21.60	64174.29	25.77	39960.56	22.78	43215.02	21.81
Q5	51714.24	31.45	91731.51	37.16	55168.68	31.46	68822.4	34.82
Overall	32892.2	34.3	49768.1	30.03	35077.8	18.6	39546.5	17.07

Source: Authors calculation based on survey data (PSLM 2010-11).

Although the doors are open to all the citizens whether they belongs to poor or rich but this may be due to reason of more individual belongs to higher income households enrolled in higher or tertiary level qualification where government had made greater expenditures on the provision of tertiary level education. Hence, the middle and higher income quintiles receive more of in-kind income transfers shares relative to their gross equivalent income shares due to greater

number of individuals enrolled in tertiary level schooling. So the middle and higher income quintiles get more benefits from publically provided educational facilities.

Chapter-4

Estimation and Results

In according with the proposed model, the gross income per adult equivalent is regressed on the proposed fiscal policy measure, namely the public expenditures for the provision of in-kind income transfers variable. The covariate shows that the one unit change in the exogenous variable does affect the dependent variable, gross income per adult equivalent, at the relevant quintile. In the following regression quintiles we display the summary of results.

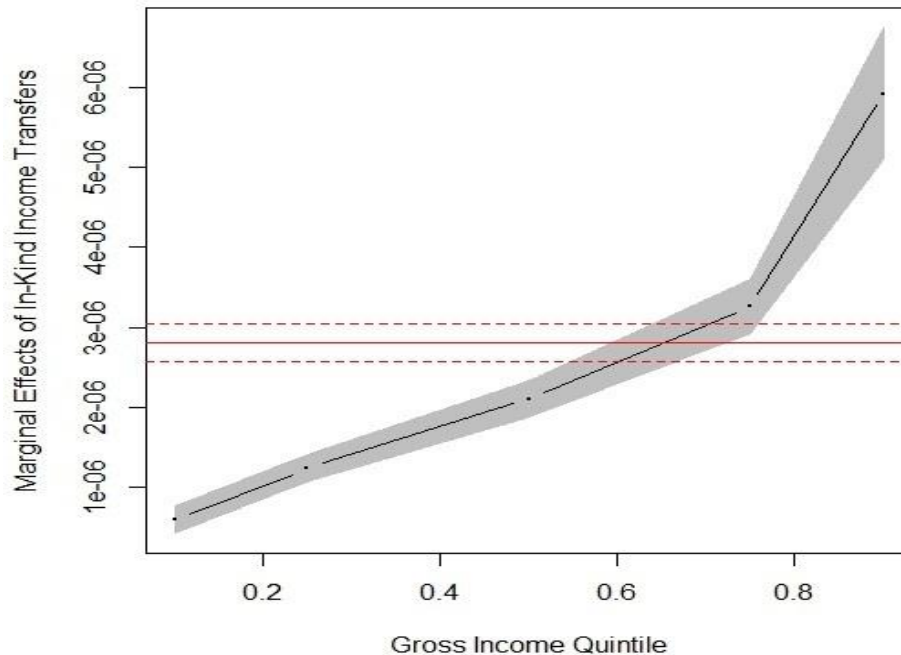
Figure 4.1 shows the result for the range of quintile at 0.10, 0.25, 0.50, 0.75 and 0.90, (Koenker and Hallock 2001). On the horizontal axis the quintile distribution of the gross income per adult equivalent is shown whereas the vertical axis shows the distribution of the covariate effect of the in-kind income transfers. The horizontal line shows the simple linear regression coefficient estimate of the conditional mean effect with dashed line around it shows the 95% confidence interval.

In the quintile regression, the regression coefficient shows for different points of interest. The thick line around the quintile regression curve shows the confidence interval. The simple linear regression model coefficients remain flat because it does not vary across quintiles. For the case of lower quintiles there is significant differences from simple linear regression coefficients and also significant difference above the simple linear regression coefficients.

At the 0.70 percentile there is no significant difference as they cross each other and the regression coefficient lies in the confidence interval of simple linear regression in the in-kind income transfer's variable. It is also found that the quintile regression coefficient is significantly

different from zero, which implies confidence interval does not include zero. So that's why we have significant difference which is the normal significance from zero.

Figure 4.1: Marginal Effects of Public Expenditures for In-Kind Income Transfers



Above analysis shows heterogeneity of the potential effect of public expenditures for the provision of in-kind income transfers on gross income per adult equivalent. It also confirms the superiority of the use of structural quintile regression instead of using the simple linear regression model.

Table 4.1 reports the result of the effect of in-kind income transfers on the explanatory variables as well as on the selected instruments. The table shows that the selected instruments are statistically significant at all selected quintiles with positive values of the instrument of compulsory schooling and of the higher education.

The compulsory years of schooling have the positive effects on receiving the in-kind income transfers by households. The result states that with the proportion of receiving benefits for higher income quintiles are more than the lower income quintiles. Similarly the higher education does affect positively on receives of in-kind income transfers for all income quintiles. It also reveals that the higher education has a positive effect on receiving of in-kind income transfers. For the higher education the entire coefficient is statistically significant with positive effect.

Table 4.1: Instrument Effect on Education Transfers

	$\tau_F=10$	$\tau_F=25$	$\tau_F=50$	$\tau_F=75$	$\tau_F=90$
Compulsory school	0.00210*** (0.00073)	0.00913*** (0.00274)	0.04678*** (0.00869)	0.06395*** (0.01277)	0.07912*** (0.02472)
Higher education	0.00002*** (0.00000)	0.00005*** (0.00000)	0.00007*** (0.00000)	0.00008*** (0.00000)	0.00009*** (0.00001)
Constant	0.02367*** (0.00671)	0.00756 (0.02508)	0.01150 (0.07824)	0.36518*** (0.11552)	0.82554*** (0.22892)

Notes: τ_F shows the quintile distribution of the household unobservable variable which affects the gross income. In the above regression it includes the variables consist of dummy for the educational level of the head of household, region of residence of the household, number of income earners in the household, residence status, gender of the head of household, age, age square and job status of the head of household. The ***, ** and * respectively, indicate significance at 1%, 5% and 10% level of significance. The standard errors are in the brackets.

Now we turn to the estimation of the in-kind income transfers effect in our structural framework. Table 4.2 reveals the results for in-kind income transfers both endogenously (structural quintile treatment effect) as well as exogenously (quintile effect). It reveals that at the first stage, in which the in-kind income transfers are endogenously determined, the mechanism is endogenous instead of exogenous in its nature. This endogenous effect of covariate does also support the proposed methodology in the thesis. The structural quintile treatment effects $\pi_1(\tau_F, \tau_A)$ are associated with the non-cash income transfers and vary with negative signs for almost all of

the quintiles. The structural quintile treatment effects are also statistically significant on the distribution of the gross income per adult equivalent.

The negative sign shows that the increase in in-kind income transfers associated with the fall in gross equivalent household income. In order to explain the results we look at the coefficient along the quintiles distribution of unobservable household characteristic (τ_A) given the distribution of (τ_F). It implies that given the distribution of the gross income per adult equivalent we look at the estimated distributional effect of the non-cash income transfers for household with varying unobservable abilities.

Table 4.2: Redistributive Effect of In-Kind Income Transfers on Gross Income Quintiles

	$\tau_F=10$	$\tau_F=25$	$\tau_F=50$	$\tau_F=75$	$\tau_F=90$
$\tau_A=10$	-0.00929*** (0.00224)	-0.00880*** (0.00290)	-0.00552*** (0.00187)	-0.00858** (0.00437)	-0.02190* (0.01279)
$\tau_A=25$	-0.01114** (0.00519)	-0.00987*** (0.00364)	-0.00587** (0.00262)	-0.00943** (0.00442)	-0.01301 (0.01580)
$\tau_A=50$	-0.01275** (0.00568)	-0.00913** (0.00390)	-0.00545*** (0.00132)	-0.00503 (0.00434)	0.01393 (0.02106)
$\tau_A=75$	-0.01384*** (0.00522)	-0.00809** (0.00377)	-0.00293 (0.00390)	-0.00158 (0.00602)	0.03268* (0.02162)
$\tau_A=90$	-0.01416*** (0.00481)	-0.00581* (0.00331)	-0.00099 (0.00414)	0.00213 (0.00689)	0.04120** (0.02007)
Mean quintile treatment effect	-0.0122	-0.00834	-0.00415	-0.0045	0.01058
Quintile effect	0.00175 (0.00720)	(0.02777) 0.00592	0.06489 (0.00660)	0.06837 (0.01230)	0.04001 (0.02544)

Notes: τ_F shows the quintile distribution of the household unobservable variable which affects the gross income. Similarly τ_A is the quintile of the distribution of unobservable characteristics that likely affect the educational choices in the household which in turn affect the in-kind income transfers. The Quintile effect corresponding to the effects of in-kind income transfers normalized by the sample mean on the quintiles of gross income distribution which also standardized over the sample mean whereas the in-kind income transfers are treated as exogenous. The mean quintile treatment effect is equivalent to the two stage least square estimator in the pure location shift model. In the above regression it includes the variables consist of dummy for the educational level of the head of household, region of residence of the household, number of income earners in the household, residence status, gender of the head of household, age, age square and job status of the head of household. The ***, ** and * respectively, indicate significance at 1%, 5% and 10% level of significance. The standard errors are in the brackets.

We now turn into the estimation of the in-kind income transfers effect in our structural framework. The estimates of the mean quintile treatment effects of in-kind income transfers reveal a more nuanced view (Table 4.2). It reveals a negative effect of around 0.0122, rising gradually with 0.01058 at upper quintiles. This suggests that higher income quintile groups have a positive effect of in-kind income transfers. This suggests that lower income households receive less from in-kind income transfers while the higher income households receive more from in-kind income transfers. It may be due to the reason that higher education is more expensive and also available by higher income households. As it is explained earlier that it may be due to the reason of not availing of higher education by lower income groups, where government made more expenditures on provision of higher education. In other words, the regressive public expenditures are due to the reason that poor classes are not that able as rich.

The further disaggregating is shown with both the directions of in-kind income transfers and gross income. The picture is almost similar with a positive effect at higher quintiles with an increase of transfers while it has a negative effect for the lower quintiles. This also shows that these households are the most negatively affected by an increase in marginal benefits, which is also an indication that the increase in transfers would increase the gap between lower and higher ability households. In absolute values, the second most vulnerable group is the 10th quintiles, which, due to an increase in non-cash income transfers, leads to an increase in the gap between low and high ability households.

By looking into the coefficients along the distribution of (τ_F) , we observe an inverse U-shaped relation, which depicts the minimum absolute values at the 50th quintiles. Except for the quintiles of $(\tau_F=10)$, as is stated above, the estimated coefficients suggest that the second greatest

decrease in gross equivalent income due to a unit increase in the in-kind income transfers is for the lowest gross income per adult equivalent quintiles.

Table 4.3 presents the estimated elasticities. It shows that for almost all of the cases the estimated elasticities are negative and are less than one in absolute terms. The elasticities decrease up to the median quintiles along the (τ_F) for any (τ_A) and then increase at higher gross income distribution (τ_F) .

It shows that lower the income and lower the ability of household to benefits from non-cash income transfers, the higher would be reduction of relative income related to 1% increase in non-cash income transfers up to the median income after which there is decrease in income reduction associated with the increase of non-cash income transfers for all of the ability levels.

The elasticities is also explained as the ratio of the mean and marginal non-cash income transfers and reveals that in Pakistan the non-cash income transfers with the exception of (τ_F) along the (τ_A) distribution are regressive in its nature. By looking at the estimated elasticities, we found that a 1% increase in in-kind income transfers penalizes higher income quintiles relatively less than the lower income quintiles of households.

Table 4.3: Elasticities for the In-Kind Income Transfers

	$\tau_F=10$	$\tau_F=25$	$\tau_F=50$	$\tau_F=75$	$\tau_F=90$
$\tau_A=10$	-0.0320	-0.0134	-0.0062	-0.0090	-0.0210
$\tau_A=25$	-0.0384	-0.0150	-0.0066	-0.0099	-0.0125
$\tau_A=50$	-0.0439	-0.0139	-0.0061	-0.0053	0.0134
$\tau_A=75$	-0.0477	-0.0123	-0.0033	-0.0017	0.0314
$\tau_A=90$	-0.0488	-0.0088	-0.0011	0.0022	0.0396

Notes: (τ_F) denotes the quintiles of distribution of the τ_A affects the gross equivalent income. (τ_A) is the distribution of unobservable characteristics that affect the household's educational choices or non-cash income transfers.

In other words the absolute value of the elasticity can also be used as an indicator for policy implication with changes of in-kind income transfers for “loser” quintiles defined as those

who receive the shares of non-cash income transfers lower than their share over the sample mean of the gross income per adult equivalent.

On other side of the coin, with changes of non-cash income transfers for “winner” quintiles defined as those who receive the share of non-cash income transfers more than their share over the sample mean of the gross income per adult equivalent. If the elasticity is less than one then a 1% increase of non-cash income transfers will tend to increase of the benefits for “winner” quintiles.

According to the classical theory of linear regression it is assumed that the conditional quintiles of function of the response variable given covariates are all parallel to one another. It implies that the slope coefficients of distinct quintile regressions will be identical. In practical consideration this is not the case for quintile regression. This means that across quintiles the slope coefficients are different.

So an immediate and fundamental problem of inference in quintile regression involves testing for the equality of slope parameters across quintiles. There are some simple tests designed for this purpose suggested by Koenker and Basset (1982). For two sample problem they correspond to the test of equality between the inter-quintile ranges of two samples. Thus they may be considered to be the test of homogeneity.

The inter-quintiles test depicts that the non-cash income transfers are statistically different for all of values of τ_A with making comparison of the gross income distribution for 10th vs. 50th quintile, 50th vs. 90th quintile and for the 25th vs. 75th quintile (Table 4.4).

Table 4.4: Inter Quintile Test for In-Kind Income Transfers

	$\tau_A=10$	$\tau_A=25$	$\tau_A=50$	$\tau_A=75$	$\tau_A=90$
In-kind(10)=In-kind(50)	37.946 2.2e-16 ***	30.037 2.2e-16 ***	27.255 2.2e-16 ***	29.872 2.2e-16 ***	31.523 2.2e-16 ***
In-kind(50)=In-kind(90)	16.328 2.2e-16 ***	16.084 2.2e-16 ***	14.26 2.22e-16 ***	12.278 7.638e-14 ***	13.081 7.883e-15 ***
In-kind(25)=In-kind(75)	28.721 2.2e-16 ***	28.212 2.2e-16 ***	33.021 2.2e-16 ***	29.592 2.2e-16 ***	30.135 2.2e-16 ***

Notes: (τ_A) is the quintiles of distribution of household's characteristic variable that leaves it impact on the household's efforts and choices related to non-cash income transfers receive. The ***, ** and * respectively, indicate significance at 1%, 5% and 10% level of significance.

This significant effect shows that the modeling of the structural quintile treatment effect of non-cash income transfers provides a more precise measure of the proposed fiscal policy, public expenditures on the provision of in-kind income transfers, the effect for gross income per adult equivalent above and below the median values.

The findings of the study reveal that the perturbation in the prevailing distribution of the non-cash income transfers affect the distribution of gross income per adult equivalent. It reveals that the effects of in-kind income transfers on gross income per adult equivalent vary across the distribution of the dependent variable. The heterogeneity in the potential effects of the proposed fiscal policy measure, in-kind income transfers, is a necessary condition for the distributional effect from rich to poor but not a sufficient condition for the distributional effect of publically provided private goods.

The Reynolds-Smolensky index is also used in order to measure the redistributive effect of non-cash income transfers by taking the difference between the post in-kind income transfers and pre in-kind income transfers Gini coefficients. The proposed index is useful in order to obtain a measure of the potential redistributive effects of the non-cash income transfers which change the non-cash benefits by 1%.

On the basis of our results we estimate the post direct tax plus in-kind income transfers. The results (Table 3.1) shows that the Gini coefficient value of disposable income increase. This shows that the public expenditures are regressive in its nature. This implies that the higher income quintiles receive more of publically provided in-kind income transfers which are allocated with the objective of improving the distribution of household incomes. However the redistributive power is limited as is shown by value of Gini coefficient. It is due to poor households are not that able as rich to avail the publically provided in-kind income transfers. The regressive public expenditures on provision of in-kind income transfers do not imply that there is wrong in government policy. The government does not exclude poor from education system. The government also did not have the policy to exclude poor from availing the tertiary level schooling. It is due to prevailing lower ability level among the poor households to avail tertiary level schooling which is the main culprit behind the regressive public expenditures.

Chapter-5

CONCLUSION

The thesis considered income distribution in Pakistan for the year of 2010-11. It evaluates the redistributive impact of non-cash income transfers on gross income per adult equivalent by using the *Pakistan Social and Living Standard Measurement survey* information provided by Pakistan Bureau of Statistics. The analysis is done at the household level. The difference in households' needs and requirement are adjusted by means of adult equivalence scale. The in-kind income transfers considered are health care services and educational services.

The objective of this study has been to analyze the effects of public expenditures for in-kind income transfers on the income distribution in Pakistan. To accomplish the objectives of the study that is, to determine whether public expenditures are pro poor or pro rich, the study applies the structural quintile treatment effect regression. This is relating a recent method to investigate the distributional effects of public expenditures for in-kind income transfers on income distribution.

The analysis tries to incorporate the potential heterogeneity of non-cash income transfers on the gross income per adult equivalent. To analysis the potential heterogeneity, the structural quintile treatment effect method is proposed. The heterogeneity in the distribution of non-cash income transfers is a necessary condition for the redistribution.

The redistributive power of the public expenditures on the provision of in-kind income transfers is measured by Gini coefficient. For this purpose we make the comparison of pre state and post state intervention Gini coefficients for gross income per adult equivalent and disposable income per adult equivalent. This provide a way to make comparison in income inequality between the pre state intervention and post state intervention.

The stated hypothesis that public expenditures on provision of in-kind income transfers are progressive in Pakistan and across the provinces is rejected. The progressiveness hypothesis is rejected due to the reason that higher income quintiles receive more of publically provided private in-kind income transfers. The results reveal that the public expenditures on the provision of in-kind income transfers have limited role in income redistribution.

The share values of different quintiles for in-kind income transfers also support the results with higher income household receive more of publically provided in-kind income transfers. The higher income quintiles avail more of in-kind income transfers benefits. This implies that public expenditures should be more specific and target oriented wherein lower income quintiles should be the focused.

The specific and target oriented policy needs to be applied in terms of fee waivers, scholarships, cash transfers or the in-kind income transfers to result in increase of subsidies to lower income groups and thus increase the share of lower quintiles households. For this purpose the lower quintiles households also have to enhance their ability to avail these in-kind income transfers receipt.

Bibliography

(PBS), P. b. o. s. (2010-11). Pakistan social and living standards measurement survey (PSLM). Islamabad.

Arrow, J. K. (1971). "A Utilitarian Approach to the Concept of Equality in Public Expenditures." The Quarterly Journal of Economics**85**(3): 409-415.

Asghar, z. and M. Zahra (2012). "A Benefit Incidence Analysis of Public Spending on Education in Pakistan Using PSLM Data " The Lahore Journal of Economics**17**(2): 111-136.

Awan, M. S. (2007). Changing Income Distribution in Pakistan – An Inter-temporal Analysis of the Household Income and Expenditure Data Department of Economics University of Sargodha Sargodha, Pakistan. Doctor of Philosophy: 177.

Azaz, O. A., et al. (2012). Fiscal Incidence in New Zealand: The Distributional Effect of Government Expenditure and Taxation on Household Income, 1988 to 2010. New Zealand Association of Economists Conference 2012. New Zealand Treasury.

Brunello, G., et al. (2009). "CHANGES IN COMPULSORY SCHOOLING, EDUCATION AND THE DISTRIBUTION OF WAGES IN EUROPE." The Economic Journal**119**: 516-539.

Bruno, M. (1976). "Equality, Complementarity and the Incidence of Public Expenditures." Journal of Public Economics(6): 395-407.

Butt, I., Husain, et al. (December, 2013). "Restructuring Compulsory Education in Pakistan in the Post-eighteenth Constitutional Amendment Era: Insights from the Region and Developed Nations." A Research Journal of South Asian Studies, **28**(2): 415-426.

Casalone, G. and D. Sonedda (2013). EVALUATING THE DISTRIBUTIONAL EFFECTS OF FISCAL POLICIES USING QUANTILE REGRESSIONS. Review of Income and Wealth, **59**(2): 305-325.

Cheshier, A. (2001). Exogenous Impact and Conditional Quintile Functions. Economics. Institute For Fiscal Studies.

Cheshier, A. (2003). Identification in Nonseparable Models. *Econometrica*, **71**(5): 1405-1441.

Dur, R. A. J. and C. N. Teulings (2001). EDUCATION AND EFFICIENT REDISTRIBUTION. CESifo Working Paper No. 592.

Hakro, A. N. and M. Akram (2007). The Incidence of Government Expenditures on Education and Health: Microeconomic Evidence from Pakistan. *The Lahore Journal of Economics*, **12**(2): 27-48.

Haq, R. (1998). Trends in Inequality and Welfare in Consumption Expenditure: The Case of Pakistan. *The Pakistan Development Review* **37**(4): 765-779.

Hare, P. G. and D. ULPH (Oct., 1979). On Education and Distribution. *The Journal of Political Economy*, **87**(5): S193-S212.

Ilyas, M. (2004). Evaluating the effects of government expenditures and taxes, a case study of Pakistan, 1979, 1986-87, 1992-93, 2001-02. IIIE, IIUI. **Phd**: 293.

Kemal, A. R. (2006). INCOME INEQUALITIES IN PAKISTAN AND A STRATEGY TO REDUCE INCOME INEQUALITIES, Ministry of Finance, Pakistan.

Ma, L. and R. Koenker (2006). Quantile regression methods for recursive structural equation models. *Journal of Econometrics* **134**: 471-506.

Mayshar, J. and S. Yitzhaki (1996). Dalton-Improving tax reform: When household differ in ability and needs, *Journal of Public Economics* **62**: 399-412.

Ministry of Finance, P. (2012-13). *Economic Survey of Pakistan*. Islamabad.

Mirrlees, J. A. (1971). An Exploration in the Theory of Optimum Income Taxation. *The Review of Economic Studies*, **38**(2): 175-208.

Mosteller, F. and J. W. Tukey (1977). *Data Analysis and Regression: A Second Course in Statistics*, Addison-Wesley Publishing Company.

PAKISTAN, N. E. M. I. S. A. O. E. P. A. M. M. O. P. A. T. T. G. O. (2010-11). *PAKISTAN EDUCATION STATISTICS*. Education. Islamabad.

SMEEDING, M. T., et al. (1993). "POVERTY, TNEQUALTTY, AND FAMTLY LIVING STANDARDS IMPACTS ACROSS SEVEN NATIONS: THE EFFECT OF NONCASI-I SUBSIDIES FOR HEALTH, EDUCATION AND HOUSING." *Review of Income and Wealth*, **39**(3): 229-256.

Smeeding, T. M., et al. (1993). "POVERTY, TNEQUALTTY, AND FAMTLY LIVING STANDARDS IMPACTS ACROSS SEVEN NATIONS: THE EFFECT OF NONCASI-INCOME SUBSIDIES FOR HEALTH, EDUCATION AND HOUSIN." *Review of Income and Wealth*, **39**(3): 229-256.

Sonedda, D. and G. Turati (2006). *WINNERS AND LOSERS IN THE ITALIAN WELFARE STATE: A MICROSIMULATION ANALYSIS OF INCOME REDISTRIBUTION*

CONSIDERING IN-KIND TRANSFERS. *Giornale degli Economisti e Annali di Economia*, **64**(4): 423-464.

ULPH, D. (1977). On the optimal distribution of income and educational expenditure. *Journal of Public Economics*, **8**: 341-356.

Wolff, E. N. and Z. Ajit (2007). THE DISTRIBUTIONAL CONSEQUENCES OF GOVERNMENT SPENDING AND TAXATION IN THE U.S., 1989 AND 2000. *Review of Income and Wealth*, **53**(4): 692-715.