Impact evaluation of the promotion of girls' education in Benin

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Note to readers

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Summary

The main goal of this impact evaluation is to assess the effectiveness of the full subsidy of school fees at the junior secondary level on enrolment and other educational outcomes in Benin. The primary outcomes imply (i) girls' school enrolment, (ii) the dropout rate for boys and girls at the secondary level and (iii) girls' early career labour market outcomes. The secondary outcomes imply girls' professional aspirations and the role of household demographic and socio-economic settings.

The research project applies an evaluation strategy that exploits variation in the treatment status across primary school graduate cohorts to identify the impact of the full subsidy of school fees. Overall, 4427 students from public and private school belonging to 8 primary school graduation cohorts are surveyed within 50 communities in Benin. The sharp regression discontinuity design is used.

The results show that the school fees subsidy for girls has led to:

A positive impact on girls' enrolment and drop-out rates from school, respectively at the cut-off point and far away the cut-off point

An increase of professional aspirations on students that previously had lower professional aspirations.

The impact on early career labour market and schooling years needs more evidence for a conclusion to be made.

These results imply that the intervention has a positive impact on enrolment but some incentives need to be implemented to better manage schools, such that teachers have the ability and skills to manage the influx of students. The implementation of the policy needs to be well oriented to obtain a thorough understanding of its influence on Benin's education system.

Keywords: Girls' education, impact evaluation, regression discontinuity design, Primary school graduation certificate.

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Abbreviations and Acronyms

ASE	:	African School of Economics
BEPC	:	“Brevet d’Etudes du Premier Cycle” meaning Lower Secondary Graduation Certificate
C4ED	:	Center for Evaluation and Development
CAP	:	“Certificat d’Aptitudes professionnelles “meaning professional skills certificates
CAPI	:	Computer Assisted Personal Interviewing
CEP	:	“Certificat d’Etudes primaires” meanings Primary School Graduation Certificate
CNS	:	“Conseil National de la Statistique” meaning “National Statistics Counsil”
CsPRO	:	Census and Survey Processing System
DANIDA	:	Denmark's Development Cooperation
HFC	:	High Frequency Checks
ICC	:	Intra-Class Correlation
INSAE	:	“Institut National de la Statistique et de l'Analyse Economique” meaning “National Institute of Statistics and Economics Analysis”
IREEP	:	“Institut de Recherche Empirique en Economie Politique“ meaning “Institute of Empirical Research in Political Economy”
MSCRT	:	Multi-Site Cluster Randomized Trials with Treatment
RDD	:	Regression Discontinuity Design
TBS	:	“Tableau de Bord Social” meaning “Social Dashboard”
UNESCO	:	United Nations Educational, Scientific and Cultural Organization
UNICEF	:	United Nations International Children's Emergency Fund
USE	:	Universal Secondary Education

1- Introduction

Why is this topic important?

One of the Sustainable Development Goals is quality universal primary and secondary education prompting countries to ensure that by 2030, all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes. Motivated by the potential long-term benefits of improving education levels, a number of developing countries have abolished school tuition fees, especially for girls.

In Benin, female schooling remains an area that requires attention. Despite commitment from the Beninese government and its international partners (including the World Bank, UNICEF, DANIDA and others), female enrolment rates remain low in Benin. UNESCO estimates the gender parity index at 0.73 at the junior secondary level, indicating a substantial gap between boys' and girls' enrolments. On the primary level, Benin records satisfactory results. The gap in gross enrolment has decreased from 32 percentage points (pp) in 2003 to 21pp in 2005 and 10.7 pp in 2008. Completion rates for the primary level increased from 22.1 percent in 1991 to 65.1 percent in 2008. However, there is still substantial room for improvement at the secondary level. Girls' enrolment rates in high school trail behind those of boys, which is reflected by a gender parity index of 0.73 in 2013. Neighbouring countries like Burkina Faso (0.90), Cameroon (0.86) or Ghana (0.95) are much closer to reaching parity.

According to UNESCO, other disadvantages resulting from gender inequality in education can create societal problems in a wide range of areas such as women's employment, empowerment and child health/nutrition. Furthermore, even areas such as environmental protection and economic growth might benefit from more equal educational opportunities for girls.

At the World Education Forum held in Dakar in 2000, resolutions were taken to eliminate disparities between female and male primary and secondary education. Benin ratified this resolution No. 5, committing itself to achieve equal access to education for girls by 2015. Within this context, the Beninese government, under the leadership of the Ministry of Secondary Education, implemented a school fee subsidy for girls for the first cycle of secondary education (junior high school).

While the government did not achieve this goal, according to the most recent data from the Ministry of Secondary Education and UNICEF, the present intervention is one major force working towards it. This evaluation seeks to evaluate if the intervention was indeed effective in achieving the goal of improving girls' school attendance and learning.

Why is this study interesting?

In order to close the gap between girls' and boys' enrolment described above, the evaluation addresses the causal chain and assumptions underlying the theory of change in the following manner. The main goal of eliminating school fees is to increase girls' school attendance, based on the assumption that abolishing school fees reduces the overall costs of schooling to such a degree that parents can now afford sending their girls to school. A related assumption, of course, is that financial reasons are at the heart of low enrolment rates among girls relative to boys. If other factors, such as cultural, social or religious factors, are responsible for girls' low enrolment rates, the present measure might not be as effective as the government predicts.

Taking these assumptions into consideration, this impact evaluation assesses parents' and girls' perceptions of girls' schooling. Wantchékon et al. (2015) find that high achieving students from age cohorts that attended colonial schools helped boost learning outcomes in their communities and across generations by raising aspirations. It is the presence of such aspirations that might interact

with the school fee subsidy for girls. In other words, girls who are part of a social network that contains a high achiever might be more inclined to attend secondary school than those girls who do not have one. Such impact heterogeneities are addressed in this impact evaluation. Fan and Chen's (2001) further emphasise the importance of investigating these dimensions by showing that parents' aspirations and expectations of their children's achievements have a strong relationship with student achievement.

Report to the fidelity on questions in the Pre-Analysis Plan (PAP)

The main question is whether the school fee waiver at the junior secondary level will improve educational outcomes.

As primary research questions for the study, we are asking:
1. What is the impact of abolishing junior high school fees for girls on girls' school enrolment rate?
2. What is the impact of abolishing junior high school fees for girls on educational outcomes for girls?
3. What is the impact of abolishing junior high school fees for girls on the dropout rate for girls at the secondary level?
4. What is the effect of abolishing junior high school fees for girls regarding girls' early career labour market outcomes?

The secondary research questions of the study are:

1. What is the role of girls' and parents' aspirations for girls' school enrolment and educational outcomes in general and in the context of the school fee subsidy?
2. What is the role of the household demographic setup and socio-economic situation for girls' educational success?
3. Does the elimination of school fees for girls at the junior high school level have unintended negative effects on girls (e.g. underage pregnancy, abuse) or boys (e.g. decline in parental attention, reduction in quality of education)?

All the research questions above are answered in this report.

Report structure

The present report will follow this structure: after introducing the intervention, we will underline its context and the theories of changes and our research hypotheses. Then, we will present the timeline, the evaluation design, methods and implementation. Lastly, the report will present the impact analysis and results of the key evaluation questions, discussions and specific recommendations for policy and practice.

2- Intervention, theory of change and research hypotheses

Intervention

In Benin, girls' lack of access to education and gender inequities in secondary schooling are a major concern given their potential effects on female empowerment and employment, child health and nutrition, and other areas. To address these issues, the Benin government, under the leadership of the Ministry of Secondary Education, implemented a school fee subsidy for girls for the first cycle of

secondary education (junior high school). To compensate the school fees that girls should pay to school directors, the government sends a certain amount to directors for schools' management. The intervention has been piloted 2007-2008 by an international NGO (DANIDA) in one department (Zou) and has been extended to the whole country starting from 2010.

In 2010 the school fee subsidy was made available in the 6th grade. In 2011, it was in the 6th and 5th cycles. The subsidy was made available one year later in 6th, 5th and 4th and finally in 6th, 5th and 4th and 3rd in 2013. This pattern allows students in our control cohorts (2006, 2007, 2008 and 2009) to benefit from the intervention if they retook classes once, twice, 3 times and 4 times respectively in lower secondary school. Our Identification strategy takes into account this possible repetition of control cohorts by including control variables (e.g. repeat grades) in the regressions.

Usually, students in lower secondary school in Benin pay tuition fees that vary from 9000FCFA to 15000FCFA (equivalent to USD 15-25) in public schools. Students in villages are requested to pay lower tuition fees than those in cities. Sometimes, depending on the needs of the school (not required by all schools), each student has to pay for his' participation in school activities and infrastructure building (around USD 5-11). Beside those fees, parents are requested to pay for books, copy books and exam' fees for their children similar to before the beginning of the intervention.

The subsidy is targeted only girls' students. All the boys had to pay tuition fees. However, boys are indirect beneficiaries of the intervention as they belong to the same class as girls and are affected by the influx of students that resulted from the girls' enrolment.

Theory of change and research hypotheses

While the main goal of the project under assessment is to increase female secondary enrolment, the causal chain continues beyond mere enrolment: Girls' school retention and academic achievement also constitute main indicators to assess the success of the intervention. With regard to these academic indicators, it is important to assess factors that encourage girls' academic success. These factors include the situation at school and at home. Additionally, well-equipped schools are potentially better suited to provide high-quality education. One hypothesis resulting from our preliminary qualitative analysis is that schools that provide both junior and senior high school have higher retention rates than schools that provide only junior high school. Regarding the situation at home, we are assessing impact heterogeneities related, among other factors, to the family's economic standing and the prevalence of child labour.

One research hypothesis tests the effect of the intervention on girls' students' academic performance. We are testing a two-sided hypothesis. On one side, the subsidy freed-up financial resources, which now reduce children's involvement in income generating activities and therefore increase their school attendance which will result in increased performance. On the other side, the influx of students in the classroom may lower their performance. However, it seems most plausible to us that we would observe a decrease of grades due to lower overall ability of the students and/or larger class sizes.

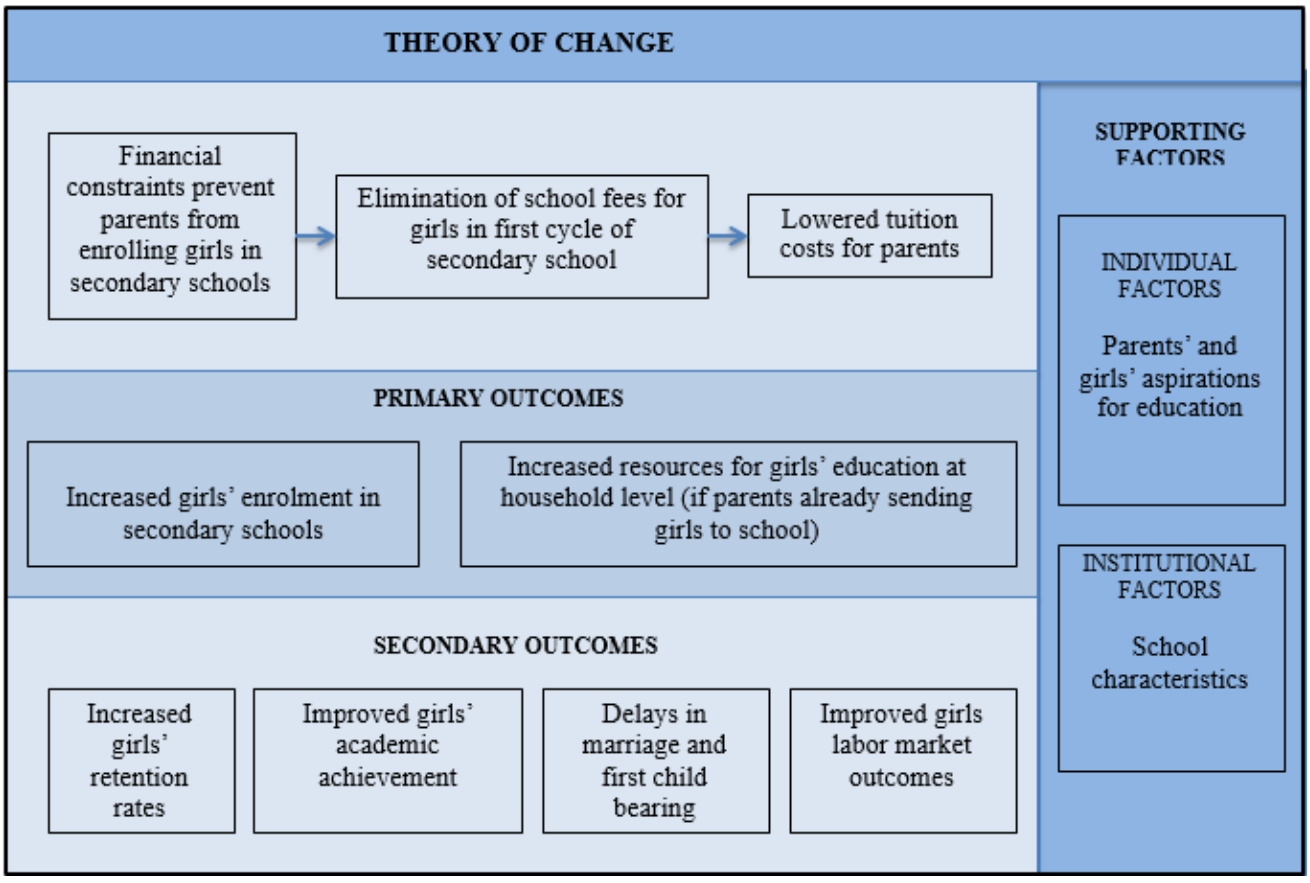
Other outcomes featured in the evaluation include the prevalence of early marriage and underage pregnancy. On the one hand, school attendance beyond primary school might reduce the likelihood of early marriage and pregnancy, as it improves the outlook for obtaining a better professional career. On the other hand, unintended negative effects might occur as a result of the school fee subsidy and

lead to the opposite result. Indeed, during the qualitative interviews some parents voiced the fear that in the absence of parental supervision, the risk of the girls' abuse by teachers as well as male peers increased.

Another factor that has received little attention in the context of education is the role of household demographics beyond the size of the household. One hypothesis that we might explore states that parents' aspirations of their children's education might vary by the order of birth. In other words, parental aspirations for their children might be higher for first-born or older children.

Finally, we are interested in whether increased access to education affects girls' success in the labour market and their early career and occupational options. While examining this question requires additional revision, we have assessed the effect of the intervention on career goals and on labour market entrance.

Figure 1: Theory of change



3- Literature review

Several studies have focused on education policies at primary and secondary levels assessing the impact of school fees waivers on school outcomes. Those studies have found various impacts of the school fees subsidies.

Chen et al (2013) have assessed the impact of a senior high school tuition relief program on poor junior high school students in rural China". Using several alternative estimation strategies, including Difference-in-Differences (DD), Difference-in-Difference-in-Differences (DDD), Propensity Score Matching (Matching) and Difference-in-Differences Matching (DD Matching), they have found that the tuition relief program has a statistically significant and positive impact on the math scores of seventh grade students. More importantly, this program is shown to have a statistically significant and positive effect on the poorest students in the treatment group compared to their wealthier peers.

In 2018 in Kenya, Milcah et al, found that non-payment of school levies by parents negatively affected educational programs and school projects and concluded that non-payment of school levies was a critical threat to secondary school programs and school projects. The study utilized descriptive survey research design. The quantitative data was analysed using descriptive statistics (tables, frequencies, percentages and graphs). In the same country, an impact evaluation study has focused on the Mbita and Suba sub-counties (Aoko Ndolo and al, 2016). Using cross sectional survey design, the evaluation has shown that a free secondary education policy was inextricably connected with access to secondary school education and that the Free Secondary Education policy has significantly impacted on access in secondary school education.

Another study on "Financial Constraints and Girls' Secondary Education: Evidence from School Fee Elimination in Gambia" demonstrated that the program increased the number of girls taking the high school exit exam by 55% (Blimpo et al, 2016). The share of older test takers increased in poorer districts, expanding access for students who began school late, repeated grades, or whose studies had been interrupted. Despite these changes in the quantity and composition of students, the authors find robustly positive point estimates of the program on test scores, with suggestive evidence of gains for several subgroups of both girls and boys. Adding up their findings suggests that financial constraints remain serious barriers to post-primary education, and that efforts to expand access to secondary education need not come at the expense of learning in low-income countries like The Gambia. Difference-in-differences identification strategy is used to evaluate the program and the Descriptive statistics method to compare students' enrolment from primary transition across secondary school.

"The Impact of Government Funding on Students' Academic Performance in Ghana" showed that students' academic performance in all four compulsory subjects: Mathematics, Integrated Science, English Language, and Social Studies, improved significantly during government partial funding (progressive free policy). Mann Whitney U Test was used to compare students' academic performance by considering the treatment group (in a period where government partial funding is used) and the control group (period where there is no funding (Abdul-Rahaman et al, 2018). By using OLS estimates, Duflo et al (2017) found that, scholarship winners were 26 percentage points (55%) more likely to complete secondary school, obtained 1.26 more years of secondary education, scored an average of 0.15 standard deviations greater on a reading and math test, and adopted more preventative health behaviour. For students admitted to academic majors, scholarships increased the chance of having enrolled in tertiary education by 5.3 percentage points on a base of 11 percent.

The effect of secondary school fees on educational attainment (Riphahn, 2012) carried out in Germany have showed that on average, upper secondary school attainment increased by at least eight percent in response to the fee abolition. Females' educational attainment appears to be more price sensitive than males'. They model optimal schooling in a framework that abstracts from dynamic processes and

describes the schooling decision as a tradeoff between costs (Ci) and expected returns (Yi) of schooling.

"Impact of Universal Secondary Education Policy on Secondary School Enrolments in Uganda" considers 2005 and 2009 survey data to analyze impacts of Universal Secondary Education (USE) policy of Ugandan Government on student's secondary schools' enrolments. The regression results of multinomial logit estimates on secondary school enrolment for boys and girls separately have shown that girls from poor households have benefited significantly from USE policy. In public secondary schools, the enrolment rates of girls from poor households have increased and have decreased for girls from richer households. The results indicate also that after introducing the USE policy, private secondary school enrolments have not changed significantly (Asankha and Takashi, 2011).

4- Timeline

Activities	**Dates**
Presentation of IE to ministries of education for approval and stakeholders' engagement	November 2016- February 2017
Baseline Survey Instruments Preparation	February –May 2017
Baseline Survey Implementation	September 2017
Statistical Visa submission and approval	May 2017
Students Census Instruments Preparation	May 2017
Students Census Implementation	June 2017
Qualitative survey	October-November 2017
Schools' Administration data collection	November 2017
Baseline data analysis and report	February- August 2018
Baseline Results presentation to conferences	September-October 2018
Follow-up survey instruments preparation	November 2018-January 2019
Follow-up survey Implementation	February-March 2019
Follow-up survey data analysis and report	March-April 2009
Final report Dissemination	June 2019
Publication preparation and submission	July 2019

5- Evaluation: Design, methods and implementation

5.1- Measures taken to ensure ethical research

Three main actions are taken to ensure ethics in this research. The research team made a presentation of the proposal and the methodology design to obtain the approval of the national Council of Statistics for the study "Conseil National de la Statistique de l'Institut national de la Statistique et de l'Analyse Economique".

Secondly, the research team obtained the support from the Ministry of Secondary Education and Professional Training as well as the support of the Ministry of Primary Education to run the study

Additionally, during the survey, the investigators are trained to explain thoroughly the objectives of the study to the respondents, to show them the importance of complying with the survey, and how that will help in making decisions for a better educational setting, and ensured the confidentially of the data collected from them. Before this, the surveyors sought the compliance of the parents by explaining the objectives of the study to them and mentioning the statistics law[1] in the first paragraph of the questionnaire before talking to the student. Below is a reference to the statistics law.

"Reference to the law of statistics: The personal information collected in this questionnaire is confidential. It is treated under statistical secrecy. The results are published anonymously pursuant to article 25 of Act No. 99-014 of April 12, 2000 on the organization and operation of the National Statistics Council".

5.2- Identification strategy

As described earlier, the government did not make the school fee subsidy available to all four levels of junior high school (6th, 5th, 4th and 3rd) immediately. Instead, it was implemented gradually starting with the entrance 6th classes followed by 5th. Then 4th and finally in 3rd. Entrance into the first year of junior high school is conditional on an "exam", a centralised selection process, which considers a test taken at the end of primary school (Certificat d'Etudes Primaire (CEP)).

However, in 2007 and 2008 the Beninese government with the support of DANIDA, had launched a pilot project in the Department of Zou. This the reason why the current evaluation design takes only into account the 11 other departments of the country (Plateau, Oueme, Atacora, Donga, Collines, Borgou, Alibori, Mono, Couffo, Atlantique and Littoral). This was done to avoid students in the department of Zou who had already been treated in 2007 and 2008 and could not be reconsidered as a control group for the evaluation.

The design is based on the primary schools' graduation certificate or CEP. Students that received primary school certificates from 2006-2009 formed the control cohorts. Those that received primary school certificates from 2010 to 2013 are the treated cohorts. Within the 11 departments, 50 villages are selected taking into account the sample design described in Section 5.4 and the appendices of this report (Appendix A- Villages Sampling process).

First, the age cohorts of those aged 10-30 in Benin has been used to estimate the number of children in each village. Secondly, the rates of children that enrolled in school and that graduated from primary school are used to determine the number of students that we might have in each village with primary school diploma. Finally, we got a sample of Benin's villages that meet the requirements of having twice to twenty times the number of students needed for our sample with regard to the power calculation results. 50 villages are randomly selected from this sample. Overall, we surveyed 26,000 students during students' census. Among them, 5,005 were randomly selected for the baseline following the power calculation requirements. During the follow-up 4,427 students were surveyed, this is equivalent to 12% attrition rate.

Eight cohorts of primary school graduation 2006, 2007, 2008 and 2009 are control cohorts and 2010, 2011, 2012 and 2013 were considered as treated cohorts were considered. The control cohorts are oversampled to 6 students in order to take into account those who retook classes and therefore

[1] A law that governed the data collection system in Benin

became treated. The same number of boys were also surveyed to check for heterogeneous effects on boys. Using an overall sample of 4427 individuals (3,875 from public school and 552 privates' school graduates), we've applied a regression discontinuity design to estimate the subsidy's effect on primary outcomes including enrolment rate, drop rate etc. Other outcomes indicators include effects of the subsidy on early career labour market outcomes, parental aspirations as well as unintended negative effects that an increase in the student body might bring about.

The graduate year 2010 where the policy started is the cut-off whereas the year graduation from primary schools is the running variable A similar approach can be found in a study by Croke et al. (2015), which assess the effect of a school fee reform on political participation in Zimbabwe. This design allows for a clean identification of the effect, as the political, economic, social and cultural context are identical for the 'treated' and the 'control' cohorts. The only difference is the elimination of school fees. Croke et al. (2015) argue that parents could not anticipate the school fee reform in the Zimbabwean context, indicating that parents in Benin should not have been able to adopt their decisions regarding girls' education.

5.3- Power calculation for quantitative survey

Power calculations are computed based on 4 outcome indicators of school performance:

- Gross enrolment ratio, lower secondary female
- Gross intake ratio to the last grade, lower secondary female
- Retention rate (computed from dropout rate) of girls
- Academic success rate (computed from repetition rate)

In the theory of change, lowering the tuition fees will result in the increase of girls' enrolment and retention in schools. These two indicators are used to compute the sample size required to detect the effect of the intervention, in addition to the academic success and the gross intake of students until the last grade in lower secondary school, which are also indicators for school performance.

We performed the power calculations using ''Optimal Design Plus Empirical Evidence'' to determine the number of schools/villages, pupils per villages, and pupils per cohort required to detect the impact of the intervention. The data comes from: http://data.uis.unesco.org/

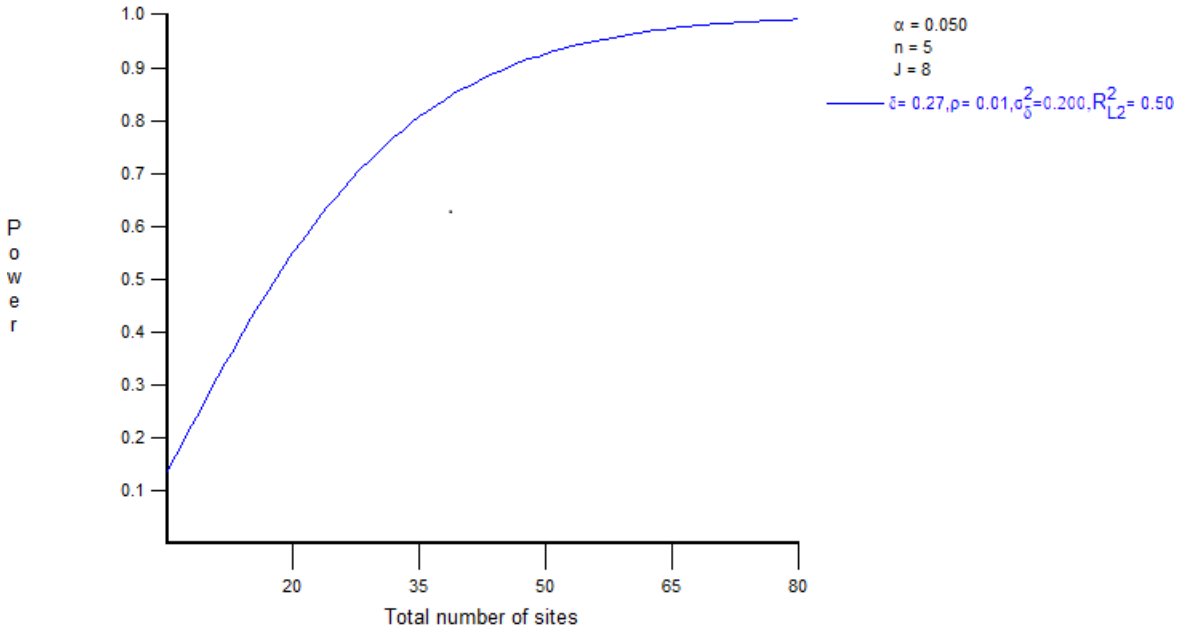
We defined the appropriate design to be Multi-site Cluster Randomized Trials with Treatment at Level 2 (p. 81 in Spybrook et al, 2011): A design using blocking before randomizing groups can be thought of as a multisite cluster randomized trial (MSCRT), an extension of the cluster randomized trial. In a MSCRT, the site is the block and the clusters are randomly assigned to treatment and control within each site. Sometimes the sites are natural administrative units, for example, schools where classrooms are randomly assigned to treatment within schools (Spybrook et al, 2011). These are assimilated to villages in our study.

In our case, the cohorts of 2010, 2011, 2012 and 2013 have been considered as the treatment groups and the cohorts of 2006, 2007, 2008 and 2009 are the control groups. Therefore, the cohorts are considered as clusters and the villages are considered as sites. Within each village 8 cohorts or clusters are considered (4 in control group and 4 in treated group) in order for the study to be balanced.

Cluster at cohort level: We suggest that 5 students per cohort and per village be surveyed.

The outcomes (enrolment rate, success rate, retention rate and gross intake rate to the last grade) are measured at the student's level.
Number of students to be surveyed within cluster/cohort: N=5
J is the number of clusters/cohorts. For this study 8 cohorts are involved. 4 cohorts for the treatment group and 4 cohorts for control group. J must be even.
δ is the desirable effect size: The minimum effect size of the intervention that we hope to identify through the study. Computation from UNESCO data gives effect size ranging from 0.04 to 0.27 with the four outcome's indicators described above. We consider the highest value of delta here.
σ^2 is effect size variability. By default, we set this to 0.2.
ρ is the Intra-class Correlation. It describes how strongly units in the same group resemble each other
In the absence of village level data we set the default value of ICC= 0.010
β defines the percent of variance explained by blocking of schools (here the blocking is at village level). This is considered to not affect the outcome. So, we set β =0
Using Optimal Design software gives the following graph (figure 2)

Figure 2: Results from power calculations



As it showed in Figure 2, we expect to identify an impact of 0.27 with a power of 90% if we survey 46.7 villages (we can round this to 50 villages) with 5 students per cohort within each village.
The intervention pertains to girls' students, as the free school fees are for them directly. Moreover, making schools free for girls may result in externalities for boys' education. In order to assess the consequences that the policy may have on male' students in secondary schools, the study has sampled the same number of boys in each cohort within the different villages. That raises the number of students to 10 per cohort and per village which meaning that 40 individuals are needed for the 4 treated cohorts (2006, 2007, 2008 and 2009) per village and the same number for the 4 control cohorts (2010, 2011, 2012 and 2013).

For the eight cohorts to be surveyed, we therefore have 4000 students within the 50 villages. Also, in control cohorts, 6 students per cohort and per village instead of 5 are surveyed to take into account those who retook classes, and therefore will be treated as beneficiaries of the intervention. We will

then have 48 students per village for the control cohorts and 40 students per village for the treated cohorts. Regarding private schools, we surveyed 630 students from private schools based on their availability from the student census.

Overall, 5030 students (5005 remain after the cleaning of the database) were surveyed during the baseline. During the follow-up, the same students were supposed to be surveyed but only 4427 were available in their home place during the survey.

5.4- Sample Design : Quantitative Survey

5.4.1- Village sampling

This study is implemented at the national level and therefore concerns all communities in Benin. Only the nine (9) communities of the department of Zou, where the free tuition for girls' intervention was piloted in 2007 and 2008, are excluded from the study.

The team has made 3 rounds of data collections. First, a pre-baseline survey was made to census all students that got the Primary School Certificate in 2006-2013 from 50 villages in Benin.
Secondly, there was the baseline data collection and finally the follow-up.
The study required students to be surveyed in 50 villages of Benin. The villages' sampling has been made by taking into account the following points:

- We have the **population of each village** in Benin (Appendices F_Villages_population Benin).
- **Birth cohorts that are eligible for the census**.

Students that received their CEP between 2006 and 2013 were needed. At the time of the census (pre baseline data collection) in 2017, we recorded all students who received their CEP between 2006 and 2016 in our villages in study, although the latest cohorts are not useful for the study. As school regulation allows students to retake grades, age wouldn't be a sufficient indicator for their identification. People take 6 years to complete primary school in Benin and children are supposed to start at 4-5 years old or more. So, children that received their CEP in the latest year (2016) without repeating classes should be at least 10 years old. The older cohorts that received their CEP in 2006 should be about 30 years old. They should start the third year at university in 2016 and should be 21 years old (if they didn't repeat classes). Taking into account the fact that participants might retake some grades, the team has set the maximum age at 30.

- **Official statistics of age-distribution:**

We have checked the official statistics of age distribution (age_distribution_Benin)[2]. In the absence of data on age distribution for each village in Benin, we have assumed that the same works for all villages in Benin.

We have used the age distribution and the village population to find an approximation of the population per age-group in each village.

[2] http://perspective.usherbrooke.ca/bilan/servlet/BMPagePyramide?codePays=BEN

The team has multiplied the proportion of people in this age interval (10-30 years old) and the population size of each village in Benin. That gives a value X1 for each village which is approximately the population size of those from 10 to 30 years old in each village.

- **Years in which these cohorts completed the Primary School Certificate.**

These birth cohorts (10-30 years old) should have received the primary school certificate from 2006 to 2016.

- **Official schools' statistics in those years (Source INSAE, TBS, 2012)**

The table 1 below shows the official schools' statistics in those years. For the purpose of the study, the population size X1 (number of people that have between 10 and 30 years old in each village) have been multiplied by the lowest percentage of people enrolled in school (that is: gross intake ratio to primary school: 44.1%) to get a value X2 for each village which is number of people enrolled in primary school. After this, X2 has been multiplied with the lowest primary school completion rate (that is 60.6%) to get approximately the number of children that completed primary school in each village X3.

Table 1: Indicators of education rate in Benin

	Indicators for schooling rate in Benin						
Years	2006	2007	2008	2009	2010	2011	2012
Primary school completion rate (%)	65	66.3	60.6	65	64.1	67.86	71.49
Gross intake ratio to primary school (%)	93	98.5	104.3	109.1	110.6	44.2	44.1
Net intake ratio to primary school		76.2			72.9	74.4	

Source INSAE, TBS, 2012

We have assumed that these primary education statistics are the same for all the villages in Benin.

- **Minimum cap**

The team set a minimum cap of number of students to census in each village. From the power calculation, we need 6 girls and 6 boys per control cohort per village and 5 girls and 5 boys per treated cohort per village. We have chosen the threshold of double the number of students that we want to sample (resulting from the power calculation). Therefore, villages where the number of students supposed to complete primary education (value X3) is below 10 girls and 10 boys for each of the treated cohorts (2010, 2011, 2012 and 2013) and below 12 girls and 12 boys for each of the control cohorts (2006, 2007, 2008, 2009) are dropped from the sample. We have also dropped every village that has at least one cohort not responding to the criterion above from the sample.
Overall, we need 40 individuals per village for the treated groups (We have considered 10 to 20 years old people) and 48 individuals/village for the control groups (We have considered the birth cohorts of 20 to 30 years old)

- **Maximum cap**

We have set a maximum cap if the number of those who are educated - is much larger, approximately 15-20 times higher. This is following the same reasoning as for the minimum cap above. We have dropped villages that have a population size X3 more than 15-20 times the number of individuals needed for our student sampling

- Selection
- After taking into account these criteria, we randomly drew 50 villages from the list of villages that fit the requirements for our study. The random selection takes into account the ratio of number of villages per department. We then made the census and found 24386 students within the 50 villages for the study. The following table shows the statistics on the number of students resulting from the census.

Table 2: Number of CEP graduates by public and private schools

	Number of students from public primary schools			Number of students from private primary schools		
	Boys	Girls	Overall	Boys	Girls	Overall
2005	632	352	984	100	67	167
2006	595	357	952	90	94	184
2007	534	340	874	76	83	159
2008	728	460	1188	117	116	233
2009	862	565	1427	166	164	330
2010	1019	767	1786	210	193	403
2011	1059	824	1883	212	175	387
2012	1178	984	2162	295	248	543
2013	1310	1007	2317	282	289	571
2014	1345	1211	2556	351	285	636
2015	1253	1014	2267	336	334	670
2016	703	547	1250	252	205	457
Total	11218	8428	19646	2487	2253	4740

5.4.2- Students' sampling

After the census, 5,005 students were drawn randomly to have the baseline sample following the requirement of the power calculation. Based on the year of CEP graduation, we randomly selected 6 boys and 6 girls per control cohort (2006, 2007, 2008, and 2009) per village and 5 boys and 5 girls per treated cohort (2010, 2011, 2012 and 2013) per village. That's made the sample size of 4,400 students, and additionally students from private schools (605) were sampled to get the sample size of 5005 for the study.

Finally, during the follow-up survey, the same students were supposed to be surveyed and we have recorded 4,427 students, representing an attrition rate of 12% comparative to the baseline.
The follow-up survey took place a year and a half after the baseline. Some students had moved from their previous home place. What's more, some of the areas of study are not far from Benin's border

with Nigeria and Togo, and Beninese close to the border used to migrate to Togo or Nigeria in search of jobs. Students who abandoned schools also migrated and are not reachable. This justifies the 12% attrition rate.

5.5. Sample design for qualitative data collection

- **Study Population**

The qualitative study benefited greatly from quantitative phase results, which helped identify interesting and characteristic case studies to ensure representative and in depth research.

The study focuses principally on:

- Female pupils forced to drop out of school for religious or cultural reasons
- Female pupils encouraged or discouraged by their family situation
- Female pupils who have developed clear strategies to continue their schooling
- Female pupils motivated by different aspirations
- Female pupils encouraged or discouraged by the situation at school
- Female pupils for whom school is an escape from their family and / or social situation
- Female pupils who have particularly benefitted from the subsidy
- Female pupils who have left private for public school due to the subsidy
- Parents particularly against the subsidy and enrolling their daughters in school
- Parents who have developed various strategies to help their daughter succeed in school
- Parents who exercise active checks on their daughters' school performance
- Parents active in parents' associations
- Parents who regularly consult school authorities or teachers regarding their daughters' and their daughters' performance
- Parents who are concerned for their daughters' safety
- Teachers who were made victims of the consequences of the subsidy
- Teachers or managers who have developed strategies to help girls succeed in school
- Other individuals who assist or support female pupils in the community

These case studies were sampled to study the various effects that have interfered with the school fees subsidy in impacting the outcomes variables.

- **Sampling Process**

After identifying the target population, the study focused on characteristic cases which emerged from the quantitative results. The chosen case studies are as follows:

- Female pupils or mothers-to-be who returned to the education system (two cases)
- Female pupils who dropped out of school altogether due to pregnancy (two cases)
- Female pupils who dropped out of school as a result of early or forced marriage (two cases)
- Female pupils who have been harassed or dropped out of school due to sexual harassment (one case)
- Female pupils who have been particularly successful thanks to the measure (two cases)
- Female pupils who dropped out of school due to family problems (one case)
- Female pupils who have shown an aversion to school (three cases)

- Female pupils affected by the distance between the school and their house (two cases)
- Female pupils who have shown a strong sense of purpose/personal motivation to succeed (two cases)
- Female pupils who have been inspired by their teachers (two cases)

- **The Study Sites**

The study sites cover various regions of Benin in which case studies were fairly representative. Table 2 lists the study sites and presents a description of the cases found at each location. Details on qualitative survey instruments can be found in Appendix C of Annexes.

Table 3: Location and description of case studies for qualitative survey

Commune/Department	Case description	Observations
Kérou /Atacora	Pregnancy without return Dropping out of school	High pregnancy rate in school settings
N'dali / Borgou	Pregnancy without return Dropping out of school Forced/early marriage Harassment	High pregnancy rate in school settings High rate of school drop outs due to forced marriage Very high rate of complaints of sexual harassment
Bantè / Collines	Dropping out of school because of long distance between school and home	The distance between school and home mentioned frequently
Zé /Atlantique	Dropping out of school due to family issues	Very high school dropout rate due to various family issues
Toffo / Atlantique	Dropping out of school because of the long distance between school & home	The distance issue was frequently mentioned but it hides other causes
Abomey-Calavi/ Atlantique	Distaste for school	The distaste for school is often the cause of dropouts in urban or semi-urban areas
Abomey-Calavi/ Atlantique	Success owing to recognized personal incentives	Personal incentives are sources of success beyond the subsidy
Cotonou / Littoral	Distaste for school	The distaste for school is often the cause of dropouts in urban or semi-urban areas
Kétou / Plateau	Dropping out of school due to lack of financial resources after the subsidy	Dropping out due to lack of financial resources after middle school is quite common

Commune/Department	Case description	Observations
Lalo / Couffo	Pregnancy followed by the return to the educational system	The region had the lowest pregnancy rate in schools Female pupils returned to continue their schooling despite interruption due to pregnancy

5.6- Data collection or dataset construction

The data collection is composed of four main elements:

- The enumerators recruitment and training;
- The organisation of the data collection team;
- The data collection methods and
- Data quality control.

- **Enumerators recruitment and training**

Data collectors are recruited on a temporary contract basis. The recruitment criteria are based on two aspects: (i) having at least the baccalaureate plus 2 years in the field of social sciences and (ii) having experience in the field of data collection.

The enumerators are trained for 3 days –for the census- and 8 days for the baseline survey and the follow-up on the following: delivering the “questionnaire” and mastering the questionnaire and filling in the platform CAPI Survey Solutions of the World Bank.

Before the training the questionnaire was piloted. The research team had three meetings with a few enumerators to test the questionnaire on tablets and correct all issues before launching the training for the census, the baseline and for the follow-up. Appendix B in annexes shows the quantitative survey questionnaire and handbook.

- **Organisation of the data collection team and roles of data collection’s team members**

The data collection team is made of:

Enumerators

Enumerators are the main actor in charge of data collection. The questionnaire is loaded on tablets and each enumerator has a certain number of questionnaires to fill each day. The enumerator is directly in contact with the beneficiary and is trained on the way to conduct the interview and practicable attitudes to have in front of the interviewees. The interviewers are organized in group of 7 to 8 by village and each team has to survey 4 to 5 villages.

Data manager

A data manager is the one who manages data, loads the questionnaire on all the surveyors’ tablets, receives the completed questionnaires filled by data in the field, converts it to STATA form and sends the database on Google drive for all the staff in charge of the survey.

Supervisors

Supervisors are controlling the data sent by the enumerators and focus on three main aspects: (i) logic checks, (ii) number of “don’t know and/or refusals responses and (iii) interview duration.

Headquarter

The data collection headquarter is in charge of checking of the quality of data that is sent on the platform.

- **Data collection methods**

This data collection procedure uses CAPI survey solutions platform. The data is collected on tablets and the synchronisation allows for sending data to supervisors and to the headquarters. The questionnaires are addressed individually to each actor in a face to face interview.

The data is collected through 3 specific steps.
To start, a census was made to register all the students that obtained the primary school certificates from 2006 to 2016 in the fifty villages sampled for the study. During this step, 24,386 students were surveyed. The baseline survey took place right after the census and 5,005 students were surveyed. The research team randomly picked 5 boys and 5 girls per cohort and per village within the list of students that registered during the census for the baseline survey. For control cohorts 6 boys and 6 girls were picked.
During the follow-up, 4,427 students were surveyed out of 5,005 students, leading to an attrition rate of 12%.

- **Data quality control**

Two kinds of data quality control are made: the “back checking” and the “high frequency checking” (HFC). The back checkers call 10% of interviewees and ask them a few questions relative to the interview that they receive from enumerators. The answers are recorded in CsPRO and compared with data sent by enumerators. There is a do file prepared to ensure this comparison. Two back checkers were recruited for this task and trained at the same time as the enumerators.

The HFC consists of writing a STATA code to address the quality of the data sent by the surveyors on the platform. In doing so, the enumerators who are not filling the questionnaires well are detected, and the feedback is sent to supervisors on the ground.

All tools are made to ensure the quality of data collected.

- **Cleaning and coding of data**

This step prepares the data for the analysis.
Some observations were dropped from the database because they were not inside the target.
Variables such as students’ sex, age, student name, phone number of households etc. that were loaded for the survey and corrected during the questionnaire delivery. They were then set together to have a final variable to be used for the analysis.
The recoding facilitates the use of the variable for the analysis.

All the data collection and data construction have followed the monitoring plan highlighted in Appendix E.

6- Program or policy: Design, methods and implementation

6.1- Key programme elements and programmatic activities

In 2010, the government allocated 1,252,378,000 FCFA to cover enrolment fees for girls in junior high school, but only 542,243,000 FCFA was ultimately spent, covering fees for 106,000 girls. In

2011, the government allocated 1,298,473,000 FCFA for school fees. In 2012, according to documents provided by the Ministry of Secondary Education, the government spent the total allocated amount of 477,394,000 FCFA, covering enrolment fees for 227,918 girls. In 2013, the government allotted 3,097,832,000 FCFA but spent a much higher amount of 7,460,141,000 million FCFA, on enrolment fees for the running school year. In 2014, the Government allocated 4,601,798,000 FCFA and spent 2,291,826,000 FCFA, finally covering the enrolment fees for all girls in junior high school. In total 424,629 girls benefitted from this program.

In general, these amounts are allocated to schools' directors who did not take any more school fees for girls before enrolling them. Starting from 2010, school fees subsidies for girls in junior high school are still operating in all public secondary schools today. All girls that obtained a primary school certificate and enrolled in junior high school are automatically beneficiaries of the program. Therefore, all girls that enrol in junior secondary schools from 2010 made up the treated group for our study.

In addition to the general school fee subsidy, the government put in place a package of other measures, including campaigns to raise awareness of the importance of girls' education, merit-based prizes for successful girls, and 'cellules d'écoutes,' school spaces intended to offer support for girls.

6.2- Monitoring system to track implementation of the intervention

The program didn't formally change during the study period. However, there were two main issues of implementation reported during the preparatory phase of the study: first, the government does not provide schools with the full amount of financial resources required to cover the actual school fees for all the girls enrolled. This issue poses financial difficulties on the side of the school. Some school directors reported that they mitigated this issue by cross-financing junior high school with resources intended for primary or senior secondary. Second, the government transfers subsidies to the schools only at the end of the school year, while ordinary fees are usually paid at the beginning. This creates a gap in the financing which school directors' bridge by taking out loans. Given that funding is not fully provided, schools and directors incur debt that might lead to schools' financial instability.

Besides the two issues mentioned above, the sudden influx of girls has created a challenging situation for the schools, given their inadequate infrastructure, such as overcrowded classrooms and insufficient staffing to supervise the pupils. Regarding the last challenge, an insufficiently supervised student body generates concerns among school staff and parents about the security of girls. Indeed, anecdotal evidence from qualitative interviews indicated increased pregnancy rates among the girls. In Benin, parents are not accustomed to having their daughters leave the household to become educated, and this might create cultural frictions.

Naturally, another concern stemming from prioritizing girls' education are externalities for the education of boys. For example, a substantially larger student body can lessen the attention boys receive from school staff. Further, parents might decide to shift financial or non-financial resources to their daughter(s) receiving free secondary education instead of supporting a male child for whom they would need to pay fees.

Regarding the study protocol planned, the research team was obliged to undertake a student census before the baseline. This was done because the office in charge of organisation of primary school certificate exam refused to share the list of students that received the certificate. In fact, confidentiality

reasons were raised and the office did not permit the list to be relinquished to the research team despite the approval of the two ministries of education for the study.

The two ministries of education were aware that ASE was running an impact evaluation of the program through the presentation of the research team, as well as through the request and receipt of approval for the study (See paragraph 5.1). But the school directors who are the main implementers of the program were not aware of the study. During the qualitative survey however, some case studies required surveying even the students' teachers and school directors as well.

7- Impact analysis and results of the key evaluation questions

7.1- Assumptions under the use of Regression Discontinuity Design

Regression Discontinuity (RD) designs are introduced as a way of estimating treatment effects in a nonexperimental setting where treatment is determined by whether an observed "assignment" variable (also referred to in the literature as the "forcing" variable or the "running" variable) exceeds a known cut-off point (Lee and Lemieux, 2010). It is applied specifically in situations where individuals are assigned to a policy/ intervention based on whether they are above or below a pre-specified cut-off on a continuously measured variable, such as age, income or weight. The strength of the design is that provided individuals do not manipulate the value of this variable, assignment to the policy/intervention is considered as good as random for individuals close to the cut-off (Smith et al, 2016).

In the following, we describe three empirically testable assumptions of the design and demonstrate whether these assumptions are met in the present study.

1. There is a discontinuity in the probability of exposure at the cut-off.

2. Individuals' value of the running variable was not manipulated.

3. Exposure groups are exchangeable around the cut-off.

Before moving forward, we define two mains concepts to be used in the document: The running variable and the cut-off point.

The running variable is the observed continuous variable that assigns exposure based on whether its value is above or below a fixed cut-off. In the case of this study, the Benin government has implemented starting from 2010 a school fees subsidy for girls at junior high school level. The running variable is the graduation year from primary school (the years of getting primary school certificate and move on to high school) and 2010 is the cutoff point, the year/point of the implementation of the program and that determines students' belonging to treated or control cohorts. The main idea behind this research design is that individuals just below the cutoff (who did not receive the subsidy) are good comparisons to those just above the cutoff (who did receive the treatment).

Assignment to the girls 'school fees subsidy in junior secondary school is based on whether the girl received the primary school certificate before or after 2010. We need to ensure that there were sufficient observations for each value of the running variable to obtain stable estimates of the mean, as well as enough values of the running variable on either side of the cut-off. Table 4 below illustrates

this for our study to estimate stable regression lines and predicted values. For this study, 8 graduation years are considered: 2006, 2007, 2008, 2009, 2010, 2011, 2012 and 2013.

Table 4: Operationalization of the running variable

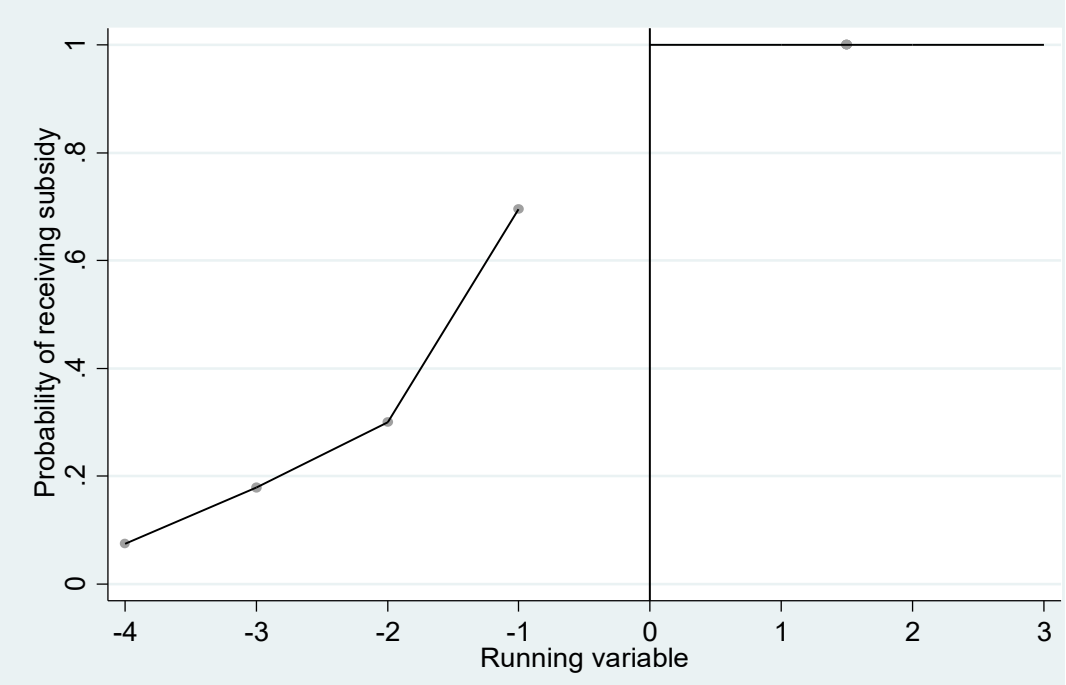
	Eligibility to the treatment	**Years of Primary school graduation**	**Value of the running variable**
	Not eligible	2006	-4
		2007	-3
		2008	-2
		2009	-1
Cut-off point	Eligible	2010	0
		2011	1
		2012	2
		2013	3

7.2- Verifying RDD assumptions

7.2.1- There is a discontinuity in the probability of exposure at the cut-off

One of the fundamental assumptions under RDD is the discontinuity at the cut-off point.
At the cut-off point, there is a discontinuity in the probability of exposure in the sense that students getting their primary certificate just before the cut-off would not receive the treatment and those getting it in 2010 and right after will receive.
Accordingly, continuity in the probability of exposure across values of the running variable except for a single notable discontinuity at the cut-off provides evidence that this first assumption is satisfied.
To evaluate this assumption, we generated line graphs of the probability of eligibility to the subsidy according to the running variable. It is good to notice that proportion here include students having the probability of receiving a subsidy for at least one year. This is mainly important for control cohorts because treated cohorts got it for each year of the junior school (at least four years) whereas some students in the control cohorts received the waiver subsidy only when they retook a certain number of grades and being considered as treated. The figure 3 below shows that conditional on the graduation year 2010 which is the year the intervention began, the eligibility to the subsidy has an effect on exposure to the subsidy shown by the jump from 0.7 to 1 at the cut-off point in the proportion of students that got subsidy for at least one year. The figure also demonstrates that there was continuity across values of the running variable on the right side of the cut-off point (for the treated cohorts) but some jumps are noticeable for control cohorts. Those jumps are attributable to grades retaking that make the last control cohorts (2009) most probable to receive the treatment just after one grade repetition. And the following cohorts (2008) after 2 repetitions and so on.
Although the assumptions suppose continuity at either side of the cut-off, there is no definition of how the discontinuity must be to invalidate the design. Taking into account the argumentation causing the discontinuity and the fact that the repetition of grades has been controlled in the model, we judged the first assumption to be satisfied because of the discontinuity noticed at the cut-off point.

Figure 3: Probability of receiving subsidy by running value



7.2.2- Individuals' value of the running variable was not manipulated.

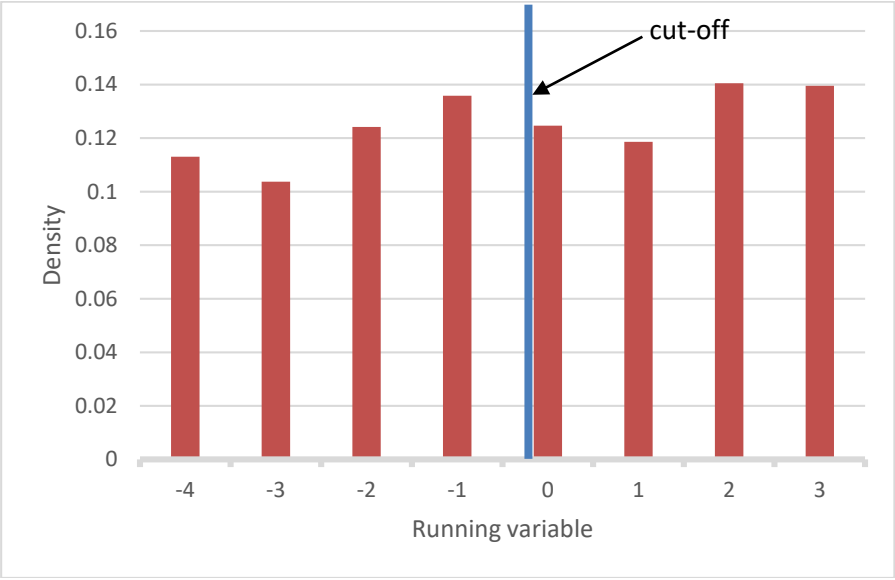
This is another important requirement for a causal interpretation of the RDD estimates is that individuals did not exert control over their value of the running variable, as this would violate the assumption that groups are assigned to the intervention in a way that is analogous to randomization. In our study, the way the program has been implemented doesn't allow the students to manipulate the running variable: being or not being included in the treatment group. This is what Hahn et al. (2001) qualifies as "no selection" condition. Students do not select themselves into the treatment group on the basis of anticipated gains from treatment, i.e. they can't anticipate to "gaining" the school fee subsidy by choosing their graduation year from primary school. They rather try their best on the test (i.e. they do not try to perform poorly in order to ensure that they benefit from the school fee subsidy) given that the cost (such as food, clothing and opportunity cost of remaining an extra year in school) of repeating another year at school is quite high compared to the amount of the subsidy. Equally, it could mean that the government does not allocate children into or out of the treatment group on the basis of information other than the year of obtaining the primary school certificate (e.g. parent income). In a more substantial way, we test this assumption of density of observations by determining the percent of cohort members per value of the running variable (Table 5) and creating a histogram of the density of the running variable (Figure 4). The percentages of cohort members per value of the running variable ranged by 3.66 percentage points, from 10.37% to 14.03%. Moreover, Figure 4 is relatively flat, indicating continuity in the density of the running variable. Together, the lack of a plausible

manipulation mechanism and the relative continuity observed from the figure provided evidence that the running variable had not been manipulated and no additional form of testing is needed.

Table 5: Percent of cohort members per value of running variable

Running variable	Frequency	Percentage n=2150
-4	243	0.11
-3	223	0.103
-2	267	0.124
-1	292	0.13
0	268	0.12
1	255	0.118
2	302	0.140
3	300	0.139
Total	2150	1

Figure 4: Continuity of the density around the cutoff point



7.2.3- Exposure groups are exchangeable around the cut-off.

To assess the exchangeability/comparability of the groups, we considered a certain number of baseline characteristics related to socio-demographics, household belongings, etc.
Socio-demographic factors included languages spoken, religion and principal religion, each categorized based on the frequency distribution of the data.
Household belongings are related to the number of radios, cell phones, televisions, farms, internet access, and other assets that the student's household possesses.
The assumption of exchangeability applies to those closest to the cut-off as there are the observations for which the causal effect applies.

The following table presents the balanced checks for the cohorts of 2009 (just before the intervention) and the cohort of 2010 that received the intervention.

Table 6: Balance checks for cohort of 2009 and 2010

Cohorts	2009			2010			t-test	
	N	mean	Sd	N	Mean	sd	Means' difference	p-value
Second language	342	0.63	0.48	305	0.66	0.47	0.03	0.37
Principal religion	595	0.33	0.47	536	0.59	4.24	0.26	0.14
Practicing only one religion	529	3.01	1.09	472	2.94	1.12	-0.07	0.34
Ethnicity_fon	595	0.43	0.5	536	0.38	0.49	-0.05	0.09
Living with parents	595	1.9	1.14	536	1.69	1.06	-0.21	0
Household belongings_Televisions	595	0.51	0.5	536	0.46	0.5	-0.05	0.1
Household belongings_Radios	595	0.67	0.47	536	0.66	0.47	-0.01	0.77
Household belongings: bicycles	595	0.27	0.44	536	0.26	0.44	-0.01	0.93
Household belongings Motorbike	595	0.67	0.47	536	0.71	0.45	0.04	0.12
Household belongings: Cars	595	0.07	0.26	536	0.11	0.31	0.04	0.04
Household belongings: mobile phones	595	0.97	0.16	536	0.98	0.15	0.01	0.63
Household belongings: Computers	595	0.13	0.34	536	0.13	0.34	0	0.95
Household belongings: uncultivated land	595	0.18	0.39	536	0.2	0.4	0.02	0.54
Household belongings : banana orchard	595	0.2	0.4	536	0.2	0.4	0	0.81
Household belongings : Carts	595	0.03	0.18	536	0.05	0.22	0.02	0.15
Household belongings:Tractors	595	0.01	0.08	536	0.01	0.1	0	0.62
Household belongings: house	595	0.72	0.45	536	0.77	0.42	0.05	0.06

Cohorts	2009			2010			t-test	
	N	mean	Sd	N	Mean	sd	Means' difference	p-value
Household belongings: poultry	595	0.36	0.48	536	0.39	0.49	0.03	0.24
Household belongings: small livestock	595	0.28	0.45	536	0.33	0.47	0.05	0.07
Household belongings: large livestock	595	0.11	0.31	536	0.16	0.37	0.05	0.01
Household belongings : toilets	595	0.67	0.47	536	0.64	0.48	-0.03	0.28
Household belongings : electricity	595	0.47	4.07	536	0.48	4.29	0.01	0.97
Household belongings : internet access	586	0.68	0.47	531	0.63	0.48	-0.05	0.09

The variables regarding languages, religion and ethnicity exhibit no statistically significant difference between the two cohorts. The shares of people speaking at least two languages within the two cohorts are very similar about 60% (those who mention second language). There is no difference between the two cohorts in terms of practicing only one religion.
Regarding belongings, 97% in the 2009 cohort have mobiles phones and 13% and 18% respectively have computers and uncultivated land. For the cohort of 2010, the proportions are very similar: 98% for mobile phone and 13 and 20 per cent respectively for computers and uncultivated land. The household's asset in terms of motorbikes, radios, televisions are very similar within the two cohorts showing none statistical difference.

Where we observe a statistically significant difference is in livestock, cars and house ownership. The treated cohort usually has more assets than the control cohort. Cohort effects are likely to be reflected in those household belongings. Additionally, an average on 1.9 students in the control cohorts declared living with their parents whereas, in the treated cohorts 1.69 have declared the same showing a statistical difference.
In sum, most of the variables included in this table are balanced for cohorts 2009 and 2010.
Variables for which we would not expect this cohort effect are balanced.
This condition is in accordance with the first and most strong requirement to identify the causal effect using the RD design according to Hahn et al. (2001). RD is about comparing two groups that are very similar except for the treatment, because the treatment depends discontinuously on some cut-off. Thus, the third assumption is also satisfied.

7.3- Model Specification

The results include the effects of the intervention on girls' enrolment. This pertains to those in first grade of the lower secondary, regarding the students' dropout and other educational outcomes.

The specification for the model is as follows: $Y_{\mathrm{ic}} = \beta_0 + \beta_1 D_i + \delta C_i + \varepsilon_{\mathrm{ic}}$ (1)

where Y_c contains the outcome variable: Enrolment in the first grade of lower secondary or other educational outcomes such as the dropout, the retake, the years of schooling, the school performance etc.

β_1 captures the jump in enrolment rate (resp. other educational outcome under evaluation) for the 2010 outcome (e.g. enrolment in 6th grade, dropout, etc.).

C_i is a linear control for the running variable, which is the CEP graduation year. The coefficient of the running variable captures the normal trend of the outcome variable in absence of any intervention.

The cut-off point is defined below

$$D_i = \begin{cases} 1 if C_i \geq 2010 \\ 0 if C_i < 2010 \end{cases}$$

In order to measure the effect of the subsidy at the cut-off, the CEP graduation year is centered on the cut-off by subtracting $\check{C}_i = C_i - 2010$. To assess the effect of the intervention far away from the cutoff point, we've explored specifications where $\check{C}_i$ interacts with D_i and run the following regression:

$$Y_{\text{ic}} = \beta_0 + \beta_1 D_i + \delta_1 \check{C}_i + \delta_2 D_i \check{C}_i + \varepsilon_{\text{ic}}. \quad (2)$$

To assess the potential for curvature, we explore specifications where $\check{C}_i$ enters also into quadratic terms, and where these terms are interacting with D_i.

The appendix D- in annexes expresses details of the Pre-Analysis-Plan.

The variables that we included in the specification are computed by the following method. The three outcome variables stand for enrolment, dropout and girls' professional aspirations: The following Table 7 shows the details on each variable used in the analysis.

Table 7: Variables used for analysis

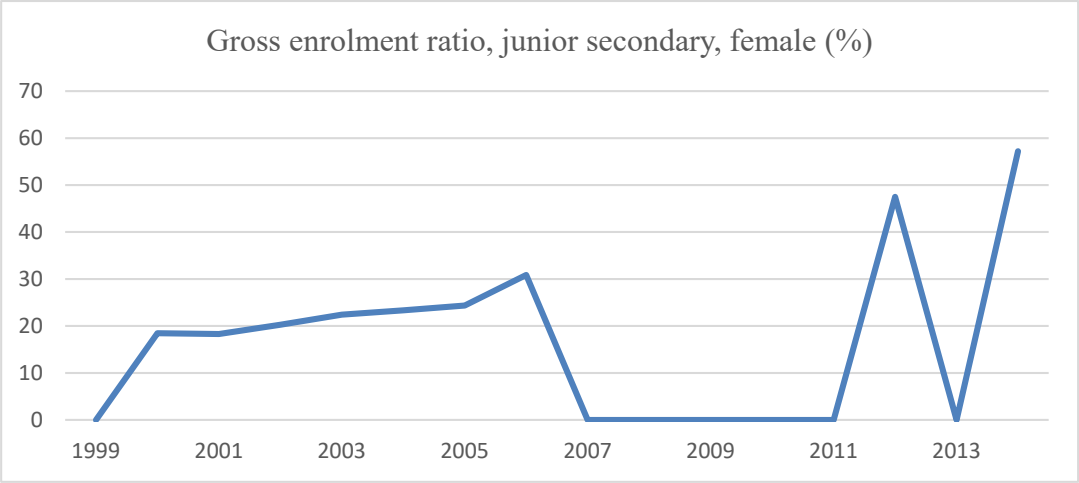
Dependent variable	**Explanatory variables**	**Controlling variable**
Each of the three dependent variables have been used to run onto the explanatory and controlling variables The first one is enrolment: it takes the value 1 if student is enrolled in 6th –first grade of lower secondary school- in the year of obtaining CEP – primary school certificate- and 0 if he dropped out from school right after the primary school certificate or registered later. The rate is computed as the number of students that enrolled in first grade of lower secondary in the year of graduation over the number of students graduated from primary school in the same year	Three main explanatory variables: 1- School fee subsidy This variable takes the value 1 for students who graduated from 2010-2013 and 0 for those who graduated from 2006-2009 2- Year of CEP graduation (running variable) The dataset has eight cohorts of CEP graduation 2006-2013. Those years are centred around 2010 which determines students belonging to the treated or control group That variable takes the value -4 for every student that obtained the CEP in 2006, -3 for the ones who obtained it in 2007, -2 for 2008, and -1 for those who obtained it in 2009. For students graduated in 2010, 2011, 2012	4- repeating grades We have generated a variable taking into account repeating grades: this variable is: coded 1 if a student of the CEP cohort 2009 has repeated only once during the lower secondary, a student of 2008 has repeated twice during the lower secondary, a student of 2007

Dependent variable	Explanatory variables	Controlling variable
	and 2013, the variable takes the value 0, 1, 2 and 3 respectively. 3- The third variable is "interaction" made by crossing the school fee subsidy variable and the running variable: interaction =school fee subsidy *running	has repeated 3 times during the lower secondary and a student of the CEP cohort 2006 has repeated 4 times during his lower secondary cycle. Otherwise the variable is coded 0
The second dependent variable is "dropout" It takes the value 1 for a student who dropped out during one of the four years of the lower secondary school and 0 for those who did not drop out of any class in the lower secondary or has not dropped out of another class during his schooling years. The rate is computed as the number of students that have dropped out in lower secondary over the number of students graduated from primary school in the same year and students belonging to the same cohorts have the same dropping rate. The dropping rate in first grade is also computed in the same way: number of students that dropped out from school in first grade over the number of students that obtained the primary school certificate.	As above	
Professional aspirations: We have classified the professional aspirations of students into three groups regarding the highest diploma that they aim to reach: They are: - Low_aspiration to a diploma: this group contains students who graduated from the fourth grade of lower secondary school (BEPC) and sixth grade of secondary school (CAP) - Medium_aspiration to a diploma: Undergraduate level - High_aspiration to a diploma: graduate level	As above	

7.4. National trend in girls' and boys' enrolment in high school

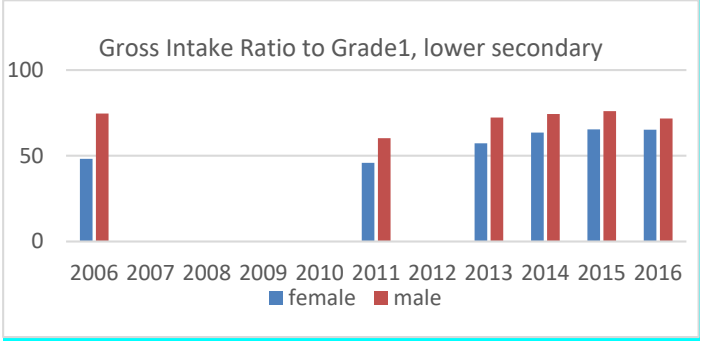
We are measuring access to education by the gross enrolment rate, which is the major impact indicator for the Ministry of Secondary Education. Unfortunately, data on this indicator is missing for the relevant years (2006-2011) in all sources. We were able to access including data from the ministry and data from UNESCO (http://data.uis.unesco.org/). See figure 5 and 6 below.

Figure 5: Gross Enrolment Ratio for Females



Source: http://data.uis.unesco.org/

Figure 6: Gross Intake to grade 1 of junior high school



According to UNESCO's data (gross intake ratio to first grade, lower secondary), shown through the graph above (figure 6), it has been established that girls', as well as boys' intake ratios gradually, increase over the years from 2011 to 2016 just after the beginning of the project implementation in 2010. As a proxy to enrolment rate, intake ratio tells us student has enrolled in increasing way into secondary school after the tuition fees have been abolished, but nothing much to say before because of unavailability of data.

7.5. Impact of abolishing junior high school fees for girls on girls' school enrolment rate

The dependant variable takes the value 1 if student is enrolled in "6th" –first grade of lower secondary school- in the year of obtaining CEP – primary school certificate- and 0 if he dropped out from school right after the primary school certificate or registered later.

Enrolment rate computed is the number of students enrolled in 6th in the year of CEP divided by the number of students that obtained their CEP in the same year.

On the table 8 below, the treatment variable (school fees subsidy) has a positive impact on girls enrolment at the cut-off in 2010 and far away from the cut-off point meaning that the policy put in place by the government has increased the entrance of female pupils in lower secondary at the year the policy started and for the following years.

Table 8: Impact of school fee subsidy on enrolment in first grade lower secondary _girls

Variables	Enrolment rate for girls in 6th
School_fee_subsidy	0.0177***
	(0.000872)
Running	0.00363***
	(0.000259)
Interaction	-0.00418***
	(0.000356)
Controling variable grade repetition_	-0.00223***
	(0.000738)
Constant	0.967***
	(0.000732)
Observations	1,979
R-squared	0.695

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

7.6. Impact of abolishing junior high school fees for girls on the dropout rate for girls at the secondary level

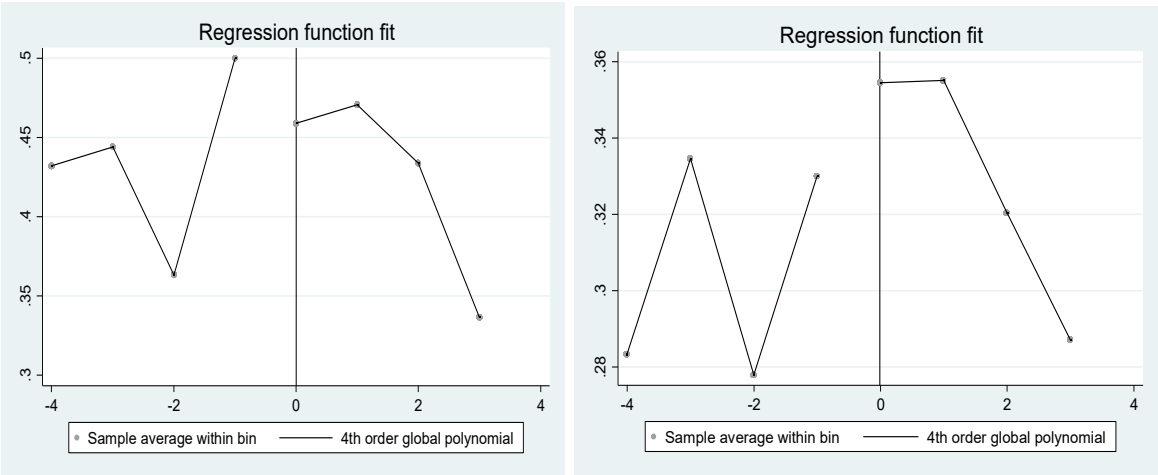
The following regressions (Table 9 and table 10) show the impact of the school fee waiver subsidy for girls in lower secondary school and in first grade of lower secondary respectively, on dropout rates.

The dependent variable is the dropout: it's represented by any student that dropped out from school during at least one of the four grades of lower secondary (junior high school) or did not enrol right after the CEP graduation. It takes the value 1 for a student who dropped out during one of the four years and 0 for those who did not drop out any class in the lower secondary or has dropped out of another class during his schooling years.

The drop rate is computed as a ratio of students that dropped out in a certain year divided by the number of students that obtained the primary school certificate in that year. The following figure (figure

7) shows the trend of dropout rate for girls (left) and boys (right) through the graduation year. The regression will run through a quadratic trend.

Figure 7: Drop rate trend for girls(left) and boys (right)



The results for girls' regression demonstrate that the treatment "school fee subsidy" has a significant negative impact on the dropout at the cut-off point and far away from the cut-off point in the first grade of lower secondary as well for the rest of lower secondary. This is shown by the coefficient of school fees subsidy and interaction which are negative in both regressions. That means that the policy intervention (school fees waiver for girls) has decreased the rate at which girls dropped out from school at the cut-off point and later on for girls in first grade and those in the whole lower secondary.

The positive sign and the significance of the running variable (table 9 and 10) show that without any intervention, we should expect an increase in the girls dropping out from school as the years of school graduation increase. In sum, the Beninese government's intervention has a very good impact on the dropout rate of girls and reinforce the hypothesis that making education free helps to keeping girls' students at school.

Table 9: Regression discontinuity results for girls' drop out from school_lower secondary

Variables	Drop rate for girls in lower secondary schools
School_fee_subsidy	-0.176***
	(0.00449)
Running	0.180***
	(0.00395)
Interaction	-0.139***
	(0.00462)

Running square	0.0334***
	(0.000783)
Interaction square	-0.0606***
	(0.00109)
Constant	0.634***
	(0.00423)
Observations	1,875
R-squared	0.793

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: Regression discontinuity results for girls' drop out in first grade junior secondary

Variables	Drop rate for girls in 6th
School_fee_subsidy	-0.0491***
	(0.00298)
Running	0.0150***
	(0.00262)
Interaction	-0.00740**
	(0.00307)
Running square	0.00276***
	(0.000520)
Interaction square	-0.00117
	(0.000726)
Constant	0.0998***
	(0.00281)
Observations	1,875
R-squared	0.397

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

7.7- Heterogeneous effects on boys

7.7.1. Enrolment rate

The regression discontinuity results for boys' enrolment (table 11) are similar to those of girls and suggest that the same interpretation goes for boys' enrolment. The school fee subsidy has led to the increase in the enrolment rate at the cut-off point and also afterwards. One potential reason that the results are similar is that making school free of charge for girls frees up household resources that can then be devoted to boys' education. Moreover, seeing more female pupils enrolled in school is a source of motivation for boys who are also more engaged.

The results for boys are identical to what was found during the baseline survey.

Table 11: Boys' enrolment in first grade lower secondary

Variables	Enrolment rate for boys in 6th
School_fee_subsidy	0.000792**
	(0.000323)
Running	0.000410***

	(9.29e-05)
Interaction	0.000660***
	(0.000133)
Controlling variable_grade repetition	-7.50e-05
	(0.000266)
Constant	0.977***
	(0.000268)
Observations	2,076
R-squared	0.248

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

7.7.2. Dropout rate

The following tables (table 12 and 13) show the dropout rate regressions for the first grade of lower secondary and the lower secondary respectively.

The results for boys' regression (table 13) show a negative sign of the treatment variable in the first grade of the junior high school. That means that the policy (school fees subsidy) has decreased the rate at which boys dropped out from school in first grade at secondary school at the cut-off point in 2010 and far away from the cut-off point.

In contrast, results in the whole lower secondary school (all of the 4 grades of lower secondary) demonstrates that the treatment "school fee subsidy" has a positive sign on the dropout at the cut-off point and a negative sign far away from the cut-off point. That means that the policy (school fees subsidy) has increased the rate at which boys drop out from school right at the year of intervention and has decreased the rate at which they drop out later when considering the 4 grades of lower secondary together.

The influence and the significance of the running variable for boys show that without any intervention, we should expect an increase in the boys dropping out from school as the years of primary school graduation increase. In sum, the Beninese government's intervention has reduced the dropping rate of boys at the cut-off point and after for boys in first grade of the junior high school whereas for the 4 grades of lower secondary school, results are conclusive later on, after the beginning of the intervention.

Table 12: Dropout rate for boys in lower secondary school

Variables	Drop rate for boys in lower secondary
School_fee_subsidy	0.0240***
	(0.00326)
Running	0.0141***
	(0.00278)
Interaction	-0.0118***
	(0.00334)
Running square	0.00110**
	(0.000544)
Interaction square	-0.00976***
	(0.000800)
Constant	0.332***
	(0.00305)
Observations	2,000

R-squared	0.640

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 13: Drop rate boys first grade lower secondary

Variables	Drop rate for boys in 6th
School_fee_subsidy	-0.00800***
	(0.00183)
Running	0.0295***
	(0.00156)
Interaction	-0.0591***
	(0.00187)
Running square	0.00557***
	(0.000305)
Interaction square	0.00430***
	(0.000449)
Constant	0.0926***
	(0.00171)
Observations	2,000
R-squared	0.530

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

7.8. Effects of abolishing junior high school fees for girls on girls' early career labour market outcomes

One of the objectives of the evaluation is to assess the impacts of the school fee subsidy put in place by the government on early career labour market outcomes. The CEP cohort students in this study takes into account students who graduated from primary school from 2006 to 2013. The earliest cohorts of our target (for those who never retook grades) have finished the master's degree in the academic year 2016-2017. We can then assume that at the time of the survey, our target is just at the "earlier" stage of the job market. This assumption excludes those who dropped out from school at any given time and have searched for a job or those who started their career with a bachelor's degree.

For the purpose of the analysis, we have divided all the types of jobs that could be taken up by the target cohorts into three categories. The low productivity jobs including the domestic work and agriculture, medium productivity jobs (this includes manual workers, hairdressers, tailors etc.) and the highly productivity job that necessitate more reflective activities, more schooling years and more technical thinking. The last group includes engineers, supervisory jobs, high class professionals, etc. Overall, in the database, only 358 students have started working in the job market. The tabulation of those individuals with respect to the control and treated cohort gives the following table 14:

Table 14: Students in labour market

Students' sex	Labour and CEP cohorts

	2006	2007	2008	2009	2010	2011	2012	2013
male	23	16	19	15	26	27	23	18
female	20	20	32	26	19	27	25	22

Varying number of students are engaged in the job market and in different categories through the years of control cohorts and treated cohort, but a consistent analysis could not be made possible as the last grade reached by the latest treated cohorts is only 6th grade of secondary school. More evidence is needed to clarify this research question.

The following sections 7.9, 7.10 and 7.11 present the secondary outcomes of the evaluation.

7.9- Effects of school fees subsidies on girls' professional aspirations

We have classified the professional aspirations of students into three groups depending on the highest diploma that they aim to reach: They are:

- Low_aspiration to a diploma: This group contains students who graduated from the fourth grade of lower secondary school (BEPC) and sixth grade of secondary school (CAP)
- Medium_aspiration to a diploma: Undergraduate level
- High_aspiration to a diploma: Graduate level

Tables 15, 16 and 17 below show the RDD regression results on female students that have respectively low, medium and high aspirations to a diploma.

The results for the RDD have showed that there is no influence of free schooling on girls who had medium and high aspirations at the cut-off point, as well as those far away from the cut-off point. This is shown by the non-significance of the coefficients of the variables "School fees subsidy" and the variable "interaction". However, there is a positive effect on students who had low aspirations far away from the cut-off point.

Table 15: Effects of school fees on girls that have low aspirations

Variables	Low aspiration to a diploma
School fee subsidy	-0.0120
	(0.0330)
Running	0.00675
	(0.0101)
Interaction	0.0382***
	(0.0142)
Constant	0.122***
	(0.0270)
Observations	1,875
R-squared	0.022

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 16: Effects of school fees on girls that have medium aspiration

Variables	Mediumaspiration to a diploma
School fee subsidy	-0.0515
	(0.0424)
Running	0.0285**
	(0.0129)
Interaction	-0.00532
	(0.0183)
Constant	0.319***
	(0.0347)
Observations	1,875
R-squared	0.008

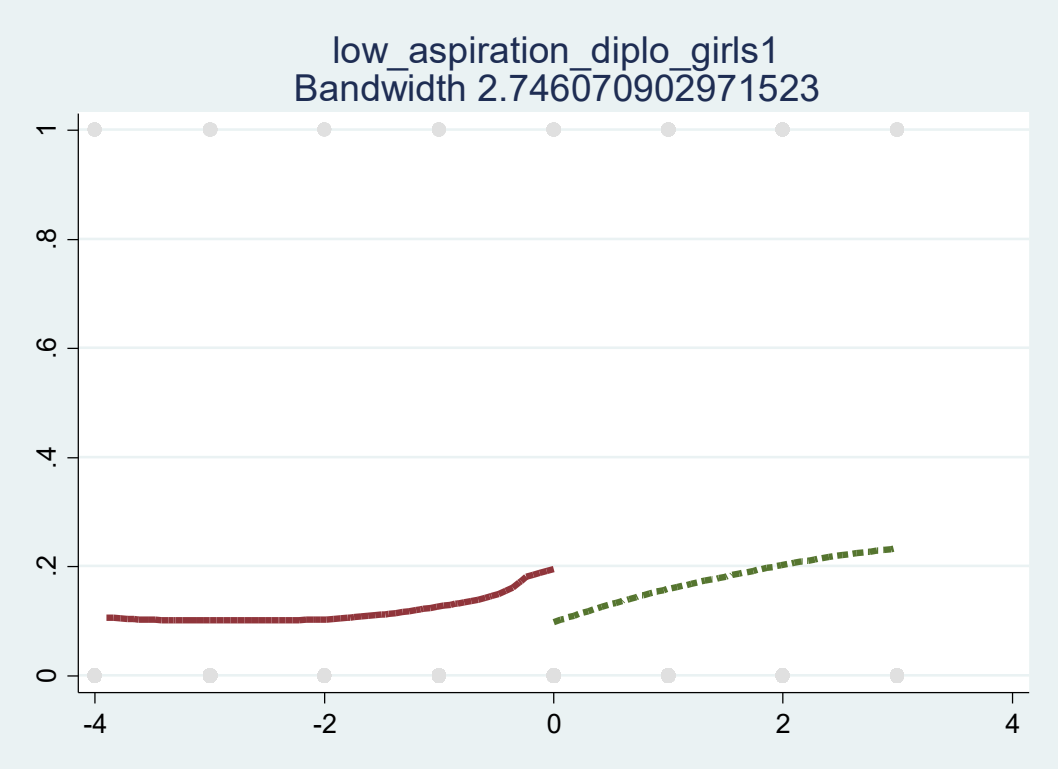
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 17: Effects of school fees on girls that have high aspiration to a diploma

Variables	High aspiration to a diploma
School fee subsidy	0.00568
	(0.0301)
Running	0.000797
	(0.00918)
Interaction	-0.0163
	(0.0130)
Constant	0.123***
	(0.0246)
Observations	1,875
R-squared	0.002

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 8: Effects of school fee subsidy far from cutoff point: girls with low aspirations



7.10- Role of the household demographic setup and socio-economic situation for girls' educational success

This section presents descriptive statistics derived from the data collected at follow-up. After presenting the structure across CEP cohorts, we proceed by providing mean estimates, as well as significance tests for differences in means for a subset of variables gathered during the follow-up. These mean tests are conducted on the pooled treatment and control cohorts.

Table 18: Cohorts of CEP graduates by year, gender and treatment status

	Control cohorts				**treatment cohorts**				
	2006	2007	2008	2009	2010	2011	2012	2013	Total
Boys	300	269	313	303	268	276	259	289	2277
Girls	243	223	267	292	268	255	302	300	2150
Total for cohort	543	492	580	595	536	531	561	589	4427
Share in total sample	0.12	0.11	0.13	0.13	0.12	0.12	0.13	0.13	1.00
Share of females in total sample	0.05	0.05	0.06	0.07	0.06	0.06	0.07	0.07	0.49

Note: This table shows the absolute numbers for the study subjects in the treatment group (CEP cohorts that graduated in 2010 or later) and the control group (CEP cohorts that graduated before 2010). It also shows the share each cohort took in the full sample as well as the share of women from a particular cohort in the full sample.

Table 18 shows total number of study subjects by CEP graduation year and gender. The observations per primary school graduation cohort range from 492 in 2007 to a maximum of 595 in 2009. The

average of observations over the eight cohorts is 553. Boys and girls are almost balanced in our sample with 49% of our observations being girls.
Table 19 shows household demographic statistics for our sample. Fon is the most spoken first language in the households in our sample. On average, 40% of households primarily speak Fon within the control group, 38% at the level of the treated group. The difference within treated and control cohorts who think religion influences schooling is significant. 20% of our study subjects are the first-born among their fathers' children and 25% are first-born to their mother in treatment and control.

Table 19: Household Demographic Statistics

	Control			**Treated**			**t-test**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	N	mean	sd	N	Mean	Sd	(5)-(2)	p-value
Fon 1st language in HH	2210	0.4	0.49	2217	0.38	0.48	-0.02	0.06
French 2nd language in HH	1294	0.65	0.48	1184	0.66	0.47	0.01	0.67
Principal HH Religion-Islam	2210	0.34	0.47	2217	0.53	3.63	0.19	0.02
HH has only one religion	2198	3.23	4.56	2213	3.22	5.03	-0.01	0.95
Religion influences schooling decisions	2204	0.23	0.42	2215	0.28	0.55	0.05	0
Ethnicity – Fon	2210	0.41	0.49	2217	0.38	0.48	-0.03	0.03
Student is father's first child	2204	0.2	0.4	2211	0.2	0.4	0	0.66
Student is mother's first child	2209	0.25	0.44	2216	0.25	0.44	0	0.94

Note: This table shows t-tests for mean differences across the treatment group (CEP cohorts that graduated in 2010 or later) and the control group (CEP cohorts that graduated before 2010).

Cohort effects are likely to be reflected in the household belongings listed in Table 20. The households of the younger cohorts (treated) own bicycles, motorbike, cars, farming land, fruit orchards, their own place of residence and small and large livestock significantly more often. The older cohorts (controls) on the contrary own computers, cell-phones, have toilets available in their property and access to internet and electricity significantly more often.

Table 20: Household belongings and expenditure

	Control			**Treated**			**t-test**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
	N	Mean	sd	N	mean	Sd	(5)-(2)	p-value
Television	2210	0.51	0.5	2217	0.48	0.5	-0.03	0.08
Radio	2210	0.65	0.48	2217	0.67	0.47	0.02	0.17
Bicycle	2210	0.22	0.41	2217	0.3	0.46	0.08	0
Moto	2210	0.71	0.45	2217	0.73	0.44	0.02	0.06
Cars	2210	0.08	0.27	2217	0.11	0.31	0.03	0
Cell-phone	2210	0.98	0.14	2217	0.97	0.17	-0.01	0.03
Computer	2210	0.17	0.38	2217	0.12	0.32	-0.05	0
Farm land	2210	0.42	0.49	2217	0.5	0.5	0.08	0
Land that cannot be farmed	2210	0.19	0.39	2217	0.2	0.4	0.01	0.5

	Control			Treated			t-test	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fruit orchard	2210	0.19	0.39	2217	0.23	0.42	0.04	0
Carriage	2210	0.03	0.17	2217	0.05	0.21	0.02	0.01
Tractor	2210	0	0.07	2217	0.01	0.1	0.01	0.03
Own place of residence	2210	0.71	0.46	2217	0.8	0.4	0.09	0
Poultry	2210	0.34	0.47	2217	0;41	0.49	0.07	0
Small livestock	2210	0.28	0.45	2217	0.36	0.48	0.08	0
Large livestock	2210	0.1	0.31	2217	0.16	0.37	0.06	0
Drinking Water outside property	2210	0.58	0.49	2217	0.61	0.49	0.03	0.02
Toilet available	2210	0.69	0.52	2217	0.6	0.49	-0.09	0
Access to electricity	2210	0.71	6.64	2217	0.6	5.15	-0.11	0.53
Access to internet	2178	0.65	0.48	2185	0.6	0.49	-0.05	0

Note: This table shows t-tests for mean differences across the treatment group (CEP cohorts that graduated in 2010 or later) and the control group (CEP cohorts that graduated before 2010).

7.11- Results on girl students' academic performance.

7.11.1-Data presentation

This section assesses the impact of free education for girls in junior secondary schools in Benin on students' academic performance.

The data were collected in general secondary schools in Benin on the basis of a secondary school randomly chosen by the commune. The team collected the numbers of students enrolled, repeated, passed a subsequent class and excluded from the schools for each class and each year (from 2006-2016).

Additionally, the annual average grades records for one random class per year and per cohort were collected. This data was collected for each cohort from 6th to 3^{le} but for the purpose of the study, records from 2006-2013 and for the four classes of the junior secondary schools were used. Data for certain communes were not complete and the study uses recorded data from 45 communes of Benin. For the analysis, the RDD methodology was used as for the section 8.5 and 8.6 of the report.

7.11.2- Analysis

- **Students recorded per year and per cohort**

Table 21 exhibits the number of girls' students recorded per year and per cohort.

Considering the repartition by year, the numbers of students show an increasing trend from 2006 to 2012 with a low decrease during 2009. When comparing across classes, there were fewer students recorded in the 5th and 6th grades than in the 3rd and 4th grades" the students in the lower grades 6th and 5th and 6th grades record less number than the upper 3rd and 4th grades. classes 4th and 3rd.

[3] The last grade of secondary school in Benin

Table 21: Number of students recorded per year and per cohort

Years	Classes				
	6th	**5th**	**4th**	**3rd**	**Total**
2006-2007	600	580	413	377	1970
2007-2008	561	537	442	411	1951
2008-2009	645	577	516	439	2177
2009-2010	511	410	375	368	1664
2010-2011	669	567	597	484	2317
2011-2012	798	669	564	546	2577
2012-2013	733	644	605	533	2515
2013-2014	613	615	501	561	2290
Total	5130	4599	4013	3719	17461

- **Average grades per year and by treatment and cohort**

The tables 22 and 23 below show the annual average grades for female students regarding the treatment, the year of schooling and the cohort. The class of 3rd seems the most difficult academically as students generally record lower average grades and the general average grade is lower than 10, the minimum required. This is understandable as they are required to pass the first national exam for secondary schools in 3rd and this is also observable in the 4th class where they are introduced to curricula similar to those of 3rd. Students in 4th also have lower grades comparatively to 6th and 5th. It can also be observed that there is no significant difference between the treated and control cohorts regarding the average grades. Moreover, it is noticeable that 5th is the easiest class for students to pass as students record the highest grades in that class.

Table 22: Annual average grades for female students per treatment and per cohort

	6th	5th	4th	3rd
Control	10.46	10.99	10.16	9.49
Treated	10.51	10.89	10.13	9.51

Table 23: Annual average grades for female students by year and per cohort

	6th	5th	4th	3rd
2006	10.49	11.16	10.16	9.87
2007	10.67	10.74	10.16	9.15
2008	10.37	11.04	10.17	9.43
2009	10.31	11.01	10.14	9.53
2010	10.51	10.85	10.17	9.63
2011	10.52	11.01	10.19	9.54
2012	10.49	10.94	9.89	9.43
2013	10.53	10.76	10.31	9.45

- **RDD results on the impact of girls' free schooling on academic performance**

First of all, the RDD plot was performed to check for trends and this shows a quadratic trend for the data on academic performance (see the following figure 9).

Figure 9: RDD plot for trends in students' academic performance data

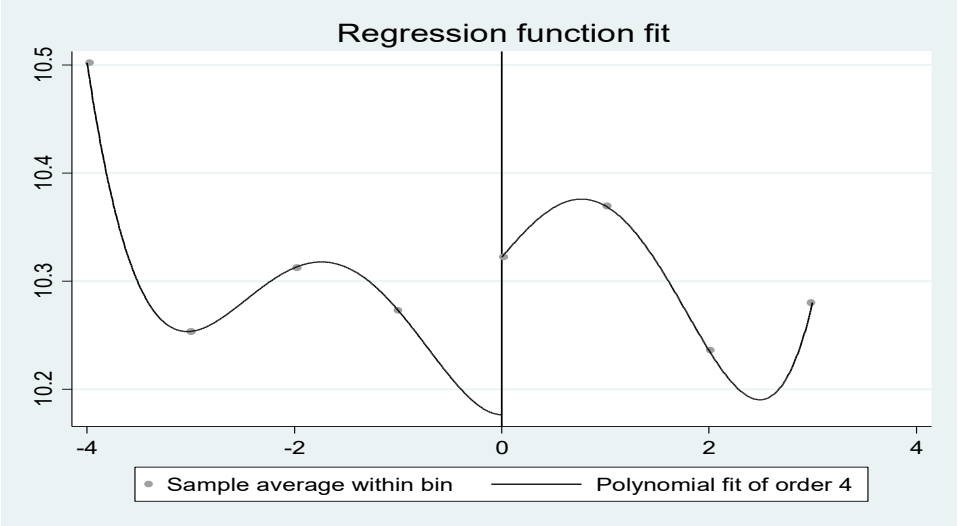


Table 24 shows the results of a regression discontinuity design assessment of free education on female students' performance.

The coefficient in the school fee subsidy that describes the impact of the subsidy on students' average grades is not significant, indicating that at national level, there is no influence of the school reform on girls' academic performance. However, the regression shows that in the absence of the subsidy, we should expect the students' grades to increase through the years (the coefficient of the running variable is significant). Additionally, the regressions show different results by regional department (table 25). In Ouémé, Littoral and Atlantique, the reform has a significant influence on girl's performance. In Littoral, there is positive impact, whereas in Atlantique and Ouémé a negative impact is noticed.

Table 24: Rdd results on girls' students' academic performance

Variables	Average grade
School fee subsidy	-0.101
	(0.131)
Running	0.197*
	(0.111)
Running square	0.0516**
	(0.0215)
Interaction	-0.220*
	(0.126)
interaction2	-0.0528*
	(0.0288)
Constant	10.44***
	(0.125)
Observations	17,461
R-squared	0.001

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 25: Rdd results on girls' students' academic performance by department

	Alibori	Atacora	Atlantique	Borgou	Collines	Couffo	Donga	Littoral	Mono	Oueme	Plateau
School fee subsidy	-1.547	-0.837	**-0.690***	0.004	-0.087	0.867	1.684	**1.062***	-0.144	**-0.584***	-0.551
	-2.544	-0.582	**-0.316**	-0.677	-0.342	-0.629	-1.034	**-0.523**	-1.072	**-0.282**	-0.35
running	1.379	1.165*	**0.848****	-0.116	0.155	-1.076	-0.56	**-1.260****	0.815	**0.511***	0.208
	-1.197	-0.452	**-0.277**	-0.596	-0.317	-0.559	-1.279	**-0.421**	-1.345	**-0.247**	-0.286
Running square	0.232	0.234**	**0.209*****	-0.008	0.005	-0.305**	-0.058	**-0.198***	0.446	**0.086**	0.047
	-0.193	-0.081	**-0.055**	-0.123	-0.069	-0.11	-0.327	**-0.082**	-0.387	**-0.049**	-0.054
interaction	0	-1.689***	**-0.921****	0.306	-0.348	0.876	0.271	**2.589*****	-0.609	**-0.737***	0.116
	(.)	-0.479	**-0.308**	-0.65	-0.355	-0.648	-1.321	**-0.558**	-1.366	**-0.29**	-0.328
interaction2	-0.954	-0.03	**-0.167***	-0.071	0.018	0.393*	0.005	**0**	-0.479	**-0.02**	-0.165*
	-0.603	-0.096	**-0.07**	-0.149	-0.085	-0.156	-0.345	**(.)**	-0.395	**-0.069**	-0.073
Constant	12.242***	11.500***	**10.863*****	10.197***	10.447***	9.539***	9.264***	**9.117*****	10.301***	**10.896*****	10.709**
	-1.737	-0.573	**-0.304**	-0.656	-0.326	-0.609	-1.019	**-0.494**	-1.064	**-0.265**	-0.331
R-squared	0.021	0.018	**0.009**	-0.001	0.002	0.042	0.062	**0.05**	0.011	**0.002**	0.009
N	1058	2042	**3098**	1125	2836	566	471	**666**	746	**2373**	2480
* p<0.05, ** p<0.01, *** p<0.001											

8- Discussion

The implementation of the evaluation has followed the requirements for the power calculation and sample size and may be therefore generalized without any problem. During the follow-up, we have recorded a 12% of attrition but the size of the baseline was much larger than what was required and, in that sense, the final sample size of 4427 does not detract from the evaluation findings.
The evaluation strategy has been presented to the national council of statistics (CNS) and has obtained validation and then must allow ideally the application of conclusions in our national context. This is reinforced by the support that we have from the ministries of education for the study.

With regards to the evaluation, similar results are found in the work of Duflo et al, 2017 which assessed the impact of free secondary schooling in Ghana. The study found that for the whole sample, scholarship winners (students who benefitted from free education) were 26 percentage points (55%) more likely to complete secondary school, obtained 1.26 more years of secondary education, scored an average of 0.15 standard deviations greater on a reading and math test, and adopted more preventative health behaviour. This positive impact is also found in our evaluation with respect to enrolment and drop-out of students.

Other studies assessing the effects of tuition fees' abolition also found similar results: This includes Asankha and Takashi, (2011), who researched the impact of Universal Secondary Education Policy on Secondary School Enrolments in Uganda and found that the enrolment rates of girls from poor households have increased comparative to a decrease noticed in richer households. The works of Riphahn, 2012 also lead to the same conclusion, stating that on average, upper secondary school attainment increased by at least eight percent in response to the fee abolition and that females' educational attainment appears to be more price sensitive than males. Blimpo et al, 2016 also found

that school fees elimination in Gambia increased the number of girls taking the high school exit exam by 55%.

The studies on academic performance throughout the world: Abdul-Rahaman et al, 2018; Chen et al (2013) found conclusive results on academic performance following a policy on school fees abolition.

As in Duflo et al (2017), it is too early to definitively assess labour market impacts in our sample as students who benefitted from free school fees didn't complete a certain level of education that allow them to enter the job market. The same reasoning goes for years of schooling. All the students, in particular the treated cohorts haven't completed school yet. Therefore, it is difficult to base the results on the current students' years of schooling.

9- Specific findings for policy and practice

Recommendations for government

The intervention has led to an increase of girls' enrolment in the first grade of lower secondary and has decreased the dropout for girls. In that sense, we could recommend the Benin government to pursue the implementation of the policy in junior high school and even extend it in the upper secondary school as this could lead to the same result.

It would also be advisable for the government to provide infrastructures and resources to school directors in order to allow them to manage the influx generated by the enrolment and to avoid the negative consequences that the fee waiver subsidy for girls' education has had on boys' education (e.g. boys' drop out in the whole lower secondary school). This is an additional cost that the government might not have planned but this is necessary for the success of the intervention and to reach relevant goals. The implementation of the measure differently in the various regions and toward various target is suggested from the qualitative study outcomes.

Finally, it's highly recommended that another study towards school directors, teachers and students' parents be implemented to assess the influence of the intervention and difficulties in implementing the reform by schools' managers.

It can also be advised that regular impact evaluations be done to assess the effectiveness of the policy and orientate the intervention. Moreover, the impact of the policy on girls' schooling years and labour market career must be evaluated in the long run.

For implementers (school directors and teachers)

Making school fees free for girls was a big challenge for implementers to manage due to the lack of resources in schools because the government didn't send the funds early enough and didn't pay the total amount equivalent to the number of girls enrolled.

Implementers need to improve their managerial capacities and develop skills to manage a larger number of students in classes. This also required sacrifice by implementers.

For students' parents

Sensitization campaigns should be organized towards students' parents in order to explain clearly the content of the intervention. The parents should continue supporting their children for all school charges except for the school fees. Parents that are not aware of the real content of the policy seems to not support their girl's children regarding the school charges.

10- Online appendixes

Online appendix A: Summary of villages sampling process

https://www.3ieimpact.org/sites/default/files/2020-10/PW3.07.BE_.IE-Online-appendix-A-Summary-of-villages-sampling-process.pdf

Online appendix B: Quantitative Survey instruments

https://www.3ieimpact.org/sites/default/files/2020-10/PW3.07.BE_.IE-Online-appendix-B-Quantitive-Survey-Instruments.docx

Online appendix C: Qualitative Survey instruments

https://www.3ieimpact.org/sites/default/files/2020-10/PW3.07.BE_.IE-Online-appendix-C-Qualitative-Survey-Instruments.pdf

Online appendix D: Pre-analysis plan

https://www.3ieimpact.org/sites/default/files/2020-10/PW3.07.BE_.IE-Online-appendix-D-PAP.pdf

Online appendix E: Monitoring Plan_girlseducation_ASE

https://www.3ieimpact.org/sites/default/files/2020-10/PW3.07.BE_.IE-Online-appendix-E-Monitoring-Plan-girlseducation.pdf

Online appendix F: Villages population in Benin

https://www.3ieimpact.org/sites/default/files/2020-10/PW3.07.BE_.IE-Online-appendix-F-Villages-population-Benin.pdf

Bibliography

Abdul-Rahaman N., Ming W., Abdul Rahaman A.B. and Amadu L. (2018) *The Impact of Government Funding on Students' Academic Performance in Ghana* International Education Studies; Vol. 11, No. 7; 2018 ISSN 1913-9020 E-ISSN 1913-9039

Aoko Ndolo M. Simatwa E. and Ayodo T. (2016) Impact of Free Secondary Education Policy on Access to Secondary School Education in Kenya. A Case Study of Mbita and Suba Sub-Counties

Asankha P. and Takashi Y. (2011) Impact of Universal Secondary Education Policy on Secondary School Enrolments in Uganda, Journal of Accounting, Finance and Economics Vol 1

Chen X., Shi Y., Yi H., Zhang L. , Mo D. , Chu J., Loyalka P. , Rozelle S.(2013) *The Impact of a Senior High School Tuition Relief Program on Poor Junior High School Students in Rural China:* China World and Economy

Croke K. Grossman G. Horacio L. A. Marshall J. (2015). *The effect of education on political participation in electoral authoritarian regimes: Evidence from Zimbabwe,* November 2014

Duflo E. Dupas P. Kremer M. (2017) *The Impact of Free Secondary Education: Experimental Evidence from Ghana* April 13, 2017

Fan, X., & Chen, M. (2001). Parental Involvement and Students' Academic Achievement: A Greener Journal of Educational Research, ISSN: 2276-7789 ICV: 6.05

Hahn J., Todd P., Van Det Klaauw W. (2001) : *Identification and Estimation of treatment effects with Regression Discontinuity Design*, Econometrica, Vol 69, N°1 (Jan, 2001), pp 201-209

Lee D. S. and Lemieux T. (2010) *Regression Discontinuity Designs:* Journal of Economic Literature 48 (June 2010): 281–355 http:www.aeaweb.org/articles.php?doi=10.1257/jel.48.2.281 Meta-Analysis. Educational Psychology Review, 13(1)

Milcah M. , Kiprop D. and Too F. (2018) *Impact of non-payment of school levies by parents on secondary school programmes and projects in Ainabkoi subcounty, Uasin-gishu county, Kenya* British Journal of Education Vol.6, No.7, pp.108-122, July 2018

Blimpo M. P., Gajigo, O., & Pugatch, T. (2016). *Financial constraints and girls' secondary education: Evidence from school fee elimination in The Gambia*.

Riphahn R. T. (2012) The effect of secondary school fees on educational attainment, Univ. of Erlangen-Nuremberg

Smith M. L., Levesque E. L., Kaufman S. J. and Strumpf E. C (2016) *Strategies for evaluating the assumptions of the regression discontinuity design: a case study using a human papillomavirus vaccination programme.* International Journal of Epidemiology, 2017, 939–949 doi: 10.1093/ije/dyw195 Advance Access Publication Date: 8 October 2016 Original article

Spybrook J., Bloomb H., Congdonc R., Hilld C., Martineze A. and Raudenbushf S. (2011). *Optimal Design Plus Empirical Evidence: Documentation for the "Optimal Design" Software*

TBS -INSAE (2012) : Tableau de Bord Social, Profils socio-économiques et indicateurs de développement du Benin -https://www.insae-bj.org/images/docs/insae-publications/annuelles/TBS/Archive/TBS%202012.pdf-

Wantchékon L., Klasnja M. and Novta N (2015): *Education and Human capital Externalities: Evidence from Colonial Benin*, The quarterly journal of Economics, 130 (2), Issue 2 703-757