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The Impact of Public School Enrolment on Child Labor in Punjab, Pakistan

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Abstract

This paper investigates the causal impact of public school enrolment on child labor. Our main hypothesis is as follows: Is school enrolment a substitute for child labor? Recognizing that schooling and work choices are jointly determined by parents in a utility maximizing framework, the study applies an instrumental variable solution to the problem of simultaneity. This approach entails using the receipt of free textbooks and access to a public primary facility as instruments for public school enrolment. Using data from the Multiple Indicator Cluster Survey for 2007/08, our working sample consists of children between 5 and 14 years of age, which makes up 25 percent of the surveyed population. The results suggest that public school enrolment can be used as a substitute for child labor. On average, a 1 percentage point increase in a household's enrolment ratio has the potential to reduce the number of hours of paid labor by almost 5 percentage points, ceteris paribus. This substitutability is highest among poor, urban, male children. Moreover, the incidence of child labor is higher among larger poor families.

Keywords: Child labor, school enrolment, instrumental variable, tobit, fixed effects, education subsidy, Pakistan.

JEL Classification: F66.

1. Introduction

Child labor poses a serious challenge for many developing countries, including Pakistan. Other than on humanitarian grounds, it is also undesirable from an economic point of view—it comes at the cost of long-term human capital development. In developing economies—often highly populous but resource-stricken—an improvement in the quality of human capital can prove to be an engine of growth. The development of this asset, however, depends critically on the education of the future work force. However, if parents (as rational agents) prefer work over school for their children, at the micro-level, this will perpetuate poverty by lowering

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the individual's future value-adding and income generating potential (Glewwe, 2002), trapping the household in a vicious intergenerational cycle of poverty (Baland & Robinson, 2000) (see Figure B1, Appendix B).

In a less extreme scenario where parents combine their children's work with school—the case where either work or school comes out of the child's leisure time—work will still have an adverse impact on the child's learning and, hence, affect the quality of human development. For example, children may miss school (or after-school tutorials) because of work or utilize the time designated for homework for the purpose of work. It has also been argued that work outside the house has a substantial negative impact on learning achievements, attributed mainly to the child's exhaustion and general "diversion of interest away from academic concerns" (Heady, 2003). At the macro-level, child labor possibly limits the economy's growth potential, owing to a low-skilled labor force (Krueger, 1996). Therefore, since any form of child labor before the completion of compulsory education comes at a cost to human capital development, it is considered undesirable (International Labour Organization [ILO]'s Minimum Age Convention, 1973).

Various strategies have been adopted to minimize child labor. Imposing legal restrictions is one option that has been used successfully in some developed countries (Angrist & Krueger, 1991). Hort (1989) provides evidence for decreased child labor following legal restrictions imposed on the cotton industry in Manchester, England. Acemoglu and Angrist (1999) find, that in the US, children living in states with child labor laws are likely to stay in school longer than those in states without child labor laws. Types of legal restrictions include a ban on child labor, minimum age-of-work laws, and compulsory schooling. While compliance with legal restrictions has been witnessed in developed countries, it has failed to achieve the desired goals in low-income countries (Krueger, 1996). This limited success has been attributed to problems of enforceability, particularly in rural areas (Ravallion & Wodon, 2000).

The limitations of imposing legal restrictions have induced policymakers in developing countries to look for policy alternatives. One such approach is the use of educational subsidies to lower schooling costs, increase school enrolments, lower dropout rates, and possibly also reduce child labor; for example, the Bolsa Escola, the Brazilian Child Labor Eradication Program, the Mexican Program for Education, Health and Nutrition, and Bangladesh's Food-for-Education program.

The validity of the use of educational subsidies to reduce child labor is based on the underlying premise that schooling competes with child labor activities. If, however, increases in schooling come from the child's leisure time, these incentives may not be effective in reducing child labor. Ravallion and Wodon (2000) conclude that while Bangladesh's Food-for-Education program increased school enrolment, it did not lead to a large reduction in child labor. Therefore, from a policy point of view, it is important to investigate whether school enrolment has the potential to displace child labor. Only if this is so can the use of such subsidies be justified as a tool for reducing child labor.

In this context, this paper aims to study the causal impact of school enrolment on child labor in Punjab, Pakistan. Our main hypothesis is as follows: *To what extent is school enrolment a substitute for child labor?* The study's methodology entails using a unique tehsil fixed effects-instrumental variable Tobit (TFE-IVT) estimator that controls for simultaneity, unobserved tehsil heterogeneity, and a 'corner solution dependent variable.'

The remainder of the paper is organized as follows: Section 2 provides a brief review of the literature on child labor and schooling. Section 3 describes the data used and presents some basic statistics on the incidence of child labor and enrolment in Punjab. Section 4 discusses the methodology and puts forth an empirical framework. Section 5 presents our results while Section 6 concludes the study.

2. Literature Review

2.1. A Definition of Child Labor

There is a lack of consensus in the literature on what defines child labor (Guarcello, Kovrova, Lyon, Manacorda, & Rosati, 2008). Child labor entails "work which is of such a nature or intensity that it is detrimental to children's schooling or harmful to their health and development"(ILO, 1998). The United Nations Children's Fund (1991) classifies child labor according to the child's age and number of hours worked per week: "Age 5–11: at least one hour of economic work or 28 hours of domestic work; Ages 12–14: at least 14 hours of economic work or 28 hours of domestic work; Ages 15–17: at least 43 hours of economic work or domestic work". Both definitions, however, have common ground: Work that is exploitative is classified as child labor (Kim, 2009). Official surveys report information on economically active children across three dimensions: (i) paid work in

the labor market, (ii) unpaid work for a family farm or nonfarm enterprise, and (iii) unpaid domestic work. There are competing views on the types of work that should be included in child labor.

Proponents of the broader definition argue that domestic and family work is undesirable to the extent that it conflicts with school attendance. Moreover, certain household chores such as cooking over an open fire and baby care may be dangerous and exhausting, diverting the child's attention from educational concerns (Heady, 2003).

Advocates of the narrower definition exclude unpaid domestic and family work from the rubric of child labor (Rodgers & Standing, 1981; Bequelle & Boyden, 1988; Blanc, 1994). They argue that these two types of work tend to occur under parental guidance and supervision. "Since parents are likely to be the least exacting of employers", certain types of work "appear to be no worse than good exercise and practical training" (Bhalotra & Heady, 2003). Also, such work "equips a child with essential skills that may not be learned elsewhere, and enhances the self-esteem of the child" (Hazarika & Bedi, 2003).

This paper takes the latter approach and considers only paid work to be child labor, mainly on two accounts. First, parents' motivation for sending a child to work may differ according to the type of work, thereby exhibiting different enrolment-elasticity according to the type of work. For instance, choosing paid work for a child is likely to be driven by financial considerations, while parents may consider family and domestic work a means of imparting essential training that might not be acquired elsewhere. In this context, parents may respond differently to policy interventions geared toward increasing school attendance and reducing child labor. Second, parents may find it easier to combine household-related work (domestic work or family business) with schooling in the absence of a typical employer-employee relationship. In such a case, the success of policy initiatives targeting school attendance and child labor may fail to achieve a maximum response. The tradeoff between hours worked and school attendance is likely to be most substantial in the case of paid work (Edmonds, 2007). Therefore, this study classifies only paid work under the rubric of child labor.[1]

[1] We do, however, estimate the separate relationships between school enrolment and domestic and family work using a TFE-IVT estimator. In both cases, school enrolment is insignificant as expected, a priori.

2.2. Child Labor and Schooling

There is a substantial body of work on child labor and schooling (for reviews, see Patrinos and Psacharopoulos, 1995; Basu, 1999; Dar, Blunch, Kim, & Sasaki, 2002; Glewwe, 2002; Kandel & Post, 2003; Edmonds & Pavcnik, 2005; Edmonds, 2007; Udry, 2006). This study extends the literature in this domain.

Studies can be classified into two main categories: those that directly study the link between child labor and schooling and those that indirectly investigate the child labor–schooling relationship. The first approach is based on contrasting educational outcomes across working and nonworking children. For instance, in Bolivia and Venezuela, the fail rate is higher among working children who also acquire two years' less education than children who do not work (Psacharopoulos, 1997). In Peru, however, child labor does not appear to have an adverse impact on schooling (Patrinos & Psacharopoulos, 1997). The main criticism of these studies is that, even though work choice and schooling is jointly determined, it enters these studies as an exogenous independent variable, which is likely to bias their results.

The second line of research studies the child labor–schooling link indirectly by looking at the impact of various educational policies and school-specific characteristics on child labor. These include access to schools, school quality, and provision of educational subsidies, etc. In rural Cote d'Ivoire, school proximity reduces the incidence of child labor but is not statistically significant in urban areas (Patrinos, 1999). Schooling costs have a significant impact, however, on child labor force participation in urban Bolivia (Cartwright & Patrinos, 1999). This inverse relationship between school-related characteristics and child labor is also confirmed for Columbia and Tanzania (Akabayashi & Psacharopoulos, 1999; Cartwright, 1999). For Pakistan, Hazarika and Bedi (2003) find that schooling costs are positively related with extra-household work but insignificant in explaining intra-household work.

More recently however, Ravallion and Wodon (2000) argue that there is not necessarily a one-to-one relationship between hours worked and school attendance. They show for Bangladesh that increases in schooling may come out of a child's leisure time and that therefore, while educational incentives may increase school attendance, they do not necessarily reduce child labor. Similarly, Akabayashi and Psacharopoulos

(1999) conclude that school quality has had an insignificant impact on the incidence of child labor in Tanzania.

In the context of this empirical ambiguity concerning child labor and schooling, it becomes important to address the following questions: Does schooling have the potential to displace child labor? What is the degree of substitutability between hours worked and school attendance? Unlike Hazarika and Bedi (2003) who employ an indirect approach to examine the link between child labor and schooling, this study attempts to analyze the direct causal impact of school enrolment on child labor. This entails using the *receipt of free textbooks and access to a public primary school facility as instruments for school enrolment* while controlling for *unobserved tehsil heterogeneity* and a *corner solution* dependent variable.

The nature of the dataset we have used distinguishes this study from other studies on child labor in Pakistan. Prior work on the subject in Pakistan constitutes either case studies (Khan, 2001; Chaudhry & Khan, 2002) or is based on household survey datasets that are rather dated. Ray (2000), Bhalotra and Heady (2003), and Hazarika and Bedi (2003) use data from the Pakistan Integrated Household Survey (PIHS) for 1991. Burki and Fasih (1998) and Rosati and Rossi (2003) employ data provided by the Child Labor Survey conducted in 1996 by the Federal Bureau of Statistics in collaboration with the Ministry of Labour, Manpower and Overseas Pakistanis, and the ILO.

This study uses the latest round of the Multiple Indicator Cluster Survey (MICS) for 2007/08, which helps extrapolate more recent estimates of the incidence of child labor and enrolment in Punjab, Pakistan. This is the first dataset on Pakistan that is representative at the tehsil level,[2] making it possible to control for tehsil-level effects. Compared to the PIHS (4,795 households and 36,109 individuals) and the Child Labor Survey (10,453 households and 77,684 individuals), the MICS dataset comprises a much larger sample (91,075 households and 594,802 individuals). Using this dataset, therefore, has the dual advantage of providing a comprehensive, in-depth analysis as well as substantially increasing the explanatory power of the results yielded by the larger sample.

[2] Pakistan comprises four provinces, of which Punjab is the largest in terms of population and the second largest in terms of area. Each province is divided into districts, which are subdivided into tehsils. Punjab has 36 districts and 143 tehsils in all.

3. Data

The MICS for 2007/08 spans 91,075 households across Punjab and is, as mentioned above, representative at the tehsil level. Out of a total surveyed population of 594,802, 25.2 percent fall in the 5–14 years age bracket. Compared to urban areas, almost twice the population resides in rural areas (Table A1, Appendix A). It is worth mentioning that, even though we have focused on paid child labor, we present basic statistics on the incidence of domestic and family work (Figures B2 and B3, Appendix B) to give a snapshot of the incidence of child work across these dimensions.

The working sample constitutes 59,993 households with at least one child in the 5–14 years age bracket. Of these, 3.3 percent report the incidence of paid child labor. A comparison of households with and without child labor reveals that school enrolment is lower in those households that engage in paid child labor. They also receive a smaller amount of books on average and are poorer than those households that do not engage in child labor (Table 1).

Table 1: Descriptive statistics by work status

	Household* with paid child labor		Household without paid child labor	
Variable	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**
Enrolment ratio	0.32	0.38	0.45	0.44
Receives books	0.07	0.25	0.11	0.31
Primary facility access	0.86	0.35	0.87	0.34
Wealth score[3]	-0.22	0.99	-0.04	0.98
Land ownership	0.24	0.43	0.34	0.48
Land area	6.28	12.70	7.61	28.05
Head's education	1.91	1.30	2.32	1.45
Head gender	0.95	0.22	0.95	0.21
Males < 0–4	0.43	0.68	0.44	0.69
Females < 0–4	0.41	0.66	0.43	0.69
Age ratio	1.10	0.90	0.78	0.86
Gender ratio	0.80	0.90	0.80	0.91
Residential location	0.43	0.50	0.34	0.47
N	1,992		58,001	

***Source*:** MICS (2007/08) and author's calculations.

[3] The wealth index ranges between -2 and +2. Details on how it has been constructed are given in Table A2, Appendix A.

Even though the number of children engaged in paid labor is higher in rural areas, on average child laborers work longer hours in urban settings. Additionally, the mean number of paid child labor hours is higher among males (Table 2). We test these differences in average working hours across gender and regional groups more formally using the t-test. Across gender, the results show that the difference in average hours for all three categories of work (i.e., paid, domestic, and family) is statistically different from 0 at a 1 percent significance level. Across region, the difference in average number of hours spent on paid and domestic work is statistically significant, but for family work it is insignificant.

Table 2: Mean child labor hours[4] (weekly)

	Paid work	Difference	Domestic work	Difference	Family work	Difference
Total	25.4		7.5		11.4	
Males	26.8	***	7.0	***	12.0	***
Females	23.2		7.9		10.3	
Rural	24.6	***	7.8	***	11.3	NS
Urban	26.3		6.6		12.6	

Note: ***, **, and * indicate significance at 1%, 5%, and 10%, respectively. NS = not significantly different from 0.
***Source*:** MICS (2007/08) and author's calculations.

Table 3 below shows that the incidence of child labor increases substantially with age.

[4] Avg Working hrs = $\sum t_{hrs} / \sum t^n$
where t represents the type of work, i.e., paid, domestic, or family. For each type of work, the numerator measures the total number of hours worked while the denominator measures the total number of children engaged in that category. For example, in the case of males, the numerator measures the total number of hours that male children engage in paid work divided by the number of male working children.

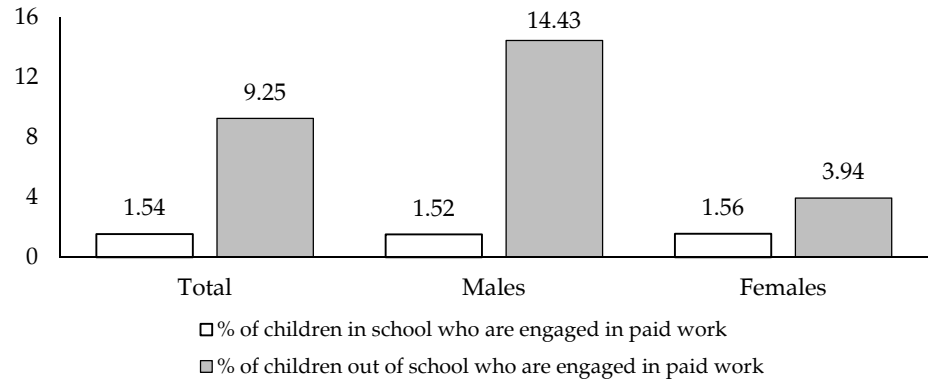
Table 3: Profile of working children by type of work[5]

Profile of children		(1) Total population size	(2) Engaged in domestic work (%)	(3) Engaged in family work (%)	(4) Engaged in paid work (%)	(5) Currently attending school (%)
5–14	Total	150,101	52.0	3.8	2.3	73.9
	Males	77,811	51.1	4.9	2.7	76.9
	Females	72,290	52.9	2.7	1.9	70.7
	Urban	48,894	46.7	1.6	3.6	84.6
	Rural	101,207	54.5	4.9	1.9	68.7
5–9	Total	76,725	40.9	2.1	1.5	73.2
10–14	Total	73,376	63.6	5.7	3.2	74.6

***Source*:** MICS (2007/08) and author's calculations.

As for the profile of children in and out of school vis-à-vis paid child labor, the incidence is 7.7 percent higher among out-of-school children than among their counterparts in school (Figure 1). This is also true across gender, and more so for males—the incidence of paid child labor is approximately 13 percent higher among out-of-school children than among male children in school.

Figure 1: School Attendance and Paid Work[6] (5-14)



Source: *Data from MICS (07-08) & author's own calculations*

[5] Figures in columns 2–4 of Table 3 are calculated as follows:
$= \sum t^{number\ of\ children\ working} / \sum total\ children$
where *t* represents the type of work, i.e., paid, domestic, or family. For each type of work, the numerator measures the total number of children (between 5 to 14 years) engaged in that work type while the denominator measures the total number of children between 5 and 14 years of age. For example, in the case of paid work, the numerator measures the total number of children engaged in paid work divided by the number of children between 5 and 14 years of age.

[6] See Table A2, Appendix A, for details of how these percentages have been calculated.

Table 4 sheds light on the dynamics between child labor, wealth, and enrolment.

Table 4: Mean enrolment across wealth quintiles (%)

Wealth quintile	Public school enrolment (PSE)[7]	PSE in the presence of paid work	PSE in the absence of paid work	Private school enrolment
1 *(Lowest)*	39.5	26.6	40.1	4.1
2	54.4	38.9	54.9	13.2
3	53.8	37.9	54.3	25.9
4	43.0	32.4	43.3	39.7
5 *(Highest)*	27.1	24.6	27.1	48.6

***Source*:** MICS (2007/08) and author's calculations.

On average, public school enrolment is lower among households with child labor compared to households without child labor. This is true for all wealth quintiles. Table 4 also shows that public school enrolment decreases while private school enrolment increases as households become richer.

In a nutshell, the raw data suggests that there might be a substitution effect between child labor and schooling in Punjab (Figure 1). Moreover, the substitution effect between child labor and schooling may be strongest in low-income rather than high-income households (Table 4).

The observations stated in this section are casual inferences from the data and warrant a rigorous econometric analysis. The precise framework for doing so is the topic of the next section.

4. Methodology

4.1. Empirical Framework

The objective here is to outline an empirical model that measures the impact of a change in school enrolment on child labor while controlling for household characteristics and unobserved tehsil-level heterogeneity. The sample consists of all households with at least one child going to a government school in the 5–14-year age bracket.

[7] PSE is calculated by dividing the number of children (aged between 5 and 14 years) going to public schools divided by the total number of children aged between 5 and 14 years of age.

Let

$$Y_{it} = f(X_{1it}, X_{2it}, \ldots X_{nit}, Z_{1t}, Z_{2t}, \ldots Z_{mt}) \quad (1)$$

where *Y* represents the incidence of child labor in household[8] *i*, tehsil *t*; the *X* terms represent *n* number of household-specific characteristics; and the *Z* terms are tehsil dummies to account for tehsil fixed effects, which are *m* in all.

Based on equation (1), we develop the following multivariate regression model.

$$y_{it}^{P} = \gamma + \beta_1 S_{it} + \sum_{j=1}^{n} X_{jit}\beta_j + \sum_{k=1}^{m} Z_{kt}\alpha_k + \varepsilon_{it} \quad (2)$$

Where

$$\varepsilon_{it} = \eta_t + \eta_{it} \quad (3)$$

y_{it}^{P} is the average number of hours worked in the past week in household *i*, tehsil *t*, and y_{it}^{P} , where a value of 0 implies that none of the children in that household are engaged in child labor.

S_{it} is the variable of interest—a measure of children's schooling in a household and is given by the number of children attending public schools as a ratio of the total number of children less those going to private schools in the relevant age bracket (see Section 4.2.1 for a discussion on why the sample is restricted to government schools). The next section describes how this variable is treated in order to estimate the empirical model given by equation (2).

β_1 measures the ceteris paribus impact of a change in school enrolment on the incidence of child labor, while controlling for household- (*X*) and tehsil-specific characteristics (*Z*).

γ is the intercept, β and α are vectors of parameters, and ε_{it} is a vector of normally distributed error terms. The error terms are based on two components as shown by equation (3). η_t represents unobserved tehsil-specific characteristics that are common to all households in a particular

[8] We specify a household-level rather than individual-level model because data on distance from school facility and on receipt of textbooks was not available on a child-by-child basis. Since both these variables are used as instrumental variables for schooling, data limitations permitted only a household rather than an individual-level analysis.

tehsil (capturing factors such as societal attitude and perceptions of schooling). η_{it} captures unobservable household-specific characteristics such as parents' motivation and willingness to school their children, etc.

Further details on how these variables have been computed are given in Table A2, Appendix A.

4.2. Estimation Strategy

The empirical model specified in equation (2) suffers from a simultaneity bias, which occurs because the variable of interest, school enrolment, is jointly determined with the dependent variable, child labor. Parents will simultaneously determine the optimal mix of work and schooling for their children so as to maximize the household's utility function. The key identification condition required to estimate equation (2) by ordinary least squares (OLS) is given by:

$$Cov(X, \varepsilon) = 0 \tag{4}$$

Simultaneity violates the identification condition (4). Therefore, applying OLS under simultaneity will produce biased and inconsistent estimators.

Even under simultaneity, equation (2) can be estimated consistently using the instrumental variable (IV) approach. We propose using the receipt of free textbooks (B_{it}) by the household and access to a primary government school facility[9] (A_{it}) as an instrument for average government school enrolment (S_{it}) in the household. It is worth mentioning that access to a public middle school facility was also considered as a potential instrument for enrolment. However, it exhibited a low correlation with public school enrolment, which is not surprising as one would expect that, as children grow older, access in terms of distance to school is likely to become a less important consideration.

Within the sample under study, free textbooks reached 6,926 households, i.e.. 11.6 percent of the total, while 87 percent of the households had access to a public primary school facility.

[9] The rationale underlying the use of 'distance to a government school facility' as an instrument for school enrolment is that it is highly correlated with enrolment but independent of hours worked in each household. Moreover, it is exogenous to the household's decision-making process.

4.2.1. Instrument Validity

For these instruments to be valid, the following conditions must be satisfied:

$$Cov(I_{it}, _{it}) = 0 \quad (5)$$

$$Cov(I_{it}, S_{it}) \neq 0 \quad (6)$$

where $I_{it} = B_{it}$ and A_{it}

A fair amount of correlation between (S_{it}) and (A_{it}), as well as between (S_{it}) and (B_{it}) provides evidence in support of condition (6) (see Table A4, Appendix A).

Condition (5) requires that the chosen instruments should not affect the incidence of child labor other than through their impact on average public school enrolment in the household.

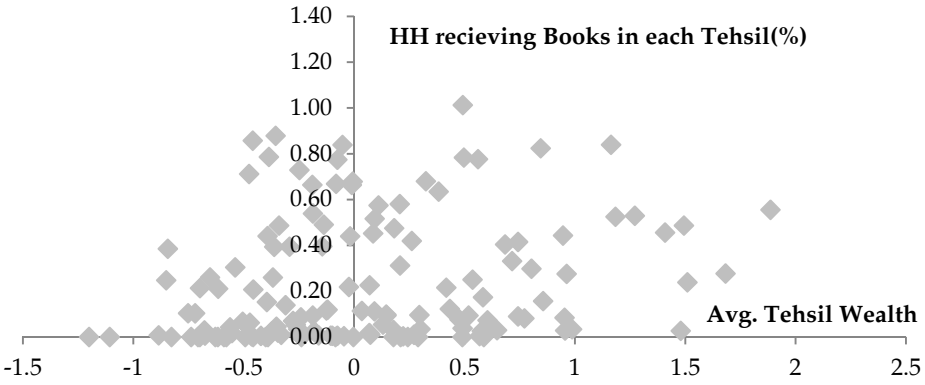
The disbursement mechanism for distributing these textbooks was such that books would be transported from the Punjab Textbook Board in the provincial capital, Lahore, to district headquarters, to tehsil warehouses, and on to union councils, where it was the latter's responsibility to distribute the books to all government schools in that area. Once the schools received the books, they were passed on to all students enrolled in that school and became their property. Since free books were provided only by government schools, we have restricted our scope of analysis to *public school enrolment* (see Appendix C for further details on the textbook project and its disbursement mechanism under the Punjab Education Sector Reform Package [PESRP]).

About 56 percent of all households have at least one child aged between 5 and 14 years attending a government school. Given the disbursement mechanism and assuming a perfectly efficient system, all these households should have received free books. In practice, however, only 20 percent of the households with at least one child enrolled in a public school benefited from the textbook subsidy.

In order to ensure the validity of the instrument, it is important to explore whether there is a systematic pattern among the households that benefited from the subsidy. For instance, are households in poor districts more likely to benefit from the subsidy? Are households on the periphery (i.e., further away from the provincial capital) less likely to receive books

than those households at the core (i.e., close to the provincial capital)? If so, the receipt of books will not serve as an appropriate instrument. Figure 2 illustrates the percentage of households receiving free books in each tehsil (measured on the y-axis) against average tehsil wealth[10] (on the x-axis), while Figure 3 shows the distance between each district and the provincial capital on the x-axis and the percentage of households receiving free books in each tehsil on the y-axis.[11] Both figures suggest that there is no systematic pattern in the receipt of free textbooks across the tehsils under study.[12]

Figure 2: Receipt of books and average wealth

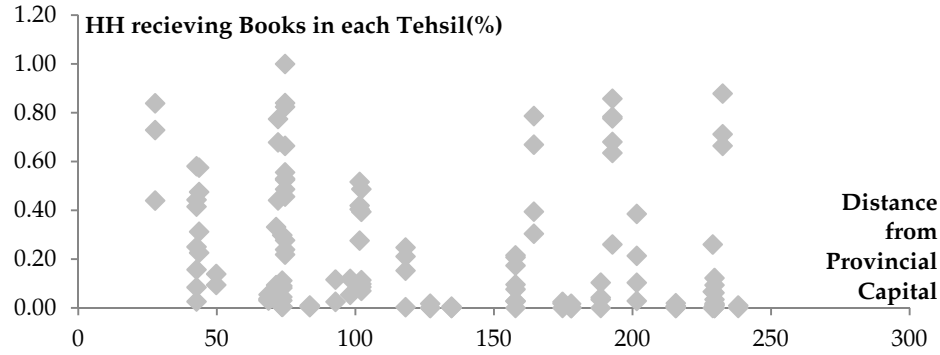


[10] We calculate average tehsil wealth by aggregating the individual wealth of each household within the tehsil and dividing it by the number of households surveyed in that tehsil. See Table A2, Appendix A, for details of how the individual household-level wealth index is created.

[11] The straight lines that emerge in Figure 3 are due to the fact that the distance between the district headquarters and the provincial capital is used as a proxy for the distance between each tehsil and the capital.

[12] A further test for ascertaining whether there is a systematic relationship between the percentage of households receiving textbooks and its average wealth and distance from the provincial capital is to regress the ratio of households separately on average tehsil wealth and on the distance from the provincial capital. Both regressions yielded a very low R-squared ranging between 1 and 2 percent.

Figure 3: Receipt of books and distance from provincial capital



To further assess the validity of the instruments, we conduct a test for over-identification restrictions (see also Section 5.1).

Given that conditions (5) and (6) are satisfied, equation (2) can be estimated in two stages. The first stage entails specifying a reduced-form equation for schooling), which is a function of) and) as well as all other exogenous variables. This equation is given by:

$$S_{it} = \pi_0 + \pi_1 B_{it} + \pi_2 A_{it} + \sum_{j=a}^{n} X_{jit}\pi + \sum_{k=1}^{m} Z_{kt}\gamma_k + \mu_{it} \quad (7)$$

where the error term is normally distributed and each explanatory variable is uncorrelated with the error. A final identification condition for) and) to be valid instruments for schooling is given by:

$$\pi_1 \neq 0 \; And \; \pi_2 \neq 0 \quad (8)$$

The second stage involves estimating equation (2) after replacing) with its fitted values obtained from equation (7).

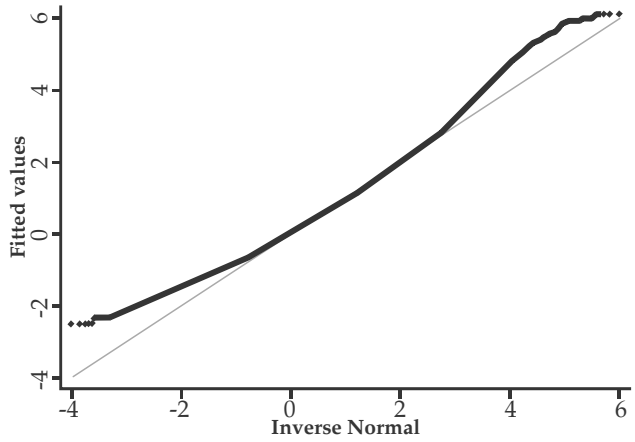
Typically, OLS would be used to estimate the reduced form, equation (7), and the structural equation, equation (2), where) has been replaced with its fitted values. In this case, however, the distribution of the dependent variable is such that it bars the use of OLS as an appropriate estimation technique.

The model outlined in equation (2) is a classic case of a corner solution model. Since child labor is only prevalent in 3.3 percent of households, the dependent variable is "continuous over strictly positive values, but equals zero for a non-trivial part of the population. It is problematic to use OLS under such a setting," (Woolridge, 2002, pp. 545–

550). To circumvent the issue of a cornered dependent variable, we use a Tobit maximum likelihood estimator (TMLE).

The validity of a TMLE, however, depends critically on two assumptions: the normality and homoskedasticity of the underlying distribution. The quintile-quintile plot in Figure 4 closely follows the quintiles of a normally distributed dataset, thus implying that normality holds for the data at hand. Homoskedasticity is, however, likely to be violated. Therefore, we employ robust standard errors to control for heterogeneity.

Figure 4: Quintile-quintile normality plot



As a robustness check of the TMLE, we also estimate a probit model whereby the dependent variable equals 1 for households in which child labor is prevalent and 0 otherwise.[13] The probit and Tobit estimates are quite similar in terms of sign and magnitude, thus supporting the use of the TMLE.

A final concern with the model outlined in equation (2) is the unobserved tehsil-specific effect, η_t, as shown in equation (3). This effect may be correlated with some of the explanatory variables, thus violating the key identification condition outlined in (4). To deal with this issue, we control for unobservable tehsil heterogeneity by employing TFE estimation,[14] which will purge the correlation between (X) and (η_t).

[13] The results are not shown here but are available on request.

[14] Given the large number of tehsils in Punjab (143 in all), estimating the model with TFE would imply adding 142 dummies to the variable of interest and the requisite controls on the right-hand side. In spite of so many fixed-effects dummies, the Tobit estimation remains consistent due to the large sample size of almost 33,000 households.

Recapitulating, the estimation technique has three dimensions: the use of (i) instruments to control for simultaneity, (ii) TFE to control for unobserved tehsil heterogeneity, and (iii) TMLE to control for a corner solution dependent variable. Putting these together yields a unique TFE-IVT estimator with which to study the relationship between average public school enrolment and child labor across Punjab in Pakistan.

5. Results and Discussion

5.1. First-Stage Results

The first-stage results are given in Table A3, Appendix A, and show that both receipt of the subsidy as well as access to a public school facility have a significant and positive effect on the percentage of children enrolled in public schools. In addition, the public school enrolment ratio decreases in richer households, implying that wealthier parents are less likely to send their children to public schools. On average, enrolment ratios are higher in households with literate parents. Moreover, as the number of older children (those in the 10–14-year age bracket) increases relative to the number of children in the 5–9-year age bracket, the public school enrolment ratio increases. This is not surprising given that there are limited private schooling options at higher tiers of schooling.[15]

5.2. Second-Stage Results

The TFE-IVT estimates are similar to the OLS estimates in terms of signs and statistical significance (Table 5).[16] The magnitude of the TFE-IVT estimates is far stronger, but a comparison of magnitudes per se is not plausible because the coefficients represent the marginal effects on the latent dependent variable for the whole sample, i.e., $y_{it}^{P} \geq 0$.

[15] Andrabi, Das, Khwaja, Vishwanath, and Zajonc (2007) have documented that the massive growth in private schools in Punjab in the past decade has predominantly been at the primary level.

[16] As a robustness check, the model was rerun using total enrolment (including private school-going children). The results were similar to those obtained for public school enrolment alone (results available on request). The subsidy could have two possible effects on enrolment. First, by reducing the cost of schooling, it may free up resources, allowing parents to send more children to school. This could result in an increase in public school enrolment, in private school enrolment, or both. Second, the subsidy may reduce the cost of public relative to private schooling, incentivizing parents to shift their children from private to public schools. The similarity of results with those for public school enrolment and total enrolment indicates that the former effect outweighs the latter in this context.

Table 5: Estimates of child labor

Dependant variable = average weekly hours	OLS-IV (1)		Tobit-IV (2)	
	Coefficient	t-stats	Coefficient	t-stats
Enrolment ratio	-0.16***	-5.35	-5.33***	-5.36
Wealth index	-0.051***	-9.76	-1.39***	-10.14
Landholding	-0.037***	-5.72	-1.12***	-5.52
Landownership*urban	-0.02***	-4.29	-1.01***	-4.76
Head's education level	-0.01**	-3.2	-0.22***	-3.10
Mother's education level	-0.00*	-2.24	-0.00*	-2.34
Head's gender	-0.00	-0.11	0.05	-0.12
Family size	0.05***	5.09	1.77***	-6.02
Family size across wealth quintiles	-0.01***	3.46	-0.15***	3.75
Gender ratio	-0.01**	-3.03	-0.19**	-2.13
Age ratio	0.04***	9.67	1.06***	-11.13
Urban	0.07***	7.05	1.88***	-7.11
First-stage residuals	0.00**	2.19	0.08**	2.27
142 tehsil dummies (included but not shown here)				
Constant	0.09*	2.08	-13.02***	-14.05
N[17]	33,938		33,938	
Log likelihood	-		-24206.58	
R-squared	0.029		0.070	
First-stage residuals (p-values)	0.03		0.027	
Over-identification test (p-values)	0.85		0.98	

Note: ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.
Source: Author's calculations.

There is a substitution effect between schooling and paid child labor[18] (Table 5), which is confirmed by a statistically significant and negative TFE-IVT estimate of average public school enrolment. We expect, on average, that a 1 percent increase in a household's public school

[17] While the MICS is a survey of 90,000 households, only 59,993 households have at least one child between the ages of 5 and 14 years. This sample is restricted further to households with at least one child enrolled in a public school, limiting the sample to 33,938 households.

[18] The model was rerun using the number of average weekly hours spent carrying out 'paid, family, or domestic work', 'paid and family work', 'only family work', and 'only domestic work'. For each of these dependents, both gender- and area-disaggregated regressions were undertaken. The significant and negative relationship between enrolment and work hours continued to hold in the aggregated regressions, but the disaggregated regressions showed that schooling is insignificant in reducing hours worked at home. This is because a large percentage of children (especially females) from both the school-going as well as out-of-school-going sample engage in domestic work (this is also evident in Figure B2, Appendix B). Since school-going children combine schooling with household chores, the reduction in cost of schooling as a result of the subsidy does not have any significant impact on reducing the number of hours worked at home. The results of the disaggregated regression on domestic work also showed that the significance in the pooled regression was driven by paid and family work. Due to the large number of regressions, these results are not shown but are available on request.

enrolment has the potential to reduce the number of hours of paid labor by almost 5 percentage points, ceteris paribus.

Child labor is more responsive to schooling in urban areas than rural areas (Table 6). Likewise, the degree of substitutability between child labor and schooling is stronger among males than females (Table 7). These two findings are also confirmed by rerunning an augmented version of the model, including the interaction terms between the enrolment ratio, gender ratio, and the household's rural/urban location.

Table 6: Estimates of child labor by location

Dependent variable = average weekly hours	Paid Work			
	Urban		Rural	
	Coefficient	t-stats	Coefficient	t-stats
Enrollment Ratio	-5.34***	-3.01	-4.68***	-3.84
Wealth Index	-1.71***	-6.90	-1.23***	-6.59
Landholding	-0.13	-0.27	-1.34***	-6.01
Head Eduation Level	-0.41***	-4.04	-0.09	-0.93
Mother's Education Level	-0.00**	2.49	-0.00	1.37
Head Gender	-0.83	-1.35	0.87	-1.42
Family Size	1.74***	-3.77	1.70***	-4.49
Age Ratio	1.11***	-6.56	1.10***	-9.32
Gender Ratio	-0.22	-1.49	-0.16	-1.42
142 Tehsil Dummies (included but not shown here)				
Constant	-9.89***	-5.10	-13.63***	-12.12
N	11687		24926	
Log Liklihood	-7341.10		-16088.59	
Hausman Test (p value)	0.029		0.025	
Overidentification Test (p value)	0.78		0.81	

Note: ***, ** & * indicate significance at 1%, 5% and 10% respectively.
Source: Author's calculations.

Poverty is an important factor explaining child labor. Less wealthy households in both urban and rural settings are more likely to engage in child labor (Table 5). While the result holds for males, in the case of females, a lack of wealth seems to have no bearing on the incidence of child labor (Table 7).

The positive TFE-IVT estimates for family size also corroborate the link between lack of wealth (or poverty) and child labor (Table 5). Larger families faced greater resource constraints, and therefore the average number of labor hours increase as families grow. This effect differs across wealth quintiles (Table 5). On average, larger families in the

lowest wealth quintile work longer hours than larger households in the highest wealth quintile (Table 5).

Table 7: Estimates of child labor by gender

Dependent variable =	Males		Females	
average weekly hours	Coefficient	t-stats	Coefficient	t-stats
Enrollment Ratio	-7.57***	-4.99	-5.84**	-2.50
Wealth Index	-1.91***	-9.17	-0.51	-1.61
Landholding	-1.39***	-4.55	-0.38	-0.89
Landownership*Urban	-0.05***	-3.66	-0.02	-0.75
Head Education Level	-0.07	-0.72	-0.00	-0.02
Mother's Education Level	-0.00*	-1.71	-0.00**	-2.49
Head Gender	-0.04	-0.06	1.23	-1.06
Family Size	1.73***	-3.93	0.38	-0.55
Gender Ratio	-0.47***	-2.59	0.41*	-1.89
Age Ratio	2.54***	-14.08	1.11***	-3.64
Urban	2.55***	-6.43	1.85***	-3.26
142 Tehsil Dummies (included but not shown here)				
Constant	-17.58***	-12.14	-18.68***	-8.29
N	30181		19783	
Log Likelihood	-21725.80		-13970.42	
Hausman Test (p values)	0.041		0.039	
Over-identification Test (p value)	0.87		0.85	

Note: ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.
Source: Author's calculations.

Land is considered a symbol of wealth in rural settings—child labor is lower among land-rich households than among land-poor households (Table 5). Land ownership is also an important determinant of male child labor—male children work less in households with land compared to those without land (Table 7). This relationship is sensitive to households' residential location—urban male children from land-rich households work fewer hours than their counterparts in rural areas (Table 7). Among females, land ownership has no bearing on the incidence of child labor (Table 7).

Households whose heads are more educated have lower average labor hours (Table 5). The incidence of child labor increases substantially with the household head's age (Tables 5, 6, and 7).

Diagnostics

The first test was undertaken to establish the endogeneity of *S*. In line with the Smith-Blundel procedure, OLS residuals were obtained from

the reduced form of S, i.e., equation (7),[19] and included in the Tobit of y on S, X, and Z, i.e., equation (2). The t-statistic of the OLS residuals provided a simple test for the endogeneity of S with the null being that S is exogenous. On the basis of the p-values, we concluded that S was indeed endogenous (Tables 5, 6, and 7).

Next, in order to ensure that condition (5) held, a test for over-identifying restrictions was constructed by regressing the residuals obtained from equation (2) on the instruments as well as on all other exogenous variables. On the basis of the p-values, we failed to reject the null that all the excluded variables were exogenous.

5.3. Discussion

In light of the results presented in the previous section, we can conclude that schooling can be used effectively to reduce child labor. Thus, schooling is important not just as an end in itself—as argued by the vast body of literature that emphasizes the need to invest in children and raise the quantity of schooling in developing countries—but it is equally important because of its positive spillover effects. Given the failure of legal restrictions on child labor and the issues of enforceability in developing countries, the use of schooling to combat child labor offers a promising yet practical approach for diverting children from work to school.

Both arguments that educational subsidies are an effective means of promoting enrolment on one hand (as documented by Chaudhury & Parajuli, 2010, for Punjab) and that increasing school enrolment can displace child labor on the other lead to an important policy implication. The government should continue investing in programs such as the PESRP, which reduce the cost and increase the attraction of schooling. Such programs will not only have direct benefits in the form of better schooling outcomes (as has already been witnessed in the past), but will also generate positive externalities in the form of fewer child labor activities.

6. Conclusions

The objective of this paper was to study the causal impact of public school enrolment on child labor in Punjab, Pakistan. Our main hypothesis was: *Is school enrollment a substitute for child labor?* The methodology entailed using a unique TFE-IVT estimator that controlled for simultaneity,

[19] The first-stage results are presented in Table A3, Appendix A.

unobserved tehsil heterogeneity, and a 'corner solution dependent variable.' The data used was provided by the MICS for 2007/08.

Our results suggest that school enrolment can be used as a substitute for child labor. On average, a 1 percentage point increase in a household's public school enrolment has the potential to reduce hours in paid labor by almost 5 percentage points, ceteris paribus. This substitutability is highest among poor, urban males. The incidence of child labor is higher among larger, poor families.

The results imply that schooling can be used effectively to reduce child labor. Thus, schooling is important not just as an end in itself, but also because of its positive spillover effects in the form of fewer child labor activities. This calls for the government to continue investing in programs such as the PESRP, which reduce the cost and increase the attraction of schooling.

Children offer a promising future for our country. The ability to realize that potential depends critically on the kind of skills and opportunities available to them. Education can provide the desired key to success, not only by enhancing their skills and capabilities, but also through positive externalities in the form of reduced child labor.

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Appendix A: Tables

Table A1: Population profile

Group		Population in sample	Percentage
5–14	Total	150,101	25.2*
	Males	77,811	51.8
	Females	72,290	48.2
	Urban	48,894	32.6
	Rural	101,207	67.4
5–9	Total	76,725	51.1
10–14	Total	73,376	48.9

* Children in the 5–14-year age bracket constitute 25 percent of the total surveyed population, equal to 594,802 individuals.
***Source*:** MICS (2007/08).

Table A2: Definitions of variables used in the model

Dependent variable		
y_{it}^{P}	Average number of hours worked for pay in the past week	(Total working hours [ ])/(total working children [ ] – private school-going children [ ])*100
Explanatory variables		
Variable of interest		
S_{it}	Share of children enrolled in a government school	Number of children enrolled in public schools [ ]/total children [ ]*100
Instruments		
B_{it}	Education subsidy in the form of books	Dummy variable: 1 = household receives books, 0 otherwise
A_{it}	Access to a government primary school facility	Dummy variable: 1 = a primary school facility is accessible within 2 km of the household, 0 otherwise
Household-level controls		
Aggregate wealth index	This index captures each household's long-term wealth through information on assets. The asset has been constructed through a principal components analysis of the following household goods and amenities (assets): number of rooms for sleeping per member; material used for floor, roof, and walls of dwelling; type of cooking fuel; availability of electricity, gas, radio, television, cable television, mobile and nonmobile telephone, computer, Internet access, refrigerator, air conditioner, washing machine, cooler, microwave oven, sewing machine, iron, water filter, motorized pump, watch, bicycle, motorcycle/scooter, animal-drawn cart; car or truck	
Land	Dummy variable: 1 = household owns land, 0 otherwise	
Head's education	Measured by completed years of schooling	
Mother's education	Measured by completed years of schooling	
Size of household	Variable enters in logarithmic form	
Gender of household head	Dummy variable: 1 = head is male, 0 otherwise	
Location of household	Dummy variable: 1 = household is located in an urban area, 0 otherwise	
Gender ratio	Number of female children [ ]/number of male children [ ]	
Age ratio	Number of children aged [10–14]/number of children aged [5–9]	
Tehsil-level controls		
Instead of specific controls, the model employs tehsil fixed effects		

* Where [ ] = 5–14-year age bracket.

Table A3: First-stage results

	Dependent variable = enrolment ratio				
	Overall	**Urban**	**Rural**	**Males**	**Females**
Receipt of books	0.334***	0.364***	0.335***	0.332***	0.306***
	(-27.79)	(-25.32)	(-30.52)	(-26.11)	(-29.55)
Access	0.78***	0.83***	0.810***	0.799***	0.801***
	(-10.11)	(-10.15)	(-9.59)	(-11.54)	(-10.99)
Wealth index	-0.025***	-0.083***	0.007	-0.051***	0.010**
	(-7.37)	(-15.15)	(-1.59)	(-12.54)	(-1.99)
Landholding	0	-0.018	0.002	-0.001	0.003
	(-0.05)	(-1.62)	(-0.41)	(-0.24)	(-0.46)
Head's education level	0.003*	-0.003	0.009***	0.002	0.003
	(-1.78)	(-1.28)	(-4.07)	(-0.79)	(-1.03)
Mother's education level	2.225**	2.201**	2.339**	2.366**	2.245**
	(-2.48)	(-2.49)	(-2.43)	(-2.18)	(-2.19)
Head's gender	0.023**	0.011	0.034**	0.027**	0.008
	(-2.19)	(-0.66)	(-2.49)	(-2.14)	(-0.46)
Family size	0.052***	0.075***	0.028***	0.042***	0.045***
	(-7.19)	(-6.55)	(-3.08)	(-4.87)	(-3.8)
	(-6.69)	(-5.89)	(-4.17)	(-4.73)	(-4.46)
Age ratio	0.033***	0.054***	0.022***	0.050***	0.020***
	(-13.16)	(-12.72)	(-7.27)	(-12.62)	(-3.87)
Gender ratio	-0.001	0.014***	-0.009***	0.003	0.006*
	(-0.65)	(-3.92)	(-3.38)	(-0.79)	(-1.83)
Area	-0.102***			-0.115***	-0.099***
	(-17.02)			(-16.02)	(-10.66)
142 tehsil dummies (included but not shown here)					
Constant	0.136***	0.260***	0.166***	0.176***	0.165***
	(-5.62)	(-4.42)	(-6.11)	(-5.91)	(-4.32)
Observations	36613	11687	24926	30181	19783

Note: t-statistics are given in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table A4: Correlation between RHS variables

	Enrollment	Books	Primary Access	Wealth	Landownership	Head Edu	Head Gender	Family Size	Males <4	Females <4	Age Ratio	Gender Ratio	Urban Location
Enrollment	1												
Books	0.2324	1											
Primary Access	0.1288	0.0763	1										
Wealth	-0.1447	-0.0445	0.0092	1									
Landownership	0.0639	0.0075	-0.0046	-0.1301	1								
Head Edu	-0.0528	-0.0405	0.0055	0.4894	0.0317	1							
Head Gender	0.0158	0.0127	-0.0011	-0.0666	0.0261	0.0900	1						
Family Size	0.0447	0.0441	-0.0088	0.0127	0.0798	-0.0995	0.1209	1					
Males <4	-0.0515	-0.0281	-0.0168	-0.0529	0.0235	-0.0401	0.0367	0.3046	1				
Females <4	-0.0373	-0.0177	-0.0098	-0.0488	0.0157	-0.0464	0.0392	0.2994	0.0414	1			
Age Ratio	0.1080	0.0733	0.0178	0.0136	-0.0051	-0.0285	-0.0085	0.2091	-0.1753	-0.1725	1		
Gender Ratio	0.0271	0.0324	0.0012	-0.0170	-0.0012	-0.0219	0.0070	0.2261	0.0038	0.0023	0.2065	1	
Urban Location	-0.1951	-0.1108	-0.0933	0.5753	-0.3324	0.2470	-0.0103	-0.0413	-0.0424	-0.0438	0.0139	-0.0077	1

Appendix B: Figures

Figure B1: Intergenerational child labor trap

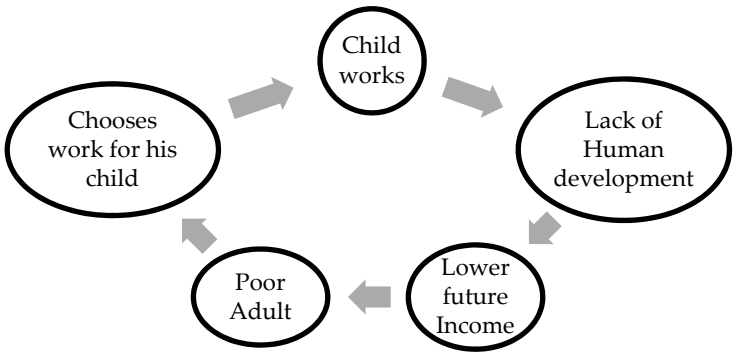
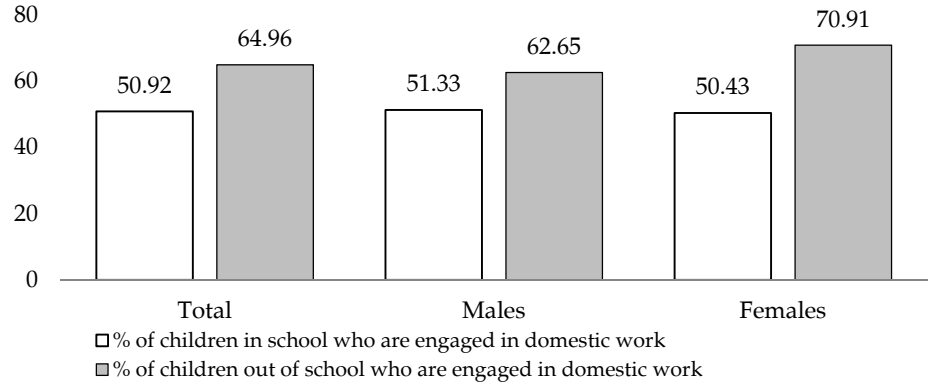
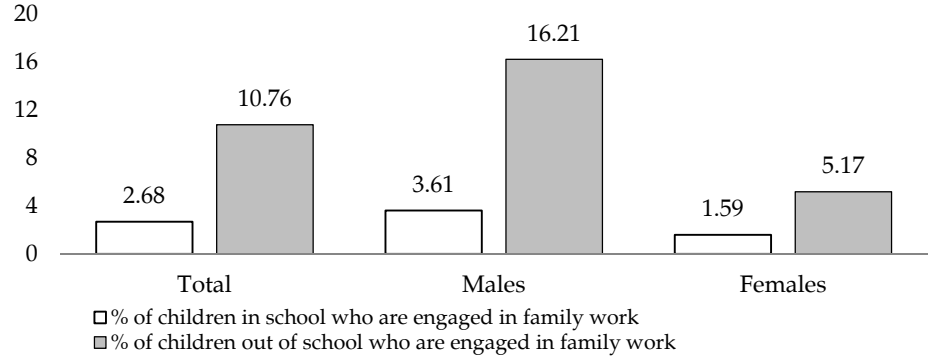


Figure B2: School attendance and domestic work (5–14 years) (%)



***Source*:** Data from MICS (07-08) & author's own calculations

Figure B3: School attendance and family work (5–14 years) (%)



Source: Data from MICS (2007/08) and author's calculations.

Appendix C

Education Subsidies under Punjab Education Sector Reform Program

In Pakistan, the provincial government in collaboration with the World Bank launched the Punjab Education Sector Reform Program (PESRP) in 2003, at a cost of PKR 21.7 billion (Punjab, Department of School Education, 2011). The main objective of the program was to improve the access, quality, and governance of the education sector (Solotaroff, 2007).

Under the PESRP, one of the projects was the provision of free textbooks in public schools from katchi to grade 10. This project was introduced in 2004/05. The main objective of providing free textbooks was to increase enrolment rates as well as induce lower dropout rates by reducing the cost of education. Free textbooks were given to approximately 11 million students annually.

Under the disbursement mechanism, textbooks were delivered from the Punjab Textbook Board (PTTB) to the district headquarters from where they were transferred to tehsil-level warehouses and on to union councils. The councils were then responsible for the eventual delivery of books to all public schools in that area. At the schools, the delivery of stock was undertaken in the presence of the school head. Once the books were distributed to students at the school, they became their property. Any surplus stock of books was returned by the school and followed the same channel backwards, eventually reaching the PTTB.

Other projects under PESRP included a female secondary school stipend program, the provision of toilets, boundary walls, and additional classrooms for about 30,000 schools, the hiring of 50,000 additional school teachers, provision of financing to 300 low-cost private schools using a public-private partnership model to support students from lower-income quintiles, establishment of community-based school councils in 43,000 primary schools, an increase in sector budget by almost 50 percent in a three-year period, making 1,000 closed schools functional, and instituting new arrangements for sector governance by signing performance-based monitoring and financing agreements between the province and the 35 district governments (Solotaroff, 2007).

The education sector witnessed significant improvements under the PESRP. The primary net enrolment rate in Punjab increased from 45 percent in 2001/02 to 58 percent in 2004/05 while the primary completion

rate in government schools increased from 58 to 61 percent in the same period (based on data from the PIHS and Pakistan Social and Living Standards Measurement Survey for 2004/05). Progress was also seen toward greater gender parity. The gross enrolment ratio for girls in middle school increased from 43 to 53 percent over the three years from 2003 to 2006, and in absolute terms enrolment increased by over 60 percent (Punjab, Department of School Education, 2011).

Although the program's initial duration was up to 2006, in view of its success, it was extended for another three years. There is, however, no evidence on how this rise in school enrolment has affected child labor activities in Punjab. Against this backdrop, it is interesting to study the link between schooling and child labor.

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What Does Pakistan Have to Join the Inflation Targeters' Club—a Royal Flush or a Seven-Deuce Offsuit?

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Abstract

The economic and institutional structure required to successfully adopt and implement an inflation targeting framework (ITF) is often lacking in emerging economies. This paper evaluates these structures both qualitatively and quantitatively for Pakistan's economy. Although our comprehensive assessment finds that many of the core requirements remain unrealized, the literature and real-time experience argue that an ITF remains possible for emerging economies even in the absence of these conditions. We investigate whether—were the State Bank of Pakistan to adopt an ITF—there exists a stable and significant relationship between the policy rate (monetary tool) and inflation measure (objective). It is important to analyze this bivariate relationship, given the key role of the interest rate in mitigating deviations between actual and target inflation when working within an ITF. To illustrate this relationship, we use Granger Causality test, but our estimates fail to find any significant link between the interest rate and inflation. On the basis of our overall findings, we suggest that Pakistan, in the absence of most of the fundamental requirements of an ITF, is perhaps not yet ready for it.

Keywords: Inflation targeting, Pakistan, monetary policy.

JEL Classification: E30, E52, E58.

1. Introduction

Over the last two decades, a monetary policy framework that has gained global recognition is the inflation targeting framework (ITF). There is a growing literature on its applicability, its effects on economic performance, and its superiority over other frameworks (exchange rate targeting, monetary aggregate targeting, etc.). Inflation targeting has been

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defined as a framework for monetary policy in which central banks commit to low and stable inflation as their long-term objective, publicly announce quantitative targets, and hold themselves accountable to achieving these targets (Bernanke, Laubach, Mishkin, and Posen, 1999).

The literature attributes three reasons to the widespread adoption of ITFs: First, the only macroeconomic variable that monetary policy is capable of affecting in the long run is the inflation rate. Second, there is virtual consensus on the negative impacts of even modest inflation on economic efficiency and growth. Although, the link between inflation and overall economic performance is ambiguous in theory as inflation is determined by the interaction of many factors, a significant number of econometric studies associate high inflation with low productivity and with a low rate of growth (Fischer, 1993; Judson & Orphanides, 1996; Bruno & Easterly, 1998). Third, inflation targeting works as a "nominal anchor" by imposing several constraints on central banks.

The successful adoption and implementation of an ITF strongly requires the existence of certain "economic" and "institutional" prerequisites in the candidate country. When it comes to emerging and developing economies, however, these prerequisites often do not exist (Masson, Savastano, & Sharma, 1997). These include: the independence of the central bank, transparency of information, fiscal discipline, a floating exchange rate, moderate or low debt levels, sufficient foreign reserves, demand-side dominance, and the strength of the financial system (Masson et al., 1997; Bernanke et al., 1999; Mishkin, 2000; Taylor, 2000).

In this study, we evaluate these prerequisites both qualitatively and quantitatively to assess the applicability of an ITF to Pakistan. Assuming the State Bank of Pakistan (SBP) were to adopt an ITF as its main monetary policy framework, we also examine whether there exists a stable and significant relationship between the interest rate (proxied by the policy rate or PR), which is the principal monetary policy tool used to affect inflation in inflation targeting countries, and inflation (proxied by the consumer price index or CPI). To illustrate this bivariate relationship, we use a Granger causality test through which we determine the authenticity of causality running from the PR to inflation (PR Granger-cause inflation). This gives us an idea of whether the PR is able to affect inflation, its behavior, and dynamics to the same extent as required by an ITF to mitigate the deviations between actual and target inflation in the short run.

Our assessment of prerequisites reveals that Pakistan either fails to meet most of the preconditions of inflation targeting or only partially meets them. In addition, as far as the relationship between the interest rate and inflation measure is concerned, our results indicate that the PR does not Granger-cause inflation, which means that the interest rate does not seem to affect inflation directly and thus cannot be used to forecast inflation dynamics.

The remainder of this paper is organized as follow: Section 2 provides an overview of monetary policy developments in Pakistan and the main objectives of its monetary policy. Section 3 discusses the prerequisites for adopting an ITF, and broadly assesses whether Pakistan meets those requirements. Section 4 develops an econometric framework to determine the viability of an ITF in Pakistan by estimating the relationships between the inflation measure, short-term interest rate, and other policy anchors. Section 5 concludes the paper.

2. Monetary Policy Developments in Pakistan

In the late 1980s, the monetary authorities in Pakistan started working on 'comprehensive financial sector reforms' with the help of the International Monetary Fund (IMF) and the World Bank. Many steps have been taken since then, but two key measures were the turning point for the monetary sector.

i. The first was the statutory independence of the central bank, which took place in 1994 when the SBP was assigned sole responsibility for making and implementing monetary policy.

ii. The second important step was the adoption of market-based or indirect instruments of monetary policy. Before this, the SBP had relied on an administered monetary policy regime governed by ad hoc changes in the reserve ratio, directed credit, and regulated interest rate policies.

From the onslaught of financial sector reforms in Pakistan during the 1980s and the initiation of the bank's independence in 1993, the SBP started to follow monetary aggregate targeting in 1994 on a *de jure* basis, assuming a stable demand for the money function in Pakistan. The ultimate goals of monetary policy under the framework of monetary aggregate targeting were inflation reduction (maintaining price stability) and output growth with broad money (M2) as the intermediate target and

base money or reserve money as the operational target. Moreover, with the adoption of market-based instruments, more attention was paid to managing the short-term interest rate; and the SBP adopted a three-day SBP discount rate as the major policy instrument with which to signal the easing or tightening of monetary policy.

On a *de facto* basis, although the SBP has been found to pursue the ultimate objective of high GDP growth and low inflation—as confirmed by the objective function developed by Malik (2007), but in line with the assessment of the IMF (2006), which has classified Pakistan's monetary regime as a "hybrid" regime—Malik (2007) argues that the country's policy has focused on several other factors such as the foreign interest rate, exchange rate, and trade deficit. Moreover, monetary policy in Pakistan can be characterized by "discretion and judgment" rather than as being "model- or rule-based," which brings about the problem of time inconsistency (see Barro & Gordon, 1983; Kydland & Prescott, 1977). It is worth noting that, though the SBP follows monetary aggregate targeting, there is no information available on the underlying macroeconomic model it uses. The SBP only announces its short-term targets for the period of one year, and there are no model-based projections given for the medium term. Geraats (2005) argues that short-term targets are indeed forecasts rather than targets in the real sense because monetary policy affects inflation with lags greater than one year.

3. Infrastructure for the Adoption of Inflation Targeting in Pakistan

The discretion- and judgment-based actions that currently characterize Pakistan's monetary regime also typified the dilemma that led to the popularity of the ITF in the rest of the world. Inflation targeting is not a pure "rule"; rather, it is a framework for policy within which "constrained discretion" can be exercised (Bernanke et al., 1999). This discretion is constrained by the announcement and commitment of a central bank to pursue low stable inflation as its ultimate objective.

Beginning with New Zealand, many developed and emerging economies have adopted ITFs, and their experience has been generally positive. However, it is often argued that economic structures in emerging economies are incapable of supporting an IT regime in the short and medium run. Ample research has been conducted to identify whether an ITF could be an appropriate framework for these economies despite the absence of its prerequisites, and the answer appears to be affirmative (Masson, Savastano, & Sharma, 1998).

3.1. Prerequisites

The literature defines varying prerequisites for an ITF. In Table 1, we provide a consensus-based list of these prerequisites (Bernanke et al., 1999; Masson et al., 1997; Mishkin, 2000; Taylor, 2000).

Table 1: Prerequisites for ITF

Prerequisite	Rationale
Independence of central bank	Independence is important to make the policy credible and to make responsibilities and accountability clear.
Transparency of information	The central bank ought to communicate clearly and frequently with the government, markets, and the public in order to earn credibility. This condition is often referred to as the transparency objective.
Fiscal discipline	Fiscal policy must be compatible with monetary policy, the conduct of which should not be constrained by the fiscal deficit. This requires that fiscal deficits be reduced through revenue-based measures rather than by relying on the central bank for domestic borrowing (Masson et al., 1997). High fiscal deficits also lead to high inflationary pressures in the economy.
Floating exchange rate	In the long run, inflation targeting works best with a flexible exchange rate regime, but short-term intervention may be permissible during the transition period.
Moderate or low debt level	In the case of high foreign debt levels, there is a trade-off between the priorities of the inherited conflicting objectives of monetary and fiscal policies.
Sufficient foreign reserves	The buffer created by foreign reserves should be adequate for the successful implementation of the ITF.
Demand-side dominance	Inflation targeting works in the case of demand-side dominance; supply-side dominance makes it unsuitable for a country.
Financial system strength	The strength of a financial system is crucial since the decisions of the central banks flow to the economy through its financial markets.

3.2. Does Pakistan Meet ITF Prerequisites?

In the following sections, we evaluate the Pakistani economy against the prerequisites listed above.

3.2.1. Independence of Central Bank

The empirical justification for central bank autonomy is based on studies demonstrating that there is a robust negative correlation between central bank autonomy and inflation. The State Bank of Pakistan Act 1956 with subsequent amendments describes the current functions and responsibilities of the SBP as the central bank of Pakistan. Two amendments are worth noting with reference to the SBP's autonomy.

- A bill[1] was passed in February 1994 that established the SBP's formal and legal autonomy by making monetary policy its sole responsibility.

- An amendment was approved in January 1997 that further enhanced the SBP's independence by giving it the right to determine and enforce limits on government borrowing from it.

However, an ordinance in 2000 compromised the SBP's effective autonomy in two ways. First, it authorized the federal government to direct the SBP to set up funds for special purposes (credit schemes); second, it delegated authority to the President to appoint the governor of the SBP, making the bank vulnerable to political pressures (Malik & Din, 2008).

Although the 2000 ordinance weakened the SBP's independence, this was countered in 2005 by the Fiscal Responsibility and Debt Limitation Act 2005, which required the government to reduce its revenue deficit to zero by 30 June 2008 and maintain it thereafter, and to concurrently reduce public debt to 60 percent of GDP by 2013 and below that limit thereafter. However, there were serious flaws in its implementation, which were pointed out by Shamshad Akhtar, the governor of the SBP, who said that, "the government had borrowed 204 billion rupees between January and March and 283.9 billion from April to June (2008). In the last two days alone, it borrowed 55 billion rupees."

A recent IMF working paper by Arnone, Laurens, Segalotto, and Sommer (2007) calculates the autonomy of the central banks of 163 countries at the end of 2003. The comparative results with reference to Pakistan are reported in Table 2 below.

[1] Act II of 1994, S.2 and S.3.

Table 2: Central banks' comparative autonomy

Economy	Political autonomy	Economic autonomy	Overall autonomy
Pakistan	0.38	0.63	0.50
India	0.25	0.75	0.50
Average for EMEs	0.56	0.75	0.65
Average for advanced economies	0.70	0.81	0.75

Source: Arnone, Laurens, Segalotto, and Sommer (2007).

Arnone et al. (2007) and the recent facts mentioned above suggest that the SBP is far less politically independent when compared to emerging and developed economies not only overall but also individually, both in the political and economic domains.

3.2.2. Transparency of Information

Transparency is another important ITF prerequisite and a byproduct of central bank independence. Over time, the importance of transparency has increased due to its impact on expectations and uncertainty about economic variables. Faust and Svensson (2001), Barro and Gordon (1983), and Geraats (2002), all using different economic indicators, show that more information is better because it reduces uncertainty about economic variables. The transparency of the central bank is vital not only for the ITF but for every monetary policy regime.

Dincer and Eichengreen (2006) have measured the transparency of 100 central banks, including that of Pakistan. They follow the definition of transparency proposed by Eijffinger and Geraats (2002) and take a large number of central banks as done by Fry, Julius, Mahadeva, and Roger (2000). They find that, "central banks in the advanced countries are more transparent than central banks in emerging markets (defined as middle-income countries with significant links to international financial markets), which in turn are more transparent than central banks in developing countries." The transparency of the SBP as measured by this approach is provided in Table 3 below.

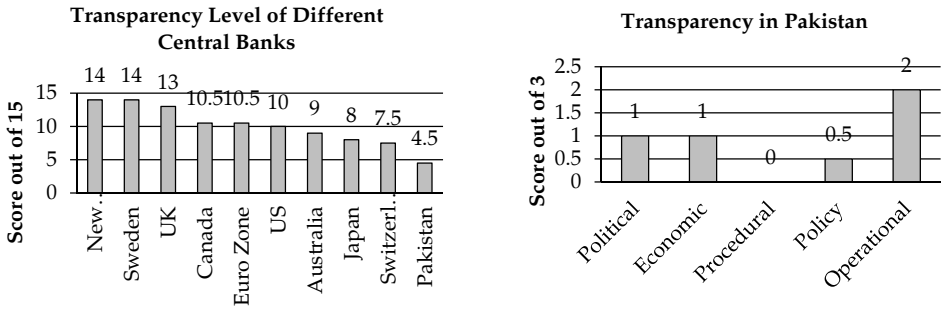
Table 3: Transparency of SBP

	1998	1999	2000	2001	2002	2003	2004	2005
Pakistan	2.5	2.5	2.5	2.5	2.5	2.5	3.5	3.5

Source: Dincer and Eichengreen (2006).

Following Eijffinger and Geraats (2002), Malik and Din (2008) analyze monetary policy transparency in Pakistan. According to them, the SBP scores 4.5 out of 15 (where 15 is the highest) in transparency, as depicted in Figure 1 below.

Figure 1: Monetary policy transparency in Pakistan



Source: Malik and Din (2008)**.**

The SBP pursues multiple objectives with the dual mandate of price stability and output growth. It announces short-term targets but not medium-term objectives. Economic data on GDP and inflation is made available on a quarterly basis, but there is no information as to which macroeconomic model or rule is being used to forecast and establish short-term targets, nor is any comprehensive forecast made. Any policy change in instrument/tool is announced on the day of implementation, but no information or explanation is provided related to the change in operating target or the effect of that change on the intermediate target. There is no information on the institutional settings for interaction between the monetary and fiscal authorities, which is the prime reason for poor coordination between the government and the SBP. The SBP provides information on forecasting errors, but it does not explain how the forecasting was made or what contributed to those forecasting errors. Nor does it provide information on the exact contribution of the monetary policy to achieving its announced objectives; rather, it conducts a superficial and vague policy evaluation.

These facts show that the SBP's transparency level is fairly low, which is the major hindrance in implementing an ITF. Unless the central bank is transparent, its credibility will be low and it cannot anchor public expectations, as a result of which policy actions cannot be transmitted to the economy as desired.

3.2.3. Fiscal Discipline

Another important prerequisite for the successful adoption of an ITF is the absence of a fiscal deficit, and sound coordination between fiscal and monetary authorities. According to Masson et al., 1997, fiscal dominance is one of the major obstacles in the implementation of inflation targeting.

Fiscal deficits are highly inflationary through their impact on the money supply. There is a vicious cycle between a fiscal deficit and inflation. A high deficit is financed by increasing the money supply; a high money supply causes high inflation; to curb this inflation, interest rates are raised, which not only crowds out investment, but also raises the deficit further by raising debt payments; the inflation indirectly impacts the fiscal deficit by reducing the real value of tax collection; and the cycle continues thus (Jha, 2005).

Pakistan's economy is characterized by high fiscal deficits. The budget deficit widened to 8.3 percent of GDP in the 12 months up to 30 June 2008—the highest since 1991, when it had reached 8.8 percent of GDP, according to the finance ministry website.[2] Monetary policy cannot effectively limit inflation in the presence of an expansionary fiscal policy and high government borrowing from the banking sector. Almost 60 percent of the budget deficit was financed by commercial banks and the SBP during the period 1 July to 29 January in the fiscal year 2008[3] (SBP MPS of January–June 2008).

As shown by Khan and Qayyum (2007), inflation is affected by the government's bank borrowing for budgetary support and the fiscal deficit. "Our inflation is reaching alarming levels mainly due to borrowing," said the SBP's governor, Shamshad Akhtar, when announcing the monetary policy for the fiscal year 2008/09.

In this situation, even if the SBP were to adopt price stability as its primary objective, achieving this objective would depend on fiscal discipline in the economy. The SBP does not have the option of not financing the high fiscal deficit—if it were to decide to do so, the outcome would still be inflationary since the public debt/GDP ratio could become unsustainable in the medium term.

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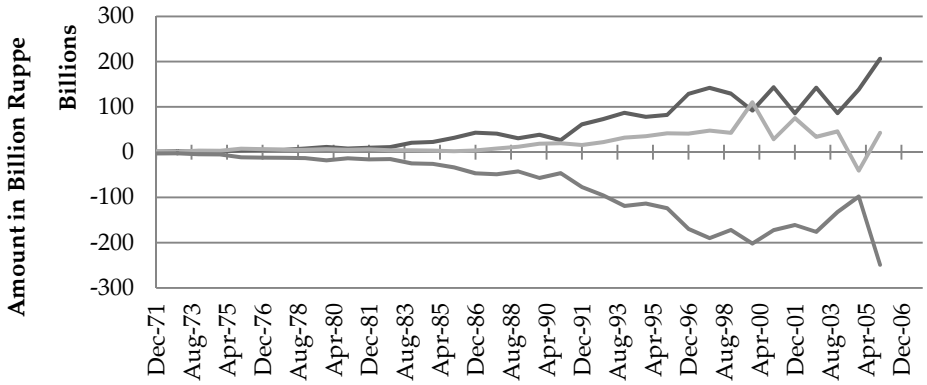
[2] http://www.nation.com.pk/pakistan-news-newspaper-daily-english-online/Politics/30-Jul-2008/Govt-borrowings-alarm-State-Bank

[3] http://www.sbp.org.pk/m_policy/MPS-JAN-JUNE-FY08-EN.pdf

Figure 2 clearly shows the higher fiscal deficit after 1990. The same pattern also occurs in domestic and foreign borrowing, although there seems to be a systematic switch between the two, which could be due to the government having used these two sources to redeem one another alternately. This situation is more likely keeping in view the fact that the main source of deficit financing in Pakistan is borrowing either from the banking sector or from foreign governments.

Figure 2: Fiscal deficit (FD), net domestic and foreign borrowings (NDB, NFB)



Pakistan has always been exposed to high fiscal deficits throughout its history, which have proved a major hindrance in the proper working of its monetary policy. The absence of this prerequisite is considered sufficient to reject the adoption of an ITF by emerging economies, and favors exchange rate targeting in these countries.

3.2.4. Floating Exchange Rate

Another important ITF prerequisite is a floating exchange rate regime. Pakistan followed a fixed-peg exchange rate regime up to the early 1980s, after which the monetary authorities decided to abandon it. As a result of this policy shift, the exchange rate regime evolved to "managed-float" till 2000 and to "free floating" thereafter (Khan & Qayyum, 2007). Although Pakistan claims to follow a floating exchange rate regime, an IMF report on the *de facto* exchange rate regimes of different countries ranks it as one of those countries with differently claimed (*de jure*) and actual (*de facto*) exchange rate policies. According to the report, Pakistan falls under the category of "other conventional fixed peg arrangement"[4].

[4] http://www.imf.org/external/np/mfd/er/index.asp

This inconsistency between the *de jure* and *de facto* actions of the monetary authorities and their reluctance to let the exchange rate float freely can be explained by the "fear-of-floating" literature (Calvo & Reinhart, 2002), which argues that:

- Exchange rate vulnerability can severely affect an economy's balance sheet through the banking, corporate, or even public sectors if the economy has high liabilities denominated in foreign currency.

- Exchange rate vulnerability may be passed through to domestic price levels by its pass-through mechanism, which can be highly inflationary.

According to Husain (2006), apparent evidence of potential balance-sheet-type effects seems to suggest a case for pegging the rupee. However, there is little evidence of significantly higher pass-through of the exchange rate into domestic inflation in Pakistan than in other countries. Hyder and Shah (2004) come to the same point that the exchange rate pass-through effect on domestic inflation in Pakistan is quite weak.

3.2.5. Sufficient Foreign Reserves

On one hand, Pakistan's foreign reserves are decreasing due to its high trade deficit and debt servicing; on the other hand, the devaluation of the Pakistani rupee is increasing the burden of foreign borrowing and the trade deficit. Figure 3 shows the forex reserves held by the SBP and other banks in the form of SDR and USD.

Figure 3: International reserves of SDR and USD

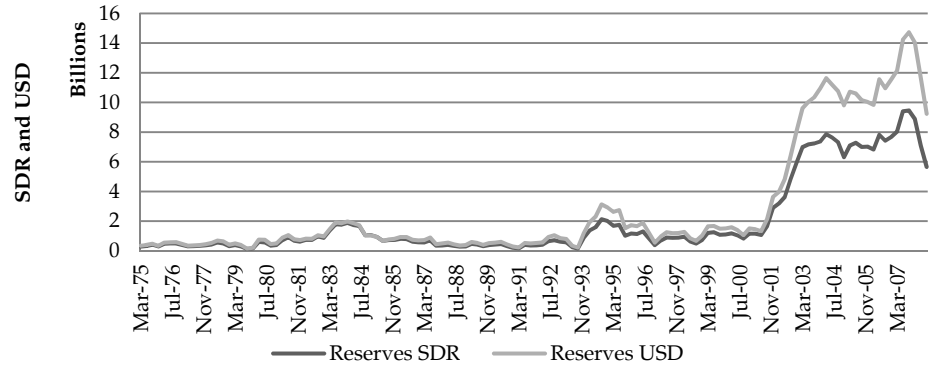


Figure 3 clearly indicates that the country's forex reserves were consistently low until 2000, after which a sharp increase is observed. The probable reason for this drastic increase is the high level of foreign

remittances from all over the world to Pakistan after September 2011. This was also confirmed by the SBP while emphasizing additionally the contribution and rise in foreign direct investment (FDI). FDI rose by more than 69 percent to USD 2.1 billion in the first seven months of the fiscal year 2006/07 (July–June), led by inflows into the financial, communications, and energy sectors. However, Pakistan's foreign reserves, which hit a record high of USD 16.5 billion in October 2007, were depleted by high payments for oil imports and fell to USD 9.57 billion in the week ending on 16 August 2008 (Reuters, 22 August 2008).

Historically, Pakistan's foreign reserves have never been very high, although there had been a constant increase during 2000 to 2007. The even higher level of uncertainty since 2007 suggests that the country would probably not be able to maintain the sufficient (that is, higher) level of reserves required to successfully adopt an ITF.

3.2.6. Demand-Side Dominance

An implicit assumption of the ITF is that monetary policy should respond primarily to demand-side shocks since the recurrence of supply shocks limits the role of monetary policy in containing inflation. Pakistan is a small open economy that is highly dependent on imports and supply shocks such as increases in oil and commodity prices within and abroad, which makes inflation in Pakistan dependent on monetary as well as nonmonetary factors.

Chaudhry and Choudhary (2006) suggest that

> Pakistan's economy is operating at a very horizontal portion of the supply curve and the major cause of inflation is an increase in import prices, not in the mismanagement of monetary policies.

They also find that

> the growth rate of import prices is the most important determinant of inflation in Pakistan, both in the short run and long run, which is followed by growth rate of output.

3.2.7. Financial System Strength

The last but not least precondition for the adoption of an ITF is the strength of a country's financial system. A healthy financial system not

only minimizes the potential conflicts that might arise between the economic stability objective and financial stability objective, but also guarantees the effective and smooth transmission of monetary policy. Financial stability is vital for the eventual success of any monetary policy; in the case of a fragile financial system, the central bank may become overly constrained whenever there is a need to increase the interest rate to tighten monetary policy since this increase could result in the contraction financial institutions' balance sheets. In addition, the more developed or sophisticated a country's financial system, the more a central bank is likely to emphasize inflation control and macroeconomic outlook.

According to the IMF's *World Economic Outlook* of October 2005, the strength of Pakistan's financial system is noteworthy. It is measured using different indicators, such as measures of financial market depth (private-bond-issuance-to-GDP, ratios of stock-market-capitalization-to-GDP, stock market turnover or the maximum maturity of actively traded nominal bonds, and the extent of banks' foreign currency open positions) and risk-weighted capital adequacy ratio. Table 4 shows that Pakistan performs better than its peers and scored 0.5, which is equal to the average score of industrial countries.

Table 4: Comparative strength of financial systems

	Financial system health[5]
Average of industrial economies	0.5
Average of emerging economies	0.4
Pakistan	0.5

Source: Zaidi (2006).

An important factor behind this favorable result is the comprehensive financial sector reforms of the late 1980s, which resulted in a healthier and more competitive banking system (Zaidi, 2006).

3.3. A Royal Flush or a Seven-Deuce Offsuit?

In Table 5, we present a summary of the analysis above along with the status of each prerequisite based on the available information and judgments (which could of course be different from those of other researchers).

[5] IMF staff calculations, source: Zaidi (2006).

Table 5: Summary of ITF 48prerequisites

Prerequisite	Status	Comments
Independence of SBP	Partial	SBP has *de jure* independence but when it comes to operationalizing monetary policy actions, it does not have much political independence.
Transparency of information	Partial	SBP is partially transparent since it has started to provide some information on economic state but does not provide information on ex ante or proactive basis that is required for pre-commitment to inflation target.
Fiscal discipline	No	This condition is not met at all. There is no coordination between fiscal and monetary authorities and fiscal gap has always been negative.
Floating exchange rate	No	Although SBP claims that it has adopted floating exchange rate regime, *de facto* regime of Pakistan is pegged exchange rate as indicated by IMF.
Moderate or low debt level	No	Government borrowing is increasing and this problem has become more severe in the last decade.
Sufficient foreign reserves	No (at least presently)	The reserves condition has always been dissatisfactory in Pakistan except for the period 2000–07. The present data also indicates a downward trend in reserves.
Demand-side dominance	No	Pakistan's economy is characterized by supply-side shocks and is heavily dependent on imports and oil prices.
Financial system strength	Yes	Pakistan's economy is bank-based as opposed to market-based. Although the reforms of the 1990s have strengthened the banking sector, there is still a need for more maturity and depth since the sector boom could be the result of a credit bubble.

All the indicators and prerequisites lead to reservations about the prospects of adopting an ITF in Pakistan. Inflation targeting requires that central banks refrain from using any other nominal anchor, but all the indicators in Pakistan suggest that inflation targeting cannot be the SBP's sole objective. The SBP cannot ignore the issue of a fiscal deficit, high government borrowing, currently falling reserves, large swings in the exchange rate, the depreciating rupee, and supply-side shocks due to high increases in consumer and oil prices. All these issues require the SBP's prime attention, thus hampering its commitment toward the single nominal anchor of inflation and metaphorically putting it in the situation of having the worst possible hand in a poker game, or a "seven-deuce offsuit".

4. Econometric Assessment

An implicit condition of pursuing an ITF is that there should be a stable and significant relationship between the measure of inflation to be controlled and the short-term interest rate. The short-term interest rate is the major tool used by central banks to transmit monetary policy, and low/stable inflation is their final objective. The interest rate can influence inflation through the cost-of-capital channel, the exchange rate channel, and the wealth effect channel. Here, however, we are interested only in the causality of the short-term interest rate with reference to the inflation measure rather than in a particular transmission channel because this causality is important in the subsequent success of an ITF.

4.1. Data, Methodology, and Results

The essence of an ITF is that the interest rate should be used to correct the deviation of actual inflation from the target. By using the Granger causality test, we investigate whether the interest rate Granger-causes the inflation measure in Pakistan. Equation (1) below expresses the general form of this causality:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots + \alpha_n y_{t-n} + \beta_1 x_{t-1} + \ldots + \beta_n x_{t-n} + \varepsilon_t \qquad (1)$$

Since the Granger causality test is relevant only when the variables involved are either stationary or nonstationary but co-integrated, the methodology of our empirical work is as follows:

- Tests for stationarity
- Tests for co-integration: Engle-Granger approach
- Tests for co-integration: Johansen and Juselius approach
- Granger-causality test

We use quarterly data from 1976 to 2007 from the International Financial Statistics database. The reason for dropping data from before this period is the separation of East Pakistan and other major political disturbances in 1971 that caused major shifts in the economy and financial structure, and due to which the economy remained turbulent up to 1975. The variables used in this analysis are as follows:

- *INF* = inflation based on CPI of 12 major cities (base = 2000)

- *PR* = policy rate (discount rate used by SBP as a primary monetary tool)
- *XRG* = exchange rate growth (appreciation/depreciation of PKR/USD, period average)
- *M1G* = growth rate of narrow money

Choosing between core and headline inflation to represent inflation is critical when analyzing inflation dynamics. It is an established fact that headline inflation is far more volatile than core inflation because of the high representation of commodities and oil, and thus policymakers should focus only on core inflation, which is much more stable, when designing monetary policy (Mishkin, 2007). However, it can also be argued that core inflation is not a true representation of inflation in any economy and that, being already very stable, there is no need to worry about it. Policymakers in less developed economies such as Pakistan, where the share of oil and food prices in individual consumption budgets is very high, should do their best to curtail headline inflation (CPI), which is a threat to growth. There is strong evidence in favor of using the CPI rather than core inflation—recent studies suggest that food and energy prices are not the most volatile components of inflation and that core inflation is not always the best predictor of total inflation (Novak, Crone, Mester, & Khettry, 2008).

The major advantage of using quarterly data is its additional relevance and usability in the context of less developed countries as observed by Ryan and Milne (1994). We calculate the quarterly growth rates of CPI-12 major cities, the exchange rate (PKR/USD), and M1 (narrow money) on an annual basis by taking the fourth lagged difference of their natural logarithms. In other words, we calculate the annual percentage change in the concerned variable with their values from the corresponding quarter in the previous year.

This percentage change will serve as *INF*, *XRG*, and *M1G*, respectively, where INF is the principal variable of interest and *PR*, *XRG*, and M1G will act as the anchors of inflation targeting, exchange rate targeting, and monetary aggregate targeting, respectively. The relationship of each anchor with the ultimate objective of low inflation is estimated in the next section.

4.2. Test for Stationarity

The Phillips-Perron (PP) test for non-stationarity is applied to all the variables. Table 6 below shows that we can reject the null of the unit root at a 1 percent level of significance only in the case of the M1 growth rate. For level inflation, the PP statistics suggest stationarity (only at a 10 percent significance level), which is more logical to assume for inflation. However, the augmented Dickey-Fuller (ADF) statistics suggest the presence of a unit root (nonstationarity), which is consistent with several previous studies on Pakistan and thus reduces the authenticity of the conclusion drawn on the basis of the PP statistics. All the other variables are found to have a unit root, i.e., they are nonstationary. However the first differences of all the variables are stationary at 5 percent or a low level of significance.

Table 6: Results of tests for stationarity of variables

Variables	PP statistics	ADF statistics	Variables	PP statistics	ADF statistics
INF	-2.765*	-2.099	ΔINF	-9.15***	-8.05***
PR	-1.75	-1.51	ΔPR	-9.94***	-9.88***
XRG	-2.57	-2.52	ΔXRG	-9.46***	-9.995***
M1G	-5.43***	-3.14**	ΔMIG	-25.87***	-10.098***

Note: ***, **, and * respectively indicate rejection of the null at 1%, 5%, and 10% significance levels.

4.3. Test for Co-Integration

Although the real purpose of any econometric model is to develop a relationship between a set of economic variables, this relationship could be spurious if the variables are nonstationary. The PP test above indicates that all the variables apart from *M1G* are stationary at first difference. In this scenario, a meaningful relationship can only be established between the variables if they are co-integrated (Engle & Granger, 1987).

To identify the co-integration relationship between *INF* and the other variables (*PR*, *XRG*, and *M1G*), we first use the Engle-Granger approach. Co-integration is checked by running a regression of variables and then by applying a stationarity test to its residuals. If the residuals are found to be stationary, it indicates that the variables are co-integrated and there exists a long-run relationship. The estimated bivariate regressions are represented by Equations (2), (3), and (4), where the dependent variable *INF* is the same and the independent variable is one

of the three anchors (*PR*, *XRG*, *M1G*), each representing three different monetary policy regimes. We also introduce a multivariate regression (equation 5) containing all three anchors simultaneously.

$$INF = c + \alpha PR + \varepsilon \quad (2)$$

$$INF = c + \alpha XRG + \varepsilon \quad (3)$$

$$INF = c + \alpha M1G + \varepsilon \quad (4)$$

$$INF = c + \alpha_1 PR + \alpha_2 XRG + \alpha_3 M1G + \varepsilon \quad (5)$$

The results of the three regressions are summarized in Table 7 below, revealing the following observations:

Table 7: Results of bivariate regressions

Variables	Coefficient	Standard error	Test statistic	Prob.
INF and PR				
c	4.21***	1.02	4.12	0.0001
PR	0.29***	0.09	3.25	0.0015
PP test applied to residuals of Equation 2			-2.89**	0.0493
INF and XRG				
c	7.61***	0.37	20.68	0.0000
XRG	-0.03	0.04	-0.75	0.4569
PP test applied to residuals of Equation 3			-2.75*	0.0686
INF and M1G				
c	7.07***	0.75	9.44	0.0000
M1G	0.025	0.05	0.50	0.6161
PP test applied to residuals of Equation 4			-2.78*	0.0643

Note: ***, **, and * respectively indicate rejection of the null at 1%, 5%, and 10% significance levels.

- *INF* and *PR* are co-integrated of order one because we can reject the null hypothesis of the unit root for the residuals of equation (2) at less than a 5 percent level of significance. The coefficient of *PR* in the co-integration vector is, however, significant but has a positive sign. This contradicts theoretical and historical expectations, thus suggesting that *PR* does not have the ability to affect *INF* in the same way as monetary authorities intend.

- The PP test when applied to the residuals of equation (3) shows that we cannot reject the existence of co-integration between *INF* and *XRG* at a 10 percent level of significance. However, the negative sign of XRG in equation (3) indicates that positive growth (the depreciation of PKR against USD) helps reduce inflation, which is surprisingly contrary to expectations as already observed in the case of the relationship between INF and PR.

- There is a possibility that *INF* and *M1G* are also co-integrated since the null of the unit root is rejected at a 10 percent significance level. Again, however, the coefficient of M1G, despite being positive, is insignificant, thus showing its inability to play any meaningful role in containing inflation in the long run.

Table 8: Results of multivariate regression

Variables	Coefficient	Standard error	Test statistic	Prob. (P-val.)
C	1.71	1.53	1.12	0.2661
PR	0.45***	0.10	4.45	0.0000
XRG	-0.098**	0.05	-2.18	0.0309
M1G	0.09*	0.05	1.74	0.0847
Tests for nonstationarity on residuals of Equation 5				
Phillips-Perron test			-3.14**	0.0264

Note: ***, **, and * respectively indicate rejection of the null at 1%, 5%, and 10% significance levels.

The results of the multivariate regression estimated in equation (5) (Table 8 above), demonstrate that there is evidence of significant long-run co-integration among the variables since the residuals are stationary at an almost 2 percent level of significance according to the PP test. All the coefficients are significant at 10 percent or below, but the positive sign of the PR as opposed to the expected negative sign still questions its importance when formulating policy decisions regarding inflation.

4.4. Test for Co-Integration (Johansen and Juselius Approach)

Given the shortcomings of the Engle-Granger approach when more than one co-integration relationship exists, we extend our analysis to the use of the vector autoregression (VAR)-based co-integration test following the framework and methodology developed by Johansen and Juselius (1990) and Johansen (1991).

Consider a VAR of order p:

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + Bx_t + \epsilon_t \quad (6)$$

where y_t is a k-vector of nonstationary I(1) variables, x_t is a d-vector of deterministic variables, and ϵ_t is a vector of innovations. This VAR could be rewritten as

$$\Delta y_t = \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + Bx_t + \epsilon_t \quad (7)$$

where $\Pi = \sum_{i=1}^{p-1} A_i - I, \qquad \Gamma_i = -\sum_{j=i+1}^{p} A_j$

We use two different specifications of Johansen's test, one with an intercept and one with both an intercept and trend term, in co-integrating equations (results not reported here), simultaneously allowing for a linear deterministic trend in the data for both specifications. The difference in specifications does not change our results.

The trace statistics and maximum eigenvalue statistics calculated according to equations (8) and (9) are reported in Table 9:

$$LR_{tr}(r|k) = -T \sum_{i=r+1}^{k} \log(1 - \lambda_i) \quad (8)$$

$$LR_{max}(r|r+1) = -T \log(1 - \lambda_{r+1}) = LR_{tr}(r|k) - LR_{tr}(r+1|k) \quad (9)$$

Table 9: Trace statistics and maximum eigenvalue statistics

Hypothesized no. of CE(s)	Eigenvalue	Trace statistic		Max. eigen statistic	
		λ_{trace}	Prob.**	λ_{max}	Prob.**
None *	0.27	82.5	0.0000	37.98	0.0016
At most 1 *	0.17	44.53	0.0005	22.71	0.0298
At most 2 *	0.14	21.82	0.0049	18.23	0.0112
At most 3	0.03	3.596	0.0579	3.596	0.0579

Table 9 indicates that, according to both the trace and maximum statistics, the null of no co-integrating relationship is rejected and we can proceed in accepting two co-integrated relationships at a 5 percent level of significance. The normalized co-integrated coefficients provided by Johansen's test are reported in Table 10 below.

Table 10: Normalized co-integrated coefficients

Variables	Coefficient	Standard error
PR	0.43	0.29
XRG	0.58***	0.15
M1G	0.99***	0.19

The results above are consistent with the Engle-Granger approach as far as the sign of PR is concerned, thus confirming the long-run "positive" relationship between the PR and inflation. This conclusion reinforces our argument that the PR cannot be used as a suitable anchor to target inflation in the long run, which is explicitly required by the ITF. The positive signs and significant values of the coefficients XRG and M1G support not only the present practice of monetary aggregate targeting by the SBP, but also indicate that exchange rate targeting could be another viable solution to stabilizing inflation, as believed by many researchers.

4.5. Granger-Causality Test

An ITF requires that, whenever inflation deviates from its target, we must use the interest rate to correct it. The interest rate can influence inflation and its behavior only if it is able to Granger-cause inflation. The results of the Granger-causality tests for INF and PR are given in Table 11. The maximum lag length is six. This is because the frequency of data is quarterly and six lags allow us to look sufficiently for the impact of the policy anchor on inflation.

Table 11: Results of the Granger-causality tests for INF and PR

Lags	PR and INF		M1G and INF		XRG and INF	
	PR does not cause INF	*INF does not cause PR*	*MIG does not cause INF*	*INF does not cause MIG*	*XRG does not cause INF*	*INF does no cause XRG*
1	0.88797	10.2621***	3.55603*	0.34824	1.83792	4.06033**
2	1.48705	3.78914**	2.69644*	0.39464	1.79348	1.97912
3	0.79772	2.91086**	1.84064	0.55833	0.99323	1.42825
4	0.91607	1.92303	1.72427	0.45566	0.97093	1.23869
5	1.28657	1.41905	3.04773**	0.95606	1.61360	1.08389
6	0.93968	1.24934	2.48110**	0.84166	1.28282	0.88718

Note: ***, **, and * respectively indicates rejection of the null at 1%, 5%, and 10% significance levels.

The results lead us to infer that the interest rate and exchange rate are not particularly effective in influencing the behavior of inflation, and instead, that PR and XRG are caused by INF. However, we can say that

M1G is able to affect INF up to six lags, which is somewhat consistent with Khalid (2005) who found that M1 Granger-causes INF at the third lag.

Since PR does not seem to affect inflation directly even up to six lags, we analyze further what PR is capable of influencing. We check the direction of causality of PR to M1G and PR to XRG. The results in Table 12 clearly indicate that the interest rate has an impact on narrow money, thus showing its importance in overall monetary policy by influencing inflation indirectly through money supply (Table 11).

Table 12: Direction of causality of PR to M1G and PR to XRG

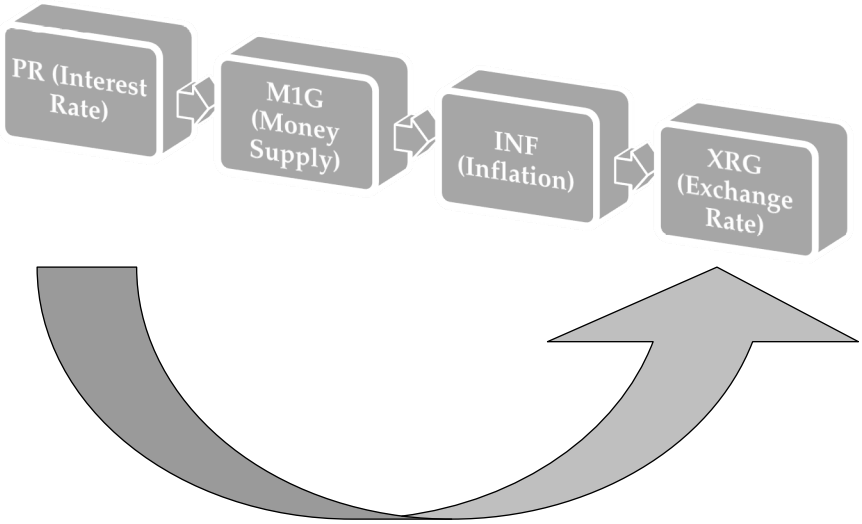
Lags	PR and M1G		PR and XRG	
	MIG does not cause PR	*PR does not cause MIG*	*XRG does not cause PR*	*PR does not cause XRG*
1	0.09594	5.07934**	0.50034	1.17508
2	0.33712	2.92512*	0.51479	4.18419**
3	0.50003	3.85172**	0.94424	4.11643***
4	0.96001	5.49555***	1.79100	2.96494**
5	3.02597**	3.35722***	3.55624***	1.00611
6	3.17425***	3.02668***	3.09913***	0.62778

Note: ***, **, and * respectively indicates rejection of the null at 1%, 5%, and 10% significance levels.

It is also useful to highlight two interesting results yielded by the Granger causality test about the relationship between INF and XRG (Table 11) and between PR and XRG (Table 12). These results[6] indicate that the interest rate not only affects the exchange rate directly, but also indirectly through the channel of money supply and inflation. All these relationships are explained clearly in Figure 4.

[6] These conclusions are robust to VAR analysis, the results of which are not reported here and can be obtained on request from the authors.

Figure 4: Observed monetary policy transmission channel in Pakistan



Although our analysis is subject to certain limitations, we can interpret our results in line with Alvarez, Lucas, and Weber (2001), who are of the view that, "in the theory of inflation, consistent with much of the evidence, interest rates play no role whatsoever".

This rule seems to apply to Pakistan, and if Pakistan were to adopt an ITF, then inflation would not be sensitive to movements in the interest rate directly. We can also interpret these results in the manner that the "Granger Causality test provides support for using interest rate as an instrument to influence money supply, that subsequently Granger Cause inflation."

5. Conclusion

Success in poker depends significantly on the ranking of the hand (combination of cards) with which a participant starts. The odds in favor of success or a reasonable performance are very low with a seven-deuce offsuit, which is unanimously considered the worst possible hand in this game. We fear that, metaphorically, Pakistan also has a seven-deuce offsuit when applied to the decision whether to opt for an ITF.

In this paper, we have qualitatively assessed whether an ITF is applicable to Pakistan by evaluating its economy on the basis of various necessary economic and institutional structures required to successfully adopt such a framework. Our analysis shows that most of the

preconditions of an ITF are either weak or nonexistent, which suggests that inflation cannot be the SBP's sole objective. The central banks cannot ignore the issues of fiscal deficit, high government borrowing, the current situation of falling reserves, large swings in the exchange rate, the depreciating rupee, and supply-side shocks.

We have also quantitatively assessed the significance and role of the short-term interest rate in the monetary policy transmission mechanism, and concluded that the former plays no role in affecting inflation directly in Pakistan. However, it can impact inflation through the money supply channel. The absence of a direct link between the interest rate and inflation is contrary to the essence of an ITF, which requires that the interest rate remain the sole anchor in targeting inflation.

These findings compel us to infer that Pakistan is not ready to adopt inflation targeting—even if the SBP were to decide to adopt it—given the absence of the framework's preconditions, and the economy's inability to control inflation directly through the interest rate measure, which is the basic premise of an ITF.

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Human Capital and Multifaceted Innovation: Evidence from the Lahore Knitwear Cluster in Pakistan

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Abstract

Clusters have the potential to grow, but their potential in Pakistan is rarely analyzed and examined. This study examines the knitwear cluster of Lahore in general and the performance of enterprises in particular. Most of the literature on clusters in Pakistan has not looked at the characteristics of the individual enterprises that play a pivotal role in cluster development. Using primary data collected from 59 finished-knitwear producers in Lahore, this study assesses the role of human capital in acquiring multifaceted innovations. We find that general human capital acquired by schooling and specific human capital acquired through operational experience is associated with the size of the enterprise. Additionally, specific human capital acquired through operational and marketing experience is strongly correlated with improved marketing channels.

Keywords: Clusters, human capital, schooling, multifaceted, Pakistan.

JEL Classification: E24.

1. Introduction

The promotion of industries has been a major agenda of developing countries, and Pakistan is not an exception. Specifically, labor-intensive industries, such as knitwear, woven products, footwear, toys, and plastic parts, create substantial employment opportunities and play a pivotal role in reducing poverty (Sonobe & Otsuka, 2006). Pakistan is a major Asian player in the garments export market and the garments sector is one of the largest sources of low-cost employment creation (Memon, 2010). The advent of the World Trade Organization (WTO) regime in 2005 has intensified competition in Pakistan in general and in the knitwear industry in particular. Such intense competition in the international apparel industry has compelled producers to reduce product prices, increase quality, and significantly shorten delivery times (Saheed, 2011).

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The knitwear cluster of Lahore is not an exception and faces the challenges of quality and price in the international market. Recently, Lahore's knitwear enterprises have also been subject to gas and electricity rate hikes and load shedding. These international and local challenges have forced these enterprises to cut their costs through various innovations such as improved production organization and enhanced production efficiency, and aggressive marketing strategies in search of higher product prices.[1] This simply means that knitwear enterprises face pressure to innovate under intensified competition. We intend to investigate empirically the characteristics of those innovative producers who adopt these innovations under such competitive conditions.

There are a variety of concepts and definitions of industrial clusters as depicted in the literature on business economics, innovation studies, and development economics. The literature broadly conceives of clusters in a geographical and sectoral sense. For instance, Porter (1990) defines a cluster as a geographic concentration of interconnected companies and institutions in a particular field. Schmitz and Nadvi (1999) and Schmitz (1995) define a cluster as a sectoral and geographical concentration of firms. Rosenfield (1995) defines a cluster as a loose, geographically bounded agglomeration of similar, related firms. Sonobe and Otsuka (2006) define an industrial cluster as a geographical concentration or localization of enterprises producing similar or closely related products in a small area. For this study, we will use the definition advanced by Sonobe and Otsuka (2006).

The reduction in transaction costs among enterprises in an industrial cluster is also significant (Sonobe & Otsuka, 2006). Sonobe and Otsuka (2006) further argue that transaction costs rather than transportation costs in industrial clusters enhance the development of the division of labor and facilitate the transaction of intermediate goods and services among enterprises. They term the industrial cluster an "artificially created" community that reduces transaction costs. However, the literature on economic geography often points out that specialization and the division of labor among enterprises occurs because of low transportation costs due to the geographical concentration of firms in a small area (Krugman, 1991). Finally, Sonobe and Otsuka (2006) argue particularly that, apart from the division of labor between manufacturers and parts suppliers, the division of labor between manufacturers and merchants is also important in an industrial cluster because clusters attract traders since they provide wider choices of products and producers.

[1] The chairperson of the Pakistan Hosiery Manufacturers Association (PHMA) Lahore mentioned this point.

Although innovations play a significant role in industrial clusters, with the term "innovation" broadly defined. Schumpeter (1912) argues that industries develop through a series of innovations and imitations, where innovation is nothing but a new combination of productive resources to increase profit. Schumpeterian innovations encompass the introduction of a new product or a new quality of product; new production methods and organization, new markets and the discovery of new materials and entrepreneurs are the carriers of such innovations.

Similarly, the concept of "multifaceted innovations", which is closely related to Schumpeterian innovations, has been introduced by Sonobe and Otsuka (2006) based on the findings of eight cluster studies on garments, motorcycles, machine tools, and low-voltage electrical appliances in East Asia. They propose an endogenous model of industrial development based on these findings. According to their model, a cluster usually passes through three distinct stages: (i) an initiation stage, (ii) quantity expansion stage, and (iii) quality improvement stage (Appendix 3).

In the initiation stage of cluster development, a few innovative producers imitate imported products directly or indirectly through a trial-and-error process and start manufacturing in the suburbs or vicinity of a large city. If the industry is labor–intensive, such as garments or footwear where marketing and cheap labor is key to success, it will be led by merchants. On the other hand, if the product is complicated and technical, the industry will be led by engineers. In the initiation stage, the market for intermediate inputs and components may not be available due to the small scale of production. So, the founding enterprise will have to procure all the materials needed and sell the final product directly to the consumer.

In the quantity expansion stage, the product, production process, and marketing channels are standardized and can be easily imitated. Then, new entrants from various fields in general imitate production on a large scale and former workers from existing pioneer enterprises, i.e., spin-offs, enter the field specifically, contributing to the spontaneous formation of the industrial cluster. The division and specialization of labor develops between manufacturers and parts suppliers and between manufacturers and traders. In the quantity expansion stage, entrepreneurs possess a mixed level of education and produce low-quality products with negligible productivity gains. The new entrants create an excess supply of the cluster's product through imitation, which reduces the innovators' profit by reducing the product price. This can discourage further innovation by the innovators.

In the transition from the quantity expansion stage to the quality improvement stage, the fortunate presence of agglomeration economies, the variety of skilled human resources, and knowledge spillovers reduces innovation costs and provides incentive to producers to innovate. The quality improvement stage is characterized partly by the productivity gains of the enterprises due to the exit of inefficient enterprises and partly by the adoption of improved production methods and the high-quality products of the surviving enterprises. Another feature of this stage is the emergence of large enterprises that produce high-quality differentiated products and that start selling or exporting to foreign buyers, and thus directly enter the global value chain as shown in Appendix 1.

A review of the existing literature shows the presence of multifaceted innovations in various clusters. For instance, the major innovation in China's low-voltage electrical appliances cluster has been the introduction of quality inspection and own branding (Sonobe, Hu, & Otsuka, 2004). Similarly, enterprises in Ethiopia's footwear cluster increased the direct procurement of raw materials and direct product sales through the use of brand names (Sonobe, Akoten, & Otsuka, 2009). Enterprises adopted different marketing channels in Agra's footwear cluster to stabilize their orders and command higher product prices (Knorringa, 1999). Shoe manufacturers in the Sinos Valley in Brazil adopted major innovations in marketing through branding to other parts of Brazil and neighboring countries (Bazan & Navas-Aleman, 2004). In Vietnam's knitwear cluster, village enterprises adopted innovations in entry into the export market and vertical integration (Nam, Sonobe, & Otsuka, 2010).

Despite the general significance of human capital, the existing literature seldom tries to identify which producers contribute to cluster development (Schmitz, 1995; Nadvi, 1999; Schmitz & Nadvi, 1999; Schmitz, 2006). A notable exception are Sonobe and Otsuka (2006), who empirically examine the role of human capital in the development process of industrial clusters. The literature on successful industrial clusters in East Asia examined by Sonobe, Hu, and Otsuka (2002) and Sonobe and Otsuka (2006) and on African countries by Akoten and Otsuka (2007) confirms that human capital plays a pivotal role in cluster and industrial development. They argue that entrepreneurs cannot innovate if high-quality human resources are lacking, because in the absence of human capital, the cost of innovation is too high.

The concept of upgrading is defined in the literature as the possibility that developing countries' suppliers will "move up the value chain" or as the "innovation to increase value added" (Giuliani, Pietrobelli, & Rabellotti, 2005). This definition demonstrates that upgrading involves innovation. The concept of upgrading entails four categories developed by Humphrey and Schmitz (2002): (i) process upgrading (achieving the more efficient transformation of inputs into outputs); (ii) product upgrading (moving into higher value-added products); (iii) functional upgrading (acquiring new functions such as branding, marketing, and designing; and (iv) inter-sectoral/chain upgrading (applying the competence acquired by one function of a chain and using it in a different sector/chain).

To our knowledge, only a few cluster studies have been conducted on the surgical instruments cluster in Sialkot (Nadvi, 1999; Thompson, 2005) and the cutlery cluster in Wazirabad (Nadvi, 1996). While these studies examine how clustered enterprises respond to international challenges and evaluate their growth trajectory, they do not focus on the characteristics of entrepreneurs and the performance of enterprises. Although the importance of multifaceted innovations is fully explored in the literature, solid empirical studies have seldom been carried out to examine the characteristics of innovative entrepreneurs in Pakistan. Arif and Sonobe (2012) examine the factors affecting the performance of enterprises in Sargodha's electrical fittings cluster, which caters to domestic needs. Interestingly, there is limited knowledge about the innovative entrepreneurs operating in Pakistan's industrial clusters and it has not yet been fully explored. Moreover, understanding the upgrading strategies of enterprises is important; as Tokatli (2007) argues, knowing enterprises' strategies helps one better understand an industry.

The next section presents an overview of the knitwear industry in Pakistan and the Lahore cluster. Section 3 puts forward a series of testable hypotheses, and Section 4 describes the data collection process and statistics used. Section 5 presents the study's results, and Section 6 brings out the conclusion, limitations, and scope for future research.

2. Overview of Pakistan's Knitwear Industry and Lahore Cluster

The knitwear industry is Pakistan's highest value-added sector (Memon, 2010) . The share of knitwear in the country's total exports was 9.3 percent in 2010/11, hovering around 8–12 percent from 1995 to 2011 (Table 1). Knitwear exports increased from USD 688.5 million in 1995 to USD 2,305.55 million in 2011. It is a high value sector, earning valuable

foreign exchange per kilogram of cotton converted in finished garments for the country as reported by the Pakistan Hosiery Manufacturers Association (PHMA, 2011).

Table 1: Exports and knitwear industry's share of total exports

Year	Total exports (USD million)	Knitwear exports (USD million)	Knitwear share of total exports (%)
1995	8,137.20	688.50	8.46
1996	8,707.10	703.40	8.08
1997	8,320.30	688.90	8.28
1998	8,627.70	696.70	8.08
1999	7,779.30	742.20	9.54
2000	8,568.60	886.70	10.35
2001	9,201.60	911.40	9.90
2002	9,134.60	845.90	9.26
2003	11,160.20	1,146.70	10.27
2004	12,313.30	1,458.70	11.85
2005	14,391.10	1,635.00	11.36
2006	16,451.20	1,751.50	10.65
2007	16,976.20	1,798.50	10.59
2008	19,052.30	1,732.10	9.09
2009	17,688.00	1,714.90	9.70
2010	19,290.00	1,765.00	9.15
2011	24,810.42	2,305.55	9.29

Source: Trade Development Authority of Pakistan (2011).

The knitwear industry is concentrated mainly in four cities: Karachi, Lahore, Faisalabad, and Sialkot, among which Lahore's knitwear cluster is considered the "home of knitwear" (Memon, 2010). Our study site is, therefore, Lahore, the capital of the province of Punjab, and Pakistan's second largest, industrialized city, with a total land area of 404 km^2 (UNIDO, 2006). Lahore's knitwear enterprises are located in suburban areas across the city, but most are located around Ferozepur Road, Kot Lakhpat Industrial Estate, and along the Defence road within a radius of 10 km^2.

The knitwear cluster of Lahore started to evolve around 30 years ago and is still growing (UNIDO, 2006). The cluster was initiated through small enterprises and mainly catered to low value-added products. In the beginning, garments were sold in the domestic market, and so the quality

requirements were not high and the cluster employed outdated machinery (Rana & Khan, 2009). However, the cluster started exporting knitwear garments in 1987 through the Ammar textile company; the enterprise brought many international labels to Pakistan and the cluster connected to medium value-added products (Rana & Khan, 2009). The major advancement in the Lahore knitwear cluster took place during the early 1990s when, for the first time, automatic and computerized knitting machines were introduced (UNIDO, 2006).

The cluster began to expand and flourish in 1995 owing primarily to endowments such as the availability of good-quality raw material, machinery parts suppliers, surplus labor, and different government incentives including an export refinance facility, duty drawbacks, and soft loans from commercial banks (UNIDO, 2006).

Another contributing factor in its growth related to the policies pursued by successive governments during the 1990s and early 2000s. The government pursued various schemes, including an export refinance facility, sales tax refunds, duty drawbacks, and soft loans introduced by commercial banks (UNIDO, 2006). Finally, growth was also catalyzed by external factors, i.e., the Multi-Fibre Agreement. This gave enterprises access to the North American market, and local manufacturers enjoyed huge margins and stable orders and huge margins as global buyers were bound to purchase from them until 2004 (Rana & Khan, 2009). The cluster expanded and grew rapidly by the turn of the century as a result of the stable orders and prices from global buyers (Rana & Khan, 2009).

The cluster experienced an external shock in 2005 with the advent of the WTO regime. The quota facility under the Multi-Fibre Agreement expired, and the enterprises were exposed to fluctuating international markets. A section of manufacturers invested in the latest machinery because of low interest rates during 2001–05 on the presumption that they would acquire stable orders even under the quota-free regime. However, most of the leveraged enterprises closed down after 2005 owing to the inefficiencies that arose out of the lack of management and training of the labor force and organization methods (Rana & Khan, 2009). The record of the Pakistan Hosiery Manufacturers' Association (PHMA) shows that 47 units closed by November 2007 (there were 126 exporters in 2005); 15 of the closed enterprises were vertically integrated ones.

The closure of these vertically integrated enterprises paved the way for "cut to pack" units, which carried out operations from cutting to

packing, i.e., garment making enterprises. As new entrants, they were smaller and outsourced the fabric production. The process flows of vertically integrated and "cut to pack" enterprises are depicted in Appendix 1. The presence of these vertically integrated enterprises was the result of a lack of development among knitwear fabric suppliers in the late 1980s and the unwillingness of suppliers to invest in knitting and dyeing at the time (Rana & Khan, 2009). This also confirms that, in the initiation stage, entrepreneurs have to procure and sell the final product directly to their buyers and operate vertically integrated plants.

There are numerous cluster actors, including suppliers of raw materials (yarn/fabric), knitting machines/parts, dyes and chemicals, electrical parts of knitting machines, buttons/zips, and packing materials, that support exporting enterprises (UNIDO, 2006). The cluster produces mainly men's products (polo t-shirts, hoods, sweatshirts, crewnecks, and jackets) in large quantities, while similar women's and children's garments are produced in small quantities along with trousers and shorts. The cluster also produces and exports various kinds of sports garments, dresses, and medical socks.

Our survey shows that the value of annual exports from the cluster was estimated at around USD 430 million in 2010/11 (Table 2). There were around 85 finished garment-exporting enterprises operating in the Lahore cluster along with 190 subcontractors that either catered to the domestic market or to the exporting enterprises. Of the exporting enterprises, 25 were vertically integrated while the rest were "cut to pack" units. The oldest existing enterprise in the cluster was established in 1987. The cluster's competitive advantage was the presence of high-quality raw material and the availability of cheap labor. The key challenge it faced was frequent electricity and gas load shedding, which was making it difficult to meet its strict deadlines. The details of the cluster are given in Table 2.

Table 2: Summary of Lahore knitwear cluster, 2011

Exports	USD 430 million approx.
Cluster structure	85 exporters 190 subcontractors
Direct employment	35,000 approx.
Indirect employment	10,000 approx.
Main markets	US, EU
Competitive advantage	High-quality raw material and cheap labor
Key challenge	Electricity and gas load shedding

Source: 2011 cluster survey.

3. Testable Hypotheses

Based on the evidence above, the Lahore knitwear cluster has already passed through the initial and quantity expansion stages and is now transitioning to the qualitative improvement stage. The emerging literature on cluster-based industrial development across Asia and Africa shows that quality improvement is possible through the introduction of multifaceted innovations in enterprise size, production organization, and improved marketing channels (Sonobe et al., 2009). All these multifaceted innovations are associated with both the generic and specific human capital of entrepreneurs.

General human capital is important because it improves the ability to decode and adopt new information (Becker 1962, 1993). Measuring human capital is difficult, but a suitable proxy used in the literature is the number of years of formal schooling—basically, a generic measure of human capital not specifically related to the business sector or production activities. Since information processing ability is important for the adoption of new ideas and technologies, human capital plays an important role in economic growth (Lucas 1988; Barro 1991; Mankiw, Romer, & Weil, 1992), and, similarly, in cluster development (Sonobe & Otsuka, 2006). Altenburg and Meyer-Stamer (1999) differentiate between the survival and growth of clusters in Africa through the presence of highly educated managers and engineers.

Specific human capital acquired by years of operation and marketing experience during the quantity expansion stage facilitates the transition from the quantity expansion stage to the quality improvement

stage. Here, management experience plays an important role in adopting multifaceted innovation (Yamamura, Sonobe, & Otsuka, 2003; Sonobe & Otsuka, 2006; Nam et al., 2010). Specific human capital is attained through related trade, business, and specialized experience (Hackler & Mayer, 2008). However, reliance on generic human capital usually underplays the significance of specific human capital, which is acquired through learning by doing (OECD, 2000).

After the cluster's formation and the presence of multifaceted innovations, highly educated entrepreneurs become the carriers of those innovations and play a significant role in expanding the size of enterprises (Sonobe et al., 2009). Hence, generic human capital measured by schooling and specific human capital measured by operation experience would be positively associated with enterprise size, and one could call it process upgrading. Thus, our first hypothesis is as follows:

Hypothesis 1: In an export-oriented knitwear cluster, general human capital acquired by schooling and specific human capital acquired by management is significantly associated with enterprise size.

Some capable producers export directly to global buyers, and thus directly connect to the global value chain. Additionally, the opening up of markets has increased the sourcing options of global buyers, who can now choose from a growing number of developing countries' producers. The number of sourcing countries for knitwear apparel and clothing (item code 61) to the US in 1995 were 139, rising to 157 in 2009 (United Nations Statistics Division, 2010). Similarly, the number of knitwear exporting countries (item code 61) to the EU-27 increased from 177 in 2000 to 185 in 2009 (United Nations Statistics Division, 2010).

From the standpoint of transaction costs, it is more likely that global buyers purchase directly from a small number of capable producers who can supply a large amount of quality products within short delivery times, than buying from a large number of small producers or buying through their local agents (Schmitz, 2006). One of our respondents confirmed that they competed with just five international competitors when a global buyer placed orders among the developing countries' suppliers. Similarly, entrepreneurs' marketing experience contributes toward improving the direct transactions of local enterprises with global buyers in the garments clusters of China and Japan (Sonobe & Otsuka, 2006). Keeping in view these factors, local knitwear producers are encouraged to export directly to global buyers since direct exports command higher prices and stable export

orders, and eliminate the intermediate channel of local agents and, hence, save on the agent's commission. Thus, specific human capital acquired though operational and marketing experience plays a significant role in improving the marketing channel and can easily be declared a form of functional upgrading. Marketing channels are depicted in Appendix 2. So, our second hypothesis is as follows:

Hypothesis 2: Superior operational experience along with superior marketing ability acquired through marketing experience is associated with improved marketing channels for enterprises.

4. Data and Descriptive Statistics

An enterprise-level survey was conducted from September to November 2011 to collect detailed financial and nonfinancial information on a sample of 59 finished knitwear manufacturing enterprises in Lahore. Since we only observe the surviving enterprises, there may have been a selection issue and we cannot carry out a Heckman selection because of the cross-sectional sample.

Although both the garments and socks producers fall into the knitwear sector, their production processes are quite different. There are four main stages in finished garment production: knitting, dyeing, cutting, and stitching. The standard method for knitting fabrics is to run a circular knitting machine loaded with yarn to produce fabric, while the standard method for making garments from fabric is to use an assembly line of sewing machines and operators. Sock production also follows four main stages: sock knitting, toe linking/over-locking, bleaching/dyeing, and finishing. As the process flows, the machinery and production of finished garments, socks, gloves, and sweaters is different, so the cluster survey focused on finished knitwear garments and omitted the others owing to their small population and different process details. The small sample size of 21 sock-manufacturing enterprises did not allow a regression analysis and comparison of results for finished garment producers.

Of a population of 85, 81 enterprises were registered with the PHMA and four with the Pakistan Readymade Garments and Exporters Association (PRGMEA). Sixty enterprises produced finished knitwear garments, 21 produced socks, and two manufactured sweaters and gloves, respectively. One of the finished garments producing entrepreneurs refused to provide information. The total sample size was, therefore, 59.

A structured and purpose-designed questionnaire was completed for each enterprise through direct interview, either with the entrepreneur or the general manager. Since we sought specific information on each enterprise's marketing channel, we approached key individuals in its merchandise department. It is important to mention here that an effort was made to examine the quality improvement stage of the cluster, and so data was collected from all leading finished garment producers. The information on entrepreneurs' years of schooling, age, marketing experience, years of operation, spin-offs, previous occupation, and family business was obtained from the 2011 cluster survey.

Table 3 presents data on the characteristics of the entrepreneurs in the sample. Their average number of years of schooling was 15.4. Entrepreneurs had an average of 2.3 years of marketing experience before having established their own enterprise. Similarly, the average number of years of operation of the sampled enterprises was 11.2. The number of spin off-entrepreneurs—workers in other enterprises—was 39, which was approximately 66 percent of the sample. Of the 59 entrepreneurs, 15 were merchants in knitwear garments, considered a merchant-led industry (Sonobe & Otsuka, 2006). Therefore, the sample reflected a moderate percentage of their presence.

Table 3: Characteristics of sample entrepreneurs before establishment of enterprise

Average number of years of schooling	15.4
Years of marketing experience	2.3
Average number of years of operation	11.2
Average age of entrepreneurs in 2011	46.3
Number of spin-off enterprises	39
Enterprises Led by Merchants (number)	15
Enterprises Led by Production executives (number)	21
Family business (number of enterprises)	8
Others (number of enterprises)	15
Total Number of enterprises	59

Source: 2011 cluster survey.

Most of the enterprises in the cluster were managed by sole entrepreneurs, while a few were managed by associations of persons. Approximately 40 and 30 percent of the entrepreneurs were executives and merchants, respectively, either in the existing enterprises or in those that

had closed down. Moreover, 20 and 10 percent of the entrepreneurs had moved to this cluster through other businesses and family connections, respectively. Among the entrepreneurs, approximately 75 percent had graduated after 16 years of education, while 23 percent had completed 14 years (2011 cluster survey). This reflects a very high level of human capital in comparison with the existing literature on cluster development. Interestingly, 36 percent of the entrepreneurs had worked as production executives before setting up their own enterprise, and formed a dominant category in the sample. Around 14 percent had taken up the business from their parents, who had founded it. The cluster survey also showed that the sons of parents who had founded the firm were more likely to have acquired their higher education from abroad. Around 25 percent of the entrepreneurs became owners by moving in from other businesses through the existence of buying houses.

Table 4 shows the distribution of the marketing channels of the sample enterprises. The composition shows that around 15 percent of sample enterprises sold their products directly to global buyers located mainly in the US and European Union; 52 percent sold their products through buying houses located in Lahore. The respondents reported long-term relations with the buying houses, which may be termed "putting out" arrangements. Under these arrangements, merchants or "putters" give designing, marketing, and procurement instructions while the enterprises carry out the manufacturing. The putters bring samples to the local enterprises for replication, which reflects that the guidelines of global buyers are mediated through buying houses. Hence, enterprises depend on the putters for sampling, product development, and marketing information. This shows the division of labor between the manufacturers and the merchants or putters. The remaining 33 percent of enterprises either directly or indirectly transacts through buying houses. One of our respondents told us that they had diversified their marketing strategy in order to overcome the uncertainty associated with the orders given to them by global buyers. The marketing channels are depicted in Appendix 2.

Table 4: Marketing channel of sample enterprises

Direct transaction	Transaction through buying houses	Transaction directly and through buying houses
9	31	19

Source: 2011 cluster survey.

5. Regression Analyses

To test the hypotheses given in Section 3, we examine the determinants of two dependent variables: (i) enterprise size through sales revenue and value-added, and (ii) the fraction of sales revenue from direct marketing through censoring. Thus, the regression equation of type would take the following form:

$$Y_i = X_i\beta + \mu_i$$

where Y_i is a vector of observations of three dependent variables, and X_i is a matrix of observations of the relevant set of explanatory variables such as years of schooling, operational experience, spin-offs dummy, years of marketing experience, and father's dummy (for inherited business). The parameter vector β represents the effects that will be measured by the regression coefficients. Finally, the vector μ_i represents disturbances.

To test the validity of Hypothesis 1, we use the cluster-based industrial development model developed by Nam et al. (2010). If the variables representing general and specific human capital are found to be significant, it will positively affect enterprise size. We measure the size of the enterprise in three different ways to check the robustness of the model. The first measure is sales revenue, which is widely used by researchers to determine the size of an enterprise. The father's dummy variable takes the value of 1 if the entrepreneur's father was in the knitwear business and 0 otherwise. Similarly, we create a dummy variable for spin-offs, which takes the value of 1 if the entrepreneur has worked in a knitwear enterprise before and 0 otherwise. By employing sales revenue, we obtain a statistically significant schooling coefficient and highly significant coefficient on the number of years of operation of enterprises, which is the specific human capital coefficient. The other variables remain insignificant for this regression. To address the problem of heteroskedasticity in the sample, we employ the heteroskedasticity-consistent standard errors proposed by White (1980).

The second measure for the enterprise size is value-added = (sales revenue – raw material cost – intermediate input cost). In the definition of value-added, we subtract raw material cost and input costs from sales revenue. The results are given in Table 5 and show that general human capital is slightly significant at around 6 percent and specific human capital is highly significant, while the remaining variables remain insignificant. This is consistent with Hypothesis 1. The third measure to determine

enterprise size is value-added = (sales revenue – raw material cost – intermediate input cost – subcontracting cost). The coefficient of general human capital is significant at the 5.4 percent level and specific human capital is highly significant. The remaining coefficients are insignificant. The results are once again consistent with Hypothesis 1. So, the results are robust for three different definitions of enterprise size.

Table 5: Regression estimates of enterprise size

2010/11	ln(sales)	ln(value-added)	ln(value-added)*
Years of schooling	4.35 (2.14)**	3.91 (2.05) *	4.07 (2.09) *
Operational experience	1.13 (0.22)***	1.06 (0.21) ***	1.08 (0.21)***
Spin-offs dummy	-0.21 (0.43)	-0.20 (0.431106)	-0.197 (0.44)
Years of marketing experience	-0.032 (0.03)	-0.026 (0.03)	-0.028 (0.03)
Father's dummy	0.24 (0.45)	0.18 (0.44)	0.20 (0.44)
Constant	4.91 (6.04)	5.38 (5.79)	4.75 (5.9)
R-squared	0.58	0.55	0.56
No. of enterprises	59	59	59

Notes: Figures in parentheses are heteroskedasticity-consistent standard errors. *** = significant at 1%, ** = significant at 5%, * = significant at 10%.
Value-added = (sales revenue – raw material cost – intermediate input cost).
Value-added* = (sales revenue – raw material cost – intermediate input cost – subcontracting cost).
Source: Author's estimates.

The variable that is highly significant in all these models is operational experience. This implies that operational experience matters and is associated with enterprise size. Enterprises grow larger over time and specifically older enterprises are larger than newer ones. It further implies that larger enterprises survive in difficult times and are able to absorb external shocks. The slight statistical significance of the schooling coefficient in the two measures of enterprise size shows that the higher level of education of entrepreneurs matters and that schooling continues to play a role. There may be a problem of an omitted variable, that of innate ability, since able entrepreneurs are more likely to attain a higher level of education, experience, and success in business operation. These human capital variables become jointly endogenous and weaken the regression results.

To test the validity of Hypothesis 2, we regress the direct transaction ratio the explanatory variables discussed above (similar to what

was done by Sonobe et al., (2009). Since the direct transaction ratio lies between 0 and 1, we cannot employ OLS, and have to use the two-limit Tobit estimator to explain the direct transaction ratio. The results are shown in Table 6 and support Hypothesis 2 that operational experience and marketing experience are positive and significant. Finally, the father's dummy remains insignificant, which shows that having a father in the knitwear business does not have any effect in acquiring improved marketing channels. The results are shown in Table 6.

Table 6: Regression estimates of improved marketing channel

2010/11	Estimates
Years of schooling	-0.06 (0.11)
Operational experience	0.05 (0.021) **
Spinoffs dummy	-0.074 (0.29)
Years of marketing experience	0.074 (0.028) ***
Father's dummy	0.023 (0.28)
Log sigma	-0.44 (0.15) ***
Constant	0.31 (1.78)
Newton Raphson maximization	8 iterations
Log-likelihood	-47.39 on 8 degrees of freedom
Number of enterprises	59

Notes: Figures in parentheses are standard errors. *** = significant at 1%, ** = significant at 5%.
Source: Author's estimates.

The positive and statistically significant sign of operational experience may imply that older entrepreneurs have improved operational efficiency and, subsequently, prefer to improve their marketing channels, i.e., direct transactions with global buyers to save on brokerage commissions and to obtain stable orders. Interestingly, specific operational experience plays a statistically significant role in the adoption of improved marketing channels, which is consistent with the findings of Sonobe et al. (2009). Specifically, marketing experience in merchandizing is statistically significant, which shows that entrepreneurs with marketing experience are in a better position to adopt improved marketing channels given their expertise.

6. Conclusion, Limitations, and Future Research

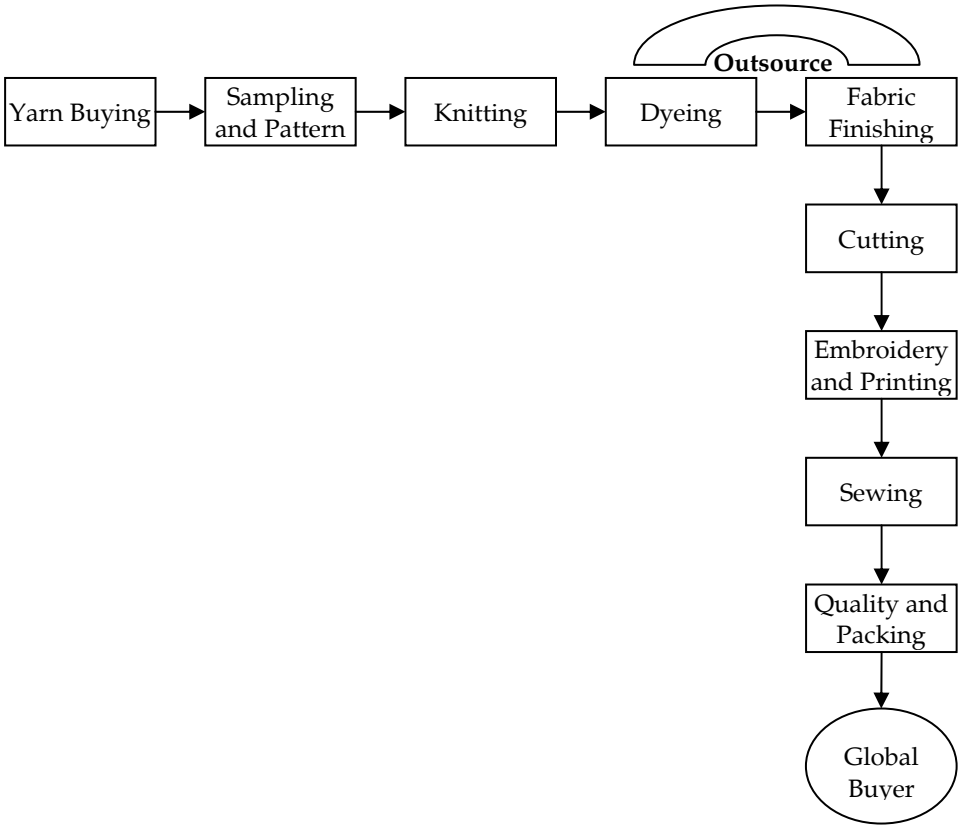
This paper has examined how enterprises innovate in developing economies by taking the suburban cluster example of Lahore in Pakistan.

Its findings suggest that highly educated entrepreneurs with specific human capital acquired through relevant experience are associated with multifaceted innovations. It is important to mention here that the knitwear enterprises in the Lahore cluster have also benefited from opportunities that arose out of the post-quota regime. Human capital acquired through operational experience is associated with the size of the enterprise; specific human capital is associated with improved marketing channels, which help acquire stable orders.

There may be a problem of omitted variables and we cannot say for certain that the human capital variables cause the enterprise outcomes with this cross-sectional study. There is a strong association between the human capital variables and enterprise outcomes. Our findings corroborate the existing body of knowledge on enterprise performance within a cluster, and the results on Lahore may extend to other locations. However, caveats to generalizing these findings include the following: This is a cross sectional study and a pool cross-sectional and/or panel study is recommended for observing the performance of enterprises over time in order to understand the dynamics of clusters and to establish causality by addressing the omitted variable problem. Another requirement is the understanding of local socioeconomic conditions. There could also be a selection issue since the study observed surviving enterprises and we could not carry out Heckman correction due to the cross-sectional sample.

Appendix 1

Knitwear garment process flow



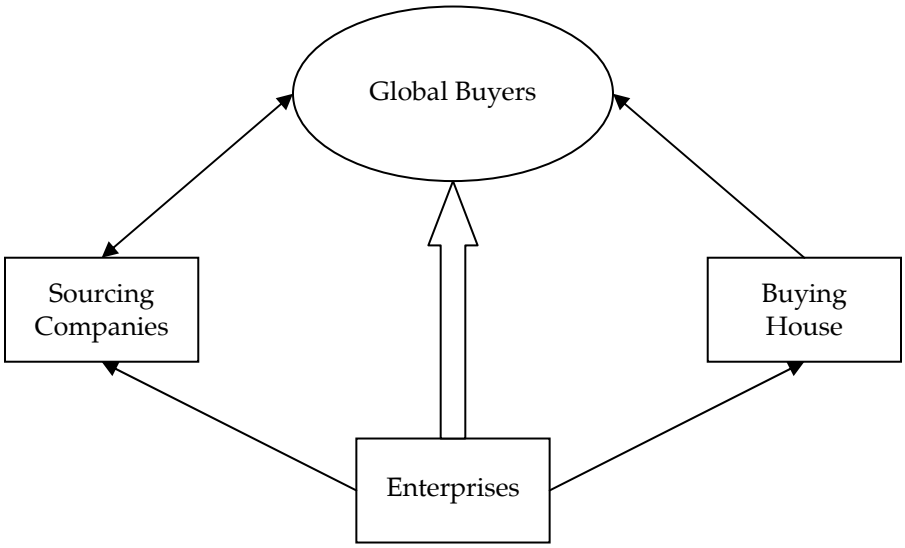
Vertical integrated enterprise: All operations from yarn buying to shipment with minor outsourcing.

Cut-to-pack enterprise: Outsourced knitting and dyeing operations, and performs the rest.

Source: 2011 Cluster Survey.

Appendix 2

Marketing channels



Source: 2011 Cluster Survey.

Appendix 3

Endogenous model of cluster-based industrial development

Stage	Experience of entrepreneurs	Education level	Imitation, innovation and productivity growth	Institutions
Initiation	Merchants/engineers	Low	Imitate foreign technology directly or indirectly	Internal production of parts, components and final products
Quantity expansion	Spin-offs and entry from various fields	Mixed	Imitate imitated technology: stagnant productivity and declining profitability	Market transaction; division of labor; formation of industrial cluster
Quality improvement	Second generation of founders and newcomers with new ideas	Very high	Multi-faceted innovations; exit of many enterprises; increasing productivity	Reputation and brand names; direct transaction with buyers; vertical integration and emergence of large enterprises

Source: Sonobe and Otsuka (2006).

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The Harberger-Laursen-Metzler Effect: Evidence from Pakistan

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Abstract

According to the Harberger-Laursen-Metzler (HLM) effect, an exogenous temporary increase in the terms of trade leads to an improvement in the current account balance. This paper uses a recursive vector autoregression to investigate empirically the existence of the HLM effect in Pakistan, using a time series dataset for the period 1980–2009. Two important results emerge. First, real income deteriorates with an improvement in the terms of trade. Second, the current account balance also responds negatively to innovations in the terms of trade, which implies that the HLM effect does not exist in Pakistan.

Keywords: Terms of trade, current account, economic growth, recursive VAR, Pakistan.

JEL Classification: C3, F32, F41.

1. Introduction

Globalization, technological innovation, financial deregulation, and the growing level of cross-border integration have resulted in exceptionally high external imbalances, which are reflected in the frequent incidence of international current account crises. The terms of trade (TOT) are, arguably, a major determinant of the current account balance, and are extremely pertinent for developing countries because they are less able to influence world prices.

The relationship between TOT and current account balance can be explained in three different ways: First, according to the **consumption-tilting effect**, the current price of imports relative to their future price decreases owing to a favorable transitory TOT shock. Second, an **exchange rate effect** occurs if the price of tradables decreases relative to the price of nontradables. Third, the **consumption-smoothing effect**, commonly known as the Harberger-Laursen-Metzler (HLM) effect, induces current income to

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increase relative to future income (Harberger, 1950; Laursen & Metzler, 1950). Broadly speaking, according to the HLM effect, the temporary improvement in TOT increases national savings, which subsequently improves the current account balance. On the other hand, a permanent improvement in TOT leads to a deterioration in the current account balance.

TOT has, by and large, remained unfavorable for Pakistan over the last three decades. The factors responsible for this disadvantageous position include the composition of exports, market concentration and inelastic demand for the import of capital goods, frequent devaluations of the currency, and external shocks. Being largely affected by TOT, Pakistan's current account balance has remained vulnerable to changes in domestic policy and the world economy. The deterioration in the current account balance has emanated mainly from the country's sharply widening trade deficit.

TOT is considered a key driver of fluctuations in real income and the current account in developing countries (Khan & Knight, 1983). A deterioration in TOT results in lower national savings and increased dependence on foreign liabilities. This may, in turn, disrupt growth and lead to considerable economic instability. Given the worsening situation in the external sector in Pakistan on one hand, and the importance of TOT for achieving stable and sustainable economic growth on the other, it becomes vital to examine the nature of the relationship between the current account balance, economic growth, and TOT.

To this end, we investigate the presence of the HLM effect in Pakistan for the period 1980–2009. Though many researchers have assessed the effect of TOT on economic growth and current account balance separately, to our knowledge no effort has been made so far to capture this effect for Pakistan. The framework we adopt is based on Otto's (2003) study, which employs a three-variable vector autoregression (VAR), using TOT, current account balance, and economic growth, to capture the HLM effect. An impulse response function indicates the nonexistence of the HLM effect in Pakistan. Furthermore, the forecast error variance decomposition shows that the macroeconomic variables used barely explain the movement in the current account.

The rest of the study is organized as follows: Section 2 presents a theoretical and empirical appraisal of the existing literature on the HLM effect. Section 3 describes our methodology and data. Section 4 presents the estimation and results of the impulse response function and forecast

error variance decomposition. Section 5 concludes the study with some policy recommendations.

2. Literature Review

2.1. Theoretical Viewpoint

The literature on the HLM effect can be divided into three strands: (i) the consumption-smoothing effect, (ii) the consumption-tilting effect, and (iii) the exchange rate effect. The consumption-smoothing effect was first explained by Harberger, (1950) and Laursen & Metzler, (1950), and says that an improvement in TOT results in an improvement in the trade balance if changes in investment and government expenditure remain constant.[1] Sachs (1981) was the first to challenge their work, adopting a dynamic equilibrium model[2] based on a lifecycle savings model, to conclude that a transitory change in TOT brings about a positive change in the current account, whereas a permanent change in TOT has an ambiguous impact on the current account. Obstfeld (1982) extended this idea to maximize indirect utility:[3] Following the savings channel, he observed a negative change in the current account due to unanticipated positive changes in TOT.

Svensson and Razin (1983) incorporate the substitution effect to test the theoretical basis of the HLM effect. They find a positive relationship between the current account and unanticipated transitory changes in TOT. Extending their work, Edwards (1989) analyzes the effects of temporary and permanent external TOT shocks on the current account by adopting the elasticity approach.[4] The results support the existence of the HLM effect.

Persson and Svensson (1985) adopt an overlapping generations model for two goods and analyze the current account dynamics of a small open economy, while considering the savings channel through the income effect. The intertemporal approach states that consumption and savings are dynamic at different points in time[5]. Sen and Turnovsky (1989) analyze the effects of deterioration in TOT on a small open economy, adopting an

[1] A single-good static, Keynesian open economy model, assuming that the marginal propensity to consume is less than unity.
[2] Employing a single-good model and a small open economy.
[3] By using a two-good utility-type function.
[4] Elasticity approach: using a three-good (imports, exports, and nontradables) model.
[5] A two-good model (imports, exports)—more specifically, optimization behavior under the intertemporal budget constraint.

intertemporal optimization model. They examine the savings and investment channel while incorporating labor–leisure choice, and find results contrary to those predicted by the HLM effect. The intertemporal approach (consumption-tilting effect) entails microeconomics-based analysis whereas the absorption approach derives macroeconomic analyses (Obstfeld & Rogoff, 1994).

Servén (1995) analyzes the consequences of permanent and transitory changes in TOT, and concludes that the conventional HLM effect does not exist. He argues that excluding capital-intensive good imports has given rise to the misleading view that the HLM effect exists. He explains this uncertainty in the light of three major factors: (i) the import content of consumption and investment, (ii) the duration of a shock, and (iii) the extent of intertemporal substitution in consumption and investment. Additionally, under the intertemporal substitution effect, the exchange rate is potentially an important variable through which TOT shocks are transmitted to the current account. Cashin and McDermott (2002) examine the downward trend in real commodity prices while considering their behavior. They find a negative and significant relationship between temporary changes in TOT and current account deficits for developing countries.

2.2. Empirical Viewpoint

Our theoretical analysis has been verified empirically by comprehensive cross-country studies based on the determinants of the current account. TOT shocks and their impact on the current account have been evaluated empirically using a variety of econometric techniques, including cross-country panel regression models, VAR models, and two-stage least squares (2SLS) models.

2.2.1. Studies Supporting HLM Effect

TOT variations are, typically, key drivers of fluctuations in the real income of developing countries, which depend on trade in primary commodities. Khan and Knight (1983) use pooled time-series cross-sectional data for 32 nonoil-producing developing countries for the period 1973–80 to analyze which factors affect their current account balances. Using simple ordinary least squares (OLS), they deduce that the empirical evidence supports the existence of the HLM effect in these countries. Using pooled time-series data for 14 Asian developing countries for the period 1961–83, and incorporating 2SLS with country dummies, Fry (1986)

estimates the national savings, domestic investment, and economic growth rate functions. The results correspond to the HLM effect.

Ostry and Reinhart (1992) provide a rationale for temporary TOT shocks, using a disaggregated commodity structure in which an agent consumes both tradables and nontradables. Their analysis is based on three different channels for four countries in Africa and Latin America each and five countries in Asia for the period 1968–87: (i) consumer behavior and regional diversities, (ii) intertemporal substitution elasticities, and (iii) estimates of intratemporal elasticity. Razin (1993) illustrates the logic and empirical validity of the dynamic optimizing approach to the current account, showing how various shocks affect saving and investment performance. The study's analysis is based on data from seven developed and 21 developing countries for the period 1960–89.

To study the response of the current account to TOT shocks and its degree of persistence, Otto (2003) has conducted an empirical study of small open economies, using structural VAR models and an impulse response function. He includes annual data on 15 small OECD economies for the period 1960–96 and on 40 developing countries for the period 1960–97. The results are compared with those of Mendoza (1995). Except for a few countries, the HLM effect is observed in the rest of the sample and the results are consistent with the theory. Finally, Misztal (2010) tests the distribution chain between variables, using a VAR model for Poland for the period 1995 (first quarter) to 2009 (third quarter). The results reveal the existence of the HLM effect in Poland.

2.2.2. Studies not Supporting HLM Effect

Khan, Hasan, and Malik (1992) analyze several determinants of savings in Pakistan besides income and interest rates. These determinants include the dependency ratio, foreign capital inflows, foreign aid,[6] changes in TOT, the openness of the economy, and other financial variables. For estimation purposes, the authors use time-series data for the period 1959/1960 to 1987/1988, employing OLS. Although the study follows the theoretical concept presented by Obstfeld (1982), its results lead the authors to infer that the HLM effect does not exist in Pakistan.

In the context of the medium-term determinants of the current account in industrial and developing countries, Chinn and Prasad (2003) use a dataset for 18 industrial and 71 developing countries (which, for most

[6] Foreign trade includes project and nonproject aid.

countries in the sample, covers the period 1971–95). Applying cross-section and panel regression techniques, the authors' results show that, in developing countries, higher TOT instability is associated with larger current account surpluses—which is contrary to the HLM effect.

Controlling for various standard determinants of private savings, Agénor and Aizenman (2004) empirically test for the existence of the HLM effect in nonoil-producing sub-Saharan African countries for the period 1980–96. The findings of this study do not support the existence of the HLM effect. Hassan (2006) uses a co-integration and error correction model to analyze the behavior of Bangladesh's current account deficit for the period 1976–2002. The results reveal that the country's TOT appears to be the only variable with a statistically positive impact on the current account deficit—a result that contradicts the validity of the HLM effect.

Each of these alternative perspectives—the elasticity, absorption, intertemporal, and intratemporal approaches—has a different way of explaining current account movements in different groups of economies over different time horizons. However, the evidence provided by the studies outlined above is still inconclusive on the issue of current account determinants in South Asia. Our study analyzes the HLM effect for a group of countries, omitted in most studies.

3. Methodology and Data

3.1. Methodology

In order to ascertain the existence of the HLM effect, we use a VAR model. Many researchers (Bouakez & Kano, 2008; Cashin & McDermott, 2002; Misztal, 2010; Onder & Anil, 2006; Sobrino, 2008) have investigated the existence of the HLM effect using different forms of VAR. The choice of estimation technique rests largely on the objectives of the study. In this case, an analysis of distribution chain and forecasting is involved, which can be appropriately carried out using a VAR. We develop a three-variable recursive VAR system, which includes (i) TOT (tot_t), (ii) real output (y_t), and (iii) the current account (ca_t). The model is given as follows:

$$X_t = A(L)X_{t-1} + U_t \tag{1}$$

where X_t is the 3 × 1 vector of endogenous variables, i.e.: $X_t' \equiv [tot_t, y_t, ca_t]$

$A(L)$ is a 3 × 3 matrix of lag polynomials and U_t is the 3 × 1 vector-reduced form innovation, i.e., $U_t \equiv [u_t^{tot}, u_t^{y}, u_t^{ca}]$. These residuals are independently and identically distributed with a variance-covariance matrix, where

$$E(U_t) = 0 \; ; \; E(U_t U_t') = \sum u_t$$

Amisano and Giannini (1997) suggest an AB model for the relationship between reduced-form and form structural shocks:

$$AU_t = BV_t \tag{2}$$

V_t represents structural shocks while *A* and *B* are 3 × 3 matrices that reflect the instantaneous relationship between variables and the linear relationship between shocks and reduced-form innovation, respectively. The remaining steps involved in deriving the final form of the model are presented in Appendix A.

The fundamental problem with recursive models is that one cannot directly estimate and derive the values of A and B in order to extract meaningful implications from the model given above. The basic purpose of identification is to transform the correlated innovation of a reduced-form model into uncorrelated and theoretically meaningful structural shocks. Generally, Sim's (1980) restrictions are imposed on the contemporaneous properties of the system, usually known as short-run restrictions. Various short-run identification schemes have been developed in the literature, which can be broadly classified into two categories: (i) triangular restrictions and (ii) nontriangular restrictions. The triangular or recursive approach to identification restricts B in equation (2) to an *n* dimensional identity matrix and A to a lower triangular matrix with a unit diagonal. The recursive approach involves a causal ordering of variables in a given model. In the case of an *m* variables model, *m*! total orderings are possible. A nontriangular scheme of identification, however, allows us to impose restrictions that are econometrically and theoretically feasible, that is, restricted matrices are fully ranked. The identification problem can be illustrated by reproducing the AB model in equation (2) as:

$$AU_t = BV_t$$

$$\begin{bmatrix} \alpha_{11} & 0 & 0 \\ \alpha_{21} & \alpha_{22} & 0 \\ \alpha_{31} & \alpha_{31} & \alpha_{33} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{tot} \\ \varepsilon_t^{y} \\ \varepsilon_t^{ca} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \mu_t^{tot} \\ \mu_t^{y} \\ \mu_t^{ca} \end{bmatrix}$$

The ordering of variable in our system has a strong theoretical and factual rationale. First, although fluctuations in TOT can be attributed both to internal and external factors, the composition and volume of trade render Pakistan's TOT relatively more vulnerable to external shocks. This is why the variable is considered the most exogenous in the system. Second, the coefficient of real GDP, which is partially endogenous, is affected by TOT in the system. The impact of TOT on GDP is, ceteris paribus, ambiguous. The current account is the only endogenous variable that is affected by the other variables (TOT, real GDP) in the system. The relationship between TOT and current account has been discussed above.

However, there is both a negative and positive relationship between output and the current account balance. There are two ways in which higher output affects the current account negatively. First, an increase in real output increases import demand and, therefore, results in a current account deficit. Second, if there is an increase in real GDP, domestic investment is stimulated, generating capital inflows into the country. As a result, real GDP causes the current account balance to worsen. The country exports goods and services to other countries if it experiences an increase in domestic output that is larger than its domestic absorption. In this way, real output is positively associated with the current account balance.

3.2. Data

This study covers a 30-year period from 1980 to 2009. All the data has been retrieved from the World Data Bank, World Development Indicators, and Global Development Finance. The data used comprises three variables: TOT, real output, and current account balance. We use the net barter TOT index (base year 2000 = 100). Real output is measured by real GDP (base year 2000 = 100) and the current account balance is taken as a percentage of GDP. TOT and real GDP are used in log form. Table 1 presents the summary statistics of the main variables.

Table 1: Summary statistics

Statistic	tot_t	y_t	ca_t
Observations	30	30	30
Mean	4.64	10.98	-2.75
Median	4.71	11.03	-3.31
Standard deviation	0.24	0.41	3.06

Source: Authors' calculations.

4. Estimations and Discussion of Results

Using a VAR model, this section provides empirical evidence on the existence of the HLM effect in Pakistan. The VAR model traces the response of a system to an innovation in one variable. VAR models have been shown to be good at capturing co-movements in time-series estimation (Stock & Watson, 2001). Before applying VAR, however, we conduct a number of time-series diagnostic tests. The steps involved in estimating the model are described below.

4.1. Time-Series Diagnostic Tests and Lag Order Selection

Determining the stationarity of variables is a prerequisite to applying the VAR model, for which purpose we use the augmented Dickey-Fuller (ADF) test (see Bhargava, 1984). The results of the ADF test for both levels and first differences are summarized in Table 2. The null hypothesis of the unit root is statistically accepted at a 1 percent level of significance. This shows that the data is not stationary in levels. However, the hypothesis of the unit root test is rejected for all the variables in first differences, showing that the data is stationary in first differences [I (1)].

Table 2: Results of ADF test

	Levels		First differences		
Variable	**t-statistic**	**p-value**	**t-statistic**	**p-value**	**Conclusion**
tot_t	-1.42	0.833	-5.63***	0.0005	I(1)
y_t	-2.11	0.520	-3.7**	0.0388	I(1)
ca_t	-2.39	0.376	-5.07***	0.0027	I(1)

Note: ***, **, and * show 1%, 5%, and 10% levels of significance, respectively.
Source: Authors' calculations.

In order to ensure stability when dealing with the VAR model, we apply three further tests. The first, Schwarz's Bayesian information criterion, is applied to determine the correct VAR order or lag length. According to the results in Table 3, it is optimal to include one lag in the model for further VAR estimations. The second test, the Chow test, is used to check the structural stability of the data. Structural breaks are checked for in 1992, for the floods that occurred in southern Pakistan, and for 2005, for the devastating earthquake. The results of the Chow test are reported in Table 4 and give strong evidence of structural breaks in the data. Accordingly, we include dummies for these years in the model. The third test is used to derive a correlation matrix to assess the strength of correlation between the selected samples. The results presented in Table 5 do not indicate evidence of strong correlation among the variables.

Table 3: VAR lag order selection criteria

Lag	Schwarz information criterion
0	5.195
1	-1.828*
2	-1.597

Note: * indicates lag order selected by the criterion.

Source: Authors' calculations.

Table 4: Chow break-point test

Variable	F-statistic	Prob. F(3,24)	Log likelihood ratio	Prob. chi-square (3)
Chow break-point test: 1992				
tot_t	10.3714	0.000145	24.94075	0.000016
Chow break-point test: 2005				
tot_t	14.06406	0.000017	30.43525	0.000001

Source: Authors' calculations.

Table 5: Correlation matrices

	$\mathbf{tot_t}$	$\mathbf{y_t}$	$\mathbf{ca_t}$
tot_t	1.000	-0.158	0.208
y_t	-0.158	1.000	-0.305
ca_t	0.208	-0.305	1.000

Source: Authors' calculations.

4.2. Impulse Response Function

The relationship between TOT, current account balance, and real output is evaluated using an impulse response function. These impulses are derived using a recursive VAR model, in which Cholesky one-standard deviation shocks are applied and the response estimated over a period of ten years, 2009–19, following the initial occurrence of the shocks. The impulses are presented in Figure 1. Appendix B reports the results of the VAR.

4.2.1. Response of TOT to TOT

Panel 1 of Figure 1 shows the response of TOT due to one standard deviation of unanticipated positive shock to itself—a gradual decline in Pakistan's TOT. The dashed line becomes parallel to equilibrium after the seventh year. This shows that the positive shock to TOT is transmitted completely to TOT itself. There is a continuous decline in TOT; asymptotically, it will converge to equilibrium in the long run, which verifies the stability of the model.

4.2.2. Response of real GDP to TOT

Panel 2 of Figure 1 shows the dynamic response of economic growth due to one standard deviation of positive unanticipated shock to TOT. Initially, real output starts rising in response to the exogenous shock to TOT. It remains negative till the second year, and then converges with equilibrium. Economic growth gradually starts declining and further deviates from equilibrium in subsequent years, showing a negative relationship between TOT and economic growth. This reveals that Pakistan's real output has responded negligibly to a transitory TOT shock.

Given a boom in commodity prices, TOT improves due to an appreciation in the real exchange rate. Consequently, real output falls due to this mechanism—also known as "Dutch Disease" (Hernández, 2011). Murphy (1983) demonstrates that several countries experienced TOT improvements that led to current account deterioration. According to her study, the responsibility lies with leaders who transfer the gain from improved TOT either to inefficient local projects or to finance their interests. Even if the government is aware of the fact that the shock is temporary, they squander the gain by investing frequently in low-return activities. The improvement in TOT has a negative relationship with real output because the gains from this improvement are either consumed or invested in low-return projects. Gelb (1988) and Tornell and Lane (1994)

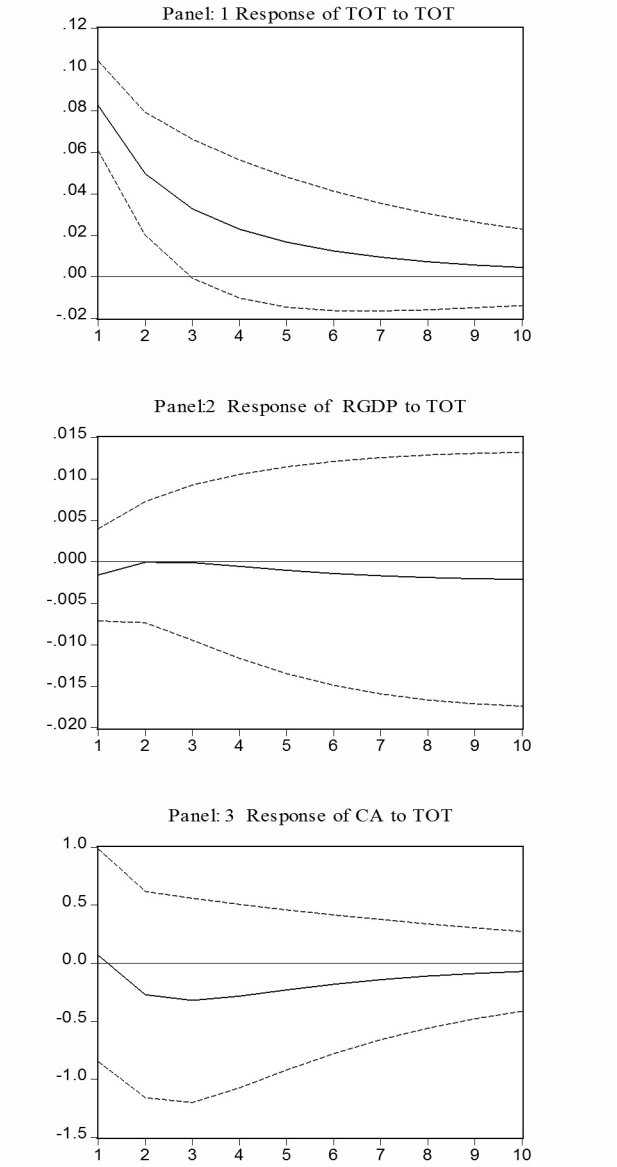
attribute this to a "voracity effect", which counteracts the consumption-smoothing effect, inducing a decline in the current account in response to a positive transitory shock to TOT.

4.2.3. Response of Current Account to TOT

Panel 3 of Figure 1 shows the impact of a one-standard deviation shock to TOT on the current account balance. We observe a moderate impact on the current account due to an unanticipated shock to TOT. Pakistan's current account balance initially appears positive, but drops gradually in the second year and reaches its lowest level in the third year. From this point onward, it starts rising and becomes parallel to equilibrium in the eighth year. This response is in line with Otto's (2003) study, where the current account's response to positive TOT shocks is not significant for Pakistan. Our results are consistent with Khan et al. (1992), who examine the determinants of savings in Pakistan, using OLS. Their results suggest that the savings rate in Pakistan increases with a deterioration in TOT. These results also support those of Chinn and Prasad (2003).

The results are, however, in contrast to the HLM effect, which can be explained by the intertemporal substitution effect. This effect is attributed to current account deterioration owing to TOT improvement. The consumption-based interest rate decreases, which further reduces the cost of current consumption in terms of future consumption. This implies a decline in savings, which contributes to the current account's deterioration (Goodger, 2001). Pearce (1955) has emphasized that any substitution effect between savings and consumption will depend on changes in the real interest rate. Razin (1993) also examines the negative relationship between TOT improvements and the current account.

Figure 1: Response to Cholesky One S.D Innovations ±2S.E for Pakistan



4.3. Variance Decomposition

A variance decomposition shows the contribution of each shock to the variance of n-period-ahead forecast error of the variable. In other words, through variance decomposition, we can find out to what extent the variable is affected by fluctuations in different shocks over different horizons (Onder & Anil, 2006).

Table 6 presents the variance decomposition for three endogenous variables, showing that most of the forecast error variance in TOT is explained by the variable itself. Current account innovation plays a relatively significant role, contributing around 22.0 percent to the forecasted error of TOT. Economic growth makes a minute contribution to the TOT standard error, even over longer time horizons (0.63 percent of the forecast error variance of TOT).

Table 6: Forecast error variance decomposition – Percentage contribution to standard error of TOT

Period	Forecasted standard error	TOT	Economic growth	Current account balance (% GDP)
1	0.08	100.0	0.000	0.00
2	0.09	94.4	0.005	5.54
3	0.10	89.0	0.004	10.9
4	0.11	85.2	0.020	14.7
5	0.11	82.6	0.064	17.2
6	0.11	80.9	0.138	18.9
7	0.11	79.6	0.239	20.1
8	0.12	78.6	0.359	20.9
9	0.12	77.9	0.493	21.5
10	0.12	77.3	0.635	22.0

Source: Authors' calculations.

Table 7 shows that most of the forecast error variance in economic growth is accounted for by the variable itself. The role of the current account balance is more prominent in explaining the standard error of economic growth, contributing almost 46.34 percent of the variation in economic growth. However, over longer time horizons in Pakistan, innovations in TOT have a minor effect on economic growth. We observe that merely 0.77 percent of the forecast variance of economic growth is explained by innovations in TOT. The variance decomposition analysis reveals that the standard error variation of economic growth is more affected by innovations in the current account balance rather than innovations in TOT.

Table 7: Forecast error variance decomposition – Percentage contribution to standard error of economic growth

Period	Forecasted standard error	TOT	Economic growth	Current account balance (% GDP)
1	0.01	1.06	98.9	0.00
2	0.02	0.52	88.0	11.4
3	0.02	0.33	77.8	21.8
4	0.03	0.26	70.5	29.2
5	0.03	0.28	65.2	34.4
6	0.03	0.35	61.4	38.1
7	0.04	0.45	58.5	41.0
8	0.04	0.56	56.2	43.2
9	0.04	0.67	54.3	44.9
10	0.05	0.77	52.8	46.3

Source: Authors' calculations.

Table 8 shows that a large portion of the forecast error variance in the current account is explained by the variable itself. However, innovations in TOT play a relatively large role in the forecasted error of the current account balance, contributing around 4.22 percent to the forecasted error of Pakistan's current account balance. Moreover, the economic growth shock does not dominate in explaining fluctuations in the current account balance since it contributes only around 1.15 percent of the variations in the current account balance. Thus, we can establish that variations in Pakistan's current account balance can be attributed largely to innovations in TOT.

Table 8: Forecast error variance decomposition – Percentage contribution to standard error of current account balance

Period	Forecasted standard error	TOT	Economic growth	Current account balance (% GDP)
1	2.46	0.07	1.12	98.8
2	2.78	1.00	1.00	97.9
3	2.89	2.15	0.93	96.9
4	2.95	2.99	0.90	96.1
5	2.98	3.52	0.90	95.5
6	3.00	3.83	0.93	95.2
7	3.02	4.02	0.97	95.0
8	3.03	4.12	1.02	94.8
9	3.03	4.19	1.08	94.7
10	3.04	4.22	1.15	94.6

Source: Authors' calculations.

5. Conclusion

This paper has empirically examined the existence of the HLM effect in Pakistan's case. The macroeconomic variables included in the analysis are real GDP, net barter TOT, and the current account balance as a percentage of GDP, for annual data over the period 1980–2009.

According to the results of our impulse response analysis, a Cholesky one-standard deviation shock to TOT creates a negative adjustment to real output in Pakistan. This adjustment confirms that an appreciation in domestic currency leads to Dutch Disease (Hernández, 2011). The major exports of developing countries, however, are mainly primary commodities with a low price elasticity of demand—an improvement in TOT does not guarantee that their economies will grow. Changes in TOT may, however, affect developing economies manifold (Broda, 2004).

The World Bank's (2006) analysis finds that Pakistan, like other developing countries, relies heavily on primary goods for its exports, and facings a low price elasticity of demand—hence, it cannot affect world market prices. Such countries' major imports include machinery, petroleum products, and capital-intensive goods with which to run their domestic industry. Therefore, Pakistan's current account balance remains vulnerable to changes in the world economy. The sharp increase in crude

oil prices has fueled the import bill significantly. The deterioration in the current account deficit has emanated mainly from the rapidly widening trade deficit in Pakistan.

Developing economies tend to suffer even in the presence of favorable TOT. Pinto (1987), Murphy (1983), Gelb (1988), Robinson and Ragnar (2005) and others emphasize that the windfall gains from an improvement in TOT can be squandered on white elephant projects in developing countries. Another striking aspect, i.e., the voracity effect, cannot be overlooked since it dissipates the gains of improved TOT. The results of our impulse response analysis illustrate that Cholesky one-standard deviation innovations in TOT lead to a negative response by the current account balance. However, favorable TOT affect Pakistan adversely because its demand for import content increases for consumption and investment, placing a burden on the current account balance. The results therefore show the nonexistence of the HLM effect in Pakistan.

Keeping in view the results of this study, we suggest that Pakistan focus on the composition of its exports. There is a need to search for new markets for exports and the trading sector should develop to the extent that it is capable of exporting capital-intensive goods rather than importing them. With reference to the results of the impulse response function, with the windfall of TOT, economic growth can be increased by utilizing resources efficiently. In order to attain maximum benefits from TOT gains, the government should ensure investment in high-return projects, along with transparency in the public and private sectors in order to steer clear of the voracity effect. The results of the variance decomposition showed that economic growth is affected mainly by the current account balance. Accordingly, Pakistan should pursue policy aimed at increased exports and reducing imports.

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Appendix A

The steps involved in the construction of the model are given as follows.

$$X_t = A(L)X_{t-1} + U_t \tag{1}$$

where X_t is a 3 × 1 vector of endogenous variables, i.e., $X_t' \equiv [tot_t, y_t, ca_t]$

$A(L)$ is a 3 × 3 matrix of lag polynomials and U_t is a 3 × 1 vector reduced-form innovation, i.e., $U_t \equiv [u_t^{tot}, u_t^{y}, u_t^{ca}]$. These residuals are independently and identically distributed with a variance-covariance matrix, where $E(U_t) = 0$; $E(U_t U_t') = \sum u_t$

Amisano and Giannini (1997) suggest the following relationship between reduced-form and form structural shocks in the form of an AB model:

$$AU_t = BV_t \tag{2}$$

V_t represents structural shocks and *A* and *B* are 3 × 3 matrices that reflect the instantaneous relationship between variables and the linear relationship between shocks and reduced-form innovation, respectively. Consequently, the recursive form of VAR can be obtained from reduced form by pre-multiplying equation (1) with *A* as

$$AX_t = AA(L)X_{t-1} + AU_t \tag{3}$$

Replacing AU_t with BV_t, we get

$$AX_t = AA(L)X_{t-1} + BV_t \tag{4}$$

$$\begin{bmatrix} 1 & -\alpha_{12} & -\alpha_{13} \\ -\alpha_{21} & 1 & -\alpha_{23} \\ -\alpha_{31} & -\alpha_{32} & 1 \end{bmatrix} \begin{bmatrix} tot_t \\ y_y \\ ca_t \end{bmatrix} = \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} \\ \beta_{21} & \beta_{22} & \beta_{23} \\ \beta_{31} & \beta_{32} & \beta_{33} \end{bmatrix} \begin{bmatrix} tot_{t-1} \\ y_{t-1} \\ ca_{t-1} \end{bmatrix} + \begin{bmatrix} 1 & \gamma_{12} & \gamma_{13} \\ \gamma_{21} & 1 & \gamma_{23} \\ \gamma_{31} & \gamma_{32} & 1 \end{bmatrix} \begin{bmatrix} u_t^{tot} \\ u_t^{y} \\ u_t^{ca} \end{bmatrix}$$

Solving equation (4) for X_t we get

$$X_t = A^{-1}A(L)X_{t-1} + A^{-1}BV_t \tag{5}$$

$$\begin{bmatrix} tot_t \\ y_y \\ ca_t \end{bmatrix} = \begin{bmatrix} 1 & -\alpha_{12} & -\alpha_{13} \\ -\alpha_{21} & 1 & -\alpha_{23} \\ -\alpha_{31} & -\alpha_{32} & 1 \end{bmatrix}^{-1} \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} \\ \beta_{21} & \beta_{22} & \beta_{23} \\ \beta_{31} & \beta_{32} & \beta_{33} \end{bmatrix} \begin{bmatrix} tot_{t-1} \\ y_{t-1} \\ ca_{t-1} \end{bmatrix} +$$
$$\begin{bmatrix} 1 & -\alpha_{12} & -\alpha_{13} \\ -\alpha_{21} & 1 & -\alpha_{23} \\ -\alpha_{31} & -\alpha_{32} & 1 \end{bmatrix}^{-1} \begin{bmatrix} 1 & \gamma_{12} & \gamma_{13} \\ \gamma_{21} & 1 & \gamma_{23} \\ \gamma_{31} & \gamma_{32} & 1 \end{bmatrix} \begin{bmatrix} u_t^{tot} \\ u_t^{y} \\ u_t^{ca} \end{bmatrix}$$

The summarized form of equation (5) can be written as:

$$X_t = A(L)X_{t-1} + \varepsilon_t \tag{6}$$

Whereas

$$C(L) = A^{-1}A(L)$$

$$\varepsilon_t = A^{-1}BV_t$$

$$\begin{bmatrix} \varepsilon_t^{tot} \\ \varepsilon_t^{y} \\ \varepsilon_t^{ca} \end{bmatrix} = \begin{bmatrix} 1 & -\alpha_{12} & -\alpha_{13} \\ -\alpha_{21} & 1 & -\alpha_{23} \\ -\alpha_{31} & -\alpha_{32} & 1 \end{bmatrix}^{-1} \begin{bmatrix} 1 & \gamma_{12} & \gamma_{13} \\ \gamma_{21} & 1 & \gamma_{23} \\ \gamma_{31} & \gamma_{32} & 1 \end{bmatrix} \begin{bmatrix} \mu_t^{tot} \\ \mu_t^{y} \\ \mu_t^{ca} \end{bmatrix}$$

Equation (6) is the autoregressive representation of the model in which each variable is expressed as a function of the past values of itself and of the other variables in the system. It also shows that reduced-form innovations are a linear combination of recursive innovations.

Appendix B

VAR RESULTS

Sample (adjusted): 1981 2009		
Included observations: 29 after adjustments		
Model: Ae = Bu where E[uu']=I		
Restriction type: short-run pattern matrix		
A =		
C(1)	0	0
C(2)	C(4)	0
C(3)	C(5)	C(6)
B =		
1	0	0
0	1	0
0	0	1

	Coefficient	Std. error	z-statistic	Prob.
C(1)	12.12659	1.592299	7.615773	0.0000
C(2)	1.260368	2.257923	0.558198	0.5767
C(3)	0.198400	2.264130	0.087628	0.9302
C(4)	66.95133	8.791140	7.615773	0.0000
C(5)	-7.139441	12.46784	-0.572628	0.5669
C(6)	-0.408136	0.053591	-7.615773	0.0000

Log likelihood	44.84547	
Estimated A matrix		
12.12659	0.000000	0.000000
1.260368	66.95133	0.000000
-0.198400	7.139441	0.408136

Estimated B matrix		
1.000000	0.000000	0.000000
0.000000	1.000000	0.000000
0.000000	0.000000	1.000000

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A Benefit Incidence Analysis of Public Spending on Education in Pakistan Using PSLM Data

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Abstract

Education is one of the most important means of economic development, and there is consensus among policymakers that it is better to be educated than not. The debate on education is not, therefore, whether it is good or bad, rather it centers on whether the state should intervene in its provision. Public provision of education at the school level is generally considered one of the most important investments for creating social opportunities to help the wider population actively participate in various economic activities. This study investigates whether public spending on education in Pakistan is pro-poor at various levels of schooling. We find that public spending at the primary and secondary level is progressive, while higher education spending is regressive. These results hold at the national and provincial level. Based on these findings, we recommend that the government increase its spending on primary, secondary, and technical education. Higher education, however, should be provided on merit, and the private sector should be encouraged to provide high-quality education.

Keywords: Education, economic, development, Pakistan.

JEL Classification: I25.

1. Introduction

Education is one of the most important factors of human capital development, and plays a key role in helping individuals acquire useful skills, which in turn, help improve a country's socioeconomic wellbeing. Pakistan is a poor performer in implementing policies in the education sector: the average number of years of schooling in Pakistan was 3.9 in 2009, compared to 6.5 years for Sri Lanka, China, the Philippines, and Malaysia. Besides having one of the lowest literacy rates in the region, Pakistan's vocational and technical infrastructure is generally inadequate,

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irrelevant, and qualitatively poor. Consequently, a very small percentage of children at the secondary level enroll in technical education.

Besides achieving high literacy rates, most East Asian and Latin American countries have a higher percentage of youth acquiring technical education than South Asian countries. High literacy rates and skilled human resources play an important role in increasing total factor productivity (TFP) and, hence, economic growth. A rising TFP helps achieve sustainable and high economic growth. Moreover, there are social benefits to a better-educated population. An educated person is less likely to be influenced by prejudice, which would otherwise be harmful not only at an individual but also at a societal level. Education also creates social opportunities for the public to actively participate in a society's economic activities.

According to Sen (2000, p. 129), the state has played a major role in expanding basic education across the world. The rapid spread of literacy in high-income countries in the West and East Asia has been through public provision rather than through the market.

Banerjee and Duflo (2011) find that parents invest in schooling for those children whom they consider to be bright. This, however, implies that it is not fair to leave children's education to their parents. Moreover, poor children with higher IQ levels are more likely not to attend school than average-intelligence children from rich families. The quality of education for poor children will also be lower than that for rich ones. So, education, particularly in developing countries like Pakistan, cannot be pursued from a purely demand-side perspective. Elementary education should be compulsory for all, as is the case in the entire developed world. The state needs to invest more in education for the poor if public spending on education is to be pro-poor.

The large majority of policymakers agree that it is necessary to find a way to get children into classrooms and provide them with well-trained teachers. This is evident from the UN's Millennium Development Goals, the second and third of which, respectively, aim to "ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling" and to "eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education by no later than 2015."

Our focus in this paper is to analyze the impact of government spending on education in Pakistan and to carry out a benefit incidence analysis (BIA) to determine whether public spending on education is pro-poor or pro-rich. If public spending on education is pro-poor, it implies that the government should share the responsibility of providing elementary education to the poor.[1] To this end, we analyze:

- How much do the poor benefit from public spending in education?
- What is the incidence of education expenditure at each level of education at the national and provincial level?

We use the BIA tool to derive answers to these questions, by evaluating how government subsidies affect the distribution of benefits among the population. The tool uses information on the consumption of government services by the population and the cost of providing these services to appraise the rate of benefit from government spending across income groups. It shows how the initial "pre-intervention" position of individuals is distorted by public spending, or how well public spending serves to redistribute resources to the poor. Thus, it estimates how much the income of a household would have to be raised if it were to fully pay for the subsidized public service.

The rest of the paper is organized as follows. After defining targeting and progressivity in Section 2, a brief review of the literature on BIA is given in Section 3. The Pakistan Social and Living Standards Measurement Survey (PSLM) dataset for 2007/08 and the education levels used are described in Section 4. Section 5 presents the methodology used and the results derived. We conclude our study with a set of recommendations in Section 6.

2. Targeting and Progressivity

2.1. Lorenz and concentration curve

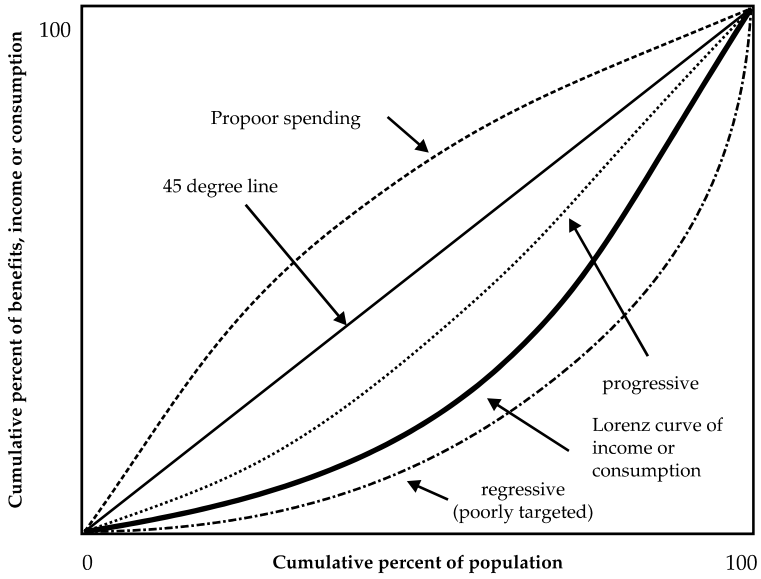
Targeting is a tool generally used with the objective of correctly identifying deserving households or individuals, to whom to provide the benefits from government spending on a service. All targeting methods share a general objective: to correctly identify which households or individuals are poor and which are not. A concentration curve or benefit

[1] We do not imply that the private sector has no role to play in education; this issue is not within the scope of our study.

concentration curve is one way of graphically representing the distribution of benefits to evaluate the targeting of government subsidies. The benefits from government spending on a service are said to be pro-poor if the concentration curve for these benefits is above the 45-degree line (Figure 1). The Lorenz curve is a graphical interpretation of the cumulative distribution of income on the y-axis against the cumulative distribution of population on the x-axis.

Whether public spending is progressive or regressive is evaluated by comparing the benefit concentration curve with the 45-degree diagonal and the Lorenz curve of income/consumption. Benefits are said to be progressive if the concentration curve for these benefits is above the Lorenz curve for income or consumption, but below the 45-degree line (Figure 1). For instance, if the concentration curve lies above the diagonal, then the poorest 10 percent of the population receives a share of benefits greater than their income/consumption share, and the distribution of benefits is said to be progressive in absolute terms (Figure 1).

Figure 1: Lorenz and concentration curves



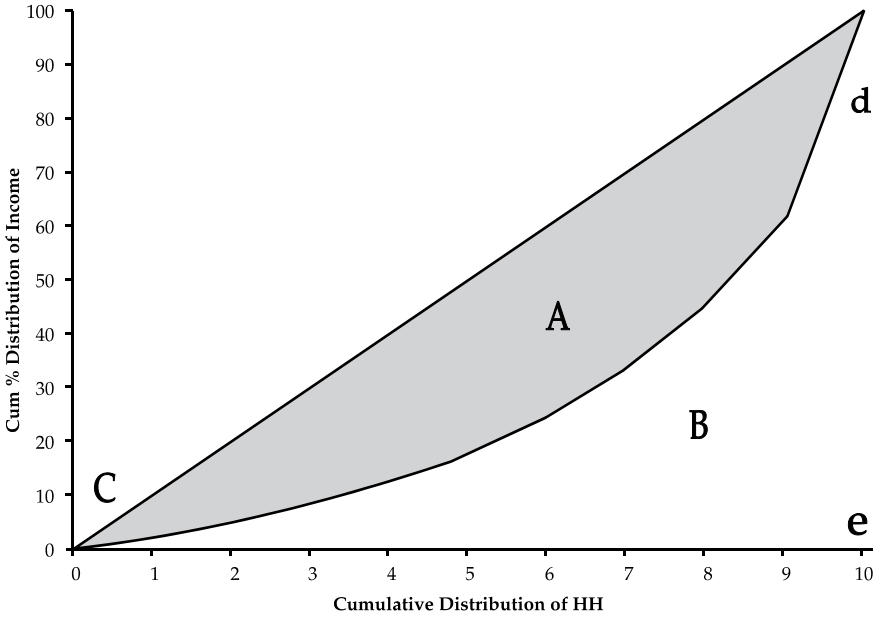
Source: Manasan et al (2008).

2.2. *Concentration Index*

The concentration coefficient is a summary measure of benefit incidence, and is based on the concentration curve. It is the ratio of the area

bounded by the diagonal and the concentration curve to the total area below the diagonal (Figure 2). If the distribution of benefits is progressive in absolute terms, the concentration index is negative. Conversely, if the distribution of benefits is regressive in absolute terms, then the concentration index is positive.

Figure 2: Gini measure of inequality



The formula used to calculate the concentration index is:

$$Concentration\ index\ = \frac{Area\ of\ A}{Area\ of\ Triangle\ cde}$$

However, the area of triangle cde = 0.5

Thus, the Concentration index = 2A, where the area of A is:

$$A = \frac{1}{2} - \left[\frac{1}{N}\sum_{i=1}^{N-1} C_i + \left(\frac{1}{N}\right) C_N\right], C_N = 1$$

N is the number of equal divisions.

If the concentration curve lies above the diagonal, then the poorest 10 percent of the population receives more than 10 percent of the benefits, and the distribution of benefits is said to be pro poor.

3. Literature Review

The BIA approach was pioneered by twin World Bank studies conducted by Selowsky (1979) for Colombia, and Meerman (1979) for Malaysia. Since then, various studies have investigated the progressive or regressive nature of public expenditure. The share of different income groups varies depending on the distribution of the benefits of public expenditure across region, caste, religion, gender, etc. Using data on 4,019 households in Colombia, Selowsky (1979) found that subsidies on primary education were strongly progressive, but that subsidies on higher education were regressive. The lowest-income families in Colombia preferred government schooling compared to higher-income families, since relatively rich households preferred private schooling to public schooling. Households in poorer quintiles had more children than those in higher-income quintiles, which made it difficult for the former to bear the cost of private schooling for their children. Meerman (1979) also found that public spending on primary education was progressive in the context of Malaysia.

Norman (1985) finds that higher-income quintiles receive more benefits than lower-income quintiles, and that government expenditure on education favors the former more than the latter. Demery and Verghis (1994) use a dataset on Kenya and conclude that public spending on secondary and university-level education is regressive while primary education spending is strongly progressive. Heltberg, Simler, and Tarp (2001) evaluate the incidence of public spending on education in Mozambique, and conclude that the poorest quintile of income groups receives 14 percent of total education spending, the poorest half receives 36 percent, and the richest quintile receives 33 percent.

Khan and Ali (2003) study the determinants of schooling in rural Pakistan, using a sample population in Pakpattan and Faisalabad districts. They identify a number of factors responsible for lower levels of schooling, key among which is that poor parents do not demand schooling because the associated expenditure is too high. Sending children to school could, therefore, be induced by subsidizing education for the poor and so the government should subsidize the cost of instructional materials, fees, uniforms, school meals, etc. Son (2006) uses a dataset on Thailand and finds

that government spending benefits the poor more than the rich and can reduce poverty.

Hakro and Akram (2007) use the PSLM dataset for 2004/05, and find that the distribution of education expenditure is progressive for Pakistan overall: 20 percent of the poorest population receives 17–20 percent of the subsidy while the share of the richest 20 percent of the population ranges between 19 and 23 percent of the education subsidy at the primary level. Almost the same distribution occurs at the secondary education level. Higher education is also progressive, that is, the lowest 20 percent of the population receives 16–18 percent of the subsidy, while the richest 20 percent of the population receives 19–22 percent of the subsidy. Our results are consistent with those of Hakro and Akram for primary and secondary education, but not for higher education. However, we evaluate results at the provincial level, which has not been done so far.

4. Data Description

We use the household level PSLM dataset for 2007/08. The Pakistan Bureau of Statistics (formerly the Federal Bureau of Statistics) developed its own urban area frame, which was updated in 2003 (Pakistan Bureau of Statistics, 2009). Each city/town is divided into enumeration blocks consisting of 200–250 households identifiable through a sketch map. Each enumeration block is classified into three categories of income groups, i.e., low-, middle-, and high-income, keeping in view the living standard of the majority. A list of villages published by the Population Census Organization as part of the 1998 census was used as the rural frame.

Information on the education section included age, sex, literacy, enrolment status, school attendance, type of school (government, private, or other, but for our purpose we have used only public sector educational institutions), distance from school, and expenditure on education. Total income and expenditure per individual was calculated using a balance sheet for income and expenditure from the survey questionnaire. Per capita income was calculated by dividing total income by household size. For all the surveys, literacy was taken as the ability to read a newspaper and to write a simple letter. The literacy rate for the population aged 10 years and above has slightly increased from 55 percent in 2006/07 to 56 percent in 2007/08.

Table 1 defines the levels of education in overall Pakistan, on the basis of which we have selected individuals currently attending school from Section 2 of the questionnaire for 2007/08. The age of every student enrolled in the current year was taken as greater than and/or equal to 4 years. Secondary education is represented by codes 6 to 10. On completing Grade 10, students are awarded a secondary school certificate (SSC), or Matriculation certificate.

Table 1: Education levels in Pakistan

Primary	Primary education/schools
Secondary	Middle and high schools
Tertiary	General universities/colleges/institutes and professional/technical universities/colleges/institutes
Others	Technical education, school for handicapped/disabled persons/libraries and museums/student hostels/education under ESPR programs

In 2007/08, according to the household survey, female primary enrolment was 43 percent and male primary enrolment was 57 percent in public schools. Total primary enrolment in public sector schools in urban and rural areas was 31 and 69 percent, respectively. The distribution of student enrolment at each level of education in the public sector is given in Table 2.

The share of female students is less than males at the national level, but, interestingly, this is *not* the case particularly in urban Punjab, Sindh and Khyber Pakhtunkhwa (KP) for at the primary and secondary levels, and is reversed in Punjab for tertiary education. At all levels, urban Punjab is an exception where female enrolment in secondary education is marginally higher than male enrolment (Table 2). The difference between the male and female enrolment ratio is more prominent in rural areas than in urban areas. There is a large gender disparity in KP and Balochistan.

Table 2: Enrolment by education level (public sector) in Pakistan (urban/rural) and provinces (%)

		Primary			Secondary			Tertiary			Other		
	Region	**Male**	**Female**	**Both**	**Male**	**Female**	**Both**	**Male**	**Female**	**Both**	**Male**	**Female**	**Both**
Pakistan	Urban	16	15	31	24	22	46	32	33	65	24	19	43
	Rural	41	28	69	37	16	54	23	12	35	42	15	57
	Total	57	43	100	61	39	100	55	45	100	66	34	100
Punjab	Urban	14	15	29	21	22	44	27	40	67	23	31	54
	Rural	38	33	71	35	21	56	15	17	33	30	16	46
	Total	52	48	100	57	43	100	42	58	100	53	48	100
Sindh	Urban	17	17	34	26	28	54	37	31	68	43	20	63
	Rural	42	25	66	35	11	46	28	5	32	31	6	37
	Total	59	41	100	62	39	100	64	36	100	74	27	100
KP	Urban	13	13	26	19	19	38	29	22	51	12	17	30
	Rural	43	31	74	43	19	62	35	14	49	47	23	70
	Total	56	44	100	62	38	100	63	37	100	59	41	100
Balochistan	Urban	22	17	38	34	21	55	53	25	78	25	7	32
	Rural	42	20	62	37	8	45	21	1	22	59	10	68
	Total	63	37	100	70	30	100	74	26	100	84	16	100

***Source**:* Authors' calculations based on PSLM (2007/08) household survey data.

The cause of this gender disparity requires careful analysis. Andrabi, Das, Khwaja, Vishwanath, and Zajonc (2007), in their study on education in Pakistan, initially find that parents send fewer girls to school than boys, which implies discriminatory behavior. However, they identify "distance to school" as a key underlying factor for this decision: The more distance there is from her home to her school, the less likely a girl is to have further schooling opportunities compared to a boy. Unfortunately, this gender disparity decreases school enrolments. One cause of the disparity between provinces may be that females are overprotected on cultural grounds. Closing the gender disparity gap will increase the school enrolment proportion.

Income deciles are defined over population, i.e., across individuals/population. Income deciles based on population/individuals are given in Table 3. The bottom income decile sends their children to government schools for primary education. With an increase in household income, the enrolment rate in public schools decreases, presumably because people who can afford the fees might now prefer to send their children to private schools rather than to state-run schools due to the quality of education or for other reasons. Lower-/middle-class families, however, show a mixed response at the secondary education level and above. Some opt for private schools as their first choice while others prefer government schools. The secondary, tertiary, and 'other education' categories show an increasing trend with respect to deciles. Since the lower-income deciles have more children than upper-income groups, it is not possible for them to afford private schools for their children.

Table 3: Total enrolments in Public Sector at four levels of education in Pakistan overall by income deciles based on population (%)

Decile	Income ('000)	Primary	Secondary	Tertiary	Other	Total
1	8.13	11.30	4.09	1.48	3.53	7.77
2	10.00	13.17	8.02	2.36	8.48	10.19
3	11.90	12.47	8.80	3.88	8.13	10.23
4	13.65	12.41	10.02	3.93	14.49	10.67
5	15.60	11.20	10.50	5.64	10.95	10.30
6	18.00	10.59	11.87	6.75	9.54	10.49
7	21.60	9.59	12.91	9.11	7.77	10.51
8	27.06	8.97	13.46	13.82	12.72	11.00
9	39.00	6.81	12.00	20.67	13.07	10.20
10	1,960.00	3.49	8.33	32.36	11.31	8.65

Source: Authors' calculations based on PSLM (2007/08) household survey data.

5. Research Methodology and Results

In general, the following three steps are involved in conducting an incidence analysis:

- Obtain the estimates of the unit cost or subsidy embedded in the provision of a particular public service. For this step, data is usually extracted from public expenditure accounts. For example, the data on per student cost or subsidy by level of schooling can be obtained from the budget.
- Impute the subsidies to the individual or household identified as a user of the service by using the information available on its use by different income groups, e.g., enrolment rates in public schools across population deciles ordered by income level ranging from poor to rich as reported by households in consumer expenditure surveys.
- Aggregate individuals or households in groups ordered by income or expenditure or any other grouping of interest such as race or gender, distribute the benefits among different groups, and arrive at an estimate of the incidence of per capita subsidies accruing to each group.

These steps can be illustrated by simple algebra as applied to the case of education spending. The total benefit from government spending at all education levels (i.e., the combined primary, secondary, tertiary, and other spending) accruing to group *j* is estimated as

$$X_{ij} = \frac{E_{ij}}{E_i} S_i = \frac{S_i}{E_i} E_{ij}$$

$$i = level\ of\ education\ j = \ population\ decile\ groups \qquad (1)$$

where E_{ij} represents the number of students enrolled in level *i* from group *j*, and S_i/E_i is the unit cost of providing education at level *i*[2]. Therefore, the total benefit from government expenditure at all levels of education accruing to group *j*[3] is

$$X_j = \sum_{i=1}^{n} X_{ij} \qquad (2)$$

Substituting equation (1) into equation (2), we can arrange it as follows:

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[2] Spending on education may occur at more than four levels, but we have focused on the four levels as in various other studies.

[3] Population is ranked from poorest to richest using per capita income, and aggregated into deciles.

$$X_j = \sum_{i=1}^{n} \frac{E_{ij}}{E_i} S_i = \sum_{i=1}^{n} \frac{S_i}{E_i} E_{ij} \quad (3)$$

The data used was obtained from the following government sources:

- The information on subsidies provided by the government to public education was obtained from the national health accounts for 2007/08 (Pakistan Bureau of Statistics).
- The PSLM dataset for 2007/08 was used to find out total household income.
- Data on current enrollments in Pakistan overall and in the four provinces was also obtained from the PSLM 2007/08 dataset.

5.1. Results

We calculate the number of students enrolled in each decile and the government subsidy for each income group (decile) both at the national and provincial level. The results are given in Tables 4–8. At the primary level of education, the share of the poorest 10 percent of the population is 12.18 percent while the share of the richest 10 percent is 4.14 percent in Pakistan overall (Table 4). The lowest income group receives greater benefit from public spending on primary education than the upper-income group. We observe that public spending at the primary level is beneficial mainly for the bottom four deciles. This means that the major share of the PKR 28.57 million spent by the government on primary education was shared by the poorest since most upper-income families prefer to send their children to private schools. We find, therefore, that public spending on primary education for Pakistan overall is pro-poor.

As Table 4 shows, for secondary education, the income-wise comparison shows that the share of the lowest decile in education expenditure is 7.69 percent, while that of the highest decile is 10.10 percent in Pakistan overall. Tertiary education expenditure is marked by large inequalities. The top decile received 37 percent, 65 percent of the total tertiary expenditure was shared by the upper three income deciles, and only 11 percent was shared by the bottom 30 percent of the population. In the 'other education' category of expenditure, the share of the different income deciles has no special pattern and seems either neutral or pro-poor.

Table 4: Enrolment and distribution of expenditure on education in Pakistan by level of education and income group, 2007/08

Income deciles (poorest to richest)	Primary			Secondary			Tertiary			Other		
	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*
1	1,103	12.18	28.57*	342	7.69	13.87*	95	5.11	104.81*	26	10.83	29.14*
2	1,137	12.56	29.46*	356	8.01	14.43*	80	4.31	88.26*	15	6.25	16.81*
3	1,066	11.78	27.62*	328	7.38	13.30*	48	2.58	52.96*	21	8.75	23.54*
4	1,157	12.78	29.97*	438	9.85	17.76*	93	5.01	102.60*	15	6.25	16.81*
5	987	10.90	25.57*	394	8.86	15.98*	83	4.47	91.57*	26	10.83	29.14*
6	1,008	11.13	26.11*	481	10.82	19.50*	105	5.65	115.84*	29	12.08	32.50*
7	867	9.58	22.46*	533	11.99	21.61*	147	7.91	162.18*	28	11.67	31.38*
8	737	8.14	19.09*	535	12.04	21.69*	187	10.06	206.31*	13	5.42	14.57*
9	616	6.80	15.96*	589	13.25	23.88*	327	17.60	360.77*	26	10.83	29.14*
10	375	4.14	9.71*	449	10.10	18.21*	693	37.30	764.57*	41	17.08	45.95*
Total	9,053	100.00	234.53*	4,445	100.00	180.23*	1,858	100.00	2,049.89*	240	100.00	269.00*

***Source**:* Authors' calculations based on PSLM (2007/08) household survey data.
Note: * Total education expenditures at the national level have been allocated to each income decile according to their share in total enrolment.

We also analyze the distribution of public spending on education and enrolment status at the provincial level. Per capita public expenditure on education is calculated by dividing total government expenditure allocated to the number of students enrolled at a particular education level (primary, secondary, tertiary, or other) by the total population *of each province*. Deciles are defined over population, i.e., across individuals. A strong assumption is being made here, that government expenditure on each level of education has been equally divided among students in each level of education and in each province. In other words, we assume that government expenditure per student is equal across all students enrolled in government schools in all provinces.

For Punjab (Table 5), at the primary level, the share of the lowest decile is 12.89 percent and the highest decile is 3.18 percent. This means that public spending on primary education for Punjab is also pro poor. This result supports the supply-side perspective that primary-level spending by the government benefits the poorest, and that the government should share the main responsibility for providing education at this level to those who cannot otherwise afford it. The market in general does not take care of the poorest of the poor.

At the secondary level, the share of lower-income groups in public expenditure is 7.42 percent while that of higher-income groups is 10.18 percent (Table 5). At the tertiary level, the share of the lowest decile is 3.99 percent, and that of the top decile is 36.36 percent. About 68 percent of the total tertiary expenditure is shared by the upper three income deciles, while the remaining 32 percent is shared by the lowest 70 percent of the population. The share of the lowest 60 percent of the population in 'other education' is 45 percent while 55 percent is shared by the upper four deciles. The poorest decile received PKR 7.58 million of government spending on primary education, while the richest decile received only PKR 1.87 million out of the total PKR 58.28 million spent by the government on primary education in 2007/08. On the other hand, out of PKR 1,237.10 million of government spending on tertiary education, only PKR 49.30 million was allocated to the poorest decile while the richest decile received PKR 449.86 million.

Table 5: Enrolment and distribution of expenditure on education in Punjab by level of education and income group, 2007/08

Income deciles (poorest to richest)	Primary			Secondary			Tertiary			Other		
	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*
1	417	12.89	7.58*	132	7.42	0.21*	32	3.99	49.30*	4	5.71	3.68*
2	407	12.58	7.40*	139	7.82	0.22*	32	3.99	49.30*	4	5.71	3.68*
3	451	13.94	8.20*	135	7.59	0.22*	19	2.37	29.27*	3	4.29	2.76*
4	442	13.66	8.03*	150	8.44	0.24*	21	2.62	32.35*	3	4.29	2.76*
5	364	11.25	6.62*	164	9.22	0.27*	37	4.61	57.00*	5	7.14	4.60*
6	339	10.48	6.16*	187	10.52	0.30*	42	5.23	64.71*	13	18.57	11.95*
7	292	9.02	5.31*	207	11.64	0.33*	71	8.84	109.38*	9	12.86	8.27*
8	239	7.39	4.34*	290	16.31	0.47*	123	15.32	189.49*	5	7.14	4.60*
9	182	5.62	3.31*	193	10.85	0.31*	134	16.69	206.44*	10	14.29	9.19*
10	103	3.18	1.87*	181	10.18	0.29*	292	36.36	449.86*	14	20.00	12.87*
Total	3,236	100.00	58.82*	1,778	100.00	2.87*	803	100.00	1,237.10*	70	100.00	64.35*

Source: Authors' calculations based on PSLM (2007/08) household survey data.
Note: * Total education expenditures at the national level have been allocated to each income decile according to their share in total enrolment.

For Sindh, (Table 6), the share of the lowest and highest deciles is 13.07 and 4.07 percent, respectively, in primary education. About 71 percent of the total expenditure on primary education is shared by 60 percent of the (low-income) population while 29 percent is shared by the highest 40 percent of the population. At the secondary level, the topmost decile receives 8.22 percent and the lowest decile receives 5.93 percent. The tertiary level is marked by the largest inequality in public spending, such that the lowest decile receives 4.65 percent and a 38.48 percent share is received by the highest decile. In the 'other education' category, the share of the lowest and highest deciles is 11.36 and 11.36 percent, respectively.

Table 6: Enrolment and distribution of expenditure on education in Sindh by level of education and income group, 2007/08

	Primary			Secondary			Tertiary			Other		
Income deciles (poorest to richest)	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*
1	279	13.07	11.39*	57	5.93	3.00*	22	4.65	25.77*	5	11.36	21.27*
2	294	13.77	12.01*	78	8.12	4.10*	12	2.54	14.06*	1	0.00	0.00*
3	256	11.99	10.45*	83	8.64	4.36*	14	2.96	16.40*	6	13.64	25.53*
4	303	14.19	12.37*	97	10.09	5.10*	22	4.65	25.77*	9	20.45	38.29*
5	162	7.59	6.62*	95	9.89	4.99*	28	5.92	32.80*	7	15.91	29.78*
6	215	10.07	8.78*	100	10.41	5.26*	25	5.29	29.29*	2	4.55	8.51*
7	192	8.99	7.84*	127	13.22	6.68*	35	7.40	41.00*	3	6.82	12.76*
8	192	8.99	7.84*	124	12.90	6.52*	49	10.36	57.41*	2	4.55	8.51*
9	155	7.26	6.33*	121	12.59	6.36*	84	17.76	98.41*	5	11.36	21.27*
10	87	4.07	3.55*	79	8.22	4.15*	182	38.48	213.22*	5	11.36	21.27*
Total	2,135	100.00	87.18*	961	100.00	50.52*	473	100.00	554.15*	44	100.00	187.20*

***Source**:* Authors' calculations based on PSLM (2007/08) household survey data.
Note: * Total education expenditures at the national level have been allocated to each income decile according to their share in total enrolment.

In KP (Table 7), 70 percent of the total primary education expenditure is shared by the lower six income deciles, while 30 percent is shared by the upper 40 percent of the population. KP's tertiary education spending is also highly unequal: Only 4 percent of students enrolled in tertiary education come from the bottom decile while 31 percent come from the top decile. The distribution of public spending on 'other education' has no fixed pattern: 51 percent of total public expenditure is shared by 50 percent of the upper-income population while 49 percent is shared by the lower 50 percent of the population.

In Balochistan (Table 8), 11.01 percent of primary education spending is shared by the bottom decile and 5.34 percent by the top decile. Secondary education expenditure is shared between the bottom and top deciles in the proportions 9.87 percent (upper-income) and 7.19 (lower-income), respectively. At the tertiary level, this share is 6.95 and 36.36 percent for the top and bottom deciles, respectively. The share in 'other education' is 14.06 percent for the lowest decile and 9.36 percent for the highest decile.

Table 7: Enrolment and distribution of expenditure on education in KP by level of education and income group, 2007/08

Income deciles (poorest to richest)	Primary			Secondary			Tertiary			Other		
	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*
1	220	11.90	7.93*	78	8.81	9.15*	18	4.56	6.71*	9	14.52	0.93*
2	212	11.47	7.64*	70	7.91	8.21*	27	6.84	10.07*	1	1.61	0.10*
3	218	11.80	7.86*	80	9.04	9.38*	17	4.30	6.34*	7	11.29	0.72*
4	215	11.63	7.75*	84	9.49	9.85*	14	3.54	5.22*	6	9.68	0.62*
5	197	10.66	7.10*	91	10.28	10.67*	37	9.37	13.80*	7	11.29	0.72*
6	223	12.07	8.04*	100	11.30	11.72*	28	7.09	10.44*	1	1.61	0.10*
7	159	8.60	5.73*	84	9.49	9.85*	24	6.08	8.95*	9	14.52	0.93*
8	187	10.12	6.74*	108	12.20	12.66*	48	12.15	17.90*	2	3.23	0.21*
9	143	7.74	5.16*	97	10.96	11.37*	59	14.94	22.00*	5	8.06	0.52*
10	74	4.00	2.67*	93	10.51	10.90*	123	31.14	45.87*	15	24.19	1.55*
Total	1,848	100.00	66.63*	885	100.00	103.76*	395	100.00	147.32*	62	100.00	6.39*

***Source**:* Authors' calculations based on PSLM (2007/08) household survey data.
Note: * Total education expenditures at the national level have been allocated to each income decile according to their share in total enrolment.

Table 8: Enrolment and distribution of expenditure on education in Balochistan by level of education and income group, 2007/08

Income deciles (poorest to richest)	Primary			Secondary			Tertiary			Other		
	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*	No. of students	% of total	Exp. on education (PKR million)*
1	202	11.01	2.41*	59	7.19	1.66*	13	6.95	7.74*	9	14.06	1.56*
2	260	14.18	3.10*	78	9.50	2.19*	8	4.28	4.76*	5	7.81	0.86*
3	161	8.78	1.92*	66	8.04	1.85*	11	5.88	6.55*	5	7.81	0.86*
4	203	11.07	2.42*	71	8.65	2.00*	7	3.74	4.17*	4	6.25	0.69*
5	203	11.07	2.42*	92	11.21	2.59*	9	4.81	5.36*	7	10.94	1.21*
6	182	9.92	2.17*	74	9.01	2.08*	10	5.35	5.95*	8	12.50	1.38*
7	179	9.76	2.14*	89	10.84	2.50*	19	10.16	11.31*	7	10.94	1.21*
8	181	9.87	2.16*	91	11.08	2.56*	12	6.42	7.14*	6	9.38	1.04*
9	165	9.00	1.97*	120	14.62	3.37	30	16.04	17.86*	7	10.94	1.21*
10	98	5.34	1.17*	81	9.87	2.28*	68	36.36	40.48*	6	9.38	1.04*
Total	1,834	100.00	21.90*	821	100.00	23.07*	187	100.00	111.32*	64	100.00	11.07*

***Source**:* Authors' calculations based on PSLM (2007/08) household survey data.
Note: * Total education expenditures at the national level have been allocated to each income decile according to their share in total enrolment.

Figures 3–6 show the benefit incidence of public spending on education using deciles for the four provinces of Pakistan. The figures also verify that government spending on primary education is pro poor in absolute terms since the concentration curve for primary education in each case lies above the diagonal or perfect equality (PE) line).

Figure 3: Distribution of government expenditure in Punjab on education and distribution of income

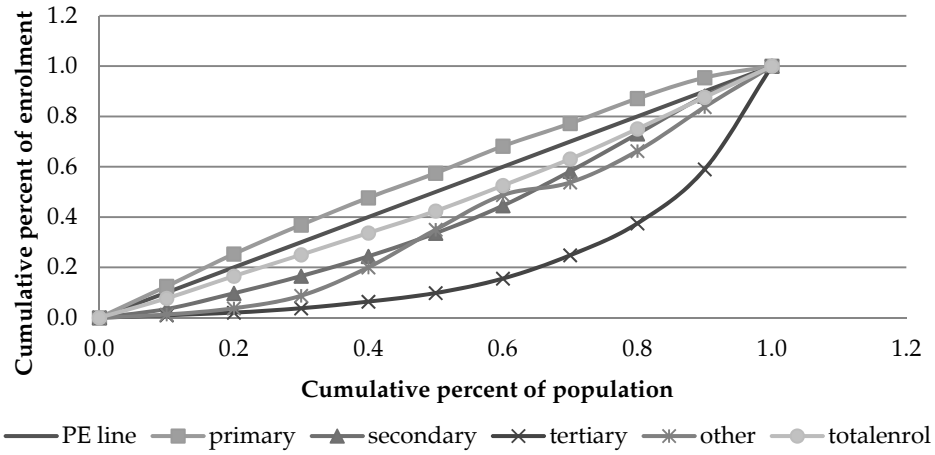


Figure 4: Distribution of government expenditure in Sindh on education and distribution of income

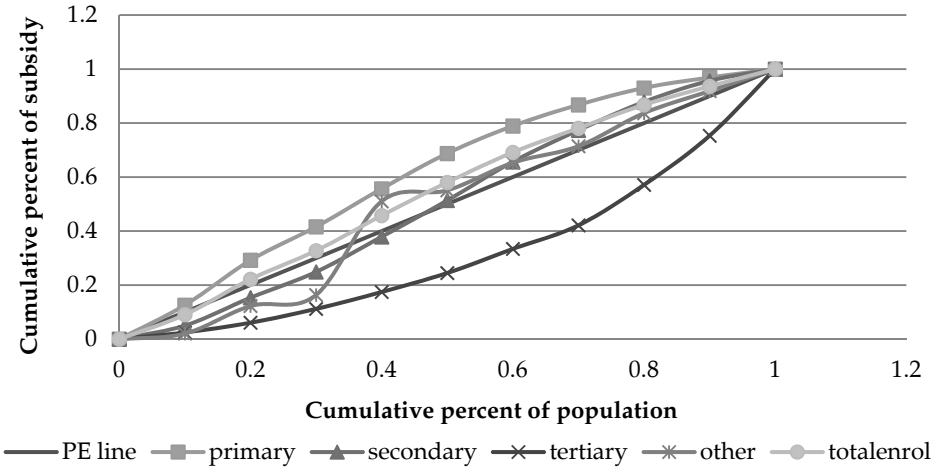


Figure 5: Distribution of government expenditure in KP on education and distribution of income

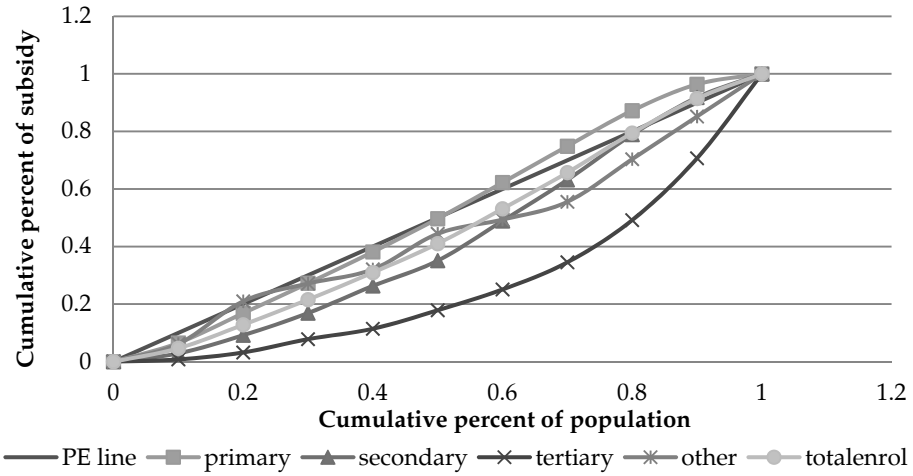
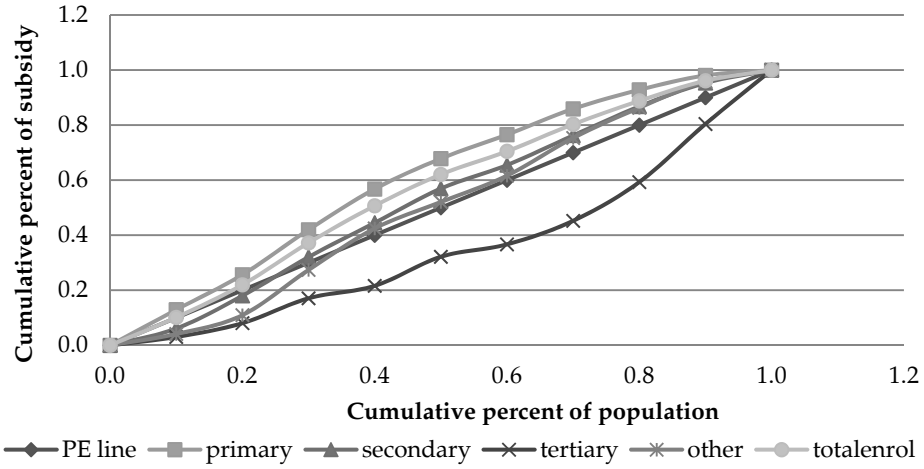


Figure 6: Distribution of government expenditure in Balochistan on education and distribution of income



Government spending at the tertiary level is, nonetheless, highly unequal, while expenditure in the secondary and 'other education' categories is generally neutral. The differences between the provinces may be because some have pursued their own policies to improve their public sector education programs more rigorously than others. In collaboration with international donor agencies, some provinces have tried to improve education for schoolchildren through a range of initiatives, from cash

stipends and low-cost private schools to more effective school councils over the last 10 years.

We have also calculated the concentration index and analyzed the data with a Lorenz curve (Table 9). As mentioned earlier, a negative concentration index value indicates that public spending is progressive, while a positive value indicates that it is regressive; a value close to 0 indicates neutrality. The table shows that primary education expenditure is pro-poor in all four provinces. Secondary education is progressive in Sindh and Balochistan, and neutral in Punjab and KP. Tertiary-level public spending is highly regressive in all four provinces. The 'other education' category shows a mixed response.

Table 9: Concentration index for all provinces for different education levels

Concentration index	Primary	Secondary	Tertiary	Other
Punjab	-0.2156	0.0969	0.4805	0.1575
Sindh	-0.3266	-0.1218	0.2607	-0.0980
KP	-0.1182	0.0536	0.3586	0.0173
Balochistan	-0.3170	-0.1629	0.1930	-0.1123

Source: Authors' calculations.

6. Conclusion and Recommendations

We have carried out a BIA for government expenditure on education (public sector) at the national and provincial level, using ungrouped or individual household survey data for 2007/08. Our results indicate that lower-income deciles have a large share of enrolment in basic education, whereas at higher levels of education, this predominance shifts to higher-income deciles. Government spending is progressive at the primary level of education, meaning that lower-income groups are its main beneficiaries—these results hold at the national and provincial level. Lower-income groups benefit least, however, from public spending on higher education, implying that government spending is regressive at the higher education level. Similar results hold at the provincial level.

Our results support the late Dr. Mahbubul Haq's point that the pattern of education spending in South Asia is inequitable because education subsidies are skewed toward upper-income groups, where a significant percentage of money is spent on university-level education (M.

Haq and Haq, 1998, p. 135). Their study implies that governments spend too little on the education of many (primary education) and too much on the education of few (university education).

We recommend that primary (preferably elementary) education be made compulsory and that education at the primary and secondary level be provided free of cost to all those who could not otherwise afford it. Technical education should be made generally available, and higher education should be accessible on the basis of merit. Society as a whole is at risk when people are poorly educated. Supply-side rather than demand-side policies should be adopted to provide education to the poorest of the poor. Such policies should aim to provide subsidies to the poor in the form of tuition fees, instructional materials, uniforms, and school meals, etc. Private markets generally fail to supply such goods and services to this income group, which is probably why Adam Smith focused on the public provision of education. Moreover, education is a merit-based good and a fundamental right. Governments, therefore, play a crucial role in providing education to all.

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Poverty, Income Inequality, and Growth in Pakistan: A Pooled Regression Analysis

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Abstract

This study estimates a set of fixed effects/random effects models to ascertain the long-run relationships between poverty, income inequality, and growth using pooled data from eight household income and expenditure surveys conducted between 1992/93 and 2007/08 in Pakistan. The results show that growth and inequality play significant roles in affecting poverty, and that the effect of the former is substantially larger than that of the latter. Furthermore, growth has a significant positive impact on inequality. The results also show that the absolute magnitude of net growth elasticity of poverty is smaller than that of gross growth elasticity of poverty, suggesting that some of the growth effect on poverty is offset by the rise in inequality. The analysis at a regional level shows that both the gross and net growth elasticity of poverty are higher in rural areas than in urban areas, whereas the inequality elasticity of poverty is higher in urban areas than in rural areas. At a policy level, we recommend that, in order to reduce poverty, the government should implement policies focusing on growth as well as adopting strategies geared toward improving income distribution.

Keywords: Poverty, inequality, growth, pooled data, Pakistan.

JEL Classification: I32, O40.

1. Introduction

Reducing poverty is a key objective of policymakers, and it has attracted increased attention since the Millennium Development Goals were adopted. Poverty depends on inequality and growth, but the relationships between poverty, income inequality, and growth are not simple. According to Kuznets' hypothesis (1955), inequality initially rises with growth, but then decreases as the benefits of growth trickle down to the poor. Deininger and Squire (1996), Ravallion and Chen (1997), and Dollar and Kraay (2002), however, argue that growth has no impact on inequality. Kaldor (1956), Li and Zou (1998), and Forbes (2000) show that

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inequality does lead to growth, but Alesina and Rodrick (1994) demonstrate that inequality affects growth adversely.

In Pakistan, only a few studies have attempted to estimate the long-run relationships between poverty, growth, and income distribution. Ali and Tahir (1999) cover the period 1963/64 to 1993/94 and Saboor (2004) looks only at rural Pakistan for the period 1990/91 to 2001/02. Both use ordinary least squares (OLS) regressions to estimate the relationships between the three variable in question using pooled data from the Household Income and Expenditure Surveys (HIES). The estimation of naïve OLS using pooled data seems problematic, however, since it fails to account for the variations in poverty, inequality, and growth across various regions of Pakistan.

A cursory examination of the data on poverty and inequality [Shown in Appendices 1, 2, and 3 reveals stark variations in the time-series estimates of poverty, Gini coefficients, and mean expenditure per adult-equivalent across various provinces and even between rural and urban areas of Pakistan. In reality, these regional differences in the levels of poverty and other social welfare measures reflect an underlying disparity in natural endowments and economic opportunities across various regions of Pakistan. To control and account for such differences, we employ panel data techniques—a fixed effects model and random effects model—to estimate the long-run relationships between poverty, inequality, and growth using pooled data from the Pakistan Bureau of Statistics' HIES conducted during 1992/93 to 2007/08.[1]

The paper is organized as follows. Section 2 describes the datasets and methodologies employed. The results are presented in Section 3, while Section 4 concludes the paper.

2. Data and Methodology

2.1. Datasets

This study uses eight household income and expenditure surveys for the survey years 1992/93, 1993/94, 1996/97, 1998/99, 2001/02, 2004/05, 2005/06, and 2007/08. The sample is representative at the national and provincial level with a rural/urban breakup. The detail of the households covered during the various surveys is given in Table 1.

[1] The HIES 2007/08 is the most recent survey available.

Table 1: Households covered across provinces over time in Pakistan

	Sample size (number of households)							
Year	**Pr**	**Pu**	**Sr**	**Su**	**Nr**	**Nu**	**Br**	**Bu**
1993	4,078	2,517	2,039	1,570	1,802	876	1,087	623
1994	4,034	2,508	2,046	1,579	1,815	890	1,141	655
1997	3,805	2,578	2,031	1,370	1,840	841	1,138	658
1999	3,729	2,531	2,172	1,532	1,844	848	1,138	658
2002	3,768	2,542	2,173	1,533	1,825	840	1,403	621
2005	3,605	2,510	1,980	1,497	1,878	1,087	1,434	713
2006	3,890	2,788	2,104	1,664	1,899	1,049	1,310	733
2008	3,849	2,751	2,093	1,670	1,883	1,048	1,408	766

Note: Pr = rural Punjab, Pu = urban Punjab, Sr = rural Sindh, Su = urban Sindh, Nr = rural NWFP, Nu = urban NWFP, Br = rural Balochistan, Bu = urban Balochistan.
Source: Pakistan Bureau of Statistics, Household Income and Expenditure Surveys.

This study uses the poverty, inequality, and growth estimates calculated from these surveys (given in Appendices 1, 2, and 3) to find the long-run relationships between them. A set of descriptive statistics is presented in Table 2.

Table 2: Descriptive statistics

Variable	Observations	Mean	Std. dev.	Minimum	Maximum
Headcount	64	28.59	9.85	8.95	57.05
Gini	64	26.29	5.07	18.83	37.61
Mean exp*	64	1,024.63	204.64	694.74	1,468.72

Note: Mean exp. = mean expenditure per adult-equivalent.
Source: Authors' calculations.

2.2. Methodology

In order to obtain poverty, inequality, and growth estimates, we employ the same methodology used by Cheema (2010) and Cheema and Sial (2010), i.e., a calorie-based approach that takes expenditure as a welfare indicator to estimate the poverty line with the help of which the headcount ratio is calculated. The headcount index calculates the proportion of the population whose consumption is below the poverty line, z, estimated below:

$$H = q/N$$

where H is the headcount ratio, q is the number of poor, and N is the size of the population. This is direct and easy to calculate and is the most widely used poverty measure.

We estimate inequality using the Gini coefficient, defined as the ratio of the area between the diagonal and the Lorenz curve to the total area of the half-square in which the curve lies (Todaro & Smith, 2002) (see Appendix 4). The lower the value of the Gini coefficient, the more equal the distribution of income; the higher the value of the Gini coefficient, the more unequal the distribution of income. A 0 value indicates perfect equality (every person has equal income) and a value of 1 shows perfect inequality (one person has all the income). The Gini coefficient satisfies the four axioms of the Pigou-Dalton transfer principle,[2] income scale independence,[3] principle of population,[4] and anonymity.[5]

Per capita income calculated from estimates of gross national product (GNP) and population are often used as a proxy for growth. However, in order to maintain consistency in our analysis, we estimate mean expenditure per adult-equivalent as an indicator of growth calculated from the sample surveys from which poverty and inequality measures have been estimated.

The methodology employed to estimate the long-run relationships between poverty, inequality, and growth is discussed below.

2.2.1. *Measuring the Relationships between Poverty, Income Inequality, and Growth*

In order to determine the relationships between poverty, income inequality, and growth, Ravallion and Datt (1992) decompose changes in poverty into growth and inequality effects. This decomposition sheds light on the relationships between two surveys. There is a residual in this decomposition. Kakwani (1997), however, separates the exact decomposition of the poverty changes into inequality and growth effects in the sense that there is no residual. This decomposition is also made between two surveys.

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[2] An income transfer from a person who is poorer to a person who is richer should show a rise (or at least not a fall) in inequality and vice versa.
[3] The inequality measure should be invariant to equal proportional changes.
[4] The inequality measure should be invariant to a replication of the population: If two identical distributions are merged, it should not change the inequality.
[5] The inequality measure is independent of individuals' any characteristics other than their income.

Ali and Tahir (1999) and Saboor (2004) estimate OLS regressions to determine the long-run relationships between these three variables using pooled data on Pakistan. The first study estimates the relationship from 1963/64 to 1993/94, using 14 HIES datasets comprising 28 observations (two observations, i.e., urban and rural from each survey). The second study estimates the same from 1990/91 to 2001/02, including seven HIES datasets using 28 observations (one observation for each of the four provinces in each survey for rural Pakistan).

Ravallion and Chen (1997), Adams (2004), and Ram (2007) estimate OLS regressions to determine the long-run relationship between poverty, income inequality, and growth using cross-country data. The first two studies show that growth plays a key role in reducing poverty; the third shows that the elasticity of poverty with respect to growth is smaller than the elasticity of poverty with respect to inequality. Wodon (1999) and Lombardo (2008) estimate fixed effects and random effects models using pooled data on Bangladesh and Italy, respectively, and find that the growth elasticity of poverty is larger than the inequality elasticity of poverty. Wodon shows that the net growth elasticity of poverty is smaller than the gross elasticity of poverty with reference to growth. Deolalikar (2002) also estimates a fixed effects model using pooled data on Thailand; the study's results reveal that the inequality elasticity of poverty is larger than the growth elasticity of poverty.

Wu, Perloff, and Golan (2006) estimate a random effects model using pooled data for 50 US states for the period 1991 to 1997, to determine the role of taxes, transfers, and welfare programs on income inequality. They show that taxes play a more important role in redistributing income in urban than in rural areas, while transfers and welfare programs are more effective in rural areas than in urban areas. Fosu (2009) estimates a random effects model to find out how inequality affects the impact of income growth on the rate of poverty change in sub-Saharan Africa (SSA) compared to non-SSA, based on an unbalanced panel of 86 countries over 1977–2004. The study shows that the impact of GDP growth on poverty reduction is a decreasing function of initial inequality. Income growth elasticity is substantially less for SSA. Janjua and Kamal (2011) also estimate a random effects model to examine the impact of growth and education on poverty using a panel dataset for 40 developing countries for the period 1999 to 2007. Their study shows that growth plays a moderately positive role in poverty reduction, but that income distribution did not play a key role in alleviating poverty in the sample overall. The study also shows that the most significant contributor to poverty alleviation was education.

There are significant differences among the provinces, and even between urban and rural areas in Pakistan. Hence, we apply two panel data techniques: a fixed effects model and a random effects model. First, we estimate a two-way fixed effects model (TWFEM), i.e., across group and over time, and conduct an F-test to find out whether it is applicable. The null hypothesis states that both dummy parameters—group and time—are equal to 0. The study rejects the hypothesis in favor of the fixed effects model. Next, we estimate a two-way random effects model (TWREM)—again, across group and over time—and conduct a Breusch-Pagan LM test to ascertain whether it can be applied. The null hypothesis states that the variance across group and time is equal to 0. The study rejects the hypothesis in favor of the random effects model.

The Hausman specification test is applied to choose the better of the two models: the TWFEM or the TWREM. The null hypothesis is that the more efficient estimates from the TWREM are also consistent. The study fails to reject the null hypothesis at the 5 percent level of significance, rendering the estimates from the TWREM statistically preferable. However, the TWFEM is also estimated to give further credibility to the empirical results. The models are estimated as follows:

$$\ln(Poverty_{it}) = \beta_0 + \beta_1 \ln(Gini_{it}) + \beta_2 \ln(average\ expenditure_{it}) + u_i + \gamma_t + \varepsilon_{it}$$

$$H_0 : \beta_1 = \beta_2 = 0$$

$$H_1 : \beta_1 > 0 \,\&\, \beta_2 < 0$$

where (i) $i = 1 \ldots N$ refers to the cross section of the provinces, (ii) $t = 1 \ldots T$ refers to the number of years, (iii) $poverty_{it}$ denotes the headcount ratio in province i in year t, (iv) $Gini_{it}$ denotes the Gini coefficient in province i in year t, (v) $average\ expenditure_{it}$ denotes the average expenditure in province i in year t, (vi) μ_i represents area fixed or random effects, (vii) γ_t is a time-specific factor, and (viii) ε_{it} is an error term such that $\varepsilon_{it} \sim IID$ (0, σ^2 for all i and t).

2.2.2. *Measuring the Impact of Growth on Inequality*

During the growth process, inequality may increase or decrease, which in turn affects poverty adversely or favorably. Thus, it is essential to determine the relationship between growth and inequality so that a proper policy can be chalked out if growth is causing inequality to increase. All the relevant tests indicate that the TWFEM is the best model to use. However, as mentioned above, the TWREM is also estimated to check for robustness.

$$\ln(Gini_{it}) = \beta_0 + \beta_1 \ln(Average\ expenditure_{it}) + u_i + \Upsilon_t + \varepsilon_{it}$$
$$H_0 : \beta_1 = 0$$
$$H_1 : \beta_1 \neq 0$$

All the variables have been defined as discussed above.

2.2.3. Measuring the Net Impact of Growth on Poverty in Pakistan

Although the elasticity of poverty with respect to growth is always negative when inequality is fixed, it is possible that inequality may increase or decrease during the growth process. If inequality rises, it will affect poverty adversely and, hence, some of the growth impact on poverty may be lost. However, if inequality declines, it will reinforce the growth impact on poverty and, resultantly, poverty will decrease more than if inequality were to remain unchanged. So, it is essential that we estimate the net growth impact on poverty while allowing inequality to change. In this case, all the relevant tests suggest that a TWREM is the better choice. However, a TWFEM is also estimated to check for robustness.

$$\ln(Poverty_{it}) = \beta_0 + \beta_1 \ln(average\,expenditure_{it}) + u_i + \gamma_t + \varepsilon_{it}$$
$$H_0 : \beta_1 = 0$$
$$H_1 : \beta_1 < 0$$

All the variables are explained above. There is, however, another way of estimating the net growth elasticity of poverty:

$\lambda = \gamma + \beta\delta$ (Wodon, 1999)

where γ = gross elasticity of poverty in terms of headcount ratio with respect to growth while keeping inequality constant, that is, estimated in the model given in Section 2.2.1 (β_2 in the model); β = elasticity of inequality with respect to growth, that is, estimated in the model in Section 2.2.2 (β_1 in the model); and δ = elasticity of poverty with respect to inequality while holding growth fixed, that is, estimated in the model given in Section 2.2.1 (β_1 in the model).

3. Results and Discussion

Economic growth helps raise the income of the population, and is, therefore, a necessary condition for poverty reduction, but it is not a sufficient condition. It is possible for inequality to increase during the

growth process, and if this happens, the poor will benefit less than the nonpoor. If, however, inequality decreases, growth will be pro-poor (Kakwani & Pernia, 2000). If growth causes inequality to rise sharply, poverty may increase instead of decreasing because the adverse impact of the rising inequality will offset the favorable impact of growth, which implies that the inequality effect dominates the growth effect. Bhagwati (1988) calls this situation "immiserising" growth. Hence, it is instructive to ascertain the separate impact of growth and inequality on poverty.

3.1. Relationships between Poverty, Inequality, and Growth

The elasticity of poverty with respect to growth, while holding inequality fixed, is called the gross growth elasticity of poverty; it indicates the percentage change in poverty due to a 1 percent change in mean expenditure, keeping inequality constant. To find the relationship between poverty, inequality, and growth in the long run, all the relevant tests (the results of the F-test, Breusch-Pagan LM test, and Hausman specification test are reported in Appendix 5) indicate that the TWREM is the better choice. Table 3 gives the results of the TWREM; the results of the TWFEM (see Appendix 5) are very similar to those of the TWREM. We apply a series of diagnostic tests to find any autocorrelation and heteroskedasticity, the results of which are also presented in Appendix 5.

Table 3: Relationships between poverty, income inequality, and growth

Variables	Pakistan	Rural Pakistan	Urban Pakistan
Constant	16.56	21.39	10.89
	(5.82)*	(28.93)	(2.34)**
Inequality (δ)	0.85	0.92	1.05
	(2.05)**	(6.94)	(2.34)**
Growth (γ)	-2.33	-3.07	-1.63
	(-4.04)*	(-25.42)	(-2.06)**
Diagnostic tests			
Autocorrelation	0.44	2.17	1.16
Wooldridge	(0.53)	(0.24)	(0.36)
(p-value)			
Heteroskedasticity	120.91	0.73	49.14
Lr test	(0.00)	(0.99)	(0.00)
(p-value)			

Notes: T-values in parentheses are based on heteroskedasticity-corrected standard error (Arellano, 1987) in case of an indication of heteroskedasticity. * = significant at 0.01 level, ** = significant at 0.05 level. Headcount ratio is a dependent variable. Wooldridge test shows that there is no autocorrelation.
Source: Authors' calculations.

Table 3 shows that all the coefficients have the expected signs. The results show that growth has a significant, strong negative relationship with poverty, keeping inequality fixed, whereas inequality has a significant positive relationship with poverty, holding growth constant. The results for the gross growth elasticity of poverty reveal that a 1 percent rise in average expenditure while holding inequality fixed decreases the incidence of poverty by 2.33 percent. The table also shows that a 1 percent rise in inequality in expenditure, keeping mean expenditure constant, raises the headcount ratio by 0.85 percent. The results imply that the growth elasticity of poverty is substantially larger than the inequality elasticity of poverty.

The analysis at a rural-urban level shows that the growth elasticity of poverty is higher in rural areas than in urban areas, while the inequality elasticity of poverty is higher in urban areas than in rural areas. The results indicate that a 1 percent increase in mean expenditure reduces poverty by almost 3 percent, holding inequality constant; in urban areas, it decreases poverty by about 1.63 percent. The results for the inequality elasticity of poverty show that a 1 percent increase in inequality increases rural poverty by 0.92 percent, and urban poverty by about 1 percent.

3.2. Comparison of Results with Other Studies

Unlike our results for the period 1993/94 to 2007/08, Saboor (2004) shows that the inequality elasticity of poverty dominated the growth elasticity of poverty during 1990/91 to 2001/02 in rural Pakistan. This is because Saboor's study estimates relationships for rural areas during the 1990s, during which the poverty levels we estimated increased in rural Pakistan over the entire period (i.e., 1990/91 and 2001/02) except between 1993/94 and 1995/96. Inequality followed a similar trend over the entire period except between 1990/91 and 1992/93. So, the inequality elasticity of poverty (i.e., 0.31), while holding growth constant, was dominant over the growth elasticity of poverty (-0.27), while keeping inequality fixed, in rural Pakistan.

Our study estimates the relationship between these variables for the 1990s and 2000s for rural, urban, and overall Pakistan. During the latter period, poverty decreased continuously in all three regions. Additionally, although inequality increased during the major part of the period under consideration, there were some periods (i.e., 1993/94 and 1996/97, 1998/99 and 2001/02, 2005/06 and 2007/08) during which inequality decreased. These inequality estimates are consistent with those of the Government of Pakistan (2003). As a result, the growth elasticity of poverty (-3.03), holding

inequality unchanged, dominated the inequality elasticity of poverty (0.92), keeping growth constant, in rural Pakistan.

Ali and Tahir (1999) show that the inequality elasticity of poverty (1.67) is greater than our results (0.89) at the national level, although both studies show that it is higher in urban areas than in rural areas. The figures given are 1.58 percent in urban areas, and 0.89 percent in rural areas for the period 1963/64 to 1993/94; and 1.05 percent and 0.92 percent in urban and rural areas, respectively, during 1993/94 and 2007/08. The inequality elasticity of poverty (1.67) dominated the growth elasticity of poverty (-0.32) according to Ali and Tahir (1999) during 1963/64 and 1993/94, which is opposite to our results, in which the growth elasticity of poverty (-2.33) is greater than the inequality elasticity of poverty (0.85) estimated for the period 1992/93 to 2007/08.

The reasons are that from 1963-64 up to 19 71-72 there was an increasing trend in poverty. After this, a decreasing trend was observed up to 1984-85. After this, it started to increase again up to 1992-93. As far as inequality is concerned, for the period covered by Ali and Tahir (1999), inequality consistently increased except for the period 1963-64 to 19971-72. As a result, the inequality elasticity of poverty dominated the growth elasticity of poverty.

3.3. Relationship between Inequality and Growth

During the growth process, inequality may increase, decrease or remain constant. It is expected to have a positive relationship with poverty. The difference between gross growth and net growth elasticity is due to rising inequality. So, it is instructive to determine the relationship between inequality and economic growth. The results of the TWFEM, which is the statistically preferred model according to the relevant tests (see Appendix 6), are given in Table 4, while the results of the TWREM and diagnostic tests are given in Appendix 6.

Table 4: Relationship between inequality and growth

Variables	Pakistan	Rural Pakistan	Urban Pakistan
Constant	1.97	1.81	2.04
	(3.23)*	(1.62)	(2.92)*
Growth (γ)	0.18	0.18	0.19
	(2.06)**	(1.08)	(1.96)***
Diagnostic tests			
Autocorrelation	0.14	2.82	0.34
Wooldridge	(0.72)	(0.19)	(0.60)
(p-value)			
Heteroskedasticity	5.73	1.21	3.12
Lr test	(0.57)	(0.99)	(0.87)
(p-value)			

Notes: T-values are given in parentheses. *, **, and *** denote statistical significance at 0.01, 0.05, and 0.1 levels, respectively. The Gini coefficient is the dependent variable. Wooldridge and lr tests indicate that neither autocorrelation nor heteroskedasticity exist.
Source: Authors' calculations.

The table shows that an increase in expenditure has a significant positive impact on inequality. A 1 percent rise in average expenditure increases inequality in expenditure by about 0.18 percent. The results for rural areas show that, although the coefficients have the expected signs, they are not statistically significant. Those for urban areas, however, have the expected signs and are also statistically significant at a 0.06 level.

3.4. Comparison of Results with Other Studies

Our results are consistent with those of Ali and Tahir (1999) with respect to the variables' signs, but there are differences with regard to magnitude. Our estimated magnitude of growth elasticity of inequality (0.18) for the period 1993/94 and 2007/08 is greater than that of Ali and Tahir for the period between 1963/64 and 1993/94 (0.04). It is possible for growth to have affected inequality more adversely during the period we have considered than that studied by Ali and Tahir.

3.5. Net Elasticity of Poverty to Growth

The gross growth elasticity of poverty shows the percentage change in poverty due to a 1 percent change in mean income, keeping inequality fixed. It is quite possible, however, that inequality may increase or decrease during the growth process. Thus, it is essential to estimate the net elasticity

of poverty to growth, which indicates the percentage change in poverty due to a 1 percent change in mean income. The results of the TWREM, the statistically preferred model according to the relevant tests (see Appendix 7), are presented in Table 5. The results of the fixed effects model, which are similar to those of the TWREM, are given in Appendix 7.

The results of the second method (see Section 2.2.3) are presented in Appendix 8, and are consistent with the results estimated by the fixed effects and random effects models.

Table 5: Relationship between poverty and growth

Variables	Pakistan	Rural Pakistan	Urban Pakistan
Constant	16.19	22.45	12.23
	(3.49)*	(19.88)*	(2.95)*
Growth (γ)	-1.90	-2.80	-1.32
	(-2.86)*	(-6.82)*	(-2.29)**
Diagnostic tests			
Autocorrelation	0.96	0.03	3.95
Wooldridge	(0.36)	(0.87)	(0.14)
(p-value)			
Heteroskedasticity	46.77	6.47	30.48
Lr test	(0.00)	(0.49)	(0.00)
(p-value)			

Notes: T-values in parentheses are based on heteroskedasticity-corrected standard error (Arellano, 1987)) in case of an indication of heteroskedasticity. * = significant at 0.01 level, ** = significant at 0.05 level. Headcount ratio is a dependent variable. Wooldridge test shows that there is no autocorrelation.
Source: Authors' calculations.

The table shows that growth has a highly significant negative impact on poverty when we do not control for inequality. A 1 percent increase in average expenditure decreases poverty incidence by 1.88 percent in Pakistan. A comparison of the gross and net growth elasticities of poverty shows that the absolute magnitude of net growth elasticity of poverty (|-1.88|) is smaller than that of the gross growth elasticity of poverty (|-2.33|), implying that some of the effect of growth on poverty is lost due to the rise in inequality.

At the regional level, our analysis shows that the net growth elasticity of poverty is higher in rural areas than in urban areas. The results

show that a 1 percent increase in mean expenditure decreases rural poverty by 2.80 percent and urban poverty by 1.32 percent.

3.6. Comparison of Results with Other Studies

The signs of the coefficients of the present study and Saboor (2004) are consistent, but the magnitude of the coefficient (-2.80) estimated by the present study is greater than that (-0.25) of the latter study. These results of this study are also consistent with those of Ali and Tahir (1999). According to both studies growth elasticity of poverty is greater in rural areas as compared to that in urban areas. But the magnitude of the elasticity (-1.90) at national level is greater in the present study than that (-0.29) of Ali and Tahir (1999) which means that the growth has contributed more to the reduction of poverty during this period (1993-94 and 2007-08) than that period (i.e., 1963-64 and 1993-94).

4. Conclusion

This study has estimated a series of TWREMs and TWFEMs to determine the long-run relationship between poverty, income inequality, and growth, using pooled data from eight HIES datasets compiled between 1992/93 and 2007/08 in Pakistan. The results show that growth contributes far more towards reducing poverty, keeping inequality constant, than the latter does to increasing poverty, holding the former constant. The regional-level analyses reveals that the growth elasticity of poverty is higher in rural areas than in urban areas, but that the inequality elasticity of poverty is higher in urban areas than in rural areas.

There is a significant positive relationship between inequality and growth in Pakistan. The results at the rural-urban level show that the growth elasticity of inequality is higher in urban areas than in rural areas. Further, the absolute magnitude of the net elasticity of poverty to growth is smaller than that of the gross elasticity of poverty to growth, implying that some of the growth effect on poverty is offset by the increase in inequality. This is equality valid in rural and urban areas. The net growth elasticity of poverty is higher in rural areas than in urban areas.

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Appendix 1: Table A1: Headcount ratio across provinces over time in Pakistan

Region	1993	1994	1997	1999	2002	2005	2006	2008
Pr	25.48	33.97	28.74	34.24	35.85	27.89	26.67	19.06
Pu	21.28	18.29	17.38	23.69	23.41	16.26	12.96	10.45
Sr	28.64	32.14	20.20	33.13	45.02	23.87	32.20	23.02
Su	16.68	12.19	12.10	15.09	20.01	11.14	11.11	8.95
Nr	35.04	40.35	43.96	42.93	43.39	34.80	31.02	19.20
Nu	24.48	26.90	28.12	25.89	29.10	22.10	24.81	13.17
Br	26.21	38.14	43.21	20.93	37.74	28.85	57.05	55.21
Bu	30.43	16.96	23.26	22.78	26.18	18.78	33.74	26.87

Pr = Punjab rural, Pu = Punjab urban, Sr = Sindh rural, Su = Sindh urban, Nr = NWFP rural, Nu = NWFP urban, Br = Balochistan rural, Bu = Balochistan urban.

Appendix 2: Table A2: Gini coefficient across provinces over time in Pakistan

Region	1993	1994	1996/97	1999	2002	2005	2006	2008
Pr	24.48	25.06	23.89	25.79	24.92	26.86	24.70	26.85
Pu	32.61	31.77	29.36	37.61	31.09	34.00	35.05	31.29
Sr	24.82	21.75	18.88	24.76	21.81	22.18	20.73	19.65
Su	30.63	29.46	27.97	33.50	34.65	33.83	34.24	33.83
Nr	19.52	18.83	20.05	23.99	21.28	22.90	24.15	23.20
Nu	29.86	29.12	26.27	35.24	27.54	32.12	33.64	32.41
Br	19.90	20.01	19.40	22.68	19.26	21.94	23.08	19.22
Bu	23.37	22.48	22.89	25.84	24.36	27.51	25.51	26.71

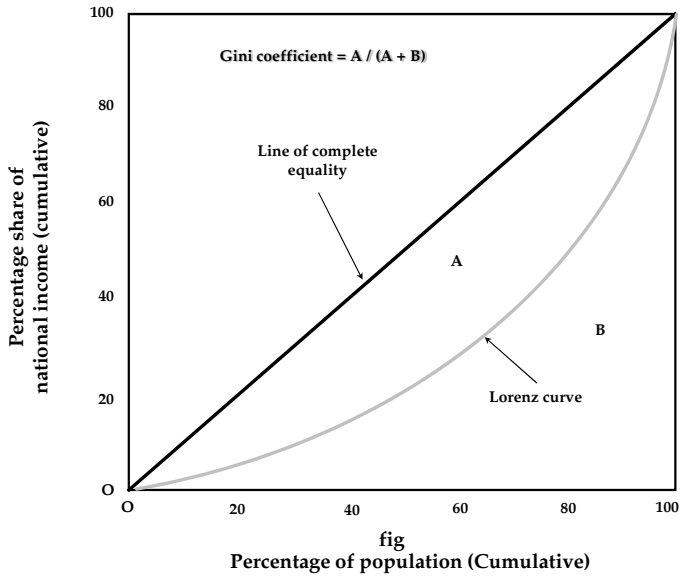
Pr = Punjab rural, Pu = Punjab urban, Sr = Sindh rural, Su = Sindh urban, Nr = NWFP rural, Nr = NWFP urban, Br = Balochistan rural, Bu = Balochistan urban.

Appendix 3: Table A3: Mean expenditure per adult-equivalent across provinces over time in Pakistan

Region	1993	1994	1997	1999	2002	2005	2006	2008
Pr	986.42	901.01	918.12	900.77	882.62	985.49	1,012.16	1,116.61
Pu	1,195.58	1,209.28	1,179.67	1,304.30	1,120.30	1,347.58	1,453.65	1,437.19
Sr	937.22	863.45	921.07	887.49	766.09	939.89	855.24	913.59
Su	1,220.54	863.45	1,250.94	1,325.89	1,260.13	1,459.72	1,439.44	1,468.72
Nr	827.52	781.25	774.40	813.79	792.90	861.38	921.18	1,017.31
Nu	1,075.18	1,057.52	977.18	1,175.14	1,004.39	1,183.28	1,182.37	1,322.61
Br	893.54	802.08	763.31	981.96	805.74	880.54	694.74	695.05
Bu	917.23	1,016.13	971.89	1,042.67	980.95	1,144.91	910.63	983.58

Pr = Punjab rural, Pu = Punjab urban, Sr = Sindh rural, Su = Sindh urban, Nr = NWFP rural, Nu = NWFP urban, Br = Balochistan rural, Bu = Balochistan urban.

Appendix 4



fig

Appendix 5: Table A4: Relationships between poverty, income inequality, and growth

	Pakistan		Rural Pakistan		Urban Pakistan	
Variables	**FE^**	**RE**	**FE**	**RE^**	**FE**	**RE^**
Constant	16.56	14.26	21.76	21.39	7.15	10.89
	(5.82)*	(3.25)	(27.85)*	(28.39)*	(1.55)	(2.34)**
Inequality (δ)	0.85	0.98	0.84	0.92	1.63	1.05
	(2.05)**	(3.88)	(6.05)*	(6.94)*	(4.69)*	(2.34)**
Growth (γ)	-2.33	-2.08	-3.09	-3.07	-1.37	-1.63
	(-4.04)*	(-3.12)	(-5.42)*	(-25.22)	(-1.90)***	(-2.06)**
F-test/Breusch-Pagan LM test P-value	2.77	4.08	4.63	2.90	5.07	6.03
	(0.00)	(0.04)	(0.01)	(0.09)*	(0.00)	(0.01)
Hausman specification test (p-value)	4.79 (0.09)		1.97 (0.37)		0.89 (0.35)	
Diagnostic tests						
Autocorrelation Wooldridge (p-value)	0.44		2.17		1.16	
	(0.53)		(0.24)		(0.36)	
Heteroskedasticity Lr test (p-value)	120.91		0.73		49.14	
	(0.00)		(0.99)		(0.00)	

Notes: T-values in parentheses are based on heteroskedasticity-corrected standard error (Arellano, 1987). * = significant at 0.01 level. FE = fixed effects model, RE = random effects model. Headcount ratio is a dependent variable. ^ denotes preferred model on the basis of statistical tests.

Appendix 6: Table A5: Relationship between income inequality and growth

	Pakistan		Rural Pakistan		Urban Pakistan	
Variables	**FE**	**RE ^**	**FE^**	**RE**	**FE**	**RE^**
Constant	1.97	0.59	1.81	0.94	2.35	2.04
	(3.23)*	(1.02)	(1.62)	(0.95)	(2.98)**	(2.92)*
Growth (β)	0.18	0.39	0.18	0.32	0.13	0.19
	(2.06)**	(4.61)*	(1.08)	(2.16)*	(1.12)	(1.96)***
F-test/Breusch-Pagan LM test (P-value)	9.57 (0.00)	2.90 (0.09)	3.05 (0.02)	1.69 (0.19)	8.15 (0.00)	5.81 (0.02)
Hausman specification test (P-value)	65.57 (0.00)		3.42 (0.06)		1.45 (0.23)	
Diagnostic tests						
Autocorrelation Wooldridge (P-value)	0.137 (0.72)		2.82 (0.19)		0.34 (0.60)	
Heteroskedasticity Lr test (P-value)	5.73 (0.57)		1.21 (0.99)		3.12 (0.87)	

Notes: T-values are given in parentheses. * = significant at 0.01 level. Headcount ratio is a dependent variable. FE = fixed effects model, RE = random effects model. ^ denotes preferred model on the basis of statistical tests.

Appendix 7: Table A6: Relationship between poverty and growth

	Pakistan		Rural Pakistan		Urban Pakistan	
Variables	**FE**	**RE ^**	**FE**	**RE ^**	**FE**	**RE^**
Constant	16.19	16.21	22.85	22.45	11.00	12.23
	(3.49)*	(11.81)	(18.26)*	(19.88)*	(2.12)**	(2.95)*
Growth (β)	-1.90	-1.88	-2.88	-2.80	-1.16	-1.32
	(-2.86)*	(-9.60)	(-5.56)*	(-6.82)*	(-1.57)	(-2.29)**
F-test/Breush-Pagan LM test P-value	3.27 (0.00)	8.75 (0.00)	4.81 (0.00)	11.74 (0.00)	(4.43) (0.00)	6.75 (0.01)
Hausman specification test (P-value)	0.01 (0.92)		0.96 (0.33)		0.15 (0.70)	
Diagnostic tests						
Autocorrelation Wooldridge (p-value)	0.96 (0.36)		0.034 (0.87)		3.95 (0.14)	
Heteroskedasticity Lr test (p-value)	46.77 (0.00)		6.47 (0.49)		30.48 (0.00)	

Notes: T-values in parentheses are based on heteroskedasticity-corrected standard error (Arellano, 1987). * = significant at 0.01 level. Headcount ratio is a dependent variable. FE = fixed effects model, RE = random effects model. ^ denotes preferred model on the basis of statistical tests.

Appendix 8: Table A7: Net growth elasticity of poverty in rural, urban, and overall Pakistan

Variables	**Pakistan**	**Rural Pakistan**	**Urban Pakistan**
Gross growth elasticity of poverty (γ)	-2.33 (-4.04)*	-3.07 (-25.42)	-1.63 (-4.42)
Inequality elasticity of poverty holding growth constant (δ)	0.85 (2.05)	0.92 (6.94)	1.05 (1.93)
Growth elasticity of inequality (β)	0.18 (2.06)	0.18 (1.08)	0.19 (1.96)
Net growth elasticity of poverty ($\lambda = \gamma + \beta\delta$)	-2.17	-2.90	-1.43

Note: * = significant at 0.01 level.

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Book Review

McCartney, Mathew, *Pakistan – The Political Economy of Growth, Stagnation and the State, 1951–2009,* Routledge, London and New York, ISBN13: 978-0-415-57747-2 and ISBN13: 978-0-203-81476-5, 2011, pp. 241.

This book is, one can assert without a doubt, *sui generis*, unique in that it provides an entirely new perspective on the development of Pakistan's political economy. It is a thorough and objective analysis, an eye-opener, and the author leaves no stone unturned.

At the outset, the book critiques conventional regression-based investigations of growth in developing countries. The author then focuses on the theoretical and develops a model in order to analyze and evaluate the role of the state in economic development. Essentially, he asserts that the state has three functions: First, a financial role in channeling the economic surplus to those individuals who are able to invest productively; second, a production role to ensure that such financial resources are utilized productively, which involves either raising productivity or upgrading to a higher technology market niche. According to McCartney, the state has a crucial role in both encouraging and facilitating learning by the private sector. Third, the state utilizes institutions to act as a mediator between conflict and economic growth.

The author asserts that conflict is an integral part of the process of growth and, further, that economic development and political stability are two entirely different and opposing processes. Conflict is almost an inevitable part of economic growth, which involves significant changes in property rights and income distribution. Not considering the role of conflict and its centrality in growth would be to ignore a central aspect of Pakistan's political economic development. A repressive state, an inclusive state, or an ideological state can help lessen the negative fallout of conflict on development. The author elaborates at great length on this later in the book. This perspective on the political economy of Pakistan is both unusual and insightful.

Following the introductory chapter, the author provides fairly scathing criticism of orthodox analysis of economic growth in developing countries. The use of averages, according to McCartney, conceals an

important empirical reality of the process of growth. These, he states, are the structural breaks and phases of expansion and stagnation that are typical of the growth process. He adds that there are numerous problems with uncovering any link from policy to growth.

The book in its entirety is schematically and methodically divided into episodes of growth and stagnation between 1951 and 2008. According to the author, there are three episodes of growth, 1951/52 to 1958/59, 1960/61 to 1969/70, and 2003/04 to 2008/09, while the two episodes of stagnation include 1970/71 to 1991/92 and 1992/93 to 2002/03.

The next chapter reveals that the surplus mobilized by the state in the first episode of growth was minimal. Creeping growth of savings and tax revenue compelled the state to rely on capital inflows from abroad. Further, the main source of growth during this period was import substitution.

Chapter 6 indicates that, although the government attempted to mobilize a surplus, during the episode of growth from 1960/61 to 1969/70, this was constrained and generally unsuccessful as savings and tax revenue only increased marginally. The following section looks at the role of the state in achieving a productive use of the surplus in both the public and private sectors. The fundamental sources of growth were domestic demand and the green revolution in agriculture, while export growth also played a part. However, there was a considerable level of inefficiency and low productivity in both industry and agriculture at the start of the period.

The chapter on the episode of stagnation, 1970/71 to 1991/92, discusses how the domestic surplus mobilized by the state was stagnant. Also, Pakistan did not then follow a pattern of growth based on its labor-intensive comparative advantage. As to the institutions that may or may not allow the state to tide over the conflicts associated with economic growth, the author claims that the elections of 1970 gave Pakistan the opportunity to allow for the supremacy of democratic over repressive state institutions.

During the episode of stagnation, 1992/93 to 2002/03, the state found it virtually impossible to mobilize a domestic surplus following 1992/93, unlike its success in this after 2003/04. During the latter period of growth, there were indications of improvements in efficiency and productivity from the abysmally low levels in the 1990s. However, the author concludes that this episode of growth was, in the final analysis,

unsustainable and would in all probability have withered away even without the financial crisis of 2008–10.

McCartney skillfully blends the political with the economic. Apart from the occasional arid and repetitive passages, and despite the academic and scholarly complexion, it is a riveting read. The plethora of statistics sprinkled throughout the chapters substantiate his arguments albeit making it somewhat tedious reading. The book is decidedly not for the uninitiated but a must-read for anyone interested in the intricacies of the subject.

Lahore School of Economics **Nina Gera**