IMPACT OF COMMUNITY INVOLVEMENT IN SCHOOL MANAGEMENT TO RAISE QUALITY OF EDUCATION: A CASE OF SINDH

Bushra Waqar
Govt college of Education at F.B.Area

Abstract

The right to education is not only indicating the right to access to education but also emphasizing the right to quality education. To improve the quality of education, World Bank and other donor agencies introduced the need of community involvement in school management system in achieving the right to education. Thus, multiple reform programs initiated based on community involvement known as school-Based Management (SBM) or School Management Committee (SMC). Given this, to improve the quality education, many countries initiated multiple reform programs and indicated the need of community involvement through community-school partnership. Therefore, in Pakistan, like other provinces, Sindh has also formed School Management Committee (SMC). This study is an attempt to evaluate the impact of community involvement i.e. SMC on quality of education in Sindh province, Pakistan. For the analysis, the study has used Sindh Education Management Information System (SEMIS) database for the year 2013-14. To evaluate the impact of SMC intervention, the study has constructed different measures of quality education such as school environment index, teacher's resource index, promotion rate, repetition rate, and dropout rate. Further, the study has also assessed the quality of matching based on different measures of matching quality. Since the study has selected those schools of Sindh in which SMC is functional. Hence, to control the problem of self-selection bias, the study has used a semi-parametric propensity score matching technique (PSM). The overall findings of the study provide useful insights and reveals that the establishment of SMC has positive and significant impact on access to school and quality of school measures except the one i.e. student's dropout rate. The study recommends that an impact evaluation is one of the best ways to provide evidence-based useful insights for the policymakers to improve educational outcomes for future generations.

Keywords: School Management Committee; Quality of Education; Impact Evaluation, program Evaluation; Propensity score matching; Average Treatment Effect

INTRODUCTION

In Pakistan, one of the key performance social indicators particularly, education, remained a challenge since its independence in 1947. The right to education is not only indicating the right to access to education but also emphasizing the right to quality education. The access to good quality education is entailed for the development of societies as a whole. Generally, the quality of education is assessed on the basis of key performance indicators such as increase in student's class enrolment, number of qualified teachers and number of institutes in a country. To improve the quality of education, World Bank and other donor agencies introduced the need of community involvement in school management system. Thus, multiple reform programs initiated based on community involvement known as school-Based Management (SBM) or School Management Committee (SMC). Therefore, in Pakistan, like other provinces, Sindh has also formed SMC in

1990. SMC was formed to control all aspects of school management such as students' enrollment, teachers' attendance, classroom teaching, school finance and outcome of the student. However, according to SEMIS 2013-14, SMC is functional in around 82 percent of the public schools in Sindh. But the deteriorating condition and current decline in the enrollment is alarming, this need an in-depth assessment. Thus, this study aims to assess the impact of School Management Committee (SMC) on quality education in Sindh for the year 2013-14.

According to UNESCO (2003), the primary source to assess the quality education is to focus the student's learning outcomes but the desired quality can be achieved if the input, process, and output ensure the quality in terms of efficiency, effectiveness and excellence and social justice. Nonetheless, it does not only impact the learner's cognitive development but also ensures a successful and productive future to our future generation. Unfortunately, in Pakistan, education remained one of the deprived fields and it has been facing serious challenges in the areas of access, quality, and governance. However, since its inception, the government of Pakistan took various initiatives for building concrete educational foundation of the country and proposed considerable attention to the betterment of the educational outcomes. Additionally, education is one of the most powerful and supported factor for achieving the sustainable development in a country. Thus, Pakistan, like other developing countries of the world also signed the 17 Sustainable Development Goals (SDGs) agenda 2030 in September 2015.

The state of Pakistan has partially successful in providing access to education, but it has not been able to ensure the quality of education. Recently, the education sector was in the federal domain but after the 18th amendment in the 1973 constitution subject to the education, which was made in 2010 under the Article 25-A, the education sector was devolved to the provincial domain. It is, therefore, provincial Govt.'s responsibility to provide prime education to all. Thus, each provincial Govt. initiated several reform programs to provide and improve the quality education. The establishment of provincial education foundation is also a result of 18th amendment. The Sindh Education Foundation (SEF) initiated a number of reform programs based on school interventions, particularly in remote areas of Sindh. In this context, the government of Sindh introduced a sector reform program for primary as well as secondary education known as the Sindh Education Sector Reform Program (SERP). Additionally, this program was financially supported by the World Bank during the Fiscal Year 2006/07 to 2011/12. The Second Sindh Education Sector Reform Program (SERP-II) was arrived to improve the quality of service delivery and to increase the student's participation in schools. Improvement in educational governance ensures the improved levels of access, quality and participation in education which ultimately reduces various problems related to service delivery (UNESCO, 2009). This indicates the need and the interest of community involvement in education for better planning and management which can help to increase the demand for education and improve the quality of education by improving the enrolment, attainment, and achievement of the students (Watt, 200l). Additionally, studies conducted in Latin America, North America, Sub-Saharan Africa, and Southeast Asia found positive impact of community-school involvement on outcomes for students, schools and community (DeSteffano et al. , 2006; Vagas, 2005; Henderson & Mapp, 2002; Watt, 2001; Mozumder & Halim, 2006). Further, Bray (2001) observed that community participation increased community interest in education and also increased equity in access to education. Finally, in almost all the studies reported three stakeholders in school-based mechanism such as school, parents and community members and the most common term used in the literature is School Management Committee (SMC).

In Sindh, a number of reform programs introduced under SERP-II for instance, community-based committee is formed called School Management Committee (SMC) which is one of the core factor of the SERP-II reform program agenda. Further to this, the need of community involvement is also indicated in the minimum standards for quality education in Pakistan, developed by the interprovincial technical working groups (IPTWGs) on quality and governance of education. However, SMC is a triangular committee consisting of its three members namely school, parents and local community. SMC is formed to provide a support to the headteachers in order to deliver quality education without any delay to the children, the monitoring of teacher's attendance and performance in the classroom. Finally, SMC is also formed to improve the student's performance by increasing the student's enrolment and reducing the dropout from the school. To improve the quality education, multiple reform programs have been initiated by the Govt. of Sindh mainly under the umbrella of SERP. However, the impact assessment studies, for evaluating the quality education, are very limited in number.

Thus, there is a need to evaluate an in-depth assessment of such interventions/programs on the overall quality of education. Thus, a number of related studies conducted to examine the impact of SMC in improving the quality education such as Asim (2013) evaluated the trends in education system of public schools in Sindh province for the periods of 2004-05 and 2011-12 using descriptive analysis. Further to this, the study also validated the statistics by robustness checks based on household-school level census collected independently in three districts of rural Sindh namely Mirpurkhas, Matiari, and Sanghar. However, Kumar (2016) studied the role and functioning of SMC in public schools in district Kullu of Himachal Pradesh. The study found that SMC has positively improved the quality education. Similarly, another study conducted by Rout (2015) to assess the role of SMC in rural elementary schools in Balasore district of India and revealed that SMC has successfully achieved universal enrolment by proper monitoring pupil's attendance and absenteeism and also efficiently developed school infrastructure. Further, the study revealed that the SMC allocated funds has also been utilized properly. Osei-Owusu and Sam (2012) analyzed the role of SMC to improve the quality education and teaching in Ashanti Mampong Municipal Township Basic schools in Ghana-West Africa, based on simple random sampling. However, the study found SMC ineffective to monitor the headteachers, teachers, and student's attendance but found very effective for developing better school-community relationship. This study contributes to the existing literature by empirically assessing the impact of SMC on quality education in Sindh.

This study is an attempt to assess the impact of one of the SERP programs that is School Management Committee (SMC). The objectives of the study are twofold. In the first step, to evaluate the impact of SMC intervention, the study has constructed different measures of quality education such as school environment index, teacher's resource index (measures of access to school), promotion rate, repetition rate and dropout rate (measures of quality of education). However, in the second step, the study evaluated the ex-post treatment effect of SMC on quality education measures using a semi-parametric propensity score matching technique (Jimenez & Sawada, 1998; Sawada, 1999; and Sawada & Ragatz, 2005). Since the study has selected those schools of Sindh in which SMC is functional. Thus, to control the problem of self-selection bias, the study has used a semi-parametric propensity score matching technique (PSM) for treatment (schools with SMC) and control (schools without SMC). The overall findings reveal useful insights to the policy makers to improve the quality of education and reveals that the establishment of SMC has positive and significant impact on access to school and quality of school measures except the one i.e. student's dropout rate.

The study is organized in such a way that after the introduction, the study is providing the relevant literature review and then in the next section, the study is discussing the proposed models based on different outcome variables and also providing the detailed construction of each variable used in the model. Additionally, the section is also discussing the source of data used for the analytical purpose. Furthermore, Section 4 is presenting the propensity score matching technique which is generally employed for an impact evaluation. Additionally, section 5 is described as the results section of the study which consists of descriptive as well as empirical insights drawn from the study. Finally, the last section concludes the study by discussing the overall findings of the study.

Model Specification and Source of Data

To evaluate the impact of SMC intervention on different aspects of quality education, such quality indicators are the outcome variables that are discussed in detail in the following econometric models. The model, given in equation 1, is basically discussing the general model which is consisting of the outcome of interest, treatment variable and different covariates used in the analysis.

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 V_i + \beta_3 W_i + \beta_4 Z_i + \epsilon \quad (1)$$

Where,

Y_i is the outcome of variable for school i (i.e. Quality and Access indices),

T is the treatment variable for whether the school received the intervention or not. This is binary in nature,

V_i is the student's enrolment based indices such as student's flow rates

W_i is the teachers' characteristics on average by school i. Such as gender of the teacher, teacher's qualification, type of training acquired their designation, etc.

Z_i denotes the school characteristics including number of classrooms in the school, building condition, availability of washroom, drinking water facility, electricity facility, etc.

Here, in the following models, each outcome variable and covariates are discussed in detail.

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 V_i + \beta_3 Z_i + \epsilon \quad (2)$$

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 V_i + \beta_3 W_i + \epsilon \quad (3)$$

In equation 2, the outcome of interest is teacher's resource index, a quality measure of access to school. Since teacher's characteristics are comprised of numerous indicators, thus, a single variable composite index is constructed using principal component analysis (PCA). Such characteristics are comprised of teacher's designation (PST, JST, HST, SS, SLT, OT, PTI, WIT, HMs, DT, others), their academic qualification (doctorate, M.Phil., masters, bachelor, intermediate, matriculation and below matric), type of post and professional training (PTC, CT, B.Ed., M.Ed., other trained and untrained). These indicators were initially discrete in nature, first converted by taking proportion of each variable from the total number of teachers and PCA is applied.

Similarly, PCA is also applied to construct another access to school outcome variable in equation 3 i.e. the school environment index. This index is constructed using a number of school-level indicators which are first converted into a dummy and scale variable. A scale variable is defined as the variable which was initially discrete in nature, converted into a scale of ranges from 0 to 2.

A scale of 2 is assigned to the highest level or degree, 1 is assigned to moderate degree and 0 to the lowest degree. For example, in case of school facility index, a scale ranges from 0 to 2 is assigned to a variable pupil-classroom ratio in such a way that a scale value of 2 is assigned if the ratio ranges from 1 to 25, scale value of 1 if the ratio is 26 to 50 and a scale value of 0 if the ratio value is above 50. The school facility index is constructed using 10 school-level indicators namely boundary wall, building condition, type of building, electricity connection, electric fan availability, drinking water facility, library facility, and pupil-classroom ratio. Thus, PCA is applied to construct a composite- school facility index based on the variables discussed above.

However, PCA is a commonly used statistical technique for transforming orthogonally a large number of indicators into a composite index (indices) which can be further defined as the process of converting correlated variables to linearly uncorrelated components. Each component of PCA is a linear (weighted) combination of original indicators that follows the common arrangement. The construction of first PCA i.e. school facility index is consisting of 9 indicators. Out of these 9 indicators, 6 indicators have 2 dimensions and 3 having 3 dimensions.

Principal Component Analysis

In general, PCA is basically a linear combination of p variables or indicators with n-dimensional vectors $x_1, x_2, \ldots, x_n$. Hence, an (n x p) matrix of X, its j^{th} column is the vector x_j of values for the j^{th} variable. Thus, a linear combination of the columns of matrix X is given as $\sum_{j=1}^{p} ajxj$ = Xa, where "a" is a vector of constants $a_1, a_2, \ldots, a_p$. these PCs can be written as:

$$PC_1 = a_{11}X_1 + \ldots + a_{1p} X_p = Xa_1$$

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$$PC_p = a_{p1}X_1 + \ldots + a_{pp} X_p = Xa_p$$

Since eigenvectors $\mathbf{a_k}$ of the covariance matrix are used to find weights for the linear combination and the eigenvalues **S** corresponding to each eigenvector **a** are the variances of the linear combinations or PC. Moreover, another symmetric p x p matrix similar to covariance matrix S, with exact eigenvalues (for k=1, 2,…, p), corresponding to eigenvectors to create an orthogonal set of eigenvectors $\mathbf{a_k}$, which is known as PC loadings. To find **p** new linear combinations i.e. X_{ak} = $\sum_{j=1}^{p} ajkxj$, a Lagrange multiplier approach can be used with the restriction of orthogonal coefficient vectors, which maximizes the variance subject to the condition that the new linear combinations are not correlated with the earlier linear combinations. The newly obtained linear combinations X_{ak} are known as the principal components.

Thus, the first and second components are not co-correlated each other. Similarly, every following component is not correlated with the preceding one. Since it is of the interest that to obtain a largest eigenvalue or variation, the corresponding eigenvector $\mathbf{a_1}$ is considered. The first PC explains the greater variation, the second PC displays second-largest amount (less than the first PC) and so on. Thus, PCA is an appropriate technique which converts a large number of original variables (9 in case of school facility and 26 variables in case of teacher's index) into small set of linear combinations that explains the total variation of the data (Dillon and Goldstein, 1984). Further, PCA is also a best-suited technique for removing the problem of simultaneity and multi co-linearity may arise among the original set of variables because it maximizes the variance relative to minimization of least square distance (Jha and Murthy, 2003).

Hence, the first principal component is used for school facility index and for teacher's quality index as well. For school facility index, the first PC explains 33% of the total variation and 62% of the variance, using first three components. However, for teacher's index, it explains 13% of the total variation and 65% variation for first 10 components. Detailed summary of both the indices is provided in Annexure 2.

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 W_i + \beta_3 Z_i + \in \quad (4)$$

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 W_i + \beta_3 Z_i + \in \quad (5)$$

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 W_i + \beta_3 Z_i + \in \quad (6)$$

However, the outcome variables given in above equations are the measures of quality education. These outcome variables namely student's promotion rate, repetition rate, dropout rate called student's flow rates that are constructed using cohort student flow rate method by taking class wise enrollment and number of repeaters.

The cohort student-flow rate method, adopted from UNESCO, is used for calculating the student-flow rates (promotion rate, repetition rate, and dropout rate) by taking class-wise enrolment and numbers of repeaters. To calculate the class-wise promotion rate, the number of students from a cohort enrolled in a given class at a given school year t+1(i.e. 2013-14)is divided by the number of students from the same cohort enrolled in the previous class in preceding school year t (i.e. 2012-13). Like promotion rate, the student's repetition rate is also derived by dividing the number of repeaters in a given class in a given year t+1 (i.e. 2013-14) by the enrollment of same class but in the previous year t (i.e. 2012-13). Finally, the student's class-wise dropout rate is calculated by subtracting the former student's flow rates (promotion rate and repetition rate) from 100.

Data Source

In assessing the impact of SMC on quality education, this study has constructed a number of variables using different techniques. In particular, at school level, this study has constructed five outcome variables namely, student's promotion rate, repetition rate, dropout rate (student's flow rates), school environment rate and teacher's resource index. Moreover, student's promotion rate (measure of access to school), student's repetition and dropout rates (measures of quality of education) are constructed using cohort student flow rate method. Additionally, the latter two indices are constructed, for assessing the quality of education, using a composite index methodology i.e. principal component analysis (PCA).

The school-level analysis is solely based on the Annual School Census called *Sindh Education Management Information System* (SEMIS), provided by the *School Education and Literacy Department of Govt. of Sindh.* SEMIS data provides comprehensive education profile of Sindh province which comprises of information such as school infrastructure and availability of school facilities, class-wise enrolment and number of repeaters and detailed teacher's information by gender and district. For impact evaluation of SMC, the study has used 2013-14 SEMIS dataset having 46,724 numbers of schools in province of Sindh out of which 6,207 schools are (temporary and permanently) closed.

Estimation Technique: Propensity Score Matching

Matching technique is being used in various fields of study where one has two comparison groups, a group of treated individuals (Y_1) called treatment and a control group of untreated individuals (Y_0). Moreover, the technique provides one of the possible solutions to the problem of selection bias by selecting on observable characteristics (X) through random selection. The treatment binary variable denoted by P, with a value (P = 1) if the individual undergoes treatment and (P = 0) if the individual is not treated.

In addition to this, there are two potential outcomes for each group. Y_i (1) denotes the potential outcome of treated group and Y_i (0) denotes the potential outcome of untreated group. Thus, the treatment effect, commonly known as the causal effect, is defined as the difference between these two potential outcomes which can be written as:

$$TE_i = Y_i(1) - Y_i(0) \qquad (7)$$

Moreover, the matching technique randomly selects the potential outcomes and their difference from the population. However, an individual effect for both the treated and untreated is not observable. Hence, an average treatment effect (ATE) is estimated. There are two parameters of interest or treatment effects. One is average treatment effect (ATE), which can be defined as the expected difference between the two outcomes and can be written as:

$$ATE = E(Y_1) - E(Y_0) \qquad (8)$$

$$ATT = E[Y(1) \mid P = 1] - E[Y(0) \mid P = 1] \qquad (9)$$

However, the average treatment effect on treated (ATT) is the difference between the outcomes of those randomly selected individuals who were treated. The ATT is constructed to deal with the problem of “selection-bias”.

In equation 9, the term on right hand E [Y (0) | P = 1] is called counterfactual mean, which is for those being treated was not observed because outcomes (both) for the same individuals cannot be observed at the same time; or in this case, a counterfactual is a possibility of what would have happened if the participating school not received (SMC) intervention Gertler et al. (2007). Thus, considering the expected outcome for untreated individuals E [Y (0) | P = 0] is not appropriate because it shows that factors which define treatment indicator also defines the outcome variable. Since both individuals (treated and untreated) differ even in the absence of treatment and leading to a problem of self-selection bias.

The comparison of average effects conditional on treatment status can be stated as:

$$\underbrace{E[Y(1) \mid P = 1] - E[Y(0) \mid P = 0]}_{ATE} = \underbrace{E[Y(1) \mid P = 1] - E[Y(0) \mid P = 1]}_{ATT} + \underbrace{E[Y(0) \mid P = 1] - E[Y(0) \mid P = 0]}_{Selection\ Bias} \qquad (10)$$

Thus, the true ATT can be estimated if the term E [Y (0) | P = 1] - E [Y (0) | P = 0] or self-selection bias becomes equal to zero.

In experimental studies, the assignment to treatment is random and can be identified directly. But in non-experimental studies, two strong assumptions are required to deal the selection bias problem.

Unconfoundedness / Conditional Independence (CIA)

Conditional on observable characteristics X, treatment P and potential outcomes Y (0) and Y (1) are independent. The assumption of CIA states as:

$$Y(0), Y(1) \perp P \mid X, \quad \forall \; X$$

The above notion is called unconfoundedness which implies that the selection is only based on observable covariates. According to Rosenbaum and Rubin (1983), the potential outcomes are independent of treatment conditional on X as well as conditional on balancing score (propensity score, PScore) – the probability of an individual who receives treatment based on his observed characteristics X. The assumption of unconfoundedness/CIA, conditional on PScore can be stated as:

$$Y(0), Y(1) \perp P \mid Prob(X), \quad \forall \; X$$

Overlap / Common Support Condition

Besides with the independence, the overlap assumption is also a strong assumption which eliminates the chance of perfect predictability of treatment P given covariates X should satisfy the overlap assumption which can be stated as:

$$0 < Prob(P = 1 \mid X) < 1$$

The probability of treated group must lie between 0 and 1 and it ensures that individuals with same characteristics X having positive propensity of being treated and untreated (Heckman, LaLonde, and Smith, 1999). Moreover, the condition of *strong ignorability* holds if both unconfoundedness and overlap assumptions are valid (Rosenbaum & Rubin, 1983).

For propensity scores, let's consider a model based on binary choice probit model.

$$Prob(P = 1 \mid X) = G(X\beta) = Prob(X)$$

Let us choose a propensity score Prob(X) at random and two individuals having same propensity score. One of them is treated and other does not. The average treatment effect conditional on propensity score is as follows:

$$E(Y \mid P = 1, P(X)) - (E(Y \mid P = 0, Prob(X)) = E(Y_1 - Y_0 \mid P(X))$$

These propensity scores are estimated via logit or probit model of estimation. Thus, such matching technique is called semi-parametric matching. However, matching can be obtained through different algorithms such as Nearest Neighbor Matching (NN) (with or without replacement), caliper matching, radius matching, Kernel matching, and stratification matching. The current study employs NN matching, the most commonly used and proposed by Abadie and Imbens (2006). Furthermore, the study also presents Kernel matching by graphical representation (see Figures 2 through 6 in Annexure 1).

Findings of the Study

This section is providing the descriptive analysis which is basically consisting of the outcome variables used in drawing the empirical findings of the study. Moreover, the section is also discussing the empirical analysis for instance, the average treatment effect of SMC using Propensity Score Matching technique.

Descriptive Analysis

The descriptive analysis of school-level data for the year 2013-14 can be depicted from the following figures. In general, the analysis is providing the description of schools in which SMC is functional and schools without SMC in Sindh province. However, the analysis is describing the pupil-class ratio, pupil-teacher ratio, schools' facilities, teacher's training by class-level and student's flow rates for primary by SMC status for the year 2013-14.

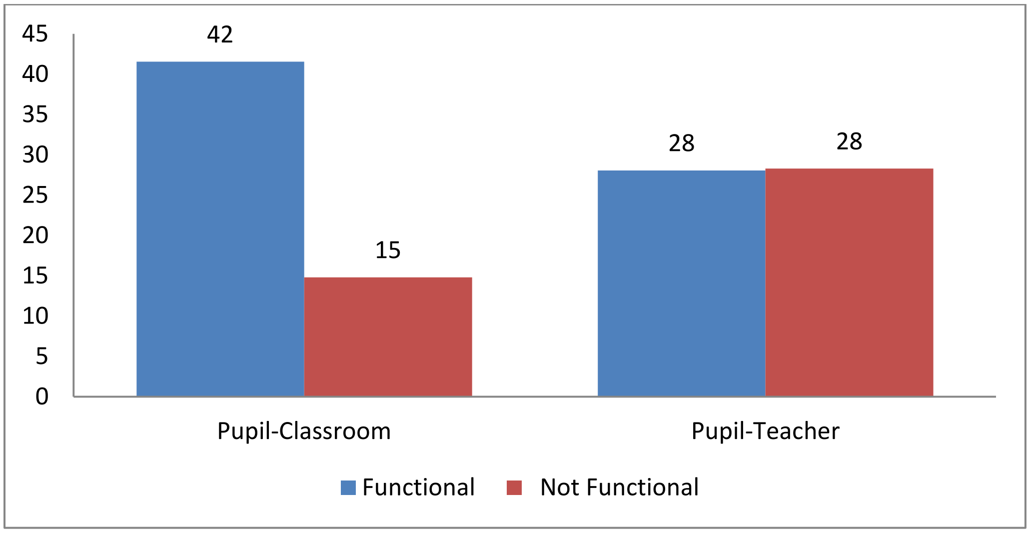

Figure 4.1: Pupil-Classroom Ratio & Pupil-Teacher Ratio by SMC

Source: Authors' illustration based on SEMIS 2013-14

The figure 4.1 is depicting the measures of quality education in Sindh that are pupil per classroom and per teacher ratios in schools in which SMC is functional and not functional for the year of 2013-14. However, a low pupil-classroom ratio is considered as a good measure of quality education. Above figure indicates that the overall pupil-classroom ratio is 42 per classroom in schools where SMC is functional, which is much higher than a ratio of 15 in schools where SMC is not functional. Additionally, as per international criteria, the pupil-teacher ratio should not exceed a ratio of 40:1, however, in case of Sindh, the pupil-teacher ratio remained 28:1 for schools where SMC is functional and not functional.

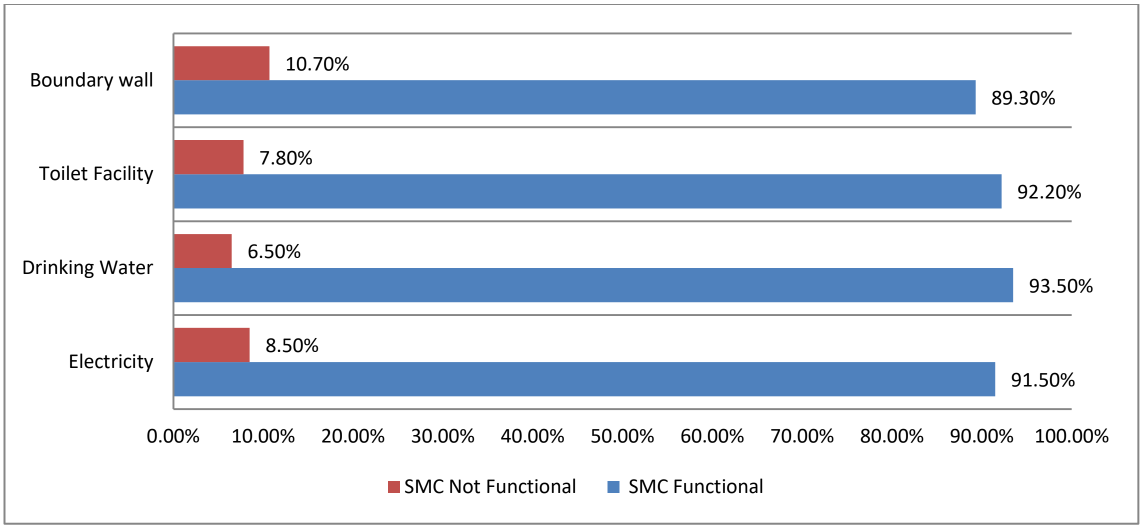

Figure 4.2: Schools with Basic Facilities by SMC

Source: Authors' illustration based on SEMIS 2013-14

Figure 4.2 is showing the status of basic facilities available in public schools of Sindh for the year of 2013-14. Additionally, the figure is also distinguishing the facilities by SMC. Moreover, the figure is illustrating that the condition of schools with basic facilities in which SMC is functional is significantly better than the schools where SMC is not functional which ensures the quality education in such schools.

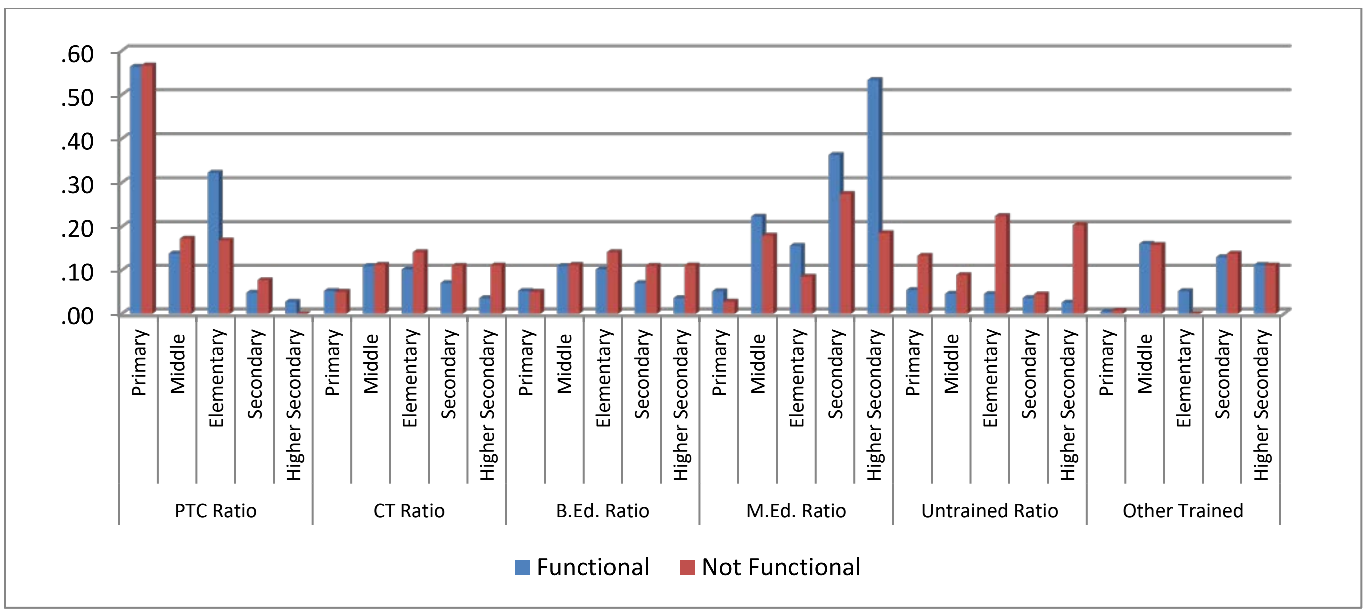

Figure 4.3: Average Number of Teachers by Training, Level & SMC

Source: Source: Authors' illustration based on SEMIS 2013-14

The assessment of quality teachers is also very important element of quality education. The figure 4.3 is depicting the average number of trained teachers across the different levels of class in schools of Sindh where SMC is functional and not functional for the year of 2013-14. Thus, in a broader way, the above figure reveals that most of the trained teachers are associated with the schools in which SMC is functional. Moreover, the PTC trained teachers are greater in belong to primary followed by elementary. However, the M.Ed. qualified teachers (belong to middle, secondary and higher secondary) are greater in SMC schools. Additionally, the figure is also presenting the condition of untrained teachers in both types of schools, which shows that the average number of untrained teachers is higher in schools where SMC is not functional.

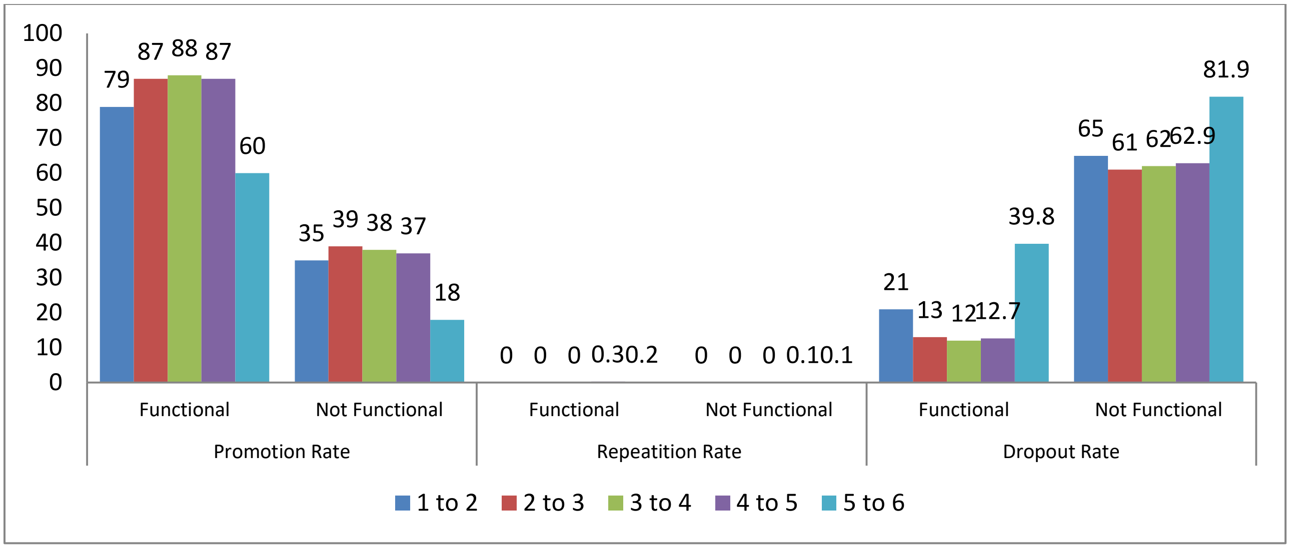

Figure 4.4: Student's Flow Rates by SMC

Source: Authors' illustration based on SEMIS 2013-14

The figure 4.4 is presenting the class-wise student's flow rates for primary level of education in schools of Sindh where SMC is functional and not functional. The figure depicts that the student's promotion rate in each class is significantly higher in those school where SMC is functional schools. Moreover, class-wise repetition rate is slightly higher in SMC functional schools than schools in which SMC is not functional. Additionally, the repetition rate for class 1 to 3 is zero that is because of the government of Sindh's policy through which all the students of class 1 to 3 were promoted. However, the dropout rate in each class is significantly lower in schools where SMC is functional as compare to the schools in which SMC is not functional. Furthermore, the figure also shows that the biggest dropout occurs for class 1 to 2 and class 5 to 6 in both types of schools. However, the dropout from class 5 to 6 reflects the transition from primary to middle-level schools and in some areas of Sindh; children who graduated from class 5 were not able to find any nearby middle-level school (Ali, 2011).

Empirical Findings: Estimates of PSM

The study is evaluated the ex-post average treatment effects of SMC on quality education, discussed in this section. Since the Probit model is used to estimate the propensities, thus the estimated coefficients, given in tables 1, 2 & 3 in Annexure 1, are not the marginal effects which cannot be interpreted directly. Following tables are providing the empirical findings of the impact of SMC on all the measures of quality education.

Matched/Unmatched	Treated	Controls	Difference	T-stat
Unmatched	11.96	11.70	0.26	6.14
Matched ATT	11.96	11.78	**0.18**	2.21

Table 4.1: Average Treatment Effects of SMC on Teacher's Index
Source: Authors' calculations based on SEMIS 2013-14

The estimates of average treatment effect on treated (ATT) from matched sample and the estimates of average treatment effect from unmatched sample are given in table 4.1. Further, the table is providing the estimates of treated group, control group and their differences as well, which is the desired coefficient, for both the matched and unmatched samples. Additionally, the estimates of ATT; in case of this study, the average treatment impact of SMC on teachers' index – measure of access to school, is positive and statistically significant. The difference coefficient is showing an increase of 18 percent after matching which reveals that the intervention of SMC has improved the student's access to school in Sindh. These findings are consistent with the studies of Brinkerhoff (2003) and King & Ozler (2005). whereas, the studies conducted by Khan (2003) and Pryor (2005) provide negative impact of SMC.

The positive impact of SMC on teachers quality ensures improved school accountability which can be measured by teacher's academic and professional qualification, reduction in teachers absenteeism, increase in teaching time, etc. in this case, the teachers' quality index – a measure of school accountability, is based on teacher's academic, professional qualification (training), and gender of the teacher. Though the difference coefficient (difference of treated and control) of unmatched sample is also positive and statistically significant but the coefficient is higher than the ATT which is indicating an upward bias in estimating the SMC impact on teacher's resource index or on access to school measure.

Sample	Treated	Controls	Difference	T-stat
Unmatched	0.35	-0.61	0.96	29.82
Matched ATT	0.35	-0.53	**0.87**	16.0

Table 4.2: Average Treatment effect of SMC on School Environment Index
Source: Authors' calculations based on SEMIS 2013-14

The above table is providing the impact of SMC on another measure of access to school that is school environment index. The estimated difference coefficients for the unmatched and matched samples are positive and statistically significant and reveal that the former is higher than the later, indicating an upward bias. Thus, the positive impact of SMC on school environment index provides that the implementation of SMC has increased the student's access to school in the province of Sindh. Studies evaluated the impact of school-based management (SBM) found that the role of community involvement particularly SMC, improves the school infrastructure. In addition to this, these studies also report that schools with SBM have more learning material and resources, better class environment (in terms of pupil-teacher ratio), and improved infrastructure as compare to non-SBM schools (Gertler et al. 2006; di Gropello and Marshall 2005; and Muskin 1999).

Variable	Sample	Treated	Controls	Difference	T-stat
Promotion Rate	Unmatched	32.32	23.47	8.84	19.63
	Matched ATT	32.32	25.34	**6.97**	3.92
Repetition Rate	Unmatched	0.06	0.02	0.04	2.53
	Matched ATT	0.06	0.01	**0.05**	3.08
Dropout Rate	Unmatched	67.62	76.50	-8.88	-19.69
	Matched ATT	67.62	74.64	**-7.02**	-3.95

Table 4.3: Average Treatment effect of SMC on Students' Flow Rates (Promotion Rate, Repetition Rate & Dropout Rate)

Source: Authors' calculations based on SEMIS 2013-14

Table 4.4 is presenting the average treatment effect of SMC on student's flow rates such as promotion rate, repetition rate, and dropout rate. Here, the student's flow rates are considered as the measure of quality of education. Hence, the above table discusses the impact of SMC on each flow rate. In general, all the three estimated difference coefficients are statistically significant and positive except the dropout rate which is negative for both unmatched and matched samples and indicating a decline in student's dropout rate in Sindh over the period of 2013-14. The estimated coefficient depicts a decline of around 7 percent. Thus, it leads to improve the quality of education in Sindh. Additionally, the difference in both the difference coefficients provides an upward bias in estimating the ATT on student's dropout rate. Furthermore, the table is also discussing the ATT on student's promotion rate and repetition rate. The estimated findings are providing the positive and statistically significant results of ex-post treatment effect of SMC. However, the difference coefficients for promotion rate and repetition rate provide an increase of around 7 percent and 0.05 percent respectively. Hence, it is evident from the above discussion that the implementation of SMC has significantly improved the quality of education in Sindh over the period of 2013-14. These findings are consistent with the findings of Skoufias and Shapiro (2006) that evaluated the impact of SBM on students' survival i.e. dropout, repetition and failure rates using propensity score matching technique. Their study found that a community participation resulted a decline in dropout, repetition and failure rates of the students in Mexico. Moreover, the studies conducted by Marshall et al. (2008); Di Gropello and Marshall (2005); Pellini (2005); and Gertler et al. (2006) also found positive impact of community involvement on student's survival rates. Finally, King & Ozler (1998) found positive effect on student's promotion rate.

Group	Pseudo R^2	LR Chi-Square	Mean Absolute Bias
Unmatched	0.04	774.58*	70.6
Matched	0.003	263.23*	3.3

Table 4.4: Average Percentage Bias

Source: Source: Authors' calculations based on SEMIS 2013-14

*Note: * indicates level of significance at 1%, ** at 5% &*** at 10%*

In addition, to estimate the plausible ATT, the assessment of the matching quality (of the covariates) is also very important for evaluating the impact of SMC on quality of education. However, there are various measures which assess the quality of matching namely standardized percentage bias-suggested by Rosenbaum and Rubin (1985), t-test for homogenous mean value of each exogenous variable – also suggested by Rosenbaum and Rubin (1985), Pseudo R^2 – suggested by Sianesi (2004) and graphical assessment of quality check. Table… is providing the reduction in average percentage bias after matching from 70.6 to 3.3 which indicates that covariates are matched efficiently. Additionally, the reduction in Pseudo R^2 after matching is also an endorsement of the efficient matching quality check. Furthermore, the standardized percentage bias for each variable before and after matching is also assessed, provided in table A4 which reveals the reduction in almost all the bias calculated before and after matching. In addition to this, the table is also providing the t-test calculated for equal variances in both the matched and unmatched samples, also an indication of efficient quality match. Finally, figure 3 in Annexure 1, is depicting the reduction in standardized percentage bias, the panel 1 of the figure is presenting the bias before matching and panel depicts the reduction in percentage bias after matching. However, figure 2 in Annexure 1, is the scatter diagram across each covariate for both matched and unmatched samples. The figure is also ensuring the efficient matching of the variables by minimizing the after matched percentage bias to zero. Conclusively, now it is evident to say that matching indicators revealed the success in matching and thus, the covariates for the both the treated and control groups are similar for estimating the ATT.

Conclusion and Implication

A number of studies empirically evaluated the impact of school-based management (SBM) and found positive, negative and mixed results quality education. In Pakistan, the recent education reform programs such as SERP-II and SDGs 2030, reports lessons from past failures of (MDGs and SERP) reform programs based on efficient monitoring and governance in the education system. Thus, the evaluation of such reform programs provides evidence-based useful insights for the policymakers to design more effective education-related policies. This study is, therefore, an attempt to evaluate the impact of SMC intervention on the overall quality education in province Sindh using a sophisticated empirical approach commonly known as semi-parametric propensity score matching technique.

The overall findings of the study conclude that SMC has helped in improving the quality of education particularly, in province Sindh. Moreover, the study reveals that the average treatment effect of SMC on all the measures of access to school and quality education used in the study namely school environment index, teacher’s index, student’s flow rates, mainly student’s promotion rate, and repetition rate, found significantly positive. Whereas, one of the student’s flow rates that is student’s dropout rate found significantly negative over the period of 2013-14 which ensures the improvement in the quality education particularly in schools where SMC is functional. Further to this, the findings also ensure that improved school facilities and quality of teachers are positively affected by SMC. Moreover, the study also assessed the quality of matching by different measures of quality check. It is evident from the overall matching quality assessment that matching is successful and hence, both the treated and untreated groups are similar to estimate the average treatment effect of SMC on quality education.

Finally, on the basis of the findings drawn, the study recommends that in order to achieve further improvement in schools, the government of Sindh should empower community involvement in rest of the public schools in which SMC is not functional. In addition to this, the government should empower teachers through their participation in decision making process and government should introduce teacher’s professional training programs. For this, the government of Sindh should allocate more SMC funds for making school management effective in these schools. Furthermore, the findings of the study also recommend that the government should initiate more school-level interventions and reform programs to further improve the education system of Sindh and Pakistan.

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Annexure 1

Table 1: Estimates of Probit Model for Teacher's Index

Variable	Coefficient	Z-Value
Gender of School		
Girls Schools	-0.310	-10.63*
Mixed Schools	0.410	5.87*
Status of school		
Temporary Closed	-1.810	-53.94*
Permanantly Closed	-2.720	-38.72*
Total No of rooms	0.032	3.57*
No of classrooms	0.010	0.77
Promotion Rate	0.015	21.03*
Repetition Rate	0.045	1.77**
Constant	1.023	34.39*
No. of observations	40019	
Pseudo R^2	0.41	
Chi-Square	12259.87*	

Source: Authors' calculations based on SEMIES, 2013-14

Note: ** denotes 1% level of significance, ** at 5% and *** at 10% level of significance*

Table 2: Probit Estimates for Students' Flow Rates

Variable	Coefficient	Z-Value
Gender of School		
Girls' Schools	-0.296	-8.72*
Mixed Schools	-0.097	3.57*
Status of school		
Temporary Closed	-1.14	-2.91*
Permanently Closed	-2.720	-38.72*
Total No of rooms	0.043	4.42*
No of classrooms	0.043	3.02*
PCA Teachers' Quality	0.056	8.85*
Constant	0.680	7.75*
No. of observations	36030	
Pseudo R^2	0.034	
Chi-Square	526.74*	

Source: Authors' calculations based on SEMIES, 2013-14

Note: ** denotes 1% level of significance, ** at 5% and *** at 10% level of significance*

Table 3: Estimates of Probit Model for School Facility Index

Variable	Coefficient	Z-Value
Gender of School		
Girls Schools	-0.35	-11.34*
Mixed Schools	-0.002	-0.08
Status of school		
Temporary Closed	-0.94	-2.48**
Permanantly Closed	-2.720	-38.72*
Promotion Rate	0.016	25.67*
Repetition Rate	0.072	2.72**
PCA Teachers' Quality	0.003	0.50
Constant	1.090	15.14*
No. of observations	40444	
Pseudo R^2	0.05	
Chi-Square	920.81*	

Source: Authors' calculations based on SEMIES, 2013-14

Note: ** denotes 1% level of significance, ** at 5% and *** at 10% level of significance*

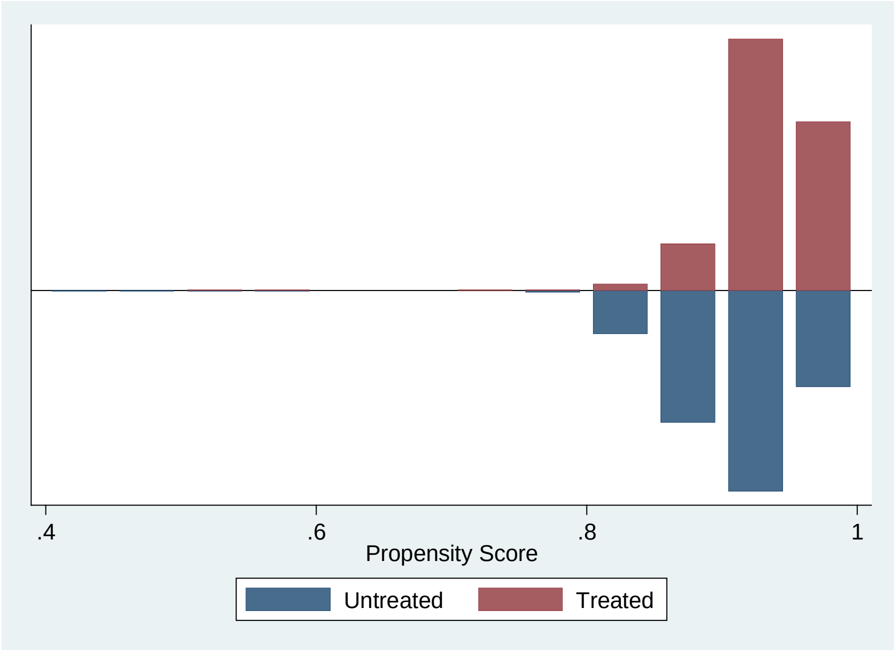
Table 4: Standardized Percentage Bias & t-test for SMC

Variable	Unmatched/	Mean		% Reduction		t-test
	Matched	Treated	Control	%bias	|bias|	t
Gender of School	U	o.145	2.03	39.1	93.4	31.77*
	M	0.146	2.36	2.6		3.69*
status of School	U	1.03	1.89	-160.6	100	-203.7*
	M	1.00	1.00	0		0.9
District	U	13.62	13.33	3.5	-74.3	2.87*
	M	13.58	13.07	6.1		8.43*
Promotion Rate	U	31.23	7.01	135.4	99.2	106.74*
	M	31.99	32.18	-1.1		-1.41
Repetition Rate	U	0.06	0.01	10.5	22.3	7.12*
	M	0.06	0.02	8.2		10.19*
Dropout Rate	U	68.71	67.77	-135.5	99.4	-106.8*
	M	67.95	65.04	0.8		1.11
PCA Teacher's Training	U	12.01	11.83	9.5	52.9	4.95*
	M	12.01	12.09	-4.5		-6.83*

Source: Source: Authors' calculations based on SEMIS 2013-14

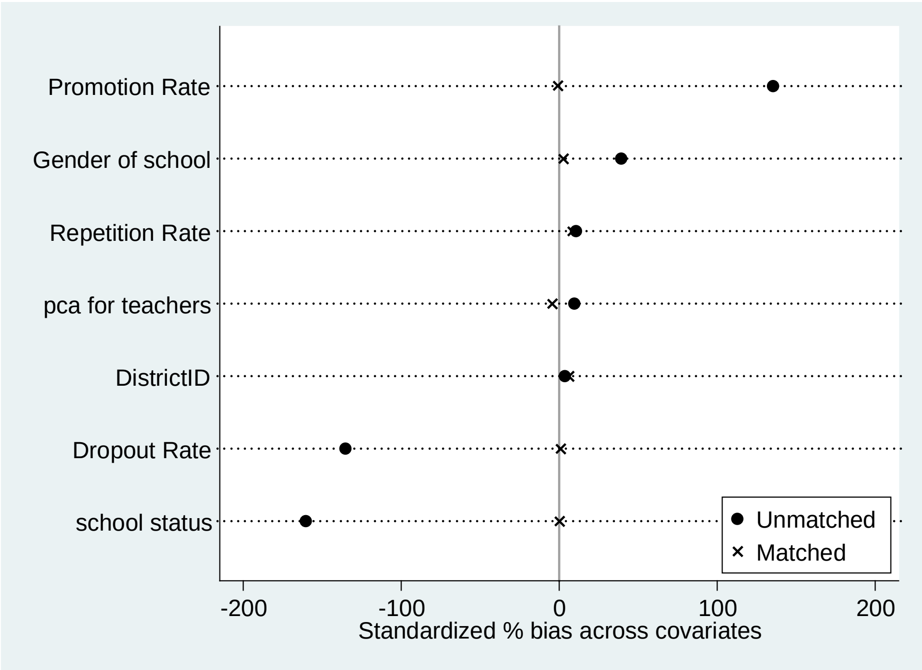
*Note: * indicates level of significance at 1%, ** at 5% &*** at 10%*

Figure 1: Overlapping of Treated and Untreated Groups



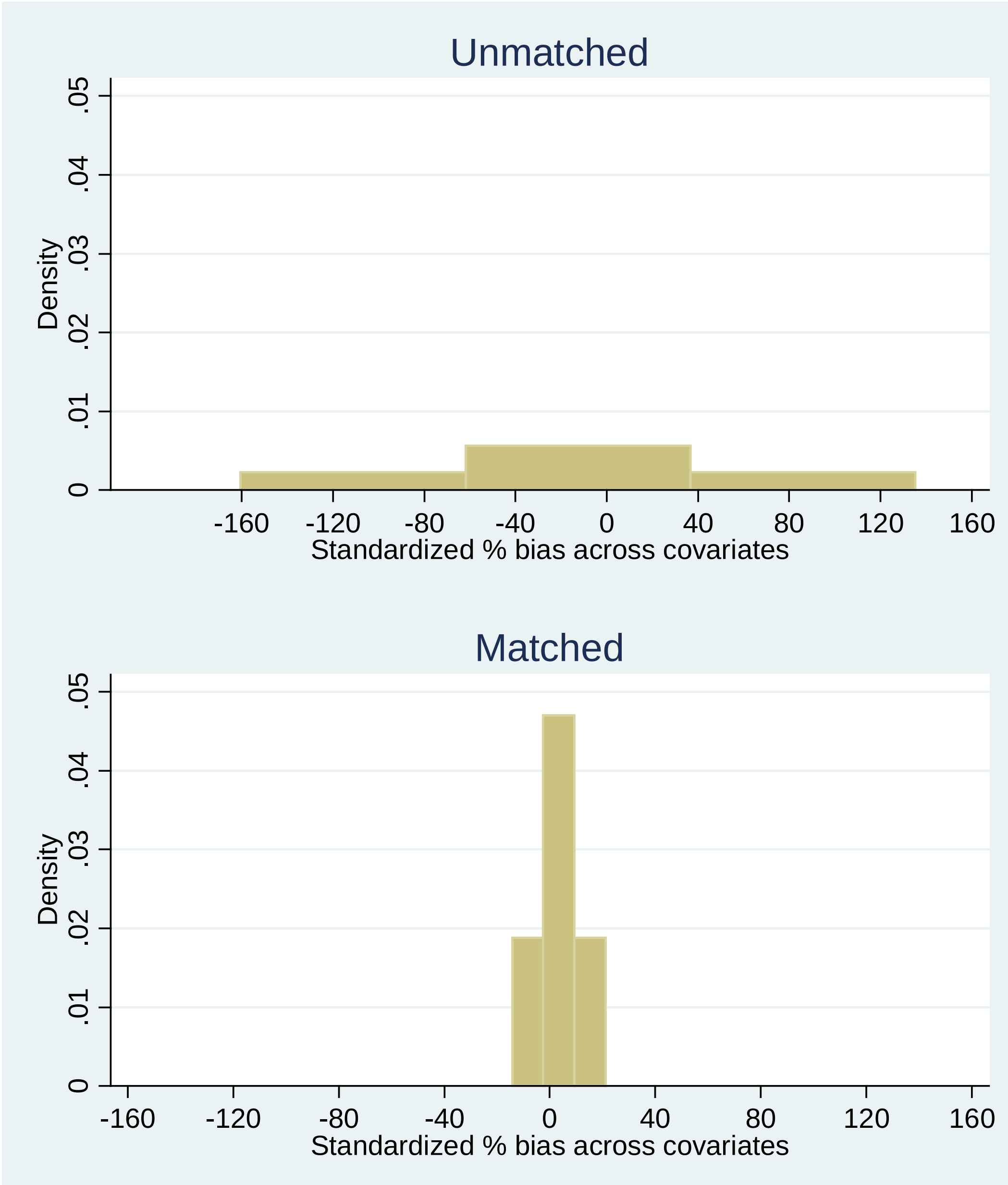
Source: Authors' illustration based on SEMIS 2013-14

Figure 2: Scatter Diagram of Differences in Matched/ Unmatched Groups



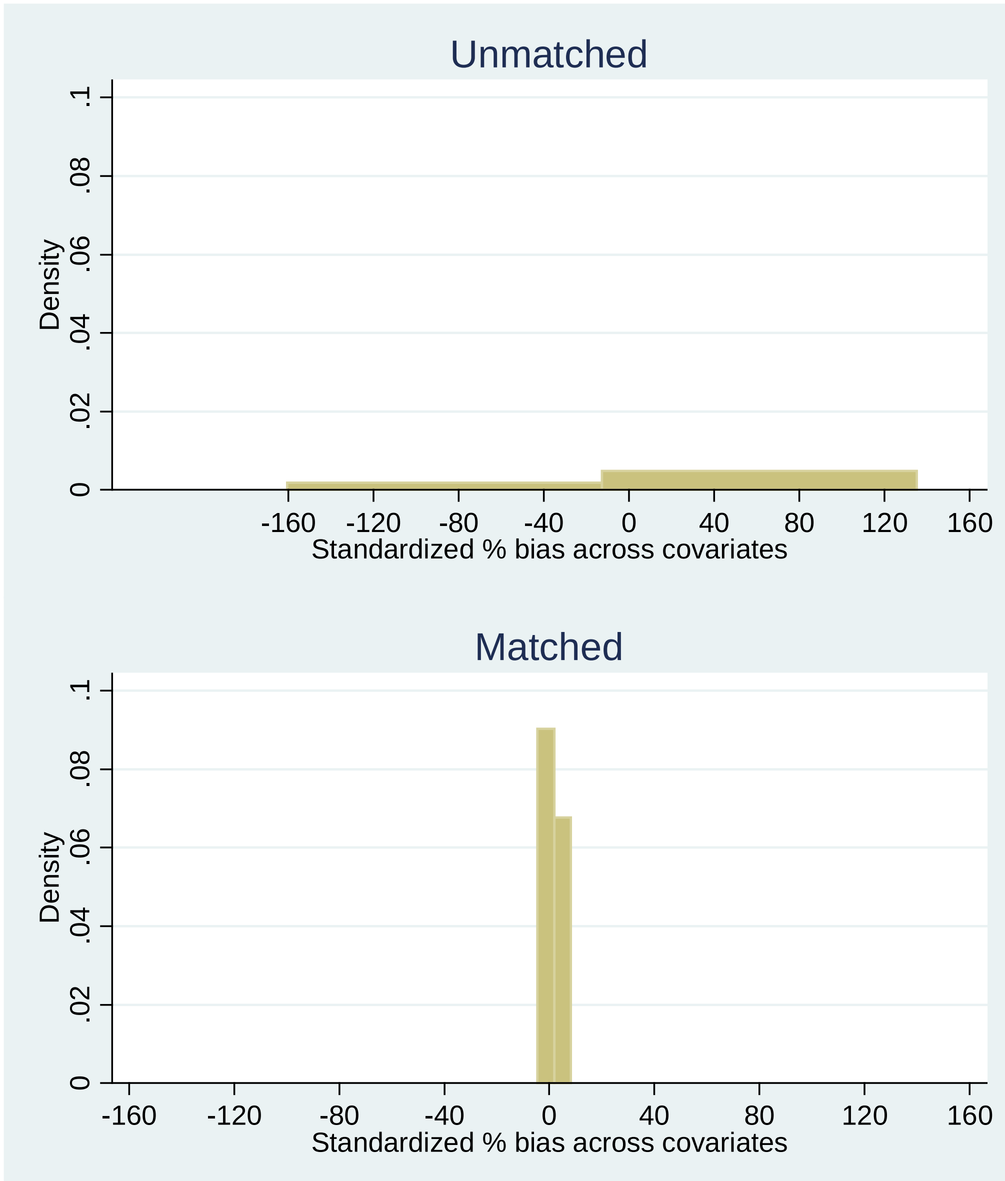
Source: Authors' illustration based on SEMIS 2013-14

Figure 3: Standardized Bias Differences in Unmatched/Matched Groups



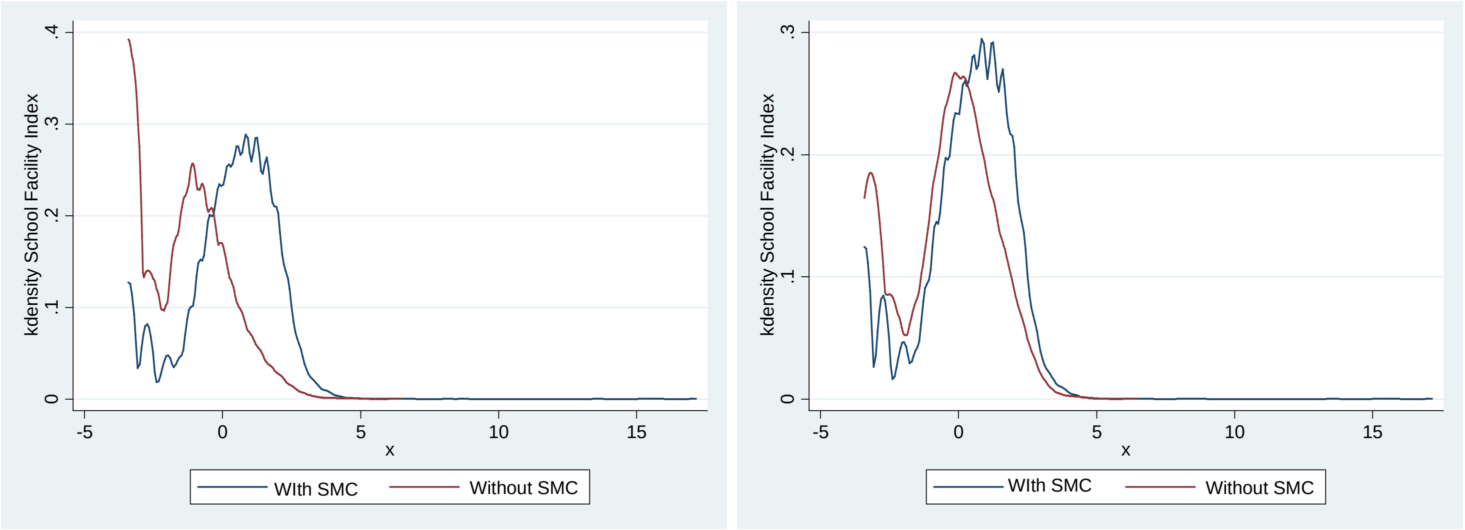
Source: Authors' illustration based on SEMIS 2013-14

Figure 4: Standardized Bias Differences in Unmatched/Matched Groups



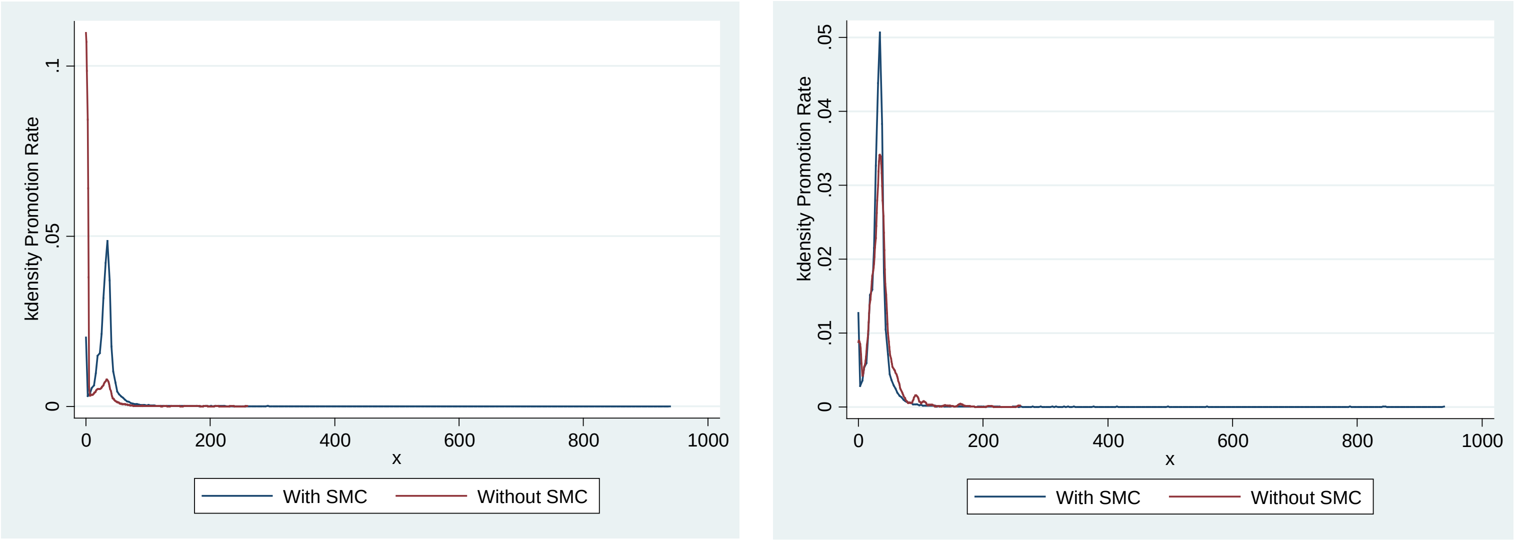
Source: Authors' illustration based on SEMIS 2013-14

Figure 5: School Facility Index Before & After Matching



Source: Authors' illustration based on SEMIS 2013-14

Figure 6: Promotion Rate Before and After Matching



Source: Authors' illustration based on SEMIS 2013-14

Annexure 2

Table 1: Descriptive Statistics for Teacher's Index

Variable	Mean	Standard Deviation	Factor Score
PST Ratio	0.793223	0.3788251	-0.2894
JST Ratio	0.018196	0.0857074	0.3001
SS Ratio	0.001154	0.0214088	0.0797
SLT Ratio	0.005038	0.0353451	0.0925
OT Ratio	0.00873	0.0498542	0.3476
PTI Ratio	0.004995	0.0369445	0.2895
WIT Ratio	0.001037	0.0165171	0.1187
HM Ratio	0.052023	0.1941735	0.0393
DT Ratio	0.005712	0.0367914	0.309
NGT Ratio	0.07546	0.2558334	-0.054
Others Ratio	0.003513	0.0443603	0.0606
PTC Ratio	0.518721	0.4386721	-0.3005
CT Ratio	0.055761	0.1837584	-0.0131
B.Ed Ratio	0.055761	0.1837584	-0.0131
M.Ed Ratio	0.074384	0.2032384	0.3327
Untrained Ratio	0.057887	0.2154333	-0.0308
Other Training Ratio	0.017221	0.0908987	0.3474
Ph.D Ratio	0.000105	0.0074452	0.0086
M.Phil Ratio	0.000216	0.0113592	0.0127
Masters Ratio	0.204197	0.3296042	0.3484
Bachelor Ratio	0.455002	0.4130731	-0.0561
Intermediate Ratio	0.235021	0.3656384	-0.17
Matriculation Ratio	0.102439	0.268185	-0.1108
Below Matric Ratio	0.00148	0.0329356	-0.0049
Male Teachers Ratio	0.814856	0.3751323	0.0011
Female Teachers Ratio	0.185144	0.3751323	-0.0011

Source: Authors' Calculations Based on SEMIS 2013-14

Table 2: Eigenvalues and Loadings

Initial Eigenvalues				**Extracted Sum of Squared Loadings**		
Component	Eigenvalue	Variance	Cumulative	Eigenvalue	Variance	Cumulative
1	3.29406	0.1267	0.1267	3.09574	0.1191	0.1191
2	2.30916	0.0888	0.2155	2.40993	0.0927	0.2118
3	2.15779	0.083	0.2985	2.25535	0.0867	0.2985
4	1.84509	0.071	0.3695			
5	1.53937	0.0592	0.4287			
6	1.46138	0.0562	0.4849			

7	1.235	0.0475	0.5324
8	1.13463	0.0436	0.576
9	1.06319	0.0409	0.6169
10	1.01007	0.0388	0.6558
11	0.997533	0.0384	0.6941
12	0.990838	0.0381	0.7322
13	0.979873	0.0377	0.7699
14	0.956947	0.0368	0.8067
15	0.940448	0.0362	0.8429
16	0.785717	0.0302	0.8731
17	0.714239	0.0275	0.9006
18	0.673017	0.0259	0.9265
19	0.569999	0.0219	0.9484
20	0.565951	0.0218	0.9702
21	0.438892	0.0169	0.987
22	0.30011	0.0115	0.9986
23	0.0347823	0.0013	0.9999
24	0.00190995	0.0001	1
25	0	0	1
25	0	0	1

Source: Authors' calculations Based on SEMIS 2013-14

Table 3: Descriptive Statistics for School Index

Variable	Mean	Standard Deviation	Factor Score
Boundary Wall	0.5860	0.4926	0.3822
Eclectricity Connection	0.4952	0.5000	0.335
Availability of Electrict Fan	0.3032	0.4597	0.3398
Availability of Drinking Water	0.4993	0.5000	0.3153
Pupil-Class Ratio	0.8307	0.8060	0.3025
Building Condition	1.7746	1.0528	0.4411
Type of school Building	2.4227	1.1529	0.4544
Availability of Library Facility	0.0148	0.1209	0.1119
Availability of Computer Facility	0.0266	0.1608	0.1471

Source: Authors' Calculations Based on SEMIS 2013-14

Table 4: Eigenvalues and Loadings

Initial Eigenvalues				**Extracted Sum of Squared Loadings**		
Component	Eigenvalue	Variance	Cumulative	Eigenvalue	Variance	Cumulative
1	3.01351	0.3348	0.3348	2.33618	0.2596	0.2596
2	1.49719	0.1664	0.5012	1.91619	0.2129	0.4725
3	1.08816	0.1209	0.6221	1.34648	0.1496	0.6221
4	0.698026	0.0776	0.6997			
5	0.681063	0.0757	0.7753			
6	0.653806	0.0726	0.848			
7	0.622086	0.0691	0.9171			
8	0.539397	0.0599	0.977			
9	0.206773	0.023	1			

Source: Authors' Calculations Based on SEMIS 2013-14