EVALUATING THE PERFORMANCE OF GENDER ORIENTED EDUCATIONAL INSTITUTES IN PAKISTAN

Zahid Hussain, [2]Bilal Mehmood, [3]Syed Hassan Raza
Department of Economics, Lahore Leads University, Pakistan.
Email: zahid13h@gmail.com, Cell #+923344345805,
[2]Department of Economics, Government College, University, Pakistan.
Email: dr.bilalmehmood@gcu.edu.pk, Cell #+923354219555,
[3]Department of Economics, Lahore Leads University, Pakistan.
Email: hassanraza.economist@gmail.com, Cell #+3214814690

ABSTRACT: *This paper investigates the technical efficiency of (male and female oriented schools) in rural and urban areas of Pakistan. For this purpose, Data envelopment analysis (DEA) has been applied. To calculate the technical efficiency of schools, 20 years secondary data, 3 input and 2 output variables have been used in this research paper. The results exhibit that none DMUs remained fully efficient on constant and variable return to scale. Schools are efficient under technical, pure and scale efficiency change, whereas inefficient in term of total factor productivity. External variables are found more in enhancing effective the efficiency of the schools and improve the quality of education than internal variables. This research paper will help government to reduce gender discrepancies and better utilizing educational resources in the education sector of Pakistan.*

Keywords: DEA, DMU, Technical Efficiency, Total Factor Productivity, Schools, Pure Efficiency.

1 INTRODUCTION

Debate on tertiary education of women has unfinished controversy in developing country like Pakistan, but school education can be safely assumed as an asset for future mothers. The fundamental right of every citizen to acquire knowledge or education, the gender discrimination still exists in the education system of Pakistan. According the report [1] of the United Nations Development Program (UNDP), around double as many males as females obtain tertiary education in Pakistan, and the government is spending amount 2.7% of the GDP of the country on education. Education for boys is prioritized vis-a-vis girls, because it to become aware of something that boys must be equipped with educational skills to contend for resources in the public ground, on the other side girls have to concentrate in household skills to be good mothers and wives. Hence, education is not understood as being significant for girls. This sexual category splitting up of labor has been internalized by the civilization, and women do not have many choices for themselves so as to could change these patriarchal realities of their lives. The culture does not agree with women to build up their human capabilities by precluding them from acquiring education. Lack of reed on the importance of women's education is one of the serious features of gender disparity in Pakistan. The Human Development Report (HDR) has issued low human development (LHD) countries with a female literacy rate of 30%, and Pakistan stands on 145 rank in term of LHD. Education is very much associated to women's capability to structure social associations on the basis of equal opportunity with others and to get the important social good of self-respect. Child survival, health and schooling are indicators of human development which can be improved by increasing the female school education. Disparity in education from a gender perspective is high in Pakistan. For instance, gross and net enrollment rates, completion and dropout rates. Millennium Development Goals and eliminate gender disparity at all levels of education are the aims of Pakistan by the year 2015. It requires better allocation of educational and financial resource between men and women in rural and urban areas of Pakistan. According to report [2], Pakistan stands 120 in 146 countries in term of Gender-related Development Index (GDI), and in terms of Gender Empowerment Measurement (GEM) ranking.

2 LITERATURE REVIEW

A substantial number of studies have examined the efficiency schools in various countries. For example, Author [3] investigated the efficiency in the public sector, education expenditure in two major provinces of Pakistan as a Punjab and Sindh. He used the data of Punjab for the year 2003-04 and Sindh for the year 2001-02 at the district level. He assessed the technical efficiency of education expenditure of 34 decision making units of Punjab and 15 decision making units of Sindh by using DEA. Results show overall three districts were most efficient. His study found the Faisalabad district was most efficient as compared to Lahore district and all 7 districts out of 34 districts worst performances. Author [4] examined the technical efficiency of the primary education system in Uganda based on panel data from 2001 to 2008. They worked on two categories urban and private schools, the government-aided and rural schools. They used the parametric technique in the Stochastic frontier analysis to measure the technical efficiency of the primary school. They selected variables as the number of teachers, number of textbooks, number of classrooms, number of teacher's house per schools, supervisor frequency, head teacher experience, performance index of candidates from a given primary school who sit the primary leaving examination and also pass rate of the school. Urban and private schools are more technically inefficient than government-aided and rural schools. They found that it was possible to improve the learning outcome in primary private schools because whose percentage deviation from their production frontier is 56% on the other hand it was impossible to increase the significantly improve learning outcome because whose percentage deviation from their production frontier is 1%. Author [5] analyzed the technical efficiency of public higher education institutes in Portugal. They worked in three groups, public universities,

polytechnics and faculties of the University of Porto. They considered three inputs (total funding of the institutions, total expenditure and total number of academic staff) and three output variables (total number of graduate students, total number of PhD awarded and total courses offered) collected data for 2008. They analyzed 14 public universities, 20 public poly techniques' and 14 faculties of the University Porto as decision making units. DEA technique was applied to estimate the technical efficiency of public higher education institutions. Results showed Group A (public universities) 83% average efficiency score, Group B (polytechnics) 77% mean efficiency scores while Group C (facilities of university Porto) average efficiency score 82.5%. This statistic represents relatively public universities more efficient to other polytechnic and the faculties of university of Porto while polytechnic less efficient relatively. In this study, 20 percent of institutions were founded efficient frontier almost half of the faculties efficient in the same year while higher education institutions were found working inefficiently. Authors [6] estimated the technical efficiency of schools in Chili. They took 2000 Chilean schools randomly as a sample for estimating the technical efficiency by using DEA and SFA technique. They used Banker, Charnes and Cooper (BCC) (1984) with the assumption of a DEA variable return to scale (VRS). They selected three types of schools in Chili free-paying private schools (FPPS), subsidized for private school (SPS) and public schools (PS). Their results show 95.39% schools were efficiently working in Chili. By using the DEA analysis 58% were fully efficient. The efficiency score remained 53%. Results, indicate FPPS were fully efficient than that of PSS and PS. While PSS was found efficiency score 74% and PS 53%, which show relatively less efficient. Author [7] evaluated the efficiency of public expenditure on education in Croatia. Author used both techniques of non-parametric approach, Free Disposal Hull (FDH) and DEA. The data set had inputs (expenditure as a share of GDP, expenditure per pupil in EU PPS, and teacher per 100 students) and average PISA 2009 as output of 31 countries with USA and Japan are a benchmark. Result showed resources (inputs) of Croatian education were misused 18.5% in FDH while 45.9% in DEA. Efficiency scores are 0.923 and 0.918 under FDH and DEA respectively, which indicates the 7.7 percent and 8.2 percent outputs resources were not used. Authors [8] estimated the technical efficiency of primary school education in Greece. They collected primary data through questionnaires, from parents and school principals. They make a sample that contains 17 primary schools in North Greece. For the technical efficiency of primary schools, DEA and regression analysis were used by authors. There were 17 decision making units (DMU's) and variables as inputs (the school facility index, student teacher ratio, the computer/4th grade student ratio) while as an output average grade in the TIMSS test for estimating the technical efficiency. Results showed 23% schools efficient while the average efficiency score was 76.26%.

3 METHODOLOGY

A study comparing the efficiency of gender oriented schools for case of Pakistan is non existent as per our knowledge. This study fills this gap. This research paper will investigate the technical efficiency of male and female schools in rural and urban areas of Pakistan. Data envelopment analysis (DEA) will be applied to calculate the technical efficiency scores and productivity scores. For this purpose, the authors have been selected several inputs and output variables and panel data. A large number of studies indicate that authors [9] investigated the technical efficiency of classrooms in 199 rural and urban municipalities, authors [10] assessed the technical efficiency and productivity scores of Higher Education Institutes in Sweden, author [11] calculated the efficiency scores of rural and urban schools in Georgia, authors [12] evaluated the technical efficiency of schools in Chili. They all have applied the DEA technique to evaluate the performance of the education department in their home countries. DEA is a non-parametric approach and mathematical linear programming technique. It has no statistical properties and hold specific or functional form of data. It allows us to identify the production frontier or relative performance of two functions. This framework is adopted from inputs and output production functions and applies in several industries to evaluate the performance or best practice frontier efficient producer. In fact, this assumption may not hold. DEA can also be used with non-parametric method in economics for estimation of production frontier. So by using DEA we will estimate the technical efficiency of the gender oriented schools in rural and urban areas of Pakistan. To be evaluated the DMU, the 'N', 'm' and 'n' are taken as a DMU, inputs and output respectively. Particularly, DMU_j use x_{ij} of input I and produces yr of output r. We further assume that $x_{ij} > 0$ and $y_r > 0$, and also that each. DMU has at least one input and one output. The efficiency measurement is based on a virtual efficiency production unit, it is constructed as a weighted average of real efficient units, which is used as a unit of comparison for other DMUs. To calculate the efficiency score of any DMU 0 we have:

The above formulae is a mathematical programming, the ratio of output and inputs is the objective function to be maximized where, the u and v are output and input weights respectively. In addition, there are a set of constraints, one for each DMU, which reveal the condition that the ratio of output to input must be less than or equal to one for all observed DMUs. A nonlinear programming problem arises from the above ratio form of the model; Charnes, Cooper and Rhodes (CCR) (1978),

However, have shown that it may be replaced by a linear programming problem that takes the form:

$$\sum u_r y_{ro}$$

$$\text{Max } h_o(u, v) = R$$

$$\sum U, v_{vi}\, x_{io}$$

$$\max h_o(u, v) = \sum_r u_r y_{ro}$$

$$u\ v$$

s.t

$$\sum_r u_{r\, Y\, rj} = \sum r\ v_i\, x_{ij} \le 0, \qquad j = 1,\ldots,n$$

$$\sum_i v_{I}\, x_{io} = 1$$

$$u_r, v_i \ge 0, \quad r = 1,\ldots,s \qquad i = 1,\ldots,m$$

By using the concept of ratios between weighted outputs and weighted inputs, DEA can also be motivated The relationship between this form and the 'virtual producer' form used in this paper is that each represents a primal-dual linear

programming formulation of the same problem. The virtual producer has been used by authors due to easier for non-DEA readers to grip. Solving this linear programming problem we obtain the efficient production for each DMU and the efficiency index. The Charnes, Cooper and Rhodes (CCR) (1978) ratio allows for both technical and scale inefficiencies via the optimal value of the ratio form. Moreover, Banker, Charnes and Cooper (BCC) (1984) offer a variant that allows inefficiencies to be divided into scale and technical inefficiency measures, a variant that becomes useful when returns to scale are important.

3.2 VARIABLES

In this research paper, we used three inputs and two outputs evaluate the performance of gender oriented schools in rural and urban areas of Pakistan.

INPUTS

Tech: Defined as number of teachers.

INS: Indicate the number of institute.

PHF: exhibits that physical facilities, having electricity, having drinking water, washroom, ownership, building etc are included in physical facilities.

OUTPUTS

ENR: reveals the enrollment, which means that register or get admission in a specific grade or class. The enrollment of student is a product of an educational institute.

STR: shows student teacher ratio. It is calculated enrollment of specific grade by number of teachers and multiply by hundred. Student teacher ratio indicates the quality of education.

3.3 DATA

For this research data source is an Academy of Educational Planning and Management [13] under the Ministry of Education, Pakistan. This data consists of 20 years as a secondary and entire country level school. The data are collected from the annual report of AEPAM Islamabad of all rural and urban regions of Punjab, KPK, Baluchistan, Sindh, Islamabad Capital Territory (ICT) and FATA.

4 RESULTS

We adopted the DEAP software 2.1 version to calculate the efficiency scores and productivity changes of male and female schools in rural and urban regions of Pakistan.

4.1 Technical Efficiency Estimates of Public Male Schools Averages

Table No. 1 shows the technical efficiencies of public male schools in Pakistan under a (CRS) scale and (VRS) scale. The Islamabad urban area has the highest position with 87% average efficiency score for last 20 years in male education under CRS. It indicates that ICT urban has managed resources to increase the enrollment of students in specific grades while failed to manage 13% resources in order to achieve efficient school. Over all male schools are less efficient in rural and urban regions with 84.33% mean efficiency score under a CRS while under VRS is 92.09% relatively more efficient than CRS. Scale efficiency has been estimated 90.86%. All rural and urban schools need for improvement by developing a better planning with the help of number of teachers and physical facilities in order to make efficient schools. Sindh rural area schools failed to utilize the educational resource for instance number of teachers and physical facilities under CRS.

4.1.1 Summary of Efficiency Aggregates

Table No. 2 shows summary of efficiency aggregates public male schools in Pakistan. None of DMUs is fully efficient under CRS, or VRS. All DMUs have failed to produce output by utilizing available resources. All 12 DMUs are less efficient under CRS and VRS. Male schools have maximum mean efficiency scores is 87.61% under CRS technical efficiency while minimum mean efficiency score is 79%. Male schools are more efficient; relatively under the VRS with 92% mean efficiency. The lowest average efficiency of male education is under CRS.

Table No. 1 Technical Efficiency Estimates of Public Male Schools Averages

Regions	*CRSTE*	*VRSTE*	*SE*
Punjab urban	0.85	0.94	0.90
Punjab rural	0.84	0.92	0.91
Sindh urban	0.85	0.92	0.91
Sindh rural	0.79	0.88	0.88
Baluchistan urban	0.85	0.95	0.89
Baluchistan rural	0.84	0.90	0.94
KPK urban	0.85	0.89	0.94
KPK rural	0.84	0.94	0.89
FATA urban	0.82	0.91	0.88
FATA rural	0.83	0.90	0.90
Islamabad urban	0.87	0.94	0.91
Islamabad rural	0.83	0.91	0.90
Mean	0.84	0.92	0.90

Notes: **CRSRTE** = Constant Return to Scale Technical Efficiency, **VRSTE** = Variable Return to Scale Technical Efficiency, **SE** = Scale Efficiency
Source: Authors' Calculation

Table No. 2 Summary of Efficiency Aggregates

Efficiency Aggregates	*CRSTE*	*VRTE*	*SE*
No. of Efficient	0	0	0
No. of Inefficient	12	12	12
Maximum Efficiency (%)	87	95	94
Minimum Efficiency (%)	79	88	88
Average Efficiency (%)	84	92	90

Notes: **CRSRTE** = Constant Return to Scale Technical Efficiency, **VRSTE** = Variable Return to Scale Technical Efficiency**, SE** = Scale Efficiency,
Source: Authors' Calculation

4.2 Malmquist Summary of Public Male Schools Annual Means

Table No. 3 indicates malmquist index the summary of annual mean efficiency score of 12 decision making units. The highest mean efficiency score of male schools is 577% in the year 2008 under technological efficiency change, whereas the lowest mean efficiency score of all DMUs is 18% in the year 2010. The male schools showed better performance, techonology is crucial while they better strategy for using the educational inputs i.e. Physical facilities, administration, lesson planning and expenditure on per student. The highest mean efficiency score of male education (12 decision making units) is 100.7% under pure efficiency change for last 20 years, whereas the lowest mean efficiency score of male education of 12 DMUs is 90.70% for the year 1993 to 2012. Results show male education is fully efficient in last 20 years.

Table No. 3 Malmquist Summary of Public Male Schools Annual Means

Year	effch	techch	pech	sech	tfpch
1994	1.17	0.69	1.14	1.01	0.81
1995	0.36	2.01	0.51	0.70	0.73
1996	2.96	0.39	1.97	1.50	1.17
1997	1	0.59	0.99	1.01	0.59
1998	0.89	2.19	0.92	0.97	1.97
1999	1	1.05	1.09	0.92	1.06
2000	0.65	0.26	0.92	0.70	0.17
2001	0.60	2.10	0.89	0.67	1.26
2002	2.83	0.23	1.20	2.34	0.66
2003	0.84	1.48	0.86	0.97	1.25
2004	1.04	1.04	1.05	0.99	1.09
2005	1.08	0.67	1.08	0.99	0.73
2006	0.94	1.97	0.95	0.98	1.85
2007	1.05	0.56	1.01	1.03	0.59
2008	0.93	5.77	0.99	0.93	5.38
2009	1.14	0.59	1.05	1.09	0.68
2010	0.76	0.23	0.81	0.93	0.18
2011	1.05	2.55	1.08	0.97	2.68
2012	1.16	0.64	1.09	1.06	0.75
Mean	1.01	0.90	1.00	1.00	0.91

Notes: **effch** = Technical Efficiency Change**, techch** = Technological Efficiency Change, **Pech** = Pure Efficiency Change, **sech** = Scale Efficiency Change, **tfpch** = Total Factor Productivity Change.
Source: Authors' Calculation

4.3 Malmquist Index Summary of Public Male Schools

Table No. 4 shows malmquist index summary of male schools education. This table shows all DMUs average performance in last 20 years. Only Sindh urban area performed 100% efficiently under technical efficiency. Punjab rural, Sind urban, Sind rural, Baluchistan urban, KPK rural, Fata urban and Islamabad urban are 100% efficient for the years 1993 to 2012. The highest average efficiency score of Islamabad rural is 139% under TFP change, whereas the lowest efficiency score of Punjab urban has been 68.40% average for the last 20 years. Under technical efficiency change KPK urban area has highest efficiency score.

4.4 Technical Efficiency Estimates of Public Female Schools Averages

Table No. 5 shows the technical efficiency of public female schools in Pakistan. KPK rural schools are relatively more efficient than other units (female schools) with 92.26% mean efficiency score and failed to achieve 100% efficiency by poorly managed educational inputs whereas Sindh urban area female schools relatively less efficient with 85.11% mean efficiency score under a CRS and have failed to better manage inputs resources. Similarly, Under VRS the highest mean efficiency score is 97.22% of Punjab rural whereas the lowest mean efficiency score is 93.61% of fatal urban. KPK rural area is relatively more efficient as compared to other DMU with highest mean efficiency score is 97.23%,

Table No. 4 Mamlquist Index Summary of Public Male Schools

Regions	effch	techch	pech	sech	tfpch
Punjab urban	0.99	0.68	0.98	1	0.68
Punjab rural	0.99	0.68	1	0.99	0.68
Sindh urban	1	0.72	1	1	0.72
Sindh rural	1	0.71	1	1	0.71
Baluchistan urban	0.99	0.85	1	0.99	0.85
Baluchistan rural	1.01	0.87	1	1	0.88
KPK urban	1.04	0.93	1.04	0.99	0.96
KPK rural	1.01	0.90	1	1.01	0.91
FATA urban	1	1.10	1	1	1.11
FATA rural	1.01	1.17	1	1	1.19
Islamabad urban	1.01	1.17	1	1	1.18
Islamabad rural	1.04	1.33	1.03	1	1.39
Mean	1.01	0.90	1	1	0.91

Notes: **effch** = Technical Efficiency Change**, techch** = Technological Efficiency Change, **Pech** = Pure Efficiency Change, **sech** = Scale Efficiency Change, **tfpch** = Total Factor Productivity Change.
Source: Authors' Calculation

Table No. 5 Technical Efficiency Estimates of Public Female Schools Averages

Regions	CRSTE	VRSTE	SE
Punjab Urban	0.85	0.96	0.88
Punjab Rural	0.88	0.97	0.90
Sindh Urban	0.85	0.94	0.04
Sindh Urban	0.85	0.94	0.04
Sindh Rural	0.86	0.95	0.04
Baluchistan Urban	0.91	0.97	0.94
Baluchistan Rural	0.89	0.93	0.95
KPK Urban	0.87	0.93	0.92
KPK Rural	0.92	0.94	0.97
FATA Urban	0.86	0.93	0.90
FATA Rural	0.86	0.95	0.89
Islamabad Urban	0.87	0.94	0.91
Islamabad Rural	0.87	0.95	0.89
Mean	0.87	0.95	0.77

Notes: CRSRTE = Constant Return to Scale Technical Efficiency, **VRSTE** = Variable Return to Scale Technical Efficiency, **SE** = Scale Efficiency,
Source: Authors' Calculation

whereas Sindh urban is relatively less efficient with lowest mean efficiency score is 4.5%. None DMUs is efficient due to lack of management resoures i.e. number of teachers, physical facilities. Parental education, expenditure on student, free stationary, uniform, lesson planning, teacher training, counseling of students and extremism, especially in the tribel areas or rural areas are very important of school efficiently. The poorest performance of Sindh rural and urban female schools under scale efficiency.

4.4.1 Summary of Efficiency Aggregates

Table No. 6 indicates the summary of public female schools in Pakistan. There is no decision making unit efficient under CRS and VRS. All of 12 DMUs are inefficient under CRS and VRS. All DMUs have failed to achieve maximum efficiency. The maximum mean efficiency score is 97.22%, whereas scale efficiency score is 4.4%. The highest average efficiency score is 95.14% under VRS.

Table No. 6 The Summary of Efficiency Aggregates

Efficiency Aggregate	CRSTE	VRSTE	SE
No. of Efficient	0	0	0
No. of Inefficient	12	12	12
Maximum Efficiency (%)	92	97	97
Minimum Efficiency (%)	85	93	4
Average Efficiency (%)	87	95	77

Notes: CRSRTE = Constant Return to Scale Technical Efficiency, **VRSTE** = Variable Return to Scale Technical Efficiency, **SE** = Scale Efficiency
Source: Author's Calculation

4.5 Malmquist Index Summary of Public Female Schools Annual Means

Table No.7 indicates Malmquist index summary of annual means of female schools. Results show the highest mean efficiency score of female schools in year 2002 whereas the lowest average efficiency score of female education in the year 2001 under technical efficiency change but female education is not performed efficiently last 20 years. The highest mean efficiency score of female education is 969% under technological efficiency change which shows the best performer in year 2008 whereas the lowest average efficiency score of female education is 13% in the year 2010 which shows the weak performance of overall female education. In year 2002, the female education is best performed with highest mean efficiency scores (119%), while the lowest mean efficiency score of female education is 85% under a pure efficiency change in the year 2001 which shows weak performance of female education in Pakistan. Similarly, on the other hand year 2002 is most efficient year for female school performance. The highest annual average efficiency score is 102.1% of female education, whereas the lowest annual average efficiency score is 92%.

4.6 Mamlquiest Index Summary of Public Female Schools

Table No. 8 shows the Malmquist index summary of public female schools. Table shows the performance of 12 DMUs separately under different technical efficiencies scales. First column shows the technical efficiency change of female education of 12 DMUs. The highest mean efficiency scores for the last 20 years of Islamabad rural areas, whereas the lowest mean efficiency score of Punjab rural and Sindh urban areas.

There are 4 urban regions and 5 rural regions performed efficiently. Islamabad urban had with highest mean efficiency score 138.8%. It shows the best utilization of available educational resources to promote the quality of education under technological efficiency change. Fourth column shows the scale efficiency change of 12 decision making unit for female education which shows performance of all DMUs. Punjab urban, Punjab rural, Sindh urban and Baluchistan urban areas had high efficiency in female schools with 100% efficiency score under scale efficiency change last 20 years.

Table No. 7: The Malmquist Summary of Public Female Schools Annual Means

Year	effch	techch	Pech	sech	Tfpch
1994	0.88	1.28	1.13	0.78	1.13
1995	1.59	0.46	1.15	1.38	0.74
1996	1.06	1.92	1	1.05	2.04
1997	0.99	0.53	0.99	1	0.53
1998	0.97	0.84	1	0.96	0.81
1999	0.86	1.65	0.99	0.87	1.43
2000	1.12	0.16	0.97	1.15	0.19
2001	0.26	5.79	0.85	0.31	1.55
2002	3.95	0.16	1.19	3.30	0.65
2003	0.86	1.56	0.94	0.91	1.35
2004	0.98	1.27	0.93	1.05	1.26
2005	1.11	0.65	1.12	0.99	0.73
2006	0.92	1.87	1	0.92	1.72
2007	0.98	0.35	0.93	1.05	0.34
2008	1.07	9.69	1.04	1.02	10.37
2009	1.08	0.51	1.04	1.04	0.55
2010	0.90	0.13	0.92	0.98	0.12
2011	1.03	6.64	1.06	0.97	6.89
2012	1.04	0.39	1	1.04	0.41
mean	1.02	0.92	1.01	1	0.94

Notes: **effch** = Technical Efficiency Change**, techch** = Technological Efficiency Change, **Pech** = Pure Efficiency Change, **sech** = Scale Efficiency Change, **tfpch** = Total Factor Productivity Change, **Source**: Authors' Calculation

Table No. 8 Malmquist Index Summary of Public Female Schools

Regions	effch	Techch	pech	sech	tfpch
Punjab urban	1	0.62	1	1	0.62
Punjab rural	0.99	0.61	0.99	1	0.61
Sindh urban	0.99	0.62	0.99	1	0.62
Sindh rural	1.01	0.65	0.99	1.01	0.66
Baluchistan	0.99	0.89	0.99	1	0.89
Baluchistan	1	0.88	1	1	0.89
KPK urban	1.03	0.99	1.01	1.01	1.02
KPK rural	1.04	1.01	1	1	1.06
FATA urban	1.04	1.21	1.04	1	1.26
FATA rural	1.03	1.28	1	1.02	1.32
Islamabad	1.03	1.38	1.03	1	1.44
Islamabad	1.04	1.38	1.03	1.01	1.44
Mean	1.02	0.92	1.01	1.00	0.94

Notes: **effch** = Technical Efficiency Change**, techch** = Technological Efficiency Change, **Pech** = Pure Efficiency Change, **sech** = Scale Efficiency Change, **tfpch** = Total Factor Productivity Change, **Source**: Authors' Calculation

5 CONCLUSIONS

This research paper evaluates the performance of gender oriented schools in rural and urban areas of Pakistan. We used DEA non-parametric technique, 3 inputs, 2 output variables and 20 years panel data set in this research paper. The male schools performed well on technical, pure and scale efficiency frontiers rather than technological and TFP frontiers. The male schools need to improve in technological advancement and TFP i.e. except for teachers and capital and all other variables. The male schools must be given more attention to increase the literacy rate in rural and urban regions. In all schools, Ministry of Education should establish subject base department so that student may avoid any disturbance during the study. The overall female schools in rural and urban areas well performed on technical, pure and scale efficiency frontier while inefficient on technological and TFP frontiers. The GOP must establish new schools in rural areas so that it may compete with the private sector. The school management need to make better strategies and planning accordingly to their available resources i.e. teachers, furniture and enrollment. The role of media is significant to promote eduation, especially in rural areas of the country. The media must publish and telecast such programs that are fruitful for student and parents in order to acquire education. The Ministry of Education should establish separate the

female schools and appoint female staff to promote the quality of education in rural and urban areas. Unfortunately, in Pakistan, there are many areas especially rural areas, where there are people are less educated and illiterate that is why female remain uneducated. As a result, the female schools fail to reach at efficient frontier. The Ministry of Education should give training to the teacher's class in subject base. The package of teachers salaries should be attractive which can meet the basic necessities and maintain living standard of teachers. Acquire knowledge, learning and education in female must be encouraged and motivate through the role of media in all rural and tribal areas of Pakistan. Generally speaking, MOE should develop better educational policies and give more attention to national education. It should better allocate financial and non-financial, educational resources in order to achieve efficiency of the gender and national education. Future research can be done on if female under performance hypothesis exists in case of schools in Pakistan. Another caved is the possible existence of female under performance hypothesis that might have hampered the female oriented schools as female due to biological, psychological and social reasons, are likely to be less efficient labor as compared to males.

BIBLIOGRAPHY

1 Ahmed, R. The public sector efficiency in the education department. *Public Policy and Administration Research,* **2**(3), 14-24(2012)

2 Muvawal, J., & E. Hisali. Technical efficiency in Uganda's primary education system: Panel data evidence. *The Africal Statistical Journal*, **15**, 119(2012)

3 Cunha, M., & V. Rocha. On the efficiency of public higher education institutions in Portugal: *An exploratory study .Universidade do Porto, Faculdade de Economia do Porto.*486(2012)

4 Mizala, A., Romaguera, P., & Farren, D. The technical efficiency of schools in Chile. *Applied Economics*, **34**(12), 1533-1552(2002)

5 Sopek, P. Efficiency of public expenditure on education in Croatia. *Institute of Public Finance,* **61**(2011).

6 Stergiou, K. Evaluating the efficiency of primary school education. *Proceedings in ARSA-Advanced Research in Scientific Areas*, **1**(2013)

7 Bogetic, Z., & S. Chattophadyay. efficiency in Bulgarias schools: A nonparametric study. *Research Working Papers*, **1**(1), 1-16(1999).

8 Anderson, C., Antellius, J., & K. Sund. Technical efficiency and productivity at higher education institutions – Some problems and some solutions: *Journal of Economics Literature* (2010)

9 Denaux, Z. S. Determination of technical efficiency: Urban and rural public school in the state of Georgia. *Southwestern Economic Review*, **36,** 105-166(2011)

10 Mizala, A., Romaguera, P., & Farren, D. The technical efficiency of schools in Chile. *Applied Economics,* **34**(12), 1533-1552(2002)

11 Abbott, M., & Doucouliagos, C. The efficiency of Australian universities: A data envelopment analysis. *Economics of Education Review*, **2**(1), 89-97(2003)

12 Afonso, A., Schuknecht, L. & Tanzi, V, Public sector efficiency: an international comparison, *ECB Working Paper*, **242(**2003)

13 Aristovnik, A. The relative efficiency of education and R & D expenditures in the new EU member states. *Journal of Business Economics and Management*, **13** (5), 832-848(2012)

14 Banker, R.D., A. Charnes & W. W. Cooper, Some models for estimating technical and scale inefficiencies in data envelopment analysis, *Management Science,* **30**, 1078-1091(1984)

15 Banker, R. D., & Morey, R. C. Efficiency analysis for exogenously fixed inputs and outputs. *Operations Research,* **34**(4), 513-52(1986)

16 Barrow, M. M. Measuring local education authority performance: A frontier approach. *Economics of Education Review* **10**, 19-27(1991)

17 Bessent, A.M. & E.W. Bessent. Determining the comparative efficiency of schools through data envelopment analysis, *Educational Administration Quarterly*, **16**, 57-75(1980)

18 Bravo-Ureta, B.E., & A.E. Pinheiro. Efficiency analysis of developing country agriculture: A review of the frontier function literature, *Agricultural and Resource Economics Review*, **22**, 88-101(1993)

19 Charnes, A., Cooper, W.W., & Rhodes, E. Measuring the efficiency of decision making units. *European Journal Operational Research*, **2**(6), 429-444(1978)

20 Cooper, W. W., Seiford, L. M., & Tone, K. Data envelopment analysis a comprehensive text with models, applications, references and DEA-Solver software, 2nd edition. *Springer*, 490(2007)

21 Chaampita. M. Analysis of technical efficiency of secondary schools in Zambia, (2011)

22 Farrell, M.J. The measurement of productive efficiency. *Journal of Royal Statistical Society*. Series A, **120**: 253-281(1957).

23 Ganley, J. A., & Cubbin, J. S. Public sector efficiency measurement: Applications of data envelopment analysis. *Elsevier Science Inc.*,(1992).

24 Grosskopf, S., and W. Weber. Measuring school district performance. *Public Finance Quarterly*, **17**, 409-29(1989)

25 Gupta, S. & Verhoeven, M. The efficiency of government expenditure – Experiences from Africa. *Journal of Policy Modeling*, **23**, 433-467(2001)

26 Kantabutra, Sangchan and John C.S. Tang. Urban-Rural and size effects on school efficiency: The case of Northern Thailand, *Leadership and Policy in Schools,* **5**, 355-377(2006)

27 Lovell, C. A. K. Production frontiers and productive efficiency, in Fried, Lovell and Schmidt (eds.), The measurement of productive efficiency. *New York: Oxford University Press* (1993)

28 Mante, B. & G. O'Brien. Efficiency measurement of Australian public sector organizations: The case of state secondary schools in Victoria, *Journal of Educational Administration,* **40**(3), 274-296(2002)

29 McCarty, T. A., & Y. Suthathip. Technical efficiency in New Jersey school districts, in Harold O. Fried, C. A. K. Lovell, and S. S. Schmidt (eds.), The measurement of productive efficiency: Techniques and applications. *New York: Oxford University Press,*(1993)

30 Mahmood, H.Z., R. Khan, B. Mehmood, & K. Khan. Efficiency analysis of conventional vs. Islamic microfinance: An appraisal for sustainability in Pakistan, *International Journal of Empirical Finance*, **3**(4), 192-201(2014).

31 Mehmood, B., & M. Waseem. Unraveling productivity of cement industry of Pakistan: A non-parametric approach. *Asian Journal of Business and Economics*, **4**(2), 1-14(2014).

32 Mehmood, B., & N. Nazir. Efficiency differences within Pakistan telecommunication sector: A non-parametric investigation. *Economy Informatics*, **14**(1), 5-13(2014).

33 Mehmood, B., Rizvi, S.H.H., & F. Ajaz. Efficiency of women financing Banks: An inter-country comparative study of South Asia using data envelopment analysis. *Asian Journal of Business and Economics*, **3**(3), 1-16(2013).

34 Mihaiu, D. M., Opreana, A., & M. P. Cristescu. Efficiency, effectiveness and performance of the public sector. *Romanian Journal of Economic Forecasting*, **4**(1), 132-147(2010)

35 Ruggiero, J. Efficiency of educational production: An analysis of New York school districts, *Economics and Statistics*, **68**, 499-509(1996)

36 Sengupta, J.K. & R.E. Sfeir. Production frontier estimates of scale in public schools in California, Economics of Education Review, **5**, 297-307(1986)

37 Subhas, C. R. Resource use efficiency in public schools: A study of connecticut data, *Management Science*, **12,** 1620-1627(1991)

38 Schmidt, P. S., & C. A. K. Lovell. Estimating technical and allocative inefficiency relative to stochastic production and cost Frontiers. *Journal of Econometrics*, **9**, 343-66(1979)

39 Wolff, L., E. Shiefelbein & J. Valenzuela. Improving the quality of primary education in Latin America: Towards the 21st Century, *Regional studies program Report* **28**. The World Bank. LACTD, Washington, D.C. (1993)

40 Shami, P. A., Hussain, K. S., & A. Waqar. Educational Planning and Management. Academy of Educational Planning and Management (2007)