Does community involvement affect teacher effort? Assessing learning impacts of Free Primary Education in Kenya.

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Abstract

While the school participation impacts of the Universal Primary Education policies in Sub-Saharan Africa have been impressive, learning impacts' assessment has received little attention. This study measures and explains the initial achievement impacts of the Free Primary Education (FPE) policy in Kenya using grade six pupils' reading and math standardized test scores. We find large achievement declines, spillover effects to private schools and heterogeneous impacts by gender and socioeconomic status. The declines are associated with decreased teacher efforts and local community disengagement. Policy studies on pathways to increased local community involvement in public schools will lead to improved learning.

Keywords

1- Educational policy
2- Learning achievement
3- Teacher Effort
4- Community involvement

1. Introduction

Individual productivity, earnings and national development are strongly associated with the stock of knowledge and skills the workforce possess, and not merely the number of school-years attained (World Bank, 2011). Many countries of Sub-Saharan Africa (SSA) have recently introduced Universal Primary Education (UPE) policies, providing tuition-free access to all children at government-aided (public) schools[1]. Previous studies have emphasized enrollment and grade-completion achievements, which accrued mainly to girls and children from low socioeconomic backgrounds who were previously unable to pay tuition fees (Deininger, 2003; Nishimura, et al., 2008; Lewin, 2009; Oketch and Somerset, 2010; Hoogeveen and Rossi, 2013). However, the quality of education has since declined and many graduating children are not achieving the minimum learning requirements (UNESCO, 2005). This study assesses the extent of the decline that is associated with the FPE policy, delineates the impacts by gender and socioeconomic status (SES), and examines the relevant pathways. We utilize internationally standardized grade six pupil-level test scores for reading and math to measure learning proficiency – a significant improvement on the existing studies. The study therefore, draws primary education policy lessons relevant to several countries from the SSA region.

Although most studies have reported impressive participation impacts, they have also highlighted several challenges that were thought to compromise the quality of education in UPE schools. In the study on UPE impacts in Uganda, Deininger (2003) attributed the high end-of-cycle exam failure rates in 1999 to the excessively overcrowded classes that resulted into

[1] UPE policies were introduced in Malawi in 1994, Uganda in 1997, Tanzania in 2000, and Burundi, Cameroon, Ghana, Kenya and Rwanda in 2003 (Grogan, 2008).

extreme pupil-to-teacher ratios (PTRs). Others involve efficiency concerns such as absenteeism, grade repetition, and dropping out before primary cycle completion. Other – mostly qualitative – studies of UPE impacts on school management structures have emphasized the effects on local community participation and school accountability (Suzuki, 2002; Sasaoka and Nishimura, 2010). These studies note the centralized political power that characterizes the UPE policies in SSA and thus, report the significant weakening of local control of public schools and the reduction of community participation in school governance. Other studies have analyzed the school choice impacts of UPE policies and categorized the resultant decisions as reflecting either the demand for differentiated schooling – the differentiated demand model – or the demand for more schools – the excess demand model. Nishimura & Yamano (2013) find that the rapid emergence of private primary schools in Kenya – the number of private schools grew four-fold in three years after the introduction of FPE – reflected demand for higher quality schooling.

A few studies have assessed the learning impacts of the UPE policies in SSA. Two such studies in Kenya were by Bold, Kimenyi, Mwabu & Sandefur (2010), and by Lucas & Mbiti (2012a). Both studies used grade eight primary-exit exam scores[2] disaggregated at school-level by gender and categorized by school type and location. These studies find that the achievement declines that followed the introduction of FPE were induced by the peer quality decline resulting from the enrolment of lower ability pupils. In particular, Lucas & Mbiti (2012a) found no substantial declines in the test scores of pupils who would have taken the Kenya Certificate of Primary Education (KCPE) exam in the absence of the FPE program. Because of possible selection bias concerns in these studies – arising from the high-stakes nature of the grade eight

[2] Primary-exit exams are high-stakes exams and are therefore, highly consequential for either the school or the pupils and in most cases, for both. As such, these exams have previously been associated with such practices as private tutoring, sifting, teaching to the test and even worse, cheating (Koretz, 2002; MacLeod & Urquiola, 2009; Glewwe, Ilias & Kremer, 2010; Figlio & Loeb, 2011).

primary-exit exams – this study's grade six pupil-level test score analysis presents an improved estimation of the true learning impacts of the FPE policy.

Using a unique repeated cross-sections dataset obtained from the Southern and East African Consortium for Monitoring Education Quality (SACMEQ), this paper applies a before and after difference in differences (DIDs) approach to analyze the grade six pupil-level learning impacts of FPE for both Reading and Math. By assuming a common trend and relying on the conditional independence assumption, we utilize private schools as a comparison group since these were not directly treated by the FPE intervention. The study finds that the FPE intervention was associated with considerable test score declines for both subjects for pupils enrolled in public schools, especially for boys and in urban schools. Specifically, FPE was associated with reading and math test score declines of 0.415 standard deviations (SDs) and 0.510 SDs respectively. Arising from possible competition for pupils, positive spillover effects were observed for elite private schools in urban areas – their math test scores improved significantly by 0.384 SDs. The pathway analyses for the observed pupil test score changes in Kenya suggest considerable importance of teachers' efforts[3]. Teacher efforts significantly declined in public schools – by over 12 hours for reading teachers and about 13.8 hours for math teachers. This decline in teacher efforts mirrors the decline in local community involvement in school operations and in frequency of school inspection and monitoring activities.

The rest of this paper is organized as follows: section 2 gives a brief background explanation of the FPE policy in Kenya. The SACMEQ dataset is explained in section 3 after

[3] We use the self-reported average number of extra hours per week that the grade six math or reading teacher spent on lesson preparation and grading of pupils' assignments to infer teacher effort. These hours are in fact additional to the official class time the teacher is required to spend teaching.

which our hypotheses and the DIDs empirical model are discussed in section 4. We present the results in section 5 and conclude with a policy relevant discussion and conclusion section.

2. The FPE policy in Kenya

In December 2002, a national coalition government was voted into power in Kenya after almost forty years of single party rule[4]. In fulfillment of a presidential campaign promise for free basic education for all Kenyans, the FPE policy was implemented effective January 2003. Primary school enrollment jumped from 5.9 million in 2002 to 7.2 million in 2003, instantly pushing the net enrollment ratio (NER) from 61.8% to 74.2% (see table 1). Together with the introduction of FPE, a new curriculum designed to reduce both student and teacher workload was implemented at both primary and secondary school levels (Wanyama & Koskey, 2013).

In June 2003, the new government embarked on a three-year "national Economic Recovery Strategy for wealth and employment" (ERS). As detailed in the Kenya Education Sector Support Program (KESSP), the ERS entailed education sector reforms that were to operationalize the FPE policy. In particular, the KESSP spelled out the adoption of the Sector Wide Approach (SWAp) for education planning, and the decentralization of education and training services to provincial and district levels (Government of Kenya, 2005). Several investment programs were undertaken, many of which focused on tackling the various educational challenges that had been manifested at the primary schooling level – most notably classroom overcrowding. The "Primary School Infrastructure Investment Program" involved the construction of new schools in areas where there had been none and the construction of

[4] The Kenya African National Union (KANU) party ruled Kenya for almost forty years from the time the country acquired its independence (1963) from Great Britain. In 2002, the National Alliance of Rainbow Coalition (NARC) defeated the KANU party and assumed government leadership in January 2003.

additional classrooms to alleviate on the extreme class size effects. Other interventions were directed at issues such as in-service teacher training, instructional materials provision, school health and feeding, and expanding opportunities in Arid and Semi-Arid Lands (ASALs).

Almost immediately after the introduction of FPE, parents became dissatisfied with the quality of education in FPE schools as they observed the extreme overcrowding effects the policy had generated. This disquiet was immediately reflected in the rapid emergence of private primary schooling in the country. In their study of the school choice decisions in rural Kenya, Nishimura & Yamano (2013) found that private schools in Kenya increased four-fold between 2002 and 2005. This was despite the fact that pre-FPE, few private primary schools had existed in Kenya and, had traditionally offered superior quality education targeting children from wealthy households in urban areas. In a detailed study of the private schooling trends in four commonwealth countries, Tooley & Dixon (2005) highlighted the relatively newer concept of private schools for the poor – the so called "budget private schools". In a report to the common wealth education ministers, Tooley (2007) dwelt in greater detail on these types of schools, noting that they targeted the poorest households in both urban and rural areas. Oketch, Mutisya, Ngware & Ezeh (2010) make the point that in urban areas, these budget private schools are of the lowest quality and are mainly located in slums where FPE schools are in short supply.

From its inception therefore, the FPE policy was characterized by centralized political power. Its implementation framework was heavily biased in favor of increased physical school resources whose supervision and management were vested in provincial and district education governments.

3. The SACMEQ dataset

SACMEQ is an international non-profit organization composed of fifteen African education ministries working together to enhance their education planning and policy expertise through the use of scientific methods to monitor and evaluate the conditions and quality of schooling in the Eastern and Southern African region[5]. It is modeled in a similar manner to the International Association for the Evaluation of Educational Achievement's (IEA) TIMSS[6]. The consortium receives technical and financial assistance from UNESCO's International Institute for Education Planning (IIEP) and the government of the Netherlands respectively.

Since 1995, SACMEQ has completed three school-based international studies (1995, 2000 and 2007) that involved administering standardized tests in reading and mathematics for grade six pupils and their teachers in the fifteen member countries[7]. Since Kenya was involved in the three completed studies, we have data for both periods before and after the policy intervention. The SACMEQ1 (1998) survey involved testing pupils only, in one subject – reading. In the pre-FPE era, there were very few private primary schools in Kenya, thus no observations for private schools are reflected in this baseline study. The subsequent two surveys contain both public and private school observations for grade six pupils and their teachers, and test scores for both subjects. At national level, the SACMEQ survey sample schools are selected by first stratifying according to regions and then according to school size. Thus, a Probability Proportional to Size (PPS) sampling technique is applied to ensure the selected schools reflect a fair representation of national shares by school type and location (Wamala, Kizito, & Jjemba, 2013). By using the attendance register in the selected schools, a simple random sample of about

[5] Organization's description obtained from SACMEQ home page http://www.sacmeq.org/ on 22nd December, 2012.
[6] TIMSS is the acronym for Trends in International Mathematics and Science Studies.
[7] Except for the first study (SACMEQ1) which was conducted in only seven countries - Kenya, Malawi, Mauritius, Namibia, Zambia, Zanzibar and Zimbabwe (Nzomo, Kariuki & Guantai, 2001). The other member countries are Botswana, Lesotho, Mozambique, Seychelles, South Africa, Swaziland, Tanzania, and Uganda.

twenty grade six pupils is generated from those present at school on the first day of the survey. These pupils complete the two tests and a pupil questionnaire in two days. The respective grade six mathematics and reading teachers also complete their respective teacher tests and a questionnaire. The school head teacher completes a questionnaire that solicits information on the school head's characteristics and other school variables.

For purposes of this study, we re-constructed the school location variable into two locations, rural and urban[8]. The SACMEQ datasets provide identification information up to the regional (province) level only, which makes it practically difficult to control for school level effects. For the analyses in this study, we utilized "Google Earth" to identify the relevant districts where the selected sample schools are located. Since the district is still a higher level of aggregation, we do not make a district-level panel analysis but rather, control for district dummies in all the regression analyzes. Standard errors are adjusted by clustering at district times rural/urban level.

"Parental education" is constructed as the mean number of school-years attained by both parents. "Home possessions" is constructed as a non-weighted average of dummies for the presence of electricity, piped water, television, radio and telephone, at a pupil's home. "School amenities" is constructed as a non-weighted average of eight dummy variables for the presence of a radio, television, staffroom, counsel room, sports ground, sick bay/first aid room, electricity, and kiosk/cafeteria at the school. "Community involvement" is constructed as a non-weighted measure of the extent to which parents (local community) are involved in school activities such as building classrooms and teacher houses, repair of school equipment and furniture, purchase of

[8] Schools located in either isolated or rural areas are all grouped under "rural" and those located either near a small town or near a large town/city are all grouped under "urban". Appendix A table A1 gives labels for other variables used in this study's analyses.

stationary and textbooks, extra-curricular activities, assisting teachers in teaching and provision of school meals. We use the self-reported grade six teacher's average number of extra hours per week spent on lesson preparation and grading of pupils' assignments as a proxy for "teacher effort".

3.1 Descriptive evidence

The pooled sample for all the three surveys involves 10,968 pupils, 1070 teachers, and 563 head teachers in 563 schools from all the eight provinces covering 57 year-2000 Kenya districts. The respective pupil sample shares for the first, second and third surveys are 30%, 30% and 40%. Whereas for the first two surveys the rural-urban shares are fairly balanced at 55% - 45%, the post-FPE survey share is heavily biased in favor of rural – 62%. For the 2000 and 2007 surveys, the proportions of pupils enrolled in private are 5% and 10% respectively. Tables 2, 3 and 4 report the descriptive summaries for important variables by school type and location.

Table 2 shows a summary of our main dependent variable, the standardized grade six pupil test scores for reading and math. In 1998, the country achieved an average test score of 0.43 SDs in reading , which was significantly higher than the SACMEQ regional mean. As illustrated in figure 1, the next survey – two years later – realized a moderate increase in reading test scores for public schools by 0.04 SDs. This positive pre-FPE trend was achieved during a period when the NER also increased three percentage points – from 62 percent to 65 percent – and average wealth (home possessions) declined for pupils from both rural and urban households (see table 3). This improvement in reading test scores is consistent with the observed increase in teacher effort – teacher extra hours for the period significantly increased in both rural and urban

public schools by over seven hours. Between 2000 and 2007 however, test scores declined by 0.22 SDs and 0.19 SDs respectively for reading and math in public schools. This decline is also consistent with both the observed significant decline in teacher effort – teacher extra hours declined by at least five hours – and the significant decline in the measure for community involvement (see table 4). Assuming a similar across-periods trend for public schools, these test score changes suggest that FPE was associated with a 0.26 SDs (0.04 + 0.22) decline in reading test scores. However, this conclusion might be misleading for several reasons. First, this decline reflects mean test score differences for public schools only. To ascertain the true impact of the intervention requires an appropriate comparison group. Second, since the FPE intervention was never implemented as a randomized trial, it is important to control for other relevant determinants of learning achievement in order to isolate the FPE effect using the conditional independence assumption. We report FPE effects that take these two concerns into consideration in section 5.1.

Important pupil-level variables in our analyses include age, gender, parental education, home possessions, and regularity of meals. From table 3, grade six pupils in private schools are younger than their peers in public schools by close to one year both before and after the intervention. This could have been due to the higher incidence of grade repetition in public schools – 60% as opposed to 48% in year 2000. Although grade repetition remained higher in public schools after 2003, it considerably declined across all schools when compared to the pre-FPE era. Concerning parental education and the measure for home possessions, private school pupils came from higher SES households in the pre-FPE era. However, by 2007 the public schools had considerably bridged the gap on both indicators. Although parents' education generally declined during the period, the greatest decline – 2.33 years – was observed in private

schools. This decline in parental education for private schools could be related to pupil transfers or even, to new enrolments into private schools for the poor as suggested by Nishimura & Yamano (2013) and Oketch et al., (2010) respectively. Similarly, whereas there was no significant change in the household wealth measure for private schools, the public school pupils' wealth measure significantly increased. This across-schools general improvement in SES measures is consistent with the Kenya demographic and health survey (DHS) trends between 2003 and 2008 that showed average improvements in housing characteristics, access to safe drinking water and availability of certain durable consumer goods in the households (Kenya DHS report, 2003; Kenya DHS report, 2008). From table 4, pupils' gender composition at both school and grade six attainment levels remained fairly balanced both before and after the intervention. Consistent with the other SES variables explained earlier, the indicator variable for pupils who had at least two daily meals – regular meals – shows a greater decline in this proportion for grade six pupils in private schools than in public schools.

4. Hypotheses and the DIDs model

The study's main objectives are to estimate the FPE impacts on learning attainment as measured by grade six pupils' standardized reading and math test scores, delineate them by gender and SES, and establish the pathways through which the test scores were affected.

Considering the achievement declines that had followed the introduction of UPE in Uganda (Deininger, 2003; Nishimura, Yamano & Sasaoka, 2008), the FPE policy in Kenya ought to have involved default measures targeted at preventing major learning declines. First, since the policy abolished tuition fees payments as a precondition for enrolment, it was expected to attract children from poor households whose parents were less or not educated. For such

children, FPE schools represented the only avenue of acquiring important skills and thus, they required extra effort from teachers and school administrators to ensure effective learning attainment. Also, to the extent that SES is a good indicator of inheritable parents' innate ability, such children would have been expected to have lower levels of ability and possibly, motivation for learning. Second, the elimination of the requirement for parents to pay tuition fees would have been expected to distance them and the local community from the school. This could result from the deliberate actions of school administrators that would effectively block parents' attempts to remain involved or, from parents' loss of interest in playing the school-monitoring role due to lack of a direct financial stake in the school. FPE schools would therefore, be less supervised at the local level and this would make teachers and school administrators less accountable for pupils' learning outcomes. Third, the overcrowding effects resulting from fee elimination, especially in urban areas, would be expected to negatively affect learning attainment. In this case, top-tier public schools in urban areas would be expected to experience the worst overcrowding effects since such schools would be a target for previously privately enrolled pupils (Lucas & Mbiti, 2012b). Another line of argument that would tend to predict quality declines after the introduction of FPE relates to the public service delivery deficiencies and institutional weaknesses that exist in many developing countries - the Ugandan experience of local capture of UPE funds (Reinikka & Svensson, 2004) and others[9]. It would have been reasonable to expect that these occurrences were likely to befall the FPE policy – as the intervention also involved political empowerment of the provincial and district education bodies. Moreover, at the time of the FPE policy introduction, Kenya's public sector was perceived to be

[9] In Uganda's case, the UPE program suffered the effects of a corruption and embezzlement scandal in which excessive amounts of UPE funds were misappropriated. The report of the commission of inquiry into the mismanagement of UPE and USE (2012) funds attributed the scandal to corruption, fraud and embezzlement; poor supervision, monitoring and maintenance of school building projects; existence of ghost pupils, teachers and schools; etc. A copy of this report was obtained from www.education.go.ug on 6th February, 2013.

at least as corrupt as Uganda's[10]. Indeed, the KESSP forensic audit of 2010 unearthed huge misappropriations of FPE funds meant for the KESSP projects for the period 2005-2009.

From the foregoing arguments, this study proposes three hypotheses. First, the FPE policy in Kenya was expected to result into significant school quality declines that would result in pupil test score declines. Second, the policy would be expected to disfavor children from lower SES households who mainly enroll in rural schools and, possibly to worsen the gender gap in learning achievement. Third, the intervention was expected to lead to reduced local community involvement in schools thereby making FPE schools less accountable to their local communities. The resultant reduction in local supervision and monitoring would be reflected through teacher behavior, thus we expect significant reduction in teacher effort.

4.1 The DIDs estimation approach

We estimate the reduced form impacts of the FPE policy in Kenya. As in Glewwe & Kremer (2006), our main education outcome variable is the pupil's test score for either reading or math. We exploit the pre- and post-intervention nature of the 2000 and 2007 datasets to identify the impacts of the policy by comparing public and private schools in a Difference in Differences (DIDs) setup using two repeated cross sections. For impacts identification, we assume a common trend for the main outcome variable across periods and between school types. As illustrated for reading test scores (see figure 1), our analyses suffer from lack of data for private schools in the 1998 survey. However, since the few private schools that existed in the pre-FPE era were mostly in urban areas and targeted children from higher SES households, it is reasonable to assume that their pre-intervention test scores were always higher than for public

[10]Transparency International's Corruption Perceptions Index (CPI) rank for Kenya in 2002 and 2003 was 96 out of 102 countries and 122 out of 133 countries respectively. In contrast, Uganda's CPI ranks for the two years were better than Kenya's at 93 and 113 respectively (information retrieved from http://archive.transparency.org on 6th June, 2014).

schools. Second, since this study utilizes observational data generated from a non-randomized policy intervention we control for important pupil-level variables in our main regression analyses and thus rely on the CIA to identify the policy effects. This equates to assuming that sorting into public and private schools is as good as random conditional on the pupil-level variables that we control for (Angrist & Pischke, 2009). Because we do not observe the child's innate ability and motivation for schooling, our results can be interpreted as overstating (understating) the negative (positive) learning impacts of the FPE intervention. However, in their study of school choices and students' achievements, Glewwe & Jacoby (1994) did not find significant evidence of innate ability related selection biases in the school choice problem involving Ghanaian middle school students.

Nishimura & Yamano (2013)'s study in rural Kenya identify important school choice determinants as those variables relating to the child's home background – specifically household wealth and the child's gender. We test the CIA by estimating a school choice equation specified in equation (1) below:

$$\Pr(Private_j = 1) = \delta_0 + \delta_F FPE_t + \delta_R R_j + \delta_{FR}(FPE_t * R_j) + \delta_C C_{ijt} + \delta_{CF}(C_{ijt} * FPE_t) + \sum_{d \in D}\{\alpha_d I_{dj} + \alpha_{dR}(I_{dj} * R_j)\} + \varepsilon_{ijt}, \quad (1)$$

for pupil *i* in school *j,* at time *t.*

Where *Private* is the dummy for private school, it takes 1 if private and 0 if public; *FPE* is a dummy for year 2007; *R* is a dummy for a rural school; *C* is a vector for child attributes; I_{dj} is a district dummy which takes 1 if school *j* is located in district *d; D* is a set of survey districts; and ε_{ijt} is the idiosyncratic estimation error term. Standard errors are robust to heteroskedasticity.

In table 5, we report the regression estimates from the linear probability model (LPM) in equation (1). Consistent with earlier studies that highlight the swift emergence of private schooling in the post-FPE era, we find that the probability of attending a private school increased by 27% points after the intervention. This increase was bigger in urban than in rural areas by 4.7% points – this too is consistent with the fact that people in rural areas mostly enroll their children in public schools. We also get the expected signs on the two most important selection variables - home possessions and parents' education. Wealthier households and more educated parents are more likely to have their grade six children enrolled in private schools. An interesting finding is that parental education became a significant determinant of private enrolment after the intervention. We also find that though home possessions remained an important determinant of private enrolment, their degree of importance reduced after the introduction of FPE. These results are consistent with the "private schools for the poor" phenomenon highlighted by Tooley & Dixon (2005) and Tooley (2007). We argue therefore, that controlling for these home background variables considerably reduces the potential estimation bias that would likely arise from the lack of an explicit measure of the child's innate ability.

4.1.1 Impacts on pupil test scores

Our main analyses involve the estimation of a reduced form education production function described in Glewwe & Kremer (2006) and shown in equation (2) below:

$$A = a\,(\boldsymbol{C}, \boldsymbol{H}, EP, \alpha), \qquad (2)$$

Where A represents the pupil's cognitive skills measured as standardized test scores, $\boldsymbol{C}$ a vector of the child's various characteristics such as age and gender, $\boldsymbol{H}$ a vector of the child's home characteristics including parents' education and other SES measures, and EP (education policy) a

dummy that equals 1 for year 2007 indicating a period after the FPE policy had been implemented. α is a measure of the child's unobserved variables – mainly relating to innate ability and motivation for schooling. To estimate this production function, we follow the specification given in equation (3) below:

$$Z_{ijt} = \alpha_0 + \beta_P P_j + \beta_F FPE_t + \beta_{FP}(FPE_t * P_j) + \beta_R R_j + \beta_C C_{ijt} + \beta_{CR}(C_{ijt} * R_j) + \sum_{d\in D}\{\alpha_d I_{dj} + \alpha_{dR}(I_{dj} * R_j)\} + \varepsilon_{ijt}, \quad (3)$$

For pupil *i*, in school *j*, at time *t*.

Where *Z* is the standardized reading or mathematics pupil test score; *P* is a dummy for a public school; *FPE* is a dummy for year 2007; *R* is a dummy for a rural school; *C* is a vector for pupil characteristics; I_{dj} is a district dummy which takes 1 if school *j* is located in district *d; D* is a set of survey districts; and ε_{ijt} is the idiosyncratic estimation error term. Standard errors are adjusted by clustering at district times rural/urban level.

Using equation (3), we can estimate the overall differential impacts in public schools and the spillover impacts for private schools. A negative and significant coefficient of main interest β_{FP} would provide a differential measure of the learning declines in public schools resulting from the policy. A fully saturated model – equation (4) – is estimated to ascertain heterogeneous policy impacts by school location – rural versus urban.

$$Z_{ijt} = \alpha_0 + \beta_P P_j + \beta_F FPE_t + \beta_{FP}(FPE_t * P_j) + \beta_R R_j + \beta_{FR}(FPE_t * R_j) + \beta_{RP}(R_j * P_j) + \beta_{FRP}(FPE_t * R_j * P_j) + \beta_C C_{ijt} + \beta_{CR}(C_{ijt} * R_j) + \sum_{d\in D}\{\alpha_d I_{dj} + \alpha_{dR}(I_{dj} * R_j)\} + \varepsilon_{ijt}, \quad (4)$$

Equations (3) and (4) are estimated separately for girls and boys in order to ascertain the heterogeneous gender effects of the intervention.

4.1.2 Pathways analyses

To estimate the intervention impacts on the various pupil-level pathways, we utilize several variants of equations (3) and (4) in which only the dependent variable changes. Estimation of the impacts on grade six teacher-related pathways and all the other school-level pathways is depicted in equations (5) and (6) shown below.

$$Q_{jt} = \beta_0 + \beta_P P_j + \beta_F FPE_t + \beta_{FP}(FPE_t * P_j) + \beta_R R_j + \beta_S S_{jt} + \beta_{SR}(S_{jt} * R_j) + \sum_{d \in D}\{\alpha_d I_{dj} + \alpha_{dR}(I_{dj} * R_j)\} + \varepsilon_{jt}, \quad (5)$$

For school *j*, at time *t*.

Where Q is a measure for school quality or community involvement; P is a dummy for public school; FPE is a dummy for year 2007; R is a dummy for a rural school; S is a vector for grade six teacher characteristics (appears only in teacher pathways regressions); I_{dj} is a district dummy which takes 1 if school j is located in district d; D is a set of survey districts; and ε_{jt} is the idiosyncratic estimation error term. Standard errors are adjusted by clustering at district times rural/urban level. Equation (6) enables the delineation of the school-level pathways analyses by location – rural versus urban.

$$Q_{jt} = \beta_0 + \beta_P P_j + \beta_F FPE_t + \beta_{FP}(FPE_t * P_j) + \beta_R R_j + \beta_{FR}(FPE_t * R_j) + \beta_{RP}(R_j * P_j) + \beta_{FRP}(FPE_t * R_j * P_j) + \beta_S S_{jt} + \beta_{SR}(S_{jt} * R_j) + \sum_{d \in D}\{\alpha_d I_{dj} + \alpha_{dR}(I_{dj} * R_j)\} + \varepsilon_{jt}, \quad (6)$$

The coefficients of main interest in equations (4) and (6) are β_F, β_{FP}, β_{FR}, and β_{FRP}. We carry out joint hypothesis tests to establish the Average Treatment Effects (ATE) on public rural schools, public urban schools, private rural schools, and private urban schools. We ascertain whether these impacts are different between rural and urban schools by comparing within rural

schools – public rural versus private rural -, and within urban schools – public urban versus private urban.

5. Results

5.1 Impacts on learning

Although grade six is mostly the last or penultimate class in primary schools for most of the SACMEQ member countries, it is the third last grade of primary schooling in Kenya (Nzomo et al. 2001). Since the 2007 grade six cohort were exposed to FPE for only five years, our findings underestimate the full FPE impacts and are thus considered initial impacts. The main results – equations (3) and (4) – are reported in tables 6 and 7. Preferred results appear in the third columns where we take care of all possible bias concerns – we control for child specific characteristics, family background and school location area specificities. We find that FPE was associated with large learning achievement declines of 0.415 SDs and 0.510 SDs in reading and math respectively. More detailed analyses (table 7) reveal that these impacts were predominantly in urban schools[11] - reading test scores in urban public schools declined by 0.492 SDs while math scores declined by 0.606 SDs. As shown in the appendix table B1, these learning declines in urban areas resulted from a combination of absolute learning deteriorations in public schools with significant learning improvements in private schools. This suggests that the FPE policy had a positive spillover effect on learning achievement in private schools located in urban areas[12]. This is thought to have resulted from the stiff competition for pupils that these schools

[11] Summarized impacts from table 7 are reported in appendix B table B1. The differential impacts for rural public schools are shown in row (g) while for urban public schools in row (h).

[12] Although the absolute learning impacts on private schools in rural areas were not statistically significant, we may not rule out negative spillover effects on these schools. These effects might result from the rapid emergence of private schools for the poor – which are thought to be offering lower quality education.

experienced after previously elite public schools dispensed with the requirement for tuition fees after the introduction of FPE.

An alternative explanation for the test score declines for the 2007 survey might be that these tests were more difficult than in 2000. If this was the case, then our findings may not reflect the true FPE learning effect but rather that grade six pupils in Kenya fell behind their counterparts in other SACMEQ countries[13]. Yet, because these pupil-level test scores are standardized, the level of difficulty of the tests has no significant influence on our findings.

Table 8 shows the learning outcomes estimated separately for girls and boys[14]. This analysis suggests heterogeneous gender impacts of the FPE policy. Statistically significant learning declines were experienced by boys in urban public schools – reading test scores declined by 0.588 SDs while math declines were larger at 0.739 SDs. On the other hand, the differences in girls' learning achievements between public and private urban schools were not significant, thus suggesting that FPE did not have a significant impact on the learning gender-gap in Kenyan primary schools. The decline in boy's learning achievement is mostly explained by the positive spillover effect for private schools[15].

5.2 Pathways to learning impacts

The pathways regressions are reflected in tables 9 – 13. Pupil absenteeism is estimated to have significantly decreased in public schools post-FPE – the proportion of grade six pupils who had been absent at least once in the month preceding the survey decreased by 37.5% points. We find no significant differential impacts on grade repetition and on availability of basic education

[13] The dependent variables in our learning achievement analyses (pupil-level reading and math test scores) are standardized deviations from the SACMEQ regional mean test scores.
[14] Appendix table B2 gives the summarized test score impacts by pupil gender.
[15] We hope to publish a separate study on the gender impacts of the FPE policy in Kenya using the SACMEQ dataset.

materials such as pens, exercise books and geometry sets. Table 10 shows the grade six reading and math teacher pathways – teacher test score, teacher effort and frequency of giving in-class written tests. We find no significant differential impacts on grade six teachers' test scores and testing frequency for both subjects. On teacher effort however, reading teachers' extra hours decreased by twelve hours while the decrease for math teachers was even larger at over thirteen hours. We analyze the grade six teacher efforts by school location in table 11. The findings on teacher efforts are consistent with our findings on pupil test scores. Large teacher effort declines occurred in urban schools and resulted from a combination of absolute declines in public schools and positive spillover effects in private schools (see appendix table B3). An alternative explanation for the teacher effort declines might be the curriculum changes that were implemented simultaneously with the FPE policy. However, we find that the absolute teacher effort reductions were quite large representing about 28% decline for reading teachers and over 40% decline for math teachers – these effort reductions represent more than double the proportionate falls in the official weekly teacher workloads.

In tables 12 and 13 we show the estimations for other school-level pathways[16]. We find no significant differential impacts on the pupil-to-teacher ratios (PTR), the proportions of classes held in the open air, school amenities, and teacher absenteeism. On the number of inspections carried out at the school in the two years preceding the survey, we find significant declines in public schools only. This finding suggests that district/provincial authorities did less monitoring and supervision activities in public schools after the introduction of FPE. Concerning local community involvement in school operations, we find that FPE was associated with significant decreases in this measure for public schools. The declines in local community involvement

[16] Appendix table B4 gives the summarized impacts for the school pathway variables – school inspections and local community involvement.

mirrored the declines in grade six teacher efforts and in pupil test scores. An alternative explanation of this finding might be that the community involvement variable merely reflects the elimination of tuition fees in public schools. If this is true, then this variable says nothing about the local community's role in teacher efforts rather that, teacher efforts declined in public schools because of reductions in teacher payments resulting from the abolition of mandatory tuition fees payments. First, like in many other countries in SSA, public school teachers in Kenya are recruited and paid by the central government through the ministry of education, science and technology (MOEST). Second, as defined in section 3, our measure for local community involvement includes activities that do not involve any payments by parents to the schools.

6. Discussion and conclusion

The FPE policy in Kenya outlawed mandatory tuition fees payments for enrolment into public primary schools since January 2003. The objective was to ensure an opportunity for every Kenyan to attain basic education. Through this study, we have assessed the impacts of this policy using grade six pupils' learning achievements in two important areas of cognitive development – literacy and numeracy. Contrary to the existing literature that has highlighted the enrollment benefits of the intervention, we find that conditional on reaching grade six, the intervention was initially associated with large declines in learning achievements for both reading and math. These declines were most pronounced in urban areas where, because of competition for pupils, the quality of private schools significantly improved. We found decreases in local community involvement in school operations, which resulted into reduced school supervision and monitoring that was reflected through large reductions in teacher effort.

Even though the community involvement measure used in this study encompasses a very limited scope[17] - mainly education materials procurements and school infrastructure improvements – the impacts on teacher effort are quite large and highly significant. Using the example of the EDUCO program in El Salvador (Jimenez & Sawada, 2014), we would expect even larger effects if community involvement in Kenya involved some direct teacher behavior monitoring roles. This study did not decipher the causal direction of the involvement decline in public schools – it is possible that parents were sidelined from active involvement or that they simply lost interest after the abolition of tuition fee payments, or both. Therefore, empirical studies to supplement the exploratory qualitative work by Nishimura, et al (2009) are needed to enhance our understanding of how to increase teacher efforts and improve pupil learning outcomes. Such studies would also seek to ascertain parents' valuation of the returns to their children's education achievements.

6.1 Conclusion

As the millennium development goals (MDGs) get replaced by the forthcoming sustainable development goals (SDGs) in the post-2015 development framework, the new target for education development needs to reflect one of the major challenges to meaningful universal education attainment – low learning achievements. This study has quantified the learning attainment declines that were associated with a UPE policy implemented in Kenya, and identified an important policy-relevant pathway. The analysis reveals that to achieve cognitive development through universal primary education policies in some countries of SSA will require the active involvement of all stakeholders – more critically, local communities need to be

[17] Our measure for community involvement was dictated by the SACMEQ questionnaire structure. A review of previous school based management (SBM) studies reveals that SBM programs involve devolution of authority and responsibility over various aspects of school operations to a specific individual or group of people (Barrera-Osorio, et al. 2009).

involved in school operations at least to ensure local ownership and efficient monitoring of UPE schools.

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References

Angrist, J. D., & Pischke, J.-S. (2009). *Mostly Harmless Econometrics: An empiricist's companion.* Princeton: Princeton press.

Barrera-Osorio, F., Fasih, T., Patrinos, A. H., & Santibanez, L. (2009). *Decentralized Decision-Making in Schools. The Theory and Evidence on School-Based Management.* Washington, D.C.: The World Bank.

Bold, T., Kimenyi, M., Mwabu, G., & Sandefur, J. (2010, December 30). Does abolishing fees reduce school quality? Evidence from Kenya. . *CSAE Working Paper WPS/2011-04* . Oxford, Oxford, UK: Centre for the study of African Economies, University of Oxford.

Deininger, K. (2003). Does cost of schooling affect enrollment by the poor? Universal primary education in Uganda. *Economics of Education Review , 22*, 291-305.

Figlio, D., & Loeb, S. (2011). School Accountability. In *Handbook of the Economics of Education* (pp. 383-421). Stanford: Elsevier.

Glewwe, P., & Jacoby, H. (1994). Student Achievement and Schooling Choice in Low-Income Countries: Evidence from Ghana. *The Journal of Human Resources , 29* (3), 843-864.

Glewwe, P., & Kremer, M. (2006). Schools, Teachers and Education outcomes in Developing Countries. In E. A. Hanushek, & F. Welch, *Handbook of the Economics of Education* (Vol. 2, pp. 945-1017). Elsevier B.V.

Glewwe, P., Ilias, n., & Kremer, M. (2010). Teacher incentives. *American Economic Journal: Applied Economics , 2*, 205-227.

Government of Kenya, MOEST. (2005). *Kenya Education Sector Support Program 2005-2010: Delivering quality education and training to all Kenyans.* Nairobi: Ministry of Education Science and Technology. Accessed from www.iiep.unesco.org on June 2nd 2014

Grogan, L. (2008). Universal Primary Education and School Entry in Uganda. *Journal of African Economies , 18* (2), 183-211.

Hoogeveen, J., & Rossi, M. (2013). Enrolment and grade attainment following the introduction of free primary education in Tanzania. *Journal of African economies , 22* (3), 375-393.

Jimenez, E., & Sawada, Y. (2014). Does Community Management Help Keep Children in Schools? Evidence Using Panel Data from El Salvador's EDUCO Program. *Economic Development and Cultural Change , 62* (2), 307-338.

Koretz, D. M. (2002). Limitations in theUse of Achievement Tests as Measures of Educators' Productivity. *The Journal of Human Resources , 37* (4), 752-777.

Lewin, K. M. (2009, May). Access to Education in Sub-Saharan Africa: Patterns, problems and possibilities. *Comparative Education* , 151-174.

Lucas, A. M., & Mbiti, I. M. (2012a). Access, Sorting, and Achievement: The Short-Run Effects of Free Primary Education in Kenya. *American Economic Journal: Applied Economics , 4* (4), 226-253.

Lucas, A. M., & Mbiti, I. M. (2012b). Does free primary education narrow gender differences in schooling? Evidence from Kenya. *Journal of African economies , 21* (5), 691-722.

MacLeod, B. W., & Miguel, U. (2009, June). Anti-lemons: School reputation and educational quality. Cambridge, Massachusetts, USA.

National bureau of Statistics, Kenya. (2004). *Kenya demographic and health survey 2003.* Nairobi: central bureau of statistics. Accessed from www.dhsprogram.com/publications/publication-FR151-DHS-Final-Reports.cfm on May 2nd 2014.

National Bureau of Statistics, Kenya. (2010). *Kenya demographic and health survey 2008-09.* Nairobi: Central bureau of statistics. Accessed from www.dhsprogram.com/publications/publication-FR151-DHS-Final-Reports.cfm on May 2nd 2014.

Nishimura, M., & Yamano, T. (2013). Emerging Private Education in Africa: Determinants of School Choice in Rural Kenya. *World Development , 43*, 266-275.

Nishimura, M., Ogawa, K., Sifuna, N. D., Chimombo, J., Kunje, D., Ampiah, G. J., et al. (2009). A comparative analysis of universal primary education policy in Ghana, Kenya, Malawi, and Uganda. *Journal of international cooperation in education , 12* (1), 143-158.

Nishimura, M., Yamano, T., & Sasaoka, Y. (2008). Impacts of the universal primary education policy on educational attainment and private costs in rural Uganda. *International Journal of Educational Development , 28*, 161-175.

Nzomo, J., Kariuki, M., & Guantai, L. (2001). *The Quality of Primary Education in Kenya: some policy suggestions based on a survey of schools.* Paris: UNESCO-IIEP.

Oketch, M., & Somerset, a. (2010). *Free primary education and after in Kenya: Enrolment impact, quality effects, and the transition to secondary school. Research monograph number 37.* University of Sussex.

Oketch, M., Mutisya, M., Ngware, M., & Ezeh, A. C. (2010). Why are there proportionately more poor pupils enrolled in non-state schools in urban Kenya in spite of FPE policy? *International Journal of Educational Development* , 23-32.

Reinikka, R., & Svensson, J. (2004). Local Capture: Evidence from a Central Government Transfer Program in Uganda. *The Quarterly Journal of Economics , 119* (2), 679-705.

Sasaoka, Y., & Nishimura, M. (2010). Does universal primary education policy weaken decentralization? Participation and accountability frameworks in East Africa. *Compare , 40* (1), 79-95.

Suzuki, I. (2002). Parental participation and accountability in primary schools in Uganda. *Compare , 32* (2), 243-259.

The World Bank (2011). *Education Strategy 2020: investing in people's knowledge and skills to promote development.* Washington, DC: World Bank Group.

Tooley, J. (2007). Private schools for the poor: Implications for Commonwealth Ministers of Education. In Commonwealth, *Commonwealth education partnerships 2007.* (pp. 137-140). London: Commonwealth secretariat.

Tooley, J., & Dixon, P. (2005). *Private Education is good for the poor: A study of private schools serving the poor in low-income countries.* Washington, DC: CATO institute.

UNESCO. (2005). *Education for All Global Monitoring Report. The Quality Imperative.* Paris: UNESCO Publishing.

Wamala, R., Kizito, O. S., & Jjemba, E. (2013). Academic Achievement of Ugandan Sixth Grade Students: Influence of Parents' Education Levels. *Contemporary Issues in Education Research , 6* (1), 133-142.

Wanyama, M. P., & Koskey, N. J. (2013). Education reforms in Kenya for innovation. *International Journal of Humanities and Social Science , 3* (9), 123-145.

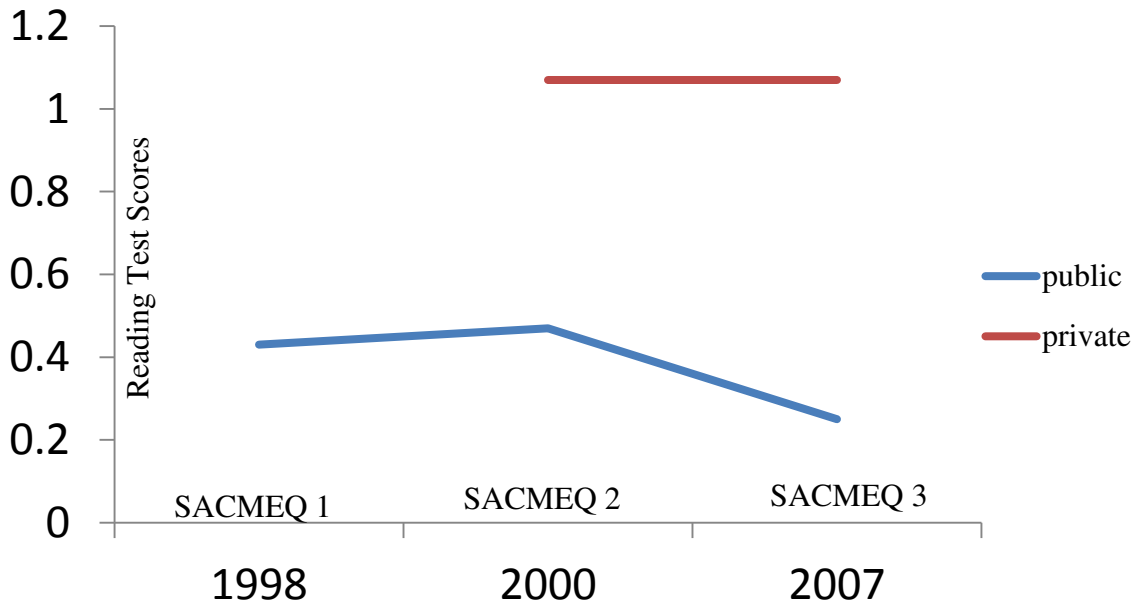

Figure 1. Pupil reading test score trends. *Source*: SACMEQ 1, 2, 3 data sets.

Table 1
Education Statistics Before and After FPE Introduction

	2002 percent	2003 percent
Gross Enrolment Rate	91.6	106.9
Net Enrolment Rate	61.8	74.2
Pupil-Teacher Ratio	34.4	38.0
Girls share	48.4	48.5
Net Enrolment for Girls	62.1	74.2
Net Enrolment for Boys	61.6	74.2

Source: World development indicators, 2014

Table 2
Pupil Standardized Test Score Summaries and Mean Differences

	Reading				Math	
	Mean (1998)	2000-1998	Mean (2000)	2007-2000	Mean (2000)	2007-2000
Public	0.43	0.04*	0.47	-0.22***	0.60	-0.19***
Private			1.07	0.02	1.13	0.18*
Diff.			-0.62	-0.22	-0.53	-0.36
Rural	0.27	0.09***	0.36	-0.22***	0.56	-0.18***
Urban	0.65	0.01	0.67	-0.04	0.74	-0.02
Diff.	-0.38	0.09	-0.30	-0.22	-0.18	-0.18

Source: Author's own computations from Kenya's SACMEQ 1, 2 and 3 datasets
*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Table 3
Descriptive Statistics and Mean Differences – Pupil, Teacher and School Variables

Variable	mean 1998			Diff: 2000-1998				Diff: 2007-2000			
	Public	Rural	Urban	Public	Rural	Urban	Private (mean 2000)	Public	Private	Rural	Urban
Pupil Age (years)	13.75	14.07	13.31	0.07	-0.09*	0.24***	12.93	-0.03	0.02	-0.16***	0.01
Repeat dummy	0.62	0.69	0.52	-0.02*	-0.03*	-0.03	0.48	-0.11***	-0.15***	-0.17***	-0.09***
Parent education	8.16	7.38	9.23	0.07	0.62***	-0.62***	10.61	-1.68***	-2.33***	-1.50***	-1.61***
Scholastics	3.49	3.42	3.58	-0.17***	-0.13**	-0.23***	4.08	-0.79***	-1.09***	-0.79***	-0.77***
Home Possessions	0.38	0.29	0.48	-0.09***	-0.03***	-0.16***	0.64	0.21***	0.00	0.17***	0.26***
Teacher extra hours	10.39	11.11	9.77	8.11***	7.45***	8.65***	20.56	-6.31***	-6.61	-6.66***	-5.47***
Weekly written test	0.57	0.65	0.49	0.14***	0.06	0.19***	0.67	-0.39***	-0.29	-0.39***	-0.37***
Weekly load	35.02	36.57	33.69	4.58***	3.91***	4.69***	39.33	-3.92***	-8.86***	-4.96***	-3.77**
School Amenities	0.43	0.36	0.53	0.00	0.03*	-0.04	0.51	0.01	0.03	0.01	0.05
School Size	564.60	452.9	713	-27.10	20.14	-75.42	426.6	48.30	4.31	47.58	85.46
Pupil-Teacher ratio	32.72	33.67	31.46	1.54	0.89	2.37	26.07	10.14***	1.56	9.59***	7.42***
Complete classes	0.80	0.72	0.92	0.05*	0.09**	0.00	0.96	-0.03	-0.19**	-0.03	-0.04
Incomplete classes	0.18	0.25	0.07	-0.05*	-0.09**	0.00	0.03	0.03	0.21**	0.04	0.04

Source: Author's own computations from Kenya's SACMEQ 1, 2 and 3 datasets. *** 1% level of significance; ** 5% level of significance; * 10% level of significance

Table 4
Descriptive Statistics and Mean Differences – Pupil, Teacher and School Variables

Variable	mean 2000				Diff: 2007-2000			
	Public	Private	Rural	Urban	Public	Private	Rural	Urban
Speaks English outside school	0.88	0.95	0.86	0.91	0.03***	-0.01	0.03***	0.04***
Takes Extra lessons	0.86	0.74	0.87	0.83	-0.18***	-0.04	-0.20***	-0.13***
Repeating grade six	0.16	0.10	0.19	0.11	-0.02***	-0.01	-0.05***	-0.01
Absent last month	0.47	-0.00	0.48	0.42	-0.18***	0.25***	-0.16***	-0.19***
Homework help	0.87	0.89	0.83	0.91	-0.04***	-0.07**	-0.02**	-0.05***
Regular meals	0.85	0.93	0.82	0.88	-0.04***	-0.16***	-0.01	-0.09***
Teacher test-score (read)	0.69	0.81	0.69	0.69	-0.07	0.03	-0.12	0.04
Teacher test-score (math)	1.47	2.04	1.57	1.41	-0.48***	-0.89*	-0.54***	-0.43***
New reading teacher	0.13	0.56	0.19	0.09	0.17***	0.13	0.15**	0.23***
New math teacher	0.19	0.22	0.22	0.17	0.03	0.15	0.03	0.06
years trained (read)	2.05	2.11	2.08	2.03	0.04	-0.59	-0.19*	0.26**
years trained (math)	2.09	1.88	2.15	1.99	0.00	-0.61	-0.10	-0.04
termly evaluation (read)	0.18	0.22	0.18	0.19	0.04	0.04	0.04	0.05
termly evaluation (math)	0.16	0.13	0.16	0.17	0.11**	-0.01	0.09*	0.08
School inspections	15	9.38	14.32	15.33	-9.88***	-2.43	-9.42***	-9.33***
Community involvement	15.72	13.13	16.01	15.09	-4.12***	-1.23	-4.51***	-3.23***
Community importance	0.18	0.11	0.19	0.16	-0.12***	-0.11	-0.14***	-0.12**
Head teacher experience (years)	20.32	17.50	19.61	20.96	1.15*	-2.66	0.59	0.95
Permanent teachers' proportion	0.95	0.85	0.95	0.93	-0.07***	-0.25	-0.10***	-0.08**
Female teachers' proportion	0.47	0.40	0.38	0.57	0.00	0.09	0.01	0.04
Female students' proportion	0.47	0.52	0.48	0.45	0.01	-0.06	-0.00	0.03
Grade six size	67.32	58.25	53.54	84.32	4.88	60.91	-1.08	35.29**
Female grade six proportion	0.49	0.47	0.49	0.48	-0.00	-0.03	-0.00	-0.01

Source: Author's own computations from Kenya's SACMEQ 2 and 3 datasets.
*** 1% level of significance; ** 5% level of significance; * 10% level of significance.

Table 5
Determinants of Private School Choice – A Linear Probability Model

	(1) Private	(2) Private	(3) Private
2007 dummy	0.0713***	0.242***	0.274***
	(0.0148)	(0.0639)	(0.0640)
Rural School	-0.0723***	-0.0297***	-0.0357**
	(0.0112)	(0.0107)	(0.0155)
2007 x Rural	-0.0485***	-0.0529***	-0.0468***
	(0.0162)	(0.0163)	(0.0154)
Age in years		-0.00863***	-0.00549*
		(0.00299)	(0.00298)
2007 x Age		-0.00713*	-0.00799**
		(0.00399)	(0.00392)
Girl		-0.00982	-0.00162
		(0.00926)	(0.00896)
2007 x Girl		-0.00570	-0.00842
		(0.0134)	(0.0128)
Home Possessions		0.467***	0.442***
		(0.0403)	(0.0374)
2007 x Possessions		-0.315***	-0.314***
		(0.0462)	(0.0429)
Parental Education		0.000851	0.000644
		(0.00110)	(0.00111)
2007 x Parent Educ.		0.00377**	0.00414**
		(0.00178)	(0.00177)
Regular Meals		-0.00358	0.00588
		(0.0109)	(0.0111)
2007 x Reg. Meals		-0.0341**	-0.0535***
		(0.0163)	(0.0162)
Constant	0.105***	0.0559	0.0121
	(0.0101)	(0.0468)	(0.0473)
District x Rural dummies	No	No	Yes
Observations	5,958	5,958	5,958
R-squared	0.036	0.109	0.222

Notes: Robust standard errors in parenthesis
*significant at 10%; ** significant at 5%; *** significant at 1%

Table 6
Impacts of FPE on Pupils' Standardized Test Scores

	Reading			Math		
	(1)	(2)	(3)	(1)	(2)	(3)
Public school	-0.623**	-0.206	-0.177	-0.526**	-0.250	-0.216
	(0.260)	(0.154)	(0.183)	(0.213)	(0.153)	(0.173)
2007 dummy	0.0204	0.0499	0.105	0.175	0.194	0.262
	(0.309)	(0.192)	(0.213)	(0.254)	(0.199)	(0.213)
2007 x Public	-0.241	-0.350*	-0.415**	-0.362	-0.424**	-0.510**
	(0.308)	(0.183)	(0.204)	(0.253)	(0.191)	(0.206)
Rural school		0.258	-0.0297		0.411	-0.00542
		(0.513)	(0.593)		(0.474)	(0.545)
Constant	1.074***	1.832***	1.794***	1.125***	1.621***	1.575***
	(0.267)	(0.555)	(0.573)	(0.219)	(0.513)	(0.525)
Other controls	No	Yes	Yes	No	Yes	Yes
District x Rural dummies	No	No	Yes	No	No	Yes
Observations	5,958	5,958	5,958	5,958	5,958	5,958
R-squared	0.071	0.207	0.291	0.078	0.163	0.233

Notes: Clustered standard errors in parenthesis
*significant at 10%; ** significant at 5%; *** significant at 1%
Other controls: Pupil's age, gender, meals, home possessions and parental education

Table 7
Impacts of FPE on Pupils' Standardized Test Scores – saturated model

	Reading			Math		
	(1)	(2)	(3)	(1)	(2)	(3)
Public school	-0.421	-0.102	-0.102	-0.406	-0.183	-0.183
	(0.336)	(0.187)	(0.188)	(0.273)	(0.184)	(0.185)
2007 dummy	0.232	0.202	0.202	0.401	0.384*	0.384*
	(0.410)	(0.217)	(0.218)	(0.312)	(0.229)	(0.230)
2007 x Public	-0.369	-0.492**	-0.492**	-0.550*	-0.606***	-0.606***
	(0.417)	(0.195)	(0.195)	(0.308)	(0.199)	(0.200)
Rural School	0.0818	0.616	1.553**	0.0731	0.711	1.644**
	(0.490)	(0.650)	(0.689)	(0.414)	(0.617)	(0.626)
2007 x Rural	-0.571	-0.452	-0.492	-0.609	-0.536	-0.514
	(0.610)	(0.387)	(0.496)	(0.503)	(0.403)	(0.474)
Rural x Public	-0.367	-0.337	-0.440	-0.230	-0.231	-0.261
	(0.470)	(0.282)	(0.403)	(0.397)	(0.302)	(0.377)
2007 x Rural x Public	0.479	0.439	0.463	0.569	0.522	0.470
	(0.608)	(0.372)	(0.488)	(0.498)	(0.385)	(0.468)
Constant	1.047***	1.715***	1.715***	1.102***	1.513***	1.513***
	(0.357)	(0.573)	(0.576)	(0.289)	(0.527)	(0.529)
Other controls	No	Yes	Yes	No	Yes	Yes
District x Rural dummies	No	No	Yes	No	No	Yes
Observations	5,958	5,958	5,958	5,958	5,958	5,958
R-squared	0.105	0.208	0.292	0.094	0.166	0.234

Notes: Clustered standard errors in parenthesis
*** 1% level of significance; ** 5% level of significance; * 10% level of significance.
Other controls: Pupil's age, gender, meals, home possessions and parental education

Table 8
Impacts of FPE on Pupils' Standardized Test Scores – by gender

	Girls		Boys	
	reading	math	reading	math
Public school	-0.113	-0.190	-0.119	-0.202
	(0.235)	(0.203)	(0.146)	(0.180)
2007 dummy	-0.0485	0.170	0.359*	0.522**
	(0.275)	(0.240)	(0.182)	(0.243)
2007 x Public	-0.304	-0.394	-0.588***	-0.739***
	(0.275)	(0.241)	(0.163)	(0.227)
Rural school	1.614**	1.631**	1.680***	1.800***
	(0.794)	(0.646)	(0.593)	(0.633)
2007 x Rural	0.0795	-0.0420	-1.050***	-0.915**
	(0.603)	(0.530)	(0.337)	(0.406)
Rural x Public	-0.253	-0.146	-0.760***	-0.458*
	(0.497)	(0.442)	(0.198)	(0.254)
2007 x Rural x Public	-0.0815	-0.00454	0.994***	0.878**
	(0.606)	(0.534)	(0.337)	(0.413)
Constant	1.740***	1.312**	1.693***	1.510***
	(0.635)	(0.502)	(0.528)	(0.564)
Other controls	Yes	Yes	Yes	Yes
Dist. x Rural dummies	Yes	Yes	Yes	Yes
Observations	2,910	2,910	3,048	3,048
R-squared	0.347	0.265	0.280	0.218

Notes: Clustered standard errors in parenthesis
*significant at 10%; ** significant at 5%; *** significant at 1%
Other controls: Pupil's age, meals, home possessions and parental education

Table 9
Impacts of FPE on Pupil Absenteeism, Repetition and Scholastics

	Absent dummy		Repeat dummy		Scholastics	
	(1)	(2)	(1)	(2)	(1)	(2)
Public school	0.397***	0.380***	0.00167	-0.00631	-0.488***	-0.459***
	(0.0310)	(0.0483)	(0.0668)	(0.0863)	(0.178)	(0.161)
2007 dummy	0.229***	0.196***	-0.166**	-0.160*	-0.937***	-0.948***
	(0.0296)	(0.0533)	(0.0743)	(0.0947)	(0.275)	(0.280)
2007 x Public	-0.386***	-0.375***	0.0408	0.0461	0.0781	0.0693
	(0.0381)	(0.0571)	(0.0765)	(0.0954)	(0.268)	(0.274)
Rural school	-0.181	-0.277	0.171	0.211	-0.158	-0.862**
	(0.193)	(0.195)	(0.198)	(0.213)	(0.317)	(0.339)
Constant	0.0151	0.0340	-0.781***	-0.777***	3.822***	3.806***
	(0.161)	(0.169)	(0.164)	(0.172)	(0.307)	(0.293)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
District x Rural dummies	No	Yes	No	Yes	No	Yes
Observations	5,079	5,079	5,958	5,958	5,958	5,958
R-squared	0.059	0.081	0.098	0.127	0.248	0.307

Notes: Clustered standard errors in parenthesis
*** 1% level of significance; ** 5% level of significance; * 10% level of significance
Other controls: Pupil's age, gender, meals, home possessions and parental education

Table 10
Impacts of FPE on Teacher's Test Score, Effort, and Testing Frequency

	Reading Teacher			Math teacher		
	Test score	Effort	Test	Test score	Effort	Test
Public school	-0.493	8.300**	0.0519	-0.747***	9.389***	-0.0101
	(0.381)	(3.764)	(0.322)	(0.148)	(3.549)	(0.261)
2007 dummy	-0.236	5.436	-0.346	-0.913***	5.932*	0.224
	(0.584)	(4.067)	(0.329)	(0.297)	(3.411)	(0.300)
2007 x Public	0.272	-12.10***	-0.125	0.357	-13.80***	-0.295
	(0.591)	(4.450)	(0.337)	(0.322)	(4.218)	(0.310)
Rural school	-1.464***	3.635	-0.765**	-1.258***	7.152	-0.599*
	(0.530)	(5.309)	(0.364)	(0.358)	(5.082)	(0.320)
Constant	1.213**	14.76***	0.518	2.017***	8.780*	0.514*
	(0.531)	(5.005)	(0.342)	(0.314)	(4.840)	(0.286)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
District x Rural dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	298	298	298	298	298	298
R-squared	0.186	0.287	0.404	0.246	0.333	0.305

Notes: Clustered standard errors in parenthesis
*significant at 10%; ** significant at 5%; *** significant at 1%
Other controls: Teacher's gender, experience and living condition

Table 11
Impacts of FPE on Grade six Teacher Effort – saturated model

	Reading teacher Effort	Math teacher Effort
Public school	7.657*	10.44**
	(4.081)	(4.811)
2007 dummy	7.987*	7.217*
	(4.575)	(4.064)
2007 x Public	-12.42**	-14.61***
	(4.845)	(5.448)
Rural School	1.230	8.329
	(5.929)	(6.698)
2007 x Rural	-9.251	-4.624
	(6.782)	(6.732)
Rural x Public	0.266	-4.077
	(6.040)	(6.006)
2007 x Rural x Public	4.832	3.765
	(8.094)	(8.608)
Constant	15.43***	7.666
	(4.757)	(5.814)
Other controls	Yes	Yes
District x Rural dummies	Yes	Yes
Observations	298	298
R-squared	0.294	0.333

Notes: Clustered standard errors in parenthesis
*significant at 10%; ** significant at 5%; *** significant at 1%
Other controls: Teacher's gender, experience and living condition

Table 12
Impacts of FPE on Other School Quality Measures and Community Involvement

	(1) Inspections	(2) Complete classes	(3) Incomplete classes	(4) Open-air classes	(5) PTR	(6) Amenities	(7) Involvement	(8) Absent Never	(9) Absent sometimes	(10) Absent often
Public school	9.210***	-0.115	0.0868	0.0286	18.45***	-0.303***	4.679***	-0.667***	0.628***	0.0392
	(3.082)	(0.192)	(0.146)	(0.0620)	(3.809)	(0.0880)	(0.467)	(0.116)	(0.135)	(0.0287)
2007 dummy	-3.451	-0.275	0.255	0.0197	8.322	-0.114	1.715*	-0.280	0.283	-0.00248
	(3.060)	(0.245)	(0.210)	(0.0593)	(5.086)	(0.107)	(1.003)	(0.220)	(0.236)	(0.0225)
2007 x Public	-6.232**	0.252	-0.225	-0.0264	0.739	0.133	-5.479***	0.159	-0.183	0.0241
	(2.790)	(0.237)	(0.202)	(0.0643)	(5.340)	(0.116)	(0.953)	(0.243)	(0.258)	(0.0402)
Rural School	4.752*	-0.0463	0.0282	0.0181	34.03***	-0.420***	6.181***	-1.109***	1.129***	-0.0200
	(2.800)	(0.196)	(0.150)	(0.0594)	(3.649)	(0.0853)	(0.428)	(0.108)	(0.128)	(0.0216)
Constant	7.248**	1.046***	-0.0282	-0.0181	15.47***	0.795***	10.82***	1.109***	-0.129	0.0200
	(2.800)	(0.196)	(0.150)	(0.0594)	(3.649)	(0.0853)	(0.428)	(0.108)	(0.128)	(0.0216)
District x Rural dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	298	298	298	298	298	298	298	298	298	298
R-squared	0.404	0.350	0.317	0.273	0.410	0.342	0.576	0.298	0.277	0.144

Notes: Clustered standard errors in parenthesis
*significant at 10%; ** significant at 5%; *** significant at 1%

Table 13
Impacts of FPE on Other School Quality Measures – Inspections and Local Community Involvement

	Inspections	Involvement
Public school	9.179**	4.799***
	(4.308)	(0.510)
2007 dummy	-4.143	2.214*
	(4.172)	(1.306)
2007 x Public	-4.724	-5.513***
	(3.648)	(1.120)
Rural School	5.000	6.500***
	(3.978)	(0.398)
2007 x Rural	2.932	-1.898
	(4.606)	(1.347)
Rural x Public	-0.241	-0.705
	(4.367)	(0.569)
2007 x Rural x Public	-4.441	1.010
	(4.283)	(1.256)
Constant	7.000*	10.50***
	(3.978)	(0.398)
District x Rural dummies	Yes	Yes
Observations	298	298
R-squared	0.406	0.582

Notes: Clustered standard errors in parenthesis
*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Appendix A.

Table A1: Variable labels

Variable	Label
Repeat dummy	1 if pupil has ever repeated, 0 otherwise
Scholastics	Measure of basic scholastic materials the pupil has.
Homework help	1 if pupil gets help at home, 0 otherwise.
Regular meals	1 if Pupil gets at least two meals daily, 0 otherwise.
Weekly load	Grade six teacher average number of teaching hours.
New teacher	1 if less than 6 years of teaching experience
Testing frequency (Test)	1 if teacher gives written weekly in-class tests, 0 otherwise
Community importance	1 if school head ranks community contacts in top two activities, 0 otherwise.
Complete classes	Proportion of classes held in complete classroom structures.
Incomplete classes	Proportion of classes held in partially complete class rooms (usually roofed).
Open-air classes	Proportion of classes held in the open-air.
Termly evaluation	1 if teacher performance assessment by head teacher is termly, 0 if monthly.
Absent Never	1 if school never experiences teacher absenteeism problem, 0 otherwise.
Absent sometimes	1 if school sometimes experiences teacher absenteeism problem, 0 otherwise.
Absent often	1 if school often experiences teacher absenteeism problem, 0 otherwise.

Appendix B. Summarized impacts for the FPE intervention in Kenya

Table B1: Impacts on Pupils' test scores

	Details	Hypothesis test	Reading	Math
(a)	Public Rural	$\beta_F + \beta_{FP}+\beta_{FR}+\beta_{FRP}$	-0.319***	-0.266***
(b)	Public Urban	$\beta_F + \beta_{FP}$	-0.290***	-0.222**
(c)	(a) Vs. (b)	$\beta_{FR} + \beta_{FRP}$	-0.029	-0.044
(d)	Private Rural	$\beta_F + \beta_{FR}$	-0.290	-0.130
(e)	Private Urban	β_F	0.202	0.384*
(f)	(d) Vs. (e)	β_{FR}	-0.492	-0.514
(g)	(a) Vs. (d)	$\beta_{FP} + \beta_{FRP}$	-0.029	-0.135
(h)	(b) Vs. (e)	β_{FP}	-0.492**	-0.606***

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Table B2: Impacts on Pupils' test scores by gender

			Girls		Boys	
	Details	Hypothesis test	Reading	Math	Reading	Math
(a)	Public Rural	$\beta_F + \beta_{FP}+\beta_{FR}+\beta_{FRP}$	-0.355***	-0.271***	-0.285***	-0.254***
(b)	Public Urban	$\beta_F + \beta_{FP}$	-0.353***	-0.224**	-0.229**	-0.217
(c)	(a) Vs. (b)	$\beta_{FR} + \beta_{FRP}$	-0.002	-0.047	-0.056	-0.037
(d)	Private Rural	$\beta_F + \beta_{FR}$	0.031	0.128	-0.691**	-0.393
(e)	Private Urban	β_F	-0.049	0.17	0.359*	0.522**
(f)	(d) Vs. (e)	β_{FR}	0.08	-0.042	-1.050***	-0.915**
(g)	(a) Vs. (d)	$\beta_{FP} + \beta_{FRP}$	-0.386	-0.399	0.406	0.139
(h)	(b) Vs. (e)	β_{FP}	-0.304	-0.394	-0.588***	-0.739***

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Table B3: Impacts on Grade six teacher Efforts

			Reading teacher	Math teacher
	Details	Hypothesis test	Effort	Effort
(a)	Public Rural	$\beta_F + \beta_{FP}+\beta_{FR}+\beta_{FRP}$	-8.852**	-8.252***
(b)	Public Urban	$\beta_F + \beta_{FP}$	-4.433	-7.393***
(c)	(a) Vs. (b)	$\beta_{FR} + \beta_{FRP}$	-4.419	-0.859
(d)	Private Rural	$\beta_F + \beta_{FR}$	-1.264	2.593
(e)	Private Urban	β_F	7.987*	7.217*
(f)	(d) Vs. (e)	β_{FR}	-9.251	-4.624
(g)	(a) Vs. (d)	$\beta_{FP} + \beta_{FRP}$	-7.588	-10.845
(h)	(b) Vs. (e)	β_{FP}	-12.42**	-14.61***

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Table B4: Impacts on other school level variables – Inspections and Local involvement

	Details	Hypothesis test	Inspections	Involvement
(a)	Public Rural	$\beta_F + \beta_{FP} + \beta_{FR} + \beta_{FRP}$	-10.376***	-4.187***
(b)	Public Urban	$\beta_F + \beta_{FP}$	-8.867***	-3.299***
(c)	(a) Vs. (b)	$\beta_{FR} + \beta_{FRP}$	-1.509	-0.888
(d)	Private Rural	$\beta_F + \beta_{FR}$	-1.211	0.316
(e)	Private Urban	β_F	-4.143	2.214*
(f)	(d) Vs. (e)	β_{FR}	2.932	-1.898
(g)	(a) Vs. (d)	$\beta_{FP} + \beta_{FRP}$	-9.165***	-4.503***
(h)	(b) Vs. (e)	β_{FP}	-4.724	-5.513***

*** 1% level of significance; ** 5% level of significance; * 10% level of significance