

## **Educational Quality and Labour Market Performance in Developing Countries: Some Evidence from Pakistan**

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### **I. INTRODUCTION**

Several studies have shown that investment in the quality of education has a higher payoff than investment in quantity alone.<sup>1</sup> However, in many developing countries, investment in improving educational quality is still accorded a lower priority than investment in educational quantity. Countries which commit more resources towards education are generally observed to expand their enrolment ratios while paying little attention on improving such schooling inputs as student-teacher ratio that contribute towards improvement of educational quality (Table 1).<sup>2</sup> There is also a tendency to allocate minimal resources towards upgrading existing schools by improving quality of teaching, facilities, and curricula. Greater emphasis is placed on rapid expansion of the number of educational institutions to reach out a large proportion of population.<sup>3</sup>

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<sup>1</sup>For example, please see Behrman and Birdsall (1983); Card and Krueger (1992, 1992a). Schooling quality in these studies is measured by the average schooling of teachers, pupil-teacher ratio, the average term length and the relative pay of teachers.

<sup>2</sup>Out of the ten countries whose data are reported in Table 1, seven expanded their primary level enrolment ratios over the fifteen year period 1980–95. These countries also reported a rise in their share of educational expenditures in GDP and a rise in student-teacher ratios in primary schools. Although one country, Iran, reported a fall in its share of educational expenditure in GDP, its enrolment ratio and student-teacher ratio were also on the rise.

<sup>3</sup>At an Institute of Business Administration (University of Karachi) seminar presented by the first author on issues related to provision of education in Pakistan, an official from the Pakistani Ministry of Education confirmed this to be indeed the case in Pakistan.

Table 1

*Gross Enrolment Ratio, Educational Expenditure as a Percentage of GDP, and Pupil-Teacher Ratio in Primary Schools: Selected Developing Countries, 1980 and 1995*

Country	Gross Enrolment Ratio in Primary Schools*		Educational Expenditure (% of GNP)		Student-Teacher Ratio in Primary Schools	
	1980 <sup>a</sup>	1995 <sup>a</sup>	1980 <sup>a</sup>	1995 <sup>a</sup>	1980 <sup>b</sup>	1995 <sup>a</sup>
Bangladesh	61	92	1.5	2.3	54	63 <sup>c</sup>
India	83	100	2.8	3.5	45	63
Iran	87	99	7.5	4.0	27	32
Kenya	115	85	6.8	7.4	36	31
Mexico	120	115	4.7	5.3	39	29
Nepal	86	110	1.8	2.9	38	39
Nigeria	105	89	6.4	n.a.	41	37
Pakistan	39	74	2.0		37	41 <sup>c</sup>
Philippines	112	116	1.7	2.2	31	35
Sri Lanka	103	113	2.7	3.1	32	28

Sources: <sup>a</sup>World Bank (1998).

<sup>b</sup>UNESCO (1995).

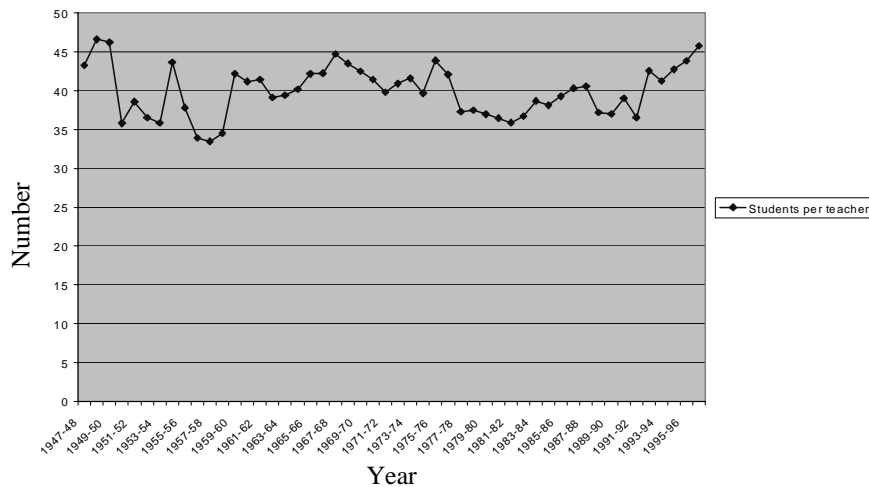
<sup>c</sup>Data available for 1992 obtained from UNESCO (1995).

\*Ratio of total school population, regardless of age, to the population of age group that officially corresponds to primary level of education.

This paper provides further evidence on the benefits of improving schooling quality in developing countries by analysing data from Pakistani labour markets. In particular, we focus on obtaining the quantitative impact of educational quality contributors on the rate of return to investment in schooling.<sup>4</sup> One can provide several reasons to highlight the importance of this study for Pakistan. First, the government of Pakistan launched a comprehensive Social Action Programme (SAP) in 1993 with the objective of improving the country's social indicators. The programme covers elementary education, primary health care, population welfare and rural water supply. Investment on education is recognised to be the most important determinant of future economic growth. Hence education is accorded the highest priority, receiving about 70 percent of designated resources during the first phase of the programme (1993-96) and expected to receive about 66 percent during the second phase (1997-2002). However, despite the findings of a World Bank study [World Bank (1996)] that the class size and teacher qualification are important determinants of student performance in Pakistan and that parental demand for education is strongly affected by their perception of its quality, very little emphasis has been placed in the programme on improving this component of educational

<sup>4</sup>The rate of return to schooling is measured as the percentage change in labour market earnings of an individual when he or she acquires an additional year of schooling.

planning. This is evident in poor performances of two important educational quality indicators: (1) the student-teacher ratio at the primary school level which reflects a student's exposure to his/her teacher and (2) the percentage of trained teachers teaching in primary schools. Over the four year period ending in 1997 since the inception of SAP, the number of primary schools in Pakistan rose by about 22 percent, and the corresponding student population rose by 30 percent. However, the student-teacher ratio remained unchanged at its pre-programme level (Figure 1).<sup>5</sup> Furthermore, while more than 90 percent of teachers teaching in primary schools are classified by the government statistics as "trained", about 93 percent of these teachers had low levels of training [Pakistan (1996)].<sup>6</sup>



**Fig. 1. Number of Students Per Teacher in Primary Schools: Pakistan (1947–1996).**

Yet another indication of the low priority given to educational quality improvement in the SAP is the absence of any direct information collected by the Pakistan Integrated Household Survey (PIHS) on the profiles of school teachers and the delivery of education in schools.<sup>7</sup>

<sup>5</sup>Zaidi (1999) notes that emphasis on increasing the number of schools may have caused a decline in educational quality.

<sup>6</sup>An earlier survey conducted by the British Council in 1980 had found that the number of untrained teachers working at the primary level was four times that at the secondary level.

<sup>7</sup>Conducted by the Government of Pakistan with the assistance of World Bank, the PIHS is an annual national survey whose objective is to provide the household and community level data necessary to study the impact of SAP.

The second reason for the importance of this study is the relationship between child labour and the quality of education. According to a Human Rights Commission report published in 1994, around 12 million Pakistani children under the age of 14 (half of these being under the age of 10), work as indentured servants for wages [Todaro (1999)]. Although these wages are pitifully low, nevertheless, they represent an opportunity cost of attending school for these children. Sensitivity to this opportunity cost will be greater if the educational system failed to offer good quality education thereby raising future economic prospects for the household. Indeed the World Bank study [World Bank (1996)] also observed the relationship between educational quality and parental demand for education in Pakistan by noting that “Poor parents in Pakistan are willing to sacrifice a great deal to educate their children if they believe the education will be of sufficient quality to justify the cost and effort”. (p. 10).<sup>8</sup> A Pakistani newspaper also reported recently that 40 percent ‘out-of-school’ kids in South Asia are from Pakistan and that dismal educational quality is one of the main reasons for this poor achievement of the education sector [*Business Recorder* (2000)].

Finally, a quantitative assessment of the importance of educational quality enhancement can direct policy-makers in establishing priorities within the education sector.

Section II provides a brief overview of the state of school and university level education in Pakistan. Method used to analyse the impact of educational quality on educational returns is presented in Section III which also discusses the data used for analysis and the econometric model employed. Section IV discusses the results of econometric estimation and the resulting magnitude of educational quality impact on educational rate of return. Section V concludes the study.

## II. EDUCATION IN PAKISTAN: A BRIEF OVERVIEW

Since the birth of Pakistan in 1947, its educational planning relative to other countries in the South Asian region can be characterised as full of high ambitions but very little achievements. Saad (1999) notes that the Pakistani education sector has suffered in the hands of “political undulations and instability experienced by the country intermittently”. Six policy documents have been produced on education, all of which reflect a political emphasis and one observes no sequential transition from one policy to another. As a consequence, education has suffered on both counts of quantity and quality. Table 2 provides an inter country comparison of educational data, available for 1990, for five South Asian countries. It is observed that Pakistan’s educational expenditure was about 3.4 percent of GNP, slightly exceeded by India only. However, its illiteracy rate was among the highest in the region, at about 65 percent which was lower than Nepal’s only.

<sup>8</sup>This point is also consistent with the human capital theory prediction that demand for education rises with improvement in its quality which promises better expected return in future.

Table 2

*Public Expenditure and Illiteracy Ratio in Five South Asian Countries, 1990*

Country	Public Expenditure on Education (% of GNP)	Illiteracy Rate (% of Population)
Bangladesh	2.0	64.7
India	3.5	51.8
Pakistan	3.4	65.2
Nepal	2.9	74.4
Sri Lanka	2.7	11.6

Source: World Bank (1993).

Although the participation rate at primary education level is about 75 percent, half of the children who are enrolled drop out.<sup>9</sup> According to Pakistan (1998), the main reason for this high drop out rate is “poor quality of instruction, harsh attitude of teachers, lack of physical facilities and inefficient managerial system”. Ahmed (1997) has noted that in the 1990s, approximately one-quarter of the primary school teachers were untrained, 16 percent of primary schools were without a building of their own and the number of teachers per school was considerably low in less developed areas. These statistics are even poorer in less developed provinces and rural regions.

Another study based on the Pakistan Integrated Household Survey (PIHS) whose findings are reported in Pakistan (1998a) has attributed two other demand side factors, income and parental education, to be important determinants of school enrolments. Parental education affects male and female enrolments differently in that mother’s education affects only girls’ enrolments while father’s education affects both. In rural areas, school distance is important in determining girl enrolments.

The state of higher education in the public sector is also very discouraging. Pasha (1995) highlights the problems which affect the delivery capability of higher education systems of many developing countries to include “under endowed institutions, demoralised administrations, demotivated faculty and students, poor quality instructions, campus violence, irrelevant and outdated nature of curricula”. Pakistan is no exception to this general rule. Political interference on campus has further aggravated the problems facing public sector universities in Pakistan. Universities are unresponsive to the forces of market demand and are mostly supply-oriented. Their research base is rather weak.

Khan (1991) provides evidence on inefficient utilisation of resources in public sector universities in Pakistan. Examining data on three public sector universities, his research shows the existence of significant excess capacity. Extremely low passing rates in public universities is another indication of inefficient utilisation of public

<sup>9</sup>Pakistan (1998).

resources. Less than half of the students who appear for their degree examinations are able to pass and a significant proportion of those who do pass do so with mediocre performance that is valued very low in the labour market. The poor performance of students in public sector universities is partly attributed to easy entry requirements in those universities.

It is interesting to note, however, that several Centres of Excellence, Centres of Advanced Studies, Area Study Centres and mono-disciplinary institutions that are affiliated with public universities have made good contributions and have been applauded internationally.<sup>10</sup> This shows that with appropriate restructuring of the system it is possible to improve the quality of higher education in Pakistan.

One outcome of the dismal picture of the public education system in Pakistan, as noted by Khan (1999) has been the emergence of “dualism” in the education sector whereby a high quality private sector schooling has grown with a poor and deteriorating quality public sector schooling. Since the 1980s, enrolments in private sector schools have quadrupled<sup>11</sup> which is reflective of a general discontent of public school system. Zaidi (1999) notes that even low income areas have their fair share of private schools, simply because there is a demand for a minimum standard of quality, which most government schools are unable to provide. However, he also notes that the lack of any regulations and controls of entry into the education sector may also have resulted in some deterioration of the quality of private sector education.<sup>12</sup>

Despite the growth of private sector schools and universities which are generally perceived to be providers of better quality education, public sector will continue to play a major role in provision of education at all levels in Pakistan. This is mainly due to (1) the high cost of education in the private sector which makes the private sector education inaccessible for general population and (2) the unwillingness of bureaucrats in that country to engage into any political risk and hence the desire to maintain status quo by continuing to subsidise education despite past inefficiencies [Pasha (1995)].<sup>13</sup> To produce labour force members that are comparable to those produced by better quality private sector institutions, policy-makers will have to respond aggressively to change the labour market’s perception of public sector education by committing resources towards better delivery of education.

<sup>10</sup>A recent World Bank study [World Bank (1995)] also makes note of this fact.

<sup>11</sup>Khan (1999).

<sup>12</sup>Zaidi (1999) is also aware that the growth of private schools has led to a clear divide in Pakistani education sector along class and linguistic lines as many of these schools, especially the ones that are considered to be of better quality, serve the “èlite or English—speaking population”. Kingdon (1996a) has discussed equity considerations of private sector education expansion in India. In sum, equity effects of the expansion of private sector education have been of concern to authors in developing countries.

<sup>13</sup>Indeed this later observation is consistent with Ramamurti (1999) and World Bank (1995) who find that privatisation has seen little success in developing countries due to political, institutional, and economic constraints.

### III. METHODOLOGY AND DATA

In economics of education literature, benefits of educational quality improvement have been measured by analysing the effect of educational quality enhancing variables on two outcomes: student achievement on standardised test scores [for e.g., World Bank (1996) and Kingdon (1996)] and post schooling earnings of individuals [Behrman and Birdsall (1983); Card and Krueger (1992, 1992a, etc.)]. Various schooling inputs are viewed as contributors of better schooling quality. These include the physical infrastructure, availability of books, student-teacher ratio, educational qualifications of teachers, expenditure per student, average term length, average teacher pay, etc.<sup>14</sup> A summary of the findings on the impacts of each of these schooling inputs on schooling outcomes in various developing countries can be found in Harbison and Hanushek (1992).

In relation to Pakistan, we were able to find two studies that assess the role of relevant schooling inputs in enhancing educational quality impacts. One study, Nasir and Nazli (2000) has analysed the role of education, technical training, school quality and literacy and numeracy skills on the earnings of wage earners and salaried persons by using micro data based on the PIHS of 1995-96. Assuming private schools to be providers of better quality education, these authors include a dummy variable for private schools in their model. The results indicate a 7 percent rate of return associated with each additional year of schooling. Private schooling has positive, significant and substantial effect on individual earnings. A graduate of private school earns 31 percent higher income compared to the graduate of public school. The authors conclude that employers in Pakistan value the skills of private school graduates higher than those of public school graduates.

It is not clear in the above study as to what level of education does the dummy variable for private schools refer. An individual may have acquired part of his or her training in private sector and part of the training in public sector. A yet another shortcoming of this study is the inappropriate specification of the earnings model. As will be discussed below, educational quality itself affects the rate of return to schooling and hence should be incorporated in the earnings model, accordingly.

<sup>14</sup>In yet another approach, the effect of educational quality differences across regions within a country are explored by isolating this effect from the effect of current working environment. Earnings of foreign born, individuals most of whom did not grow up where they presently live so their human capital is not affected by quality differences in education in the place of *current* residence, are compared with those of native born for most of whom the opposite applies. A proxy variable for the current working environment in the region is introduced in each earnings equation. This variable is expected to be significant determinant of the earnings of foreign born but not for native born, if educational quality does vary across regions. Using Canadian data, Akbari (1996) has shown that the working environment has a significant effect on the earnings of foreign as well as native born, leading to the conclusion that persistent earnings differences across Canadian provinces may be largely due to differences in working environment and not due to differences in educational quality. Applying the same approach on United States data, Simon (1992) found opposite result.

Another important recent study on the impact of educational quality in Pakistan is by Behrman, Khan, Ross and Sabot (1997) who used 1989 micro data on rural households to assess the impact of various schooling inputs, used indicators of educational quality, on cognitive achievements of individuals.<sup>15</sup> The analysis has been performed within a human capital production function context. Various schooling inputs such as student-teacher ratio; teachers' quality as measured by their schooling, training and experience; and school equipment and infrastructure, are considered as determinants of an individual's cognitive achievement. The cognitive achievement is measured in this study by performance on specially designed tests of literacy and numeracy. Results indicate that student-teacher ratio and teacher quality are important determinants of student cognitive achievement. Availability of school equipment and infrastructure have little effect. Hence, the authors concluded that investments which increase student exposure to teachers and those that improve teacher quality are likely to have higher returns than those that improve physical infrastructure and equipment.

In this study, we analyse the effect of an important educational quality predictor, the student-teacher ratio in primary schools, on the post schooling income of individuals earned through employment. In other words, this study extends the Behrman, Khan, Ross and Sabot's (1997) analysis by assessing the impact of an educational quality predictor on the labour market performance of individuals.<sup>16</sup> The analysis will also permit a more accurate measurement of the marginal rate of return to investment in educational quantity than that conducted by others such as Shabbir and Khan (1991); Shabbir (1991, 1993, 1994) and Nasir and Nazli (2000), all of whom either ignore the role of educational quality inputs in earnings model or include it incorrectly. An accurate measurement of the marginal rate of return to educational investment is essential in forming appropriate priorities within the social sector of the economy.

Following Mincer (1974), the following earnings model in semi logarithm form is now standard in human capital theory literature:

$$\ln Y_i = \ln Y_0 + rS + aE + bE^2 + U \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

Where  $\ln Y_i$  is the natural logarithm of annual earning of individual  $i$ ,  $S$  is the number of years of schooling completed by this individual,  $E$  is the number of years

<sup>15</sup>The data are collected since 1986, four times a year, on a sample of randomly selected households by the International Food Policy Research Institute under the auspices of the Pakistan Ministry of Food and Agriculture. In 1989, special human capital modules were administered to obtain measures of respondents' cognitive achievements and corresponding schooling inputs.

<sup>16</sup>We wanted to incorporate the impacts of teachers' educational qualifications and salary into our analysis, but were constrained by the availability of reliable data. However, with respect to teacher salary, it is worth noting that some authors have suggested that this may not be an appropriate indicator of educational quality in developing countries. For instance Kingdon (1996) has found for India that teacher incentives, including salaries, are not determined by teacher characteristics that produce improved student achievement.



of post-schooling experience in labour market and  $U$  is the stochastic error term. The relationship is quadratic in experience to account for a concave earnings-experience profile during post schooling years.<sup>17</sup> The concavity of earnings-experience profile implies a decline in marginal returns to post schooling experience as the individual ages. For details on the derivation of the above earnings model, the reader may refer to Mincer (1974).

In the above relation, the coefficient of schooling variable,  $r$ , reflects the marginal rate of return to an additional year of schooling investment. If the equation is used to explain variations in pre-tax earnings, then ' $r$ ' represents social rate of return to schooling. If variations in post-tax earnings are explained, then ' $r$ ' represents private rate of return to schooling.<sup>18</sup>

As Behrman and Birdsall (1983) have argued, schooling in the above equation is represented merely by "quantity", often measured in terms of years of schooling. Variations in schooling quality affect the rates of return to schooling as better quality education generally receives higher reward in labour market.<sup>19</sup> Hence, ignoring the impact of educational quality contributors will introduce an omitted variables bias in the above earnings equation.

Many studies [for e.g., Wachtel (1976)] have modified the above earnings equation to incorporate the effect of schooling quality on rates of return to schooling. The following modified form of earnings equation is used:

$$\ln Y_{S,Q} = \ln Y_{0,0} + r_0 + r_1 S + r_2 Q + aE + bE^2 + W \quad \dots \quad (2)$$

Where  $Q$  is an educational quality contributor variable and  $W$  is the stochastic error term. This equation is derived by replacing  $S$  in Equation (1) by "effective schooling", which is assumed to be a quadratic function of schooling quantity ( $S$ ) and quality ( $Q$ ), and then limiting the approximation to effective schooling to linear terms only. However, Behrman and Birdsall (1983) have criticised the above modification on two grounds. First, this specification does not explicitly incorporate the human capital theory prediction that educational quality improves the rate of

<sup>17</sup>The suggested concavity of earnings profile, the relationship of earnings ( $Y_i$ ) with the number of years of experience ( $E$ ), is accounted for by the addition of the  $E^2$  term. The semi-logarithmic form is used under the presumption that errors of such specification are normally distributed as well as homoscedastic. However, using data for different countries, several authors have found that the hypotheses of normality and homoscedasticity of error terms does not always hold. Akbari and Ogwang (1996) who have conducted this analysis for Canada, have also reviewed the evidence for other countries. In the present study, normality and homoscedasticity assumptions are maintained without testing. Such tests will be the subject of another study.

<sup>18</sup>While calculating the marginal rate of return in this manner, the cost of schooling is the income foregone by the individual due to postponement of labour market earnings by one more year.

<sup>19</sup>This assumes that better quality education is scarce in the overall educational endowment of the economy. Scarcity of better quality education may be reflected in the higher tuition fee paid in private schools and universities than in public school system as private sector is generally viewed to provide better quality education.

return to schooling quantity. Second, this specification implies that the quality of schooling can affect earnings even if an individual has no schooling ( $Q$  may be nonzero even if  $S=0$ ). Another modified form of Equation (1) is presented by these authors as under:

$$\ln Y_{S,Q} = \ln Y_{0,0} + (r_0 + r_1Q + r_2Q^2)S + aE + bE^2 + V \quad \dots \quad (3)$$

Where  $V$  is the stochastic error term in the equation. This equation is obtained by explicitly representing the rate of return ( $r$ ) to investment in schooling ( $S$ ) as a quadratic function of schooling quality and is preferred over Equation (2).<sup>20</sup> We thus base our analysis on the estimation of Equation (3).

We base our estimations on micro data obtained from the Labour Force Survey (LFS) of 1996-97. The LFS is conducted annually by the Federal Bureau of Statistics (Government of Pakistan) and provides detailed information on such aspects of labour force members as age, education, employment, unemployment, types of employment, hours worked, wages, etc. About 96 percent of the labour force residing in rural and urban areas of each of the four provinces is covered by the survey. A sample of 20,400 households was drawn from which 20,221 were enumerated due to non response from the remaining. Data were collected by direct interviews. The total sample for the year was evenly distributed for enumeration on monthly basis to offset the effect of seasonal variations. However, the information collected refers to the week prior to the date of enumeration. The entire sample was based upon 476 primary sampling units (PSU). These are distributed in each division of the province in such a way that equal number of sample PSUs were covered in each month of the year as to take care of the seasonal variations. The allocation of PSUs to provinces is proportional to their population. Higher proportion of PSUs were allocated to urban domain of the population as it was more heterogeneous. To account for sample variability, a separate weighting variable is included in the micro data. We thus based our analysis on the weighted sample.<sup>21</sup> Furthermore, we confined our analysis to a sample of those workers who reported non-zero employment income.<sup>22</sup>

The dependent variable in our analysis, is the logarithm of monthly employment income. Information on monthly employment income was reported by the respondents of the LFS.

One of the independent variables in the earnings model includes years of schooling ( $S$ ). The LFS questioned respondents on their highest level of educational attainment. Following standard procedure in literature, we converted the levels of

<sup>20</sup>For detailed derivation of Equations (2) and (3), please see Behrman and Birdsall (1983).

<sup>21</sup>For the importance of the weighting of household sample data in developing countries, please see Deaton (1998).

<sup>22</sup>As noted by Heckman (1979), confining the analysis to employed individuals with non-zero wages may give rise to a sample selectivity bias, which we have not explored in this paper.

schooling into years of schooling. The absolute conversions that we used for this study are provided in Appendix A .

Another independent variable in our model is the number of years of labour market experience ( $E$ ). No question was asked in the LFS about the respondent's labour market experience. Hence, we followed the standard procedure in literature [for example Mincer (1974)], and calculated the number of years of experience as:  $E = \text{Current Age} - \text{Number of years of schooling} - 5$ . This calculation assumes that the individual entered the education system at age 5.

The third independent variable in our model is the all important educational quality contributor variable,  $Q$ . Several studies in literature have shown the significance of primary education in determining the future productivity and labour market performance of individuals.<sup>23</sup> Therefore, in our earnings model, we wished to include a variable that incorporated the quality of education offered at the primary school level. An important educational quality contributor is the student-teacher ratio which reflects student exposure to teacher. As discussed by Kurian (1991), this ratio is particularly important in primary schools where children need more individualised attention. A lower student-teacher ratio implies greater student exposure to teachers during primary school attendance, thereby raising his/her classroom learning potential, which is expected to translate into higher labour market productivity in future years. The higher labour market productivity, in turn, is expected to result in higher potential for labour market earnings. Hence, a lower student-teacher ratio can be considered as reflective of higher educational quality acquired by the individual. A higher student-teacher ratio reflects otherwise.

Computations of student-teacher ratio were based on published data. Pakistan (1996) provides data on the number of primary school teachers and corresponding student enrolments in each of the four provinces, further classified by the region of residence as urban and rural. The LFS micro data allowed us to match these data for each respondent. In sum, our quality variable has a total of eight observations, one for each of the two regions (urban and rural) in each of the four provinces. Hence, these observations vary across individuals in our micro data according to their province and region of residence.

We realise that there are several issues related to our above methods of computations of variables. We now turn to a discussion of some of those issues.

First, our computation of experience variable assumes that after age 5, each individual remained employed when not attending school. This assumption is commonly made in earnings function studies that are based on micro data that do not collect direct information on labour market experience of individuals. To minimise the possibility of disruptions in employment, we restricted our analysis to only male

<sup>23</sup>Colclough (1982) provides a review of such studies.

workers as they are expected to be more permanently attached to the labour force than female workers.<sup>24</sup>

The second issue relates to the quality contributor variable, i.e., the student-teacher ratio in primary schools. This issue arises because the student-teacher ratio for the year 1994 has been used and not for the years during which the individual attended primary school.<sup>25</sup> This approach is expected to create a bias in estimation if the student-teacher ratio changed significantly or if the individual's place of residence at the time of survey were different from the one where primary school was attended.

The available published data from the Government of Pakistan sources allow us to estimate a time series of the student-teacher ratio only nationally and not separately for provinces and urban rural regions. In a separate regression, we used these time series data with appropriate lags to account for the average educational quality during the five years the individual acquired primary school education. A perfect co-linearity between  $SQ$  and  $SQ^2$  variables prohibited us from obtaining meaningful results. We therefore decided in favour of the 1994 cross sectional data on student-teacher ratio which have been computed separately for each province and place of residence, defined as urban or rural.<sup>26</sup> Hence, we have accounted for provincial and regional variations in our educational quality variable. We do not expect these variations to have changed significantly over time. However, to further minimise the bias, we also considered only those men in the sample who were aged between 15 and 35 years at the time of survey as did Behrman and Birdsall (1983) in their study on Brazil.

Finally, we argue that the current educational quality contributors in a region are also expected to affect an individual's labour market productivity in that region, and hence earnings, in another way. This is because the current educational quality contributors reflect the prevalent working environment in the region which is complementary to the individual's productivity as he works with workers who were locally educated.

#### IV. DISCUSSION OF RESULTS

Table 3 presents some descriptive statistics on the variables used in our earnings models. We note that an average worker in our sample had acquired 7.4 years of education and 13.9 years of labour market experience and earned about

<sup>24</sup>Blinder (1976) notes, "Using the (experience) proxy for prime-age white males is probably appropriate, but using  $j$  (the experience proxy) for females is hazardous...". The females' labour force participation rates, as well as employment, may be discontinuous due to child raising and family responsibilities, social attitudes and discrimination.

<sup>25</sup>Student and teacher data for 1994 were used since these were the most reliable and consistent data for the year closest to 1997—the year for which earnings are used.

<sup>26</sup>This method also follows the previous study on Brazilian data by Behrman and Birdsall (1983).

2465 rupees per month in 1996.<sup>27</sup> The age of the average worker, not reported in Table 3, was 26 years. We have mentioned earlier that we used student-teacher ratio data for the year 1994 since it was the closest year to 1996 whose data were reliable. The average student-teacher ratio was 43.58. The wide variation in the student-teacher ratio, from a minimum of 26 to a maximum of 76.77, is worth noting.

Table 3  
*Descriptive Statistics on the Variables Used in Earnings Models*  
*(Weighted Regressions, Males Aged 15–35)*

Variable	Minimum Value	Maximum Value	Average Value
$\ln Y_i$	0.00	10.82	7.81
S	0.00	16.00	7.40
E	1.00	30.00	13.90
Q	26.01	76.77	43.58

Source: Labour Force Survey, micro data (1996).

Table 4 reports the values of the student-teacher ratio across the four provinces and also for each region, urban and rural, in each province. Overall, in the province of Sindh, the student-teacher ratio is significantly lower than the national average. Punjab and NWFP have about the same ratio while Balochistan has the highest. One striking feature of Table 4 data is the rural-urban differences. With the exception of Sindh, the rural regions in each province exhibit lower primary school student-teacher ratio than in urban regions. This result can be attributed to lower enrolments in rural primary schools in the three provinces.

Table 4  
*Student-Teacher Ratio in Primary Schools; Pakistan,*  
*Province and Regions, 1993-94*

Province	Region		
	Urban	Rural	Total
Punjab	61.31	43.48	46.84
Sindh	26.01	31.38	29.24
North Western Frontier Province (NWFP)	49.56	46.38	46.89
Balochistan	76.77	37.93	51.36

Source: Pakistan (1996).

<sup>27</sup>The 2465 rupees value is the geometric mean of earnings which is obtained by taking anti-log of the mean value of  $\ln Y_{s,Q}$  which was 7.81.

We now turn to our regression results. We estimated both Equations (1) and (3) using the Ordinary Least Squares method of estimation. Equation (1) is the traditional basic earnings equation that specifies the logarithm of annual earning as a function of the years of schooling ( $S$ ), years of post-schooling experience ( $E$ ) and to account for the concavity of experience-earnings profile, the square of experience variable ( $E^2$ ). As discussed earlier, this is the most commonly used specification in literature when estimation of the rates of return to schooling is desired.<sup>28</sup> Results of our estimation are reported below:

$$\ln Y_{s,q} = 6.772 + 0.0716S + 0.046E - 0.0005 E^2$$

(4145.1) (840.6) (240.4) (82.1)

$R^2 = 0.213$ ; figures in parentheses are 't' statistics.

Number of observations: Weighted sample: 2,751,876.

Unweighted sample: 4,097.

All coefficients are statistically significant at 0.05 level and their signs are as expected. The negative sign of the coefficient of the  $E^2$  variable confirms the concavity of the experience-earnings profile indicating diminishing marginal returns to post schooling experience.

The marginal rate of return to schooling investment is 7.16 percent in the above equation.<sup>29</sup> This value of the marginal rate of return is obtained by multiplying the coefficient of the  $S$  variable by 100 and measures the percentage change in earnings accruing to an individual due to an extra year invested in education. The computed value of 7.16 percent educational rate of return is within the 6 to 9.7 percent range reported in other earnings function studies on Pakistan which we have mentioned earlier in this section. Thus, if one ignored the effect of educational quality on earnings, it may be concluded that an extra year of schooling in Pakistan increases the potential labour market earnings of an individual by 7.16 percent. This value is about 71 percent higher than the 1996 growth rate of Pakistani Gross Domestic Product (GDP), which was about 4.19 percent. Since wages and salaries form an important component of GDP, these results suggest that education plays an important role in determining the economic growth in Pakistan.

Now the above results may be misleading if a correct specification of earnings equation must include educational quality as an independent variable. Furthermore, if educational quality does affect the returns to schooling investment, then this information will be important for policy-makers, who confront the issue of allocation of limited funds to alternative uses.

<sup>28</sup>This specification has been discussed in the previous section.

<sup>29</sup>Mathematically, the coefficient of  $S$  variable is  $\partial \ln Y / \partial S$  which measures the proportionate change in labour market earnings resulting from an extra year invested in education.

In the previous section, we presented Equation (3) as the preferred specification of earnings equation that includes educational quality variable as an independent variable. Our estimates of that equation are presented below:

$$\ln Y_{s,Q} = 6.807 + 0.152S - 0.004SQ + 0.000042 SQ^2 + 0.044E - 0.0005 E^2$$

(4166.7) (350.9) (185.3) (178.6) (232.4) (78.9)

$R^2 = 0.223$ ; again figures in parentheses are 't' statistics.

Number of observations: Weighted sample: 2,751,876.

Unweighted sample: 4,097.

All variables in this equation are also statistically significant at 0.05 level. We also computed an  $F$  statistic to test the significance of adding the quality variable,  $Q$ , in the traditional earnings equation. The computed  $F$  statistics was 17708.3 while the tabulated  $F$ -value at 0.01 level of significance was 4.61. We thus reject the hypothesis that the quality variable, as defined by the student-teacher ratio, has no impact in the earnings model. Hence, any educational rate of return estimates for Pakistan that are based on an earnings model that does not include educational quality variable as one of the determinants, are likely to be biased.

In the above estimation, the coefficients of the two experience variables and also the constant term are about the same as in the traditional earnings model estimated earlier (Equation 1). The coefficient of  $S$  variable has changed significantly, from 0.0716 in the previous estimation to 0.152. However, it is important to note that the coefficient of  $S$  variable alone can no longer be interpreted as the marginal rate of return to schooling because of its interaction with the quality variable in the new equation. The marginal rate of return to schooling is computed in the new equation as under:

$$[\partial (\ln Y) / \partial S] \times 100 = [r_0 + r_1Q + r_2Q^2] \times 100$$

Based upon Equation 3 estimates, we perform the above computation using the average value of 'Q' variable which is 43.58 in our sample. This computation yields a marginal rate of return to schooling of only 5.74 percent as opposed to 7.16 percent rate which was based upon the estimates of traditional earnings function (Equation 1). Hence, if the number of students per teacher at the primary level of education is held constant, an additional year of schooling is expected to raise the potential earnings of an individual by 5.71 percent which is about 32.3 percent higher than the GDP growth rate. We conclude that the estimates of the educational rates of return based on traditional earnings model have an upward bias.

The above pattern of our results is consistent with the Behrman and Birdsall (1983) study on Brazil which also showed an upward bias in educational rate of return calculated from estimates of traditional earnings model.

## V. CONCLUSIONS

This study has provided further evidence on the importance of educational quality in determining the rate of return on educational investment in developing countries. Using data on Pakistani male workers, schooling quality was measured by the differential labour market earnings of individuals who had been exposed to different levels of an important schooling input, i.e., student-teacher ratio. This ratio not only represents the environment in which an individual may have acquired education in the past but also represents the environment in which present complementary workers may have been educated.

We have shown that an estimate of educational rate of return based on the traditional Mincerian earnings equation, which does not incorporate the effect of quality contributing schooling inputs, has an upward bias. This estimate yielded a marginal rate of return of 7.16 percent which was 71 percent faster than the Pakistani GDP growth rate during 1995-96. However, a correct specification of the earnings equation in which the impact of quality contributing variable is held constant, yields the result that the marginal rate of return on schooling investment is only 5.71 percent or 32.3 percent faster than the GDP growth rate in Pakistan. This decline in the value of educational rate of return due to incorporation of an educational quality contributing variable is consistent with that reported for Brazil in a previous study. Policy-makers confronted with the allocation of limited resources to different sectors on the basis of financial rates of return must take this "quality adjusted" rate into account in order to make a correct choice.

We now use the above results to obtain the quantitative impact of variations in student-teacher ratio on the rate of return to schooling investment. This quantitative impact will allow policy-makers to maintain a student-teacher ratio that would obtain the desired rate of return to schooling investment. The 5.71 percent rate of return to schooling investment in the present study was computed using the sample average value of 43.58 students per teacher at primary school level. Table 2 provided the average student-teacher ratio for several countries including five South Asian countries. These were, Bangladesh, India, Nepal, Pakistan and Sri Lanka. Sri Lanka had the lowest primary student-teacher ratio, at 28 students per teacher, in the mid-nineties. If we consider this ratio in our computations, we observe that the rate of return to schooling investment in Pakistan will rise to 7.3 percent which is about the same as that yielded by the conventional earnings function estimates.<sup>30</sup> Since the rate of return to schooling investment essentially measures the growth rate in wages and salaries which are an important component of GDP, these results show significant benefit in terms of economic growth in improving educational quality in Pakistan.

<sup>30</sup>This computation also implies that decreasing the student-teacher ratio by 10 students increases the rate of return by 1.02 percentage which is only slightly higher than Card and Krueger's (1992) U.S. result of 1 percentage increase in the rate of return for every 10 students decrease in the student-teacher ratio.



The finding that the student-teacher ratio is significantly lower in rural regions than in urban regions in three out of four provinces is also important. We noted that this result could be due to a lower student enrolment in rural areas, which in turn may be due to lower number of rural primary schools. In the light of the present study results and those of Behrman, Khan and Sabot's (1997), there are several implications of this observation. First, any increase in primary schools in rural areas must be accompanied by a corresponding increase in the number of better educated teachers. This implication should also be seen in the light of Zaidi's (1999) suggestion that greater emphasis on increasing the number of schools may have actually resulted in a decline in educational quality. Second, a replication of Behrman, Khan and Sabot's (1997) study on the impact of educational quality enhancing variables on cognitive achievement of students in urban Pakistan is also warranted to draw comparison with results for rural Pakistan. Finally, this result may also be seen in the light of the current rural/urban job quota system in government departments which aims to fill in a certain number of vacancies with individuals holding rural residencies (domicile).<sup>31</sup>

The present study has an important caveat in that it used only one educational quality contributor, the student-teacher ratio at the primary level of education, to determine the educational quality impact on labour market performance of individuals. A more comprehensive study should also consider other contributors of educational quality such as teachers' training and educational attainment, teachers' salaries, school equipment and infrastructure, etc.<sup>32</sup> Due to paucity of reliable data, we were unable to analyse the impacts of these educational quality enhancing variables on labour market performance. However, as we noted earlier, Behrman, Khan and Sabot (1997) who used another data set for Pakistan, found that only the student-teacher ratio and teachers' education and training have an effect on cognitive achievement of individuals. Since better cognitive achievement of students is expected to result in better productivity, which in turn translates into improved labour market earnings, the present study strengthens the case for improving the student-teacher ratio by providing a quantitative assessment of its impact on labour market earnings. When more data are available, it will be useful to assess the impacts of other educational quality contributors on an individual's labour market performance.

<sup>31</sup>It may also be noted that besides private farm, government is the major employer in rural regions.

<sup>32</sup>As mentioned earlier, teacher salary may not be an appropriate indicator of educational quality in developing countries. The reviewer of this paper noted that since student-teacher ratio is lower in rural regions it may not be reflective of better educational quality in corresponding schools, rather a reflection of lower enrolments in rural schools (of course implying implicitly that rural schools deliver poorer quality education). We contend that whatever be the reason for regional differences in student-teacher ratio, our analysis shows that it does have the potential in Pakistan to enhance educational returns. Similar results have been shown for other countries for whom literature views student-teacher ratio as an important educational quality contributor. Perhaps a future analysis of Pakistani data can address the regional differences in economic achievements of individuals possessing identical educational qualifications.

## APPENDIX

## Appendix A

Level of Schooling	Years of Schooling
No Formal Education	0
KG, Nursery	1
KG but below Primary	3
Primary but below Middle	6
Middle but below Matriculation	8
Matriculation but below Intermediate	10
Intermediate but below Degree	12
Degree in Engineering	16
Degree in Medicine	16
Degree in Agriculture	16
Degree in Other (e.g., BA/B.Sc./B.Com. etc.)	14
Postgraduate	16

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## Comments

The authors have addressed an important topic of Education and Earnings in the context of human capital formation and increasing productivity and economic growth, with a particular focus on educational quality as an important component of the whole process. The subject has been widely studied and a vast body of literature exists on various aspects of the relationship between education and earnings in both developed and developing countries including Pakistan. This paper is also an attempt in that direction. Using data from the 1996-97 Labour Force Survey (LFS), the paper provides good empirical evidence on the positive impact of education and experience on income, and that educational quality contributes significantly to increasing productivity and economic growth.

As I read the paper as a reviewer, I found a number of caveats and problems in the data used and in the methodological estimation of the variables used in the analysis. To begin with, the authors have judiciously reviewed the earlier studies done on the subject to set the ground for describing their objective and method of analysis. Using the conventional and most commonly used Mincerian earning function, specification of the estimation model is described including a quality indicators student-teacher ratio, as an additional input to the equation. At this point, the authors need to spell out whether there has been any modifications or other forms of functions that can be used for estimating the earning function and the justification for using this method for the analysis.

For the estimation of variables, I would like to raise three major points. First, as the model used requires data on single years of schooling to explain a unit increment in income or earnings, it is noted that the data used gives information on levels of education attained as described in Appendix A, of the paper. It is not clear how these level have been converted into completed years of schooling and what is the justification for doing so. For example, KG, but below primary as 3 years of schooling, and primary but below middle as 6 years of schooling and degree in agriculture as 16 years of education has been changed to single years of schooling which is erroneous and questionable. In this regard, more appropriate data with single year of schooling need to be used to capture a unit increase in income.

My second point relates to the issue of quality indicator used in the analysis. As we know, a number of indicators reflect quality of education as has been mentioned in the paper as well. Subject to the availability of data, the authors have selected only one indicator of quality, student-teacher ratio, which has inherent problems in its estimation and application to the labour force statistics used for the analysis. As we may note, a different source of information, Education Census of

1993-94, is used to estimate the student-teacher ratio and then related to the experience and earnings in the labour market much later in life. It is not clear how these data have been matched at micro level to capture the effect of quality on individual earnings. There seems to be a disjointed relationship between quality of education and earnings because these data do not indicate whether those with high or low student-teacher ratio at primary level years ago are the same people experiencing higher incomes as reported in the 1996-97 Labour Force Survey. Moreover, student-teacher ratio is affected by a number of factors that is not spelt out in the paper. The quality indicator used shows great variation across regions as indicated by Table 6, of the paper. For example, student-teacher ratio in rural areas is lower than urban areas. Does it mean that quality is better in rural than in urban schools. Then, this ratio is much higher in urban Punjab and Balochistan than other provinces reflecting the unevenness in the education data used across provinces. Hence, these 8 observations of quality indicator used for urban-rural areas in the four provinces are contradictory and need further explanation.

There is no doubt that measurement of quality is a thorny issue and has difficulties in choosing the data to measure the quality index. In my view, a composite indicator of quality should be used incorporating more than one measure of quality. Some studies have used private schooling as a proxy of quality indicator which reflects better student-teacher ratio, higher expenditure per pupil, better salary of teachers, and better school facilities and teacher training, in this regard, equally strong argument exists for using teacher training and skills as a better indicator of quality, because teachers with no training skills and a small class size may not give a good exposure to quality schooling.

Another major point of concern relates to the gender question. It is noted that the analysis refers to males only with no satisfactory explanation and justification given to excluding females in the analysis. There is enough research evidence on gender differentials in earnings and gender variable has emerged as a significant variable in other studies. With exchanged female enrolment and employment in recent years through the initiation of Social Action Programme (SAP) and structural adjustment policies in Pakistan, capturing gender differentials in earnings has large implications in terms of policies and programmes. It would, therefore be insightful to estimate earning equations for females also.

In the concluding section of the paper, the discussion of results and policy implications of the analysis remain inadequate. The findings reflect the need for collecting more relevant information and data for capturing quality related indicators in estimating educational earnings function. We also need to be careful in selecting data for this type of analysis to be able to derive more meaningful and accurate results.

In the end, I would like to reiterate my opinion that the paper provides good empirical evidence on the importance of quality of education in enhancing

productivity and economic growth. Like most research work on education and measurement of its quality, the analysis may have some weaknesses and problems in the measures applied to the income earners in the labour market. However, with some more efforts and refinement of the quality measures used, the study could usefully add to our knowledge about the role of educational quality in improving labour market performance in Pakistan.

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