



## THESIS / THÈSE

### ADVANCED MASTER IN INTERNATIONAL AND DEVELOPMENT ECONOMICS

#### Increasing access to secondary education : evidence from a quasi-experiment in Rwanda

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Advanced Master in International and Development Economics

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# **INCREASING ACCESS TO SECONDARY EDUCATION: EVIDENCE FROM A QUASI- EXPERIMENT IN RWANDA**

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## **Abstract**

In 2009, the government of Rwanda implements the nine-year basic education program, with the aim of increasing secondary enrolment rate. In this study we assess the effect of this program on the access to secondary school. Using the data from cross sectional household survey held before and after the program respectively in 2005/06 and in 2010/11, we perform a difference-in-differences approach to compare different cohorts. We refer to the control group for individuals aged between 13 and 15 years, and to the treated group for individuals aged between 16 and 18 years.

Under the assumption that other programs implemented countrywide at the same time have not differently affected the control and treatment group, we find that the program has increased the enrolment rate for individuals aged between 16 and 18 years by 11 percent. Female have a great benefit from the program, where their enrolment rate increased by 14 percent while for male in the same age group it increased by 8.5 percent.

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## 1. Introduction

Education is a key factor for the development of a country. No any country can achieve sustainable economic growth without skilled human capital capable to respond to in today's knowledge-driven economies. Quality education helps to gain more skills in order to improve individual and society social economic benefits. Banerjee & Duflo, (2012) highlight the constraint facing the education in the last decade. They identified constraint in both side: supply side -lack of textbook, lack of qualified teacher, insufficient classrooms...- and demand side – lack of interest, lack of school material, poverty, parent illiteracy...-.

Secondary education is a crucial stage in the education of a child, it is a strong transitional bridge between primary and tertiary education. Secondary education opens the door to a professional world. Upon completion of this level individual can directly join the labor market or continue pursuing studies at university.

The economic literature has identified that developing economies need to expand secondary education, in order : (1) to respond to the increasing demand of access to secondary school (Duflo, 2001a; Lewin, 2005, 2011) (2) to meet skills required on the labor market and to increase earnings (Lassibille & Tan, 2005; Onsomu, 2006; Psacharopoulos, 2004; Tilak, 2007) and (3) to improve society welfare, especially though youth welfare to shape a bright future for those young generation (Behrman, 1996; Cochrane SH, 1979; Cuadra & Moreno, 2005; UNESCO, 2013).

With the implementation of the Millennium Development Goals (MDGs) and Education for All (EFA) in 2000, special attention has been put on successful completion of universal primary education. This is a promising step to also increase the access to secondary education where complete primary education is a prerequisite to join secondary. However, the World Bank report illustrates that in a cohort that began primary education at 93% of net enrollment rate<sup>1</sup>, only 12% of the cohort complete secondary education in Sub Saharan Africa (World Bank, 2008).

To respond to this low access to secondary education, Sub-saharan African countries adopted strategies like fees free, school construction, training of teachers, curriculum

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<sup>1</sup>Net Enrolment rate (NER): Enrolment of the official age group for a given level of education, expressed as a percentage of the population in that age group (UNESCO UIS 2009).

review, etc. The government of Rwanda in 2009 introduced the program called “nine-year basic education” to address the problem of insufficient secondary classrooms.

The main objective of the program was to avail at least three classrooms for lower secondary, within the same vicinity with primary school. This program helps not only to increase access to secondary school but also to decrease the cost of attending secondary. Children attend secondary school in their home village without going to boarding schools as it was the case before the program. In 2009 the government of Rwanda built 3072 classrooms equivalent to one classroom per 75 individuals aged 13 years. Secondary net enrolment rate increased from 13.2 in 2009 to 22.6 in 2010.

In this study we attempt to assess the impact of the “nine-year basic education” program on the access to secondary school. To do this we perform a difference-in-differences approach comparing different cohorts. We use data from cross sectional household survey held before and after the program respectively in 2005/06 and in 2010/11. We refer to the control group for individuals aged between 13 and 15 years, and to the treated group for individuals aged between 16 and 18 years. Because the latter group was affected by the program while the former not. We found that the individuals aged between 16 and 18 years in the second wave benefited more from the program than individuals aged between 13 and 15 years.

It is also important to notify that 82 percent of individuals aged between 13 and 15 years were still in primary in 2010. The increase in percentage of individual attending secondary between the two waves is 17.69 and 6.63 percent for respectively individuals aged between 16-18 years and those aged between 13-15 years.

## **2. Literature review**

This section describes the related written literature from related topics, articles, books, scripts in relation to the present context of secondary education in Rwanda and the rest of the world that shares Rwanda’s situation. The first sub-section focuses on literatures explaining why countries need to expand secondary education while the second sub-section illustrates obstacles facing secondary education.

## 2.1 Demand for secondary education

Nowadays, primary education only does not respond to the need on labor market. Thus, the demand for secondary education did not cease to increase. In one hand, countries work toward sustaining the enrolment gain in primary and also want skilled citizen able to compete at international level. And in the other hand, people want to increase their level of education to earn more and improve their living condition. This section illustrates the cited reasons of why countries do need to expand secondary education.

**(a) To respond to the increasing demand of secondary education:** With the implementation of MDGs and Education for All (EFA) most countries work toward Universal primary education<sup>2</sup>, with free and compulsory primary education. Given the rapid increase in primary enrolments and ever increasing demand for secondary education, many African governments urged to expand access to secondary education to sustain the enrolment gain in primary school (Lewin, 2005).

In 1973, the government of Indonesia starts a program of school construction with an explicit target of children of primary school age not previously enrolled in school. Duflo (2001b) uses data from 1995 intercensal cross section survey of Indonesia, on men born between 1950 and 1972 and links it with district level data of new schools built between 1973-1974 and 1978-1979 to analyze the impact of school construction on education attainment and earnings in Indonesia. She compares, the treatment group -young generation aged between two and six years that was fully exposed to the program- with the control group -their elder aged between 12-17 years who completes primary when the program started. As falsification check, she also compares those who aged between 12-17 years with those aged between 18-24 years.

Duflo finds a positive effect on the education of younger generation, and no effect on the education of older generation, those who were not attending school during the program. The increase in education attainment was positively correlated with the

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<sup>2</sup> Goal 2: universal primary school : <http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-all/efa-goals/>

availability of the additional school in the region. Even though, the program was designed for primary schools, she finds a positive impact on secondary school: those who complete primary school are more likely to continue to secondary, despite the high cost related to secondary school when compared to primary school.

The link between primary and secondary education is also illustrated in the article "Expanding access to secondary education: can India catch up?", where Lewin (2011) says: " Universal access to primary schooling will also be difficult to sustain unless there are sufficient numbers graduating from secondary schools willing and able to become primary teachers", he continues to explain that where there is gender disparities in primary, they are almost always greater at secondary school, and do not diminish until enrolment include majority of children.

**(b) To meet skills required on labor market and increase earnings:** In specific fields of secondary education (such as technical and vocational area), students complete the level with the required skills to join the labor market. As mentioned, there is a need to expand secondary school to produce more primary teacher and also to produce youth with adequate basic skills to join technical labor market.

When analyzing the returns to education in Rwanda, Lassibille & Tan (2005) find that the returns to education are quite different across sector of employment and also increase with the level of education, they say "...those with higher education receive on average 20 times the wage of those with no schooling; those with secondary general and vocational education earn about five and six times as much as these workers, while those with primary education have an earning premium of only 50%".

The increase in earning contribute to improvement of living standard; Tilak (2007) analyses the post-elementary education, poverty and development in India and finds that post- elementary education helps to improve infant mortality, life expectancy, economic growth and drives to escape poverty trap. The quality of secondary education requires also a strong linkage with the needed skills on labor markets not only at the national but also at the international level (Onsomu et al., 2006).

**(c) To improve society welfare especially youth welfare:** The official school age for secondary school lies between 12-19 years, this is a crucial stage in the development of a child as she/he is passing through "the teen years". There is a

need to expand secondary education to help youth to shape their future through education.

Literatures illustrate the effect of fertility, health and nutrition as determinant of society welfare on education (Behrman, 1996; Cochrane SH, 1979). Several reports show that secondary education contributes to the reduction the of youth exposure to child labor, juvenile delinquency, and girl's early marriage. The 2013 EFA Global Monitoring Report illustrates that there were 2,867,000 child marriages for all girls by age 15 in Sub-Saharan Africa, south and west Asia. This number would be decreased by 14% if all girls have primary and by 64% if all girls have secondary education. The report also emphasizes on the impact of secondary education on different social factors like early birth, fertility, democracy, environment, etc.(UNESCO, 2013).

## **2.2 Barriers of access to secondary education**

The literature has identified several barriers to secondary education; their intensity and effects vary across region, country and age of student. The access to secondary school is affected by different obstacles: some are barriers to access to education in general regardless of the level education others are specific barriers to access to secondary education.

The most cited barrier to education are: cost of education and poverty, inequitable access, selection process, distance between school and household, low quality of education, insufficient textbooks, lack of qualified teachers, lack of adequate teaching materials, inadequate curriculum, low level of parent's education, child labor, early marriages, war and family conflict.

**Cost of education:** The cost of education is composed by direct and indirect cost. To attend school, families have to pay tuition fees, other direct cost (school material, transport to school, uniforms....) and other living cost (food, cloths, shelter...). Economic literatures identified the cost of education as foremost reason of not attending class,(de Janvry, Finan, Sadoulet, & Vakis, 2006; Lewin & Little, 2011; Ohba, 2011; Siddhu, 2011; Suryadarma, 2006; World Bank, 2008). The cost of attending secondary school is higher than the cost of attending primary school and still unaffordable for children from poor family. The opportunity to earn income

induces families to send the child to work causing “child labor”. In the district of Uttar Pradesh in India, over 50% of boys left school for revenue generating activities, while almost 80% of girls left school for domestic work (Siddhu, 2011).

Countries opt for free fees and conditional cash transfer to make education more affordable, motivate parents to send their children to school and increase access to education. Some Sub-Saharan Africa countries adopt a strategy of free fees for basic education where schools run using transfer from the government as capitation grant. But Ohba (2011) conducted a study on the abolition of secondary school fees in Kenya, and finds that this policy measure alone is not sufficient to increase the access to secondary education, especially for the children from low income families. He founds that returns to secondary education was relatively insufficient to keep the child to school, other direct cost and high opportunity cost affect negatively the transition to secondary school.

To analyse the effect of negative shocks on child labour as one of the reason of not attending, De Janvry et al. (2006) use the data collected for the evaluation of the conditional cash transfer “PROGRESSA” in Mexico and find that the program decrease child work by 2–7% depending on the child’s gender and age group. They also find that the income effect was not enough sufficient to change household behaviour during a negative shock.

**Inequitable access:** is measure across different groups, based on social economic characteristics like gender, age, religion, income level, etc. Literature (Siddhu, 2011a; Suryadarma, 2006; World Bank, 2008b) show that the probability attending school is affected by (i) child’s gender, where girls have lower probability of continuation than boys.(ii) Child’s household location, where child from rural area have lower probability of continuation than those from urban area. (iii) Family’s religions where Muslim have lower probability than other religion. And (iv) child’s social economic status where children from economically disadvantaged families have lower probability of continuation

**Selection process:** Before entering to the first year of secondary education student passes national examination at the last year of primary. Secondary education enrolment is negatively affected by the selection process, where the pass rate is

determined not only by the note received but also by the available places in secondary one (Suryadarma, 2006; World Bank, 2008).

**Distance:** when the school is too far away from home, children spend much time on road, for those who went to school by foot, they reach the school tired and not able to follow appropriately the class, children lose interest in school and sometimes decide to early leave school. With the identification of distance among the main hindrance to school attendance (Lewin & Little, 2011; Suryadarma, 2006), government addresses this issue by construction of more schools. Duflo and Siddhu (2001; 2011) argue that the school construction affect positively the school attendance.

**Lack of interest:** the irregular attendance of school is a big challenge in South Asia and Sub-Saharan Africa. Students lose interest in school because of poor quality and ineffectiveness of what they learnt (Lewin & Little, 2011). Siddhu (2011) identified early pregnancy for girls as one of the reason of irregular attendance, he also argues that the probability of continuation for over aged students is lower than that of students in the range of official school age.

**Parental education level:** Banerjee et al. (2007) analyze the impact of parents and community on improving children learning achievement in Jaunpur, rural district of India. They realize that parents were aware that their children do not attend school but they do not react. The findings show that some parents were not aware about the existence of village education committee while this committee stands out as the main channel of communication between parents and school. A remarkable difference was observed between what parents think about the performance of their children and real picture. Illiteracy of parents affects negatively the learning achievement of a child.

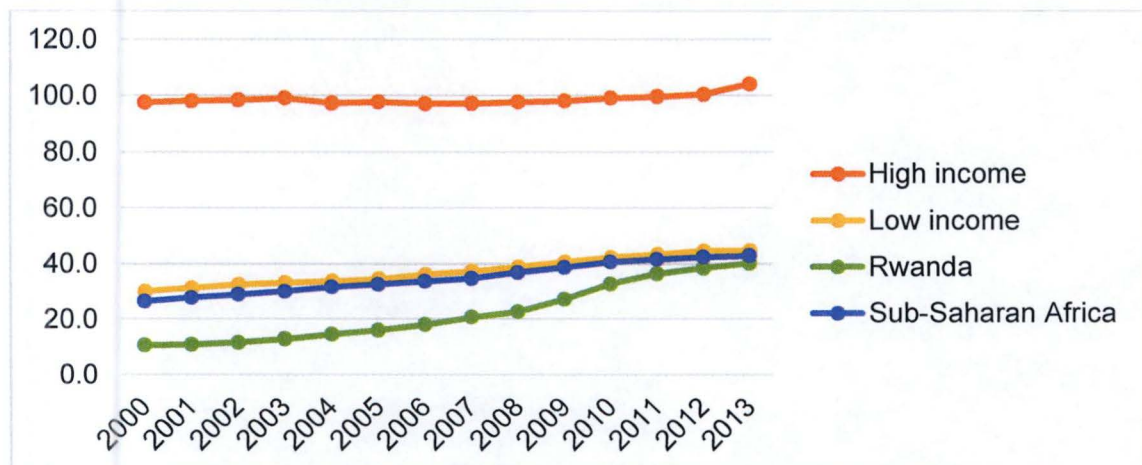
To emphasize on the role of parent on individual's education, Banerjee & Duflo, (2012) argue that to some parents the education of their children is partly an "investment" and also partly "gift". Investment because the child will grow up into a self-sustaining citizen able to respond to their daily needs and at some point taking care of their parents in their old age. They say that "(...) most parents are in a position of power relative to their children- they decide who goes to school, who stays home or goes out to work, and how their earnings are spent..."

**Conflict and war:** The 2011 EFA Global Monitoring Report brought specific attention to the impact of conflict and war on the education of children. Across the world, 28 million children in conflict-affected countries was out of school, and the death rate for those children is twice as likely as children in other low income countries to die before their fifth birthday. They argue that refugees and internally displaced people face major barriers to education (UNESCO, 2011).

### 3. Presentation of the context

This section presents the current context, illustrates the trend over the years of secondary education access using World Bank data - for high/low income countries and Sub-Saharan Africa<sup>3</sup>- and administrative data from Ministry of Education, Education Management Information System (EMIS) in Rwanda.

**Figure 3.1: Secondary gross enrolment rate**



Source: Author's own graph based on World Bank data

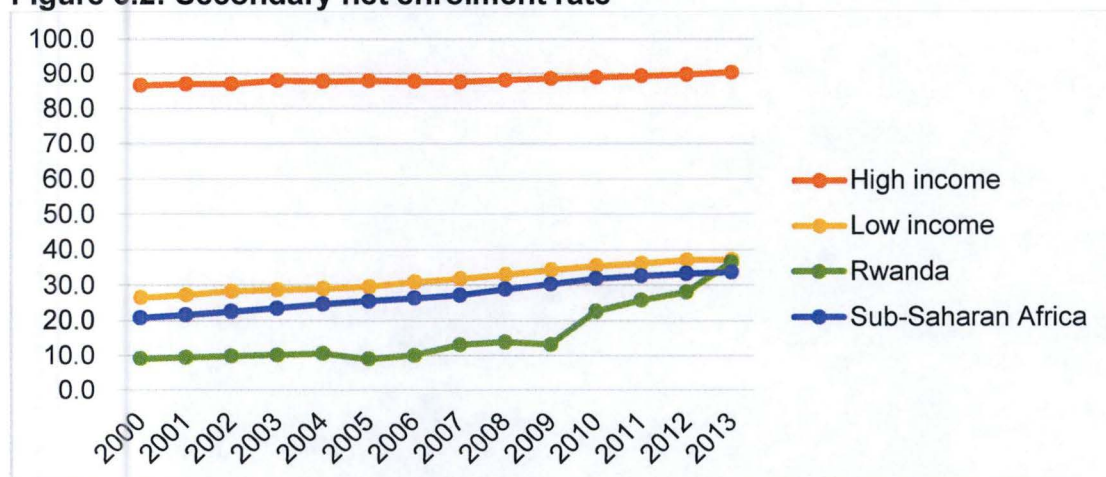
Figure 3.1 shows the increase of secondary Gross Enrolment Rate (GER)<sup>4</sup> between 2000 and 2013, respectively from 97.7 percent to 104.2 percent in high income countries, from 30.2 percent<sup>3</sup> to 44.6 percent in low income countries, from 26.5 percent to 42.8 percent in Sub-Saharan Africa and from 10.7 percent to 40.2 percent in Rwanda.

<sup>3</sup> <http://data.worldbank.org/about/country-and-lending-groups> . Data used in this paper for Sub-Saharan Africa represent the mean for developing Sub-Saharan Africa countries.

<sup>4</sup> **GER:** Total enrolment in a specific level of education, regardless of age, expressed as a percentage of the population in the official age group corresponding to this level of education. The GER can exceed 100% because of early or late entry and/or grade repetition

High income countries have the highest rate while other countries face a low rate under 50 percent. This means that the number of individuals attending secondary school in low income countries, Sub-Saharan Africa and Rwanda is less than the number of total population in the age of being in secondary. GER alone do not provide information on the cohort in the age of being in secondary school. Let us examine the trend of secondary net enrollment rate.

**Figure 3.2: Secondary net enrolment rate**



Source Author's graph based on World Bank and Rwanda EMIS data

Figure 3.2 show the trend between 2000 and 2013, secondary NER increased from 86.7 percent to 89.9 percent in high income countries, from 26.5 percent to 37.1 percent in low income countries, from 20.8 percent to 33.7 percent in Sub Saharan Africa and from 9.1 percent to 36.4 percent in Rwanda.

The trend in this period is constant in high income countries, and a sharp increase is observed in Rwanda from 2009. This motivates our study to estimate the effect of nine year basic education program on secondary access.

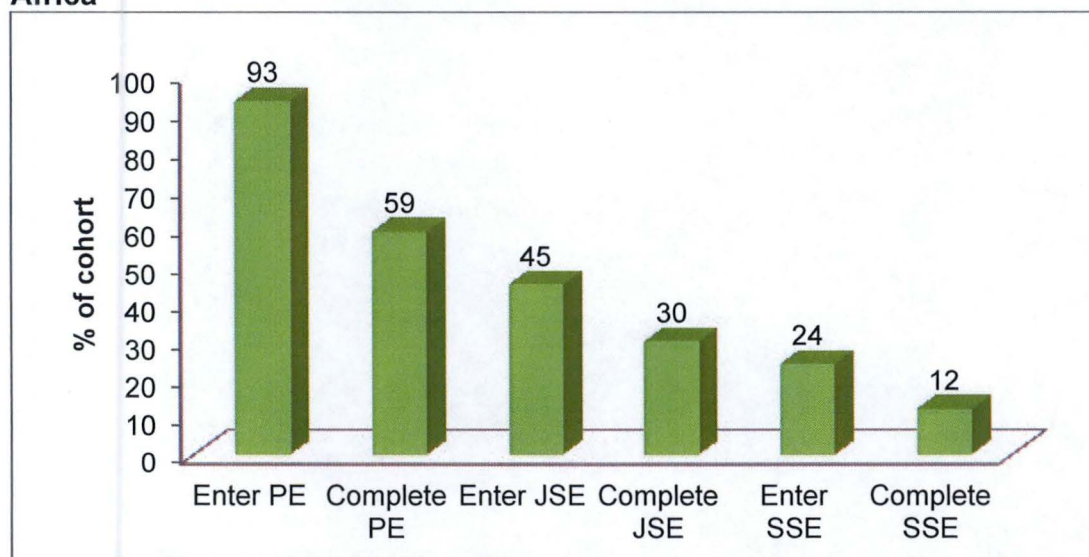
### 3.1. Secondary education in Sub-Saharan Africa

Secondary education in Sub-Saharan Africa has known a significant progress since 2000, but there still a long way to do to universalize it. As aforementioned literatures identify different reasons not to transit to secondary education: distance between school and household, poverty, parent illiteracy, late starting, etc. Banerjee & Duflo (2012) say that "Access to secondary school is not part of the MDGs, but even there progress has been made, ...despite the fact that the cost of secondary school are much higher. Teachers are expensive because they need to be better qualified, and

for parent and children the value of forgone earnings, and the forgone labor market experience, is much larger because teenage children can work and earn money.” This highlights the impact of secondary schooling on youth welfare, especially to eradicate child labor in Sub-Saharan Africa. As the economic level still low, families send their children to work in order to earn money and help economically their family.

Low enrolment rate observed at secondary education is mainly caused by the late enrollment, high repetition and dropout rates in primary education. As illustrated in the figure 3.3 (World Bank, 2008) researcher follows a cohort that began primary education at 93% of net enrollment rate, observe a decreasing percentage across levels and finds that only 12% complete secondary education in Sub Saharan Africa.

**Figure 3.3: Students who complete secondary education in Sub-Saharan Africa<sup>5</sup>**



Source: World Bank, 2008

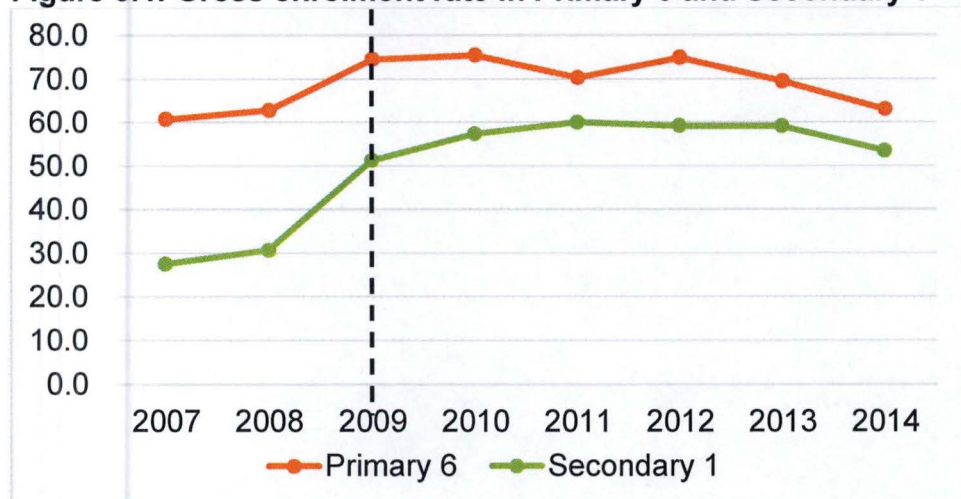
### 3.2. Secondary education in Rwanda

Secondary education in Rwanda takes a period of six years under normal progress that is three years of lower secondary education and three years of upper secondary education. One qualifies to enroll for lower secondary education after passing national primary examination as well as passing national ordinary level examination to be able to enroll in upper secondary education.

<sup>5</sup> PE : Primary Education, JSE : Junior Secondary Education, SSE : Senior Secondary Education

The figure 3.4 shows gross enrolment rate of student enrolled in primary 6 and secondary 1 from 2007 to 2013.

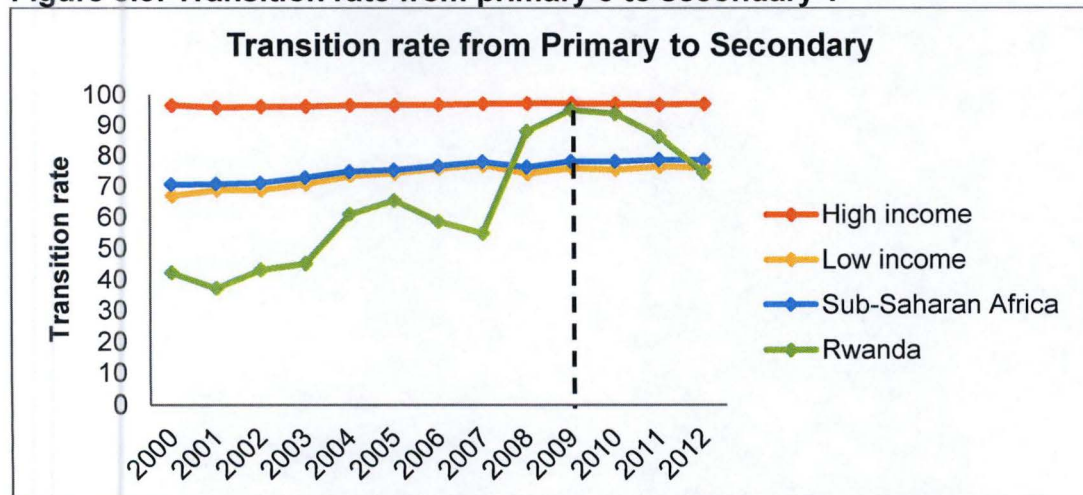
**Figure 3.4: Gross enrolment rate in Primary 6 and Secondary 1**



Source: Author's own graph based on data from Ministry of Education in Rwanda

Figure 3.4 illustrates a notable increase in 2009 with the beginning of nine-year basic education the program. The difference between Primary 6 and Secondary 1, narrow across the time. This show a decrease in number of student who do not transit to secondary education. Figure 3.5 show the trend of transition rate from primary 6 to secondary 1 from 2000 to 2014.

**Figure 3.5: Transition rate from primary 6 to secondary 1**



Source: Author's own graph produced using World Bank and Rwanda EMIS data

As illustrated in figure 3.5 the transition rate<sup>6</sup> from primary 6 to secondary 1 for Rwanda was very low in 2000 about 42%. The main obstacle was the limited capacities to acquire student in secondary one. At that time the passing rate was based on the cutting points, according to the places available in secondary schools.

In 2009, Rwanda registered the highest transition rate to approach the rate of high income countries, this period correspond to the time that Rwanda implement the nine years' basic education program.

### **Nine and twelve-year basic education programs in Rwanda**

Before 2009, most of secondary schools in Rwanda were entirely boarding schools. This wasn't easy for poor families, as the cost for secondary education was relatively high compared to the cost of primary education. Because in addition to tuition fees, parents were also providing other scholastic materials and comfort kits related to boarding situation while a student enrolled in a not boarding school share common consumption with the whole household.

The government of Rwanda in the framework of increasing the secondary education enrolment initiated the program, called "Nine-year basic education: 9YBE", with the objective of facilitating primary school leavers to have more access to lower secondary education from the same vicinity with the same primary school.

Through structured mass mobilization organized from the lower administrative entity "umudugudu" or village up to national level, population has been sensitized to actively participate in the activity of school construction. Community participate in the construction by doing those activities which do not require advanced skills in construction like fetching water, carrying bricks..., and during this period every citizen participates (Rwanda Ministry of Education, 2015b).

The identification of school expansion was done at district level with the support from lower level local authorities. Parents were impressed by this arrangement, seeing their children going to secondary school in the same locality. And this came with advantages of reduced education cost.

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<sup>6</sup> **Transition rate:** The number of pupils (or students) admitted to the first grade of a higher level of education in a given year, expressed as a percentage of the number of pupils (or students) enrolled in the final grade of the lower level of education in the previous year.

It is also important to note that after three years, it became a problem for those that completed ordinary level to enroll in upper secondary education so the government opted for twelve-year basic education where students can be able to complete secondary education from the same primary schools locality (6 years of primary and 6 years of secondary), which helped economically poor families to send their children to these schools.

The activity of construction may take longer, construction projects using the Rwandan community service tradition of "Umuganda". Which helped to construct standardized secondary schools and classrooms at a lower cost and in shorter periods of time with local labour and materials (unconventional methods) supplemented by government purchases of non-local materials such as steel and concrete, and avails professional construction engineer to ensure the quality of school constructed. This resulted in a savings of an estimated USD49 million (Rwanda Ministry of Education, 2015b).

The participation of the community in the activity of school construction was also used as a mechanism of awareness on the importance of secondary education. Parents participating in the school construction are more likely to send their children to this school. They feel that they build the classrooms for their children and they encourage them to go to school.

The construction of classroom was not the only concerns. Other related activities such as providing textbooks, hiring new teachers, purchasing teaching materials were also taken into consideration. The annex 8.4 shows that in 2009/10 the activity started with construction of 3072 classrooms and 9175 latrines, accompanied with purchase of 70656 desks and 3072 chairs and tables. All these activities were organized through decentralized level. Where every district and every sector now have a staff in charge of education and this helps in the communication channel from local level to central level to identify the required materials on time.

Additional to this specific program, since 2000 several programs like Catch up program (2002), health insurance (2005), one cow per family "Girinka (2006), Vision 2020 umurenge program (2007), double shift program in primary (2009) has been implemented and contribute in a way to increase of access of secondary education.

In this study we analyze the effect of nine year basic education under the assumption that those programs<sup>7</sup> do not differently affect the analyzed group.

Statistics shows that net enrollment rate for secondary school increased from 13.9% in 2008 to 35.7% in 2014 (Rwanda Ministry of Education, 2012, 2013, 2014, 2015a). This is a remarkable progress and strategies should be taken to bring to school the missing 64.3% of student in the age of being in secondary school, who are not yet in secondary.

#### **4. Data and Methodology**

##### **4.1. Data**

The data used in this study mainly come from Rwanda Integrated Household Living Condition Survey commonly known as EICV<sup>8</sup> (*Enquête Intégrale sur les Conditions de Vie des ménages*). Those are cross-sectional data and the dataset is available on the website of National Institute of Rwanda<sup>9</sup>. For our study we focus on children in the age of attending secondary school. We match this information with the district level education statistics on schools, classrooms and number of students. Table 4.1 gives summary descriptive statistics of the database, and we work with education sample which consider individuals ages six years and above.

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<sup>7</sup> Details on these programs are given in Annex 8.5.

<sup>8</sup> Currently four surveys of the Integrated Household Living Condition Survey have been administered: EICV1 (Year: 2000/01), EICV2 (Year: 2005/06), EICV3 (Year: 2010/11), EICV4 (Year: 2013/14). But for our study we use the dataset for the first 3 surveys because the dataset for the fourth survey was not yet released during the time of our study

<sup>9</sup> <http://microdata.statistics.gov.rw/index.php/catalog>

**Table 4.1: Descriptive statistics: EICV**

<b>Survey</b>	<b>EICV1</b>	<b>EICV2</b>	<b>EICV3</b>
<b>Year</b>	<b>2000/01</b>	<b>2005/06</b>	<b>2010/11</b>
Number of households	6 420	6 900	14 308
Individuals aged six years and above	25 143	28 018	56 116
of which female (percentage)	54.4	53.1	52.9
Percentage of individuals ever been to school	75.1	79.6	83.2
<b>Percentage of highest level attained</b>			
Never attend	24.9	20.4	16.8
Pre-primary			0.33
Primary	64.6	68.4	68.54
Post primary	2.5	2.3	1.87
Secondary	7.3	7.8	10.69
University	0.7	1.1	1.74
<b>Current education status</b>			
Never in school	24.91	20.38	16.8
Not anymore at school	45.97	45.41	44.22
In pre-primary			0.33
In primary	24.99	29.16	30.42
Post primary	0.22	0.21	0.22
In secondary	3.62	4.2	6.98
In University	0.29	0.63	1.03

*Source: Author's own computation based on EICV education database from NISR*

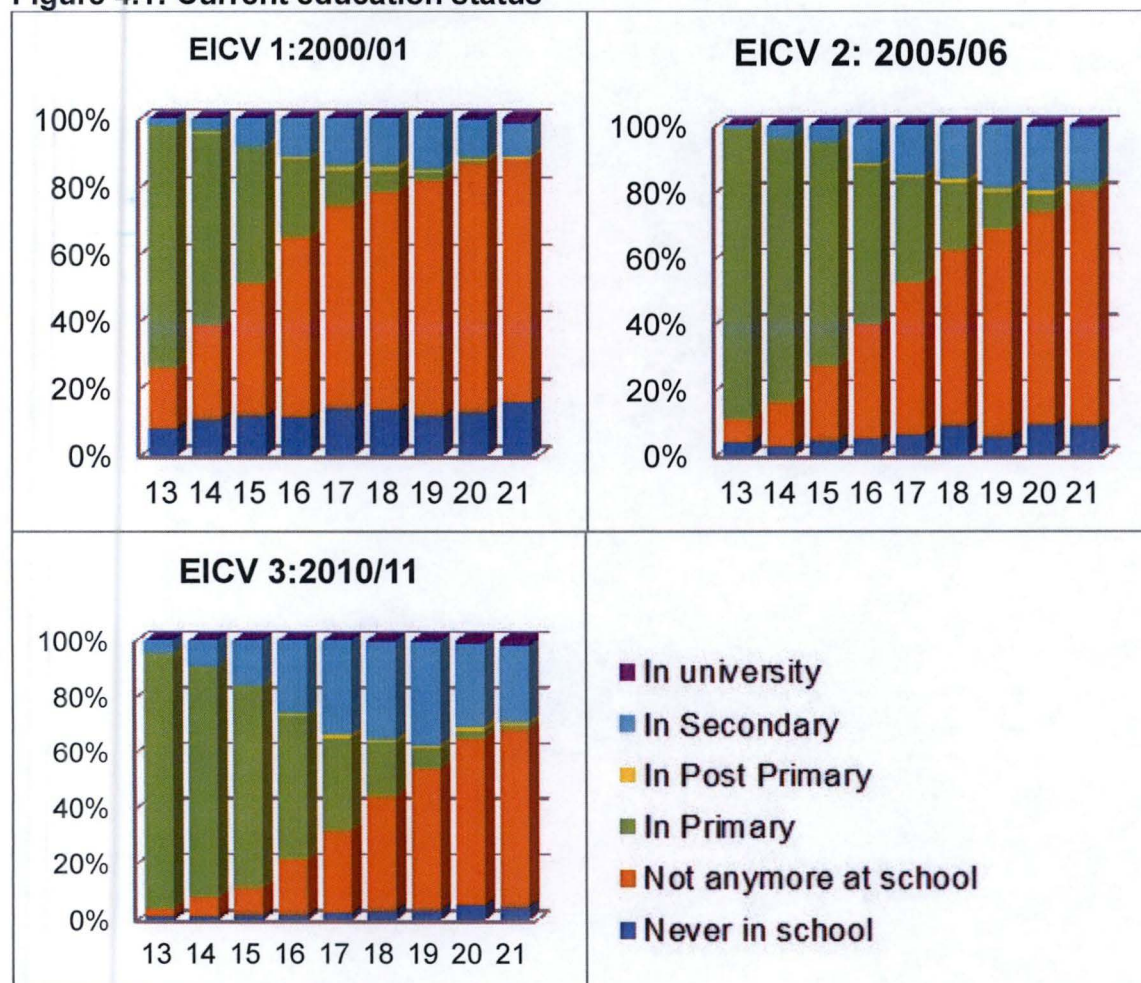
We work with 109277 observations from the three waves. The percentage of female reflects the proportion of female in Rwandan population. The percentage of individuals ever been to school increased from 75.1 percent in 2000/01 to 83.2 percent in 2010/11. This can be attributed to different programs implemented in line with Economic Development and Poverty Reduction Strategy (EDPRS).

Looking at the highest level attended in table 4.1, the EICV sample shows that a big share of individuals achieves primary education (68.54 percent in 2010/11). A noteworthy increase is observed between the two last waves, where the percentage of individuals with secondary as highest level of education increased from 7.8 percent in 2005/06 to 10.69 percent in 2010/11. The percentage of those who never attend school also decreased from 20.4 percent in 2005/06 to 16.8 percent in 2010/11.

When focusing on those who were currently attending the class during the time of the survey, we found that the percentage of those who was attending secondary school increased from 4.2 percent in 2005/06 to 6.98 percent in 2010/11. This increase is

particularly observed with those aged between 17 and 19 years, as illustrated by the following figure which show the current education status among individuals aged between 13 and 21. For instance, the increase of percentage of individual attending secondary school was about 19.08 percent (from 16.32 percent in 2005/06 to 35.40 percent in 2010/11) for those aged 18 years while for those aged 13 was about 3.5 percent (from 0.82 percent in 2005/06 to 4.38 percent in 2010/11).

**Figure 4.1: Current education status**



Source : Author's own graph produced using EICV data

The figure 4.1 illustrates that a big share of those aged between 13 and 15, still in primary school, this is due to a late starting, late completion, repetition and interruption at primary level (Rwanda Ministry of Finance, NISR, 2012).

## 4.2. Methodology

To assess the impact of nine-year basic education program on the increase of access to secondary school, we perform a difference-in-differences approach comparing the mean of individuals in the age group: (1)13-15 years, (2)16-18 years, (3)19-21 years, (4)22-24 years, across waves. This approach is valid if the different groups before the program follow a similar trend (parallel trend assumption).

The choice of the age group was based on the official age in terms of enrolment rate to attend secondary education in Rwanda (between 13 and 18 years). Considering the late starting foreseen in descriptive statistics we also add two more groups (between 19 to 24 years). We end up with the age group 16-18 years as treated group and the age group 13 -15 years as control group. Table 4.2 shows the chronological period of three surveys and the implementation of 9YBE program.

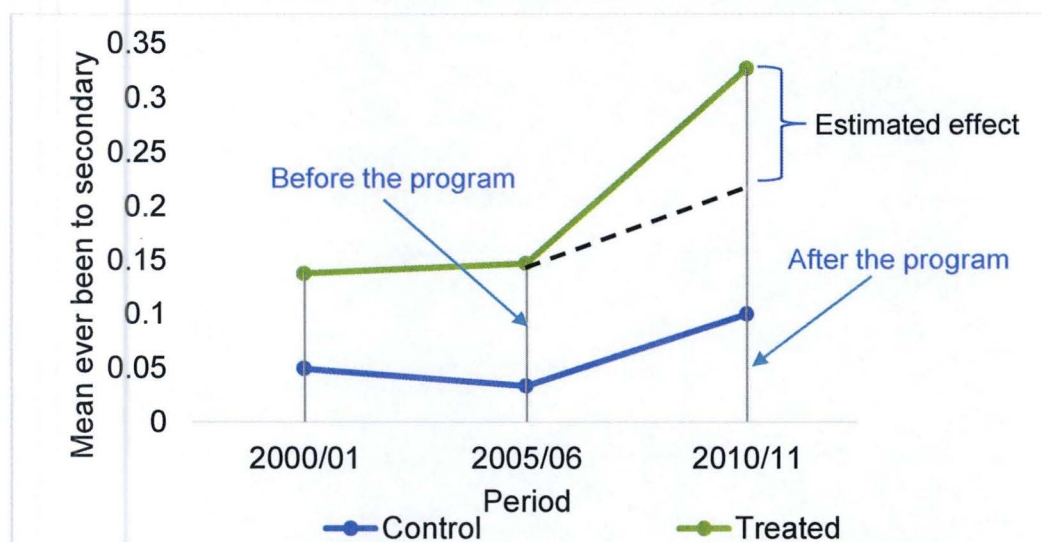
**Table 4.2: Chronological period of EICV and 9YBE program**

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Survey	EICV1						EICV2					EICV3
Program										9YBE		

Source: Authors 'own produced table

We exploit data from the three waves: EICV1 (Year: 2000/01), EICV2 (Year: 2005/06), EICV3 (Year: 2010/11). The first one is used to check the parallel trend assumption with the second. The second one represents the wave “before” the treatment and the third, the wave “after” the treatment. The figure 4.2 shows graphically the effect of the program by comparing the mean of individuals ever been to secondary school across the three waves.

**Figure 4.2: Difference in difference of enrolment rate in ever been to secondary**



Before the program we find a slight decrease in wave 2 enrolment for the control group. The discrepancy is too small (about 0.01) to be considered as violation of the parallel trend assumption. After the program, the enrolment of control group increased but not as deeper as the increase in the enrollment of treated group. For this, we observe that the last group benefited more from the program as they were starting secondary school when the program started, while the control group benefited less as they were still in primary school. Using the Stata software, we proceed to a difference-in-differences in unconditional mean of ever been to secondary, to evaluate the impact of the program on secondary education enrolment.

**Table 4.3: Difference-in-differences in unconditional mean of ever been to secondary**

Outcome var.	Before	After	Difference
Control	0.033	0.100	0.067
Treated	0.147	0.326	0.180
Difference	0.113	0.227	<b>0.113</b>
S. Err.	0.010	0.007	0.012
t	11.79	31.50	9.44
P> t	0.000***	0.000***	0.000***

Sample=15220, Control=7724, Treated=7496

R-square: 0.09

\* Means and Standard Errors are estimated by linear regression

\*\*Inference: \*\*\* p<0.01; \*\* p<0.05; \* p<0.1

Table 4.3 shows unconditional means of ever been to secondary school for control and treated group. At  $\alpha=0.01$ , the difference is statistically significant of 0.113 and 0.227 respectively before and after the program, the overall difference is 0.113. This difference can be interpreted as that the program has increased the enrolment rate by 11 percent, under the assumption that other programs (as mentioned in section 3) implemented countrywide at the same time have not differently affected the control and treatment group.

The following section of this paper will rely on this estimation strategy to elaborate on these descriptive results and contending for various variables to estimate the impact of the program across different age groups on the enrollment of secondary education.

To do this we run a linear regression model, using data from EICV2 (Year: 2005/06); period before the 9YBE program and data from EICV 3 (Year: 2010/11) just one year after program. We focus on one dependent variable “**ever been to secondary schools**” which is a dummy variable, created based on all individual aged 13 and above who either have been in secondary education in the past or was attending secondary education during survey time. Then we include the variable “sex” in the model to see if the program had similar effects (or not) for male and female across different age groups.

## **5. Study results**

This section presents the result of our study, illustrating the effect of the nine-year-basic education program on secondary education enrolment. The first sub-section shows the trend in enrolment rate of the individuals in the age of being in primary and secondary school, underlining the difference between sex, location and province. The second sub-section present the result of linear regression of ever been to secondary education and stress on the effect of the program on male and female.

### **5.1 Trend in secondary education enrolment**

In Rwanda, the requirement to enter to secondary education is to successful complete primary education, meaning that the increase in secondary education is directly linked to the enrolment and completion of primary education. To illustrate the

trend in primary and secondary enrolment, we calculate the proportional of individual in the age of being in primary and secondary respectively aged between 7- 12, and 13-18 who was attending the school during the survey, as illustrated in table 5.1

**Table 5.1: Proportion of individuals currently attending primary and secondary**

Survey	EICV1	EICV2	EICV3	EICV1	EICV2	EICV3
Year	2000/01	2005/06	2010/11	2000/01	2005/06	2010/11
Proportion of individuals	aged 7-12 currently attending Primary			Aged 13-18 currently attending secondary		
<b>Total</b>	<b>76.0</b>	<b>87.0</b>	<b>91.5</b>	<b>8.8</b>	<b>9.0</b>	<b>20.5</b>
<b>By Sex</b>						
Male	75.6	85.9	90.5	7.5	8.8	18.3
Female	76.3	87.9	92.5	9.8	9.1	22.6
<b>By Location</b>						
Rural	74.6	85.6	91.3	5.4	5.7	17.5
Urban	81.5	91.8	93.0	19.1	19.4	37.5
<b>By Province</b>						
Kigali City	83.4	92.3	93.6	23.4	23.3	43.9
South	75.5	85.8	90.9	7.5	5.5	17.8
West	74.5	85.1	91.4	5.8	7.3	18.3
North	76.7	89.2	95.1	3.8	4.9	18.7
East	73.9	85.1	88.9	6.8	7.4	18.5

*Source: Author's own computation based on EICV database*

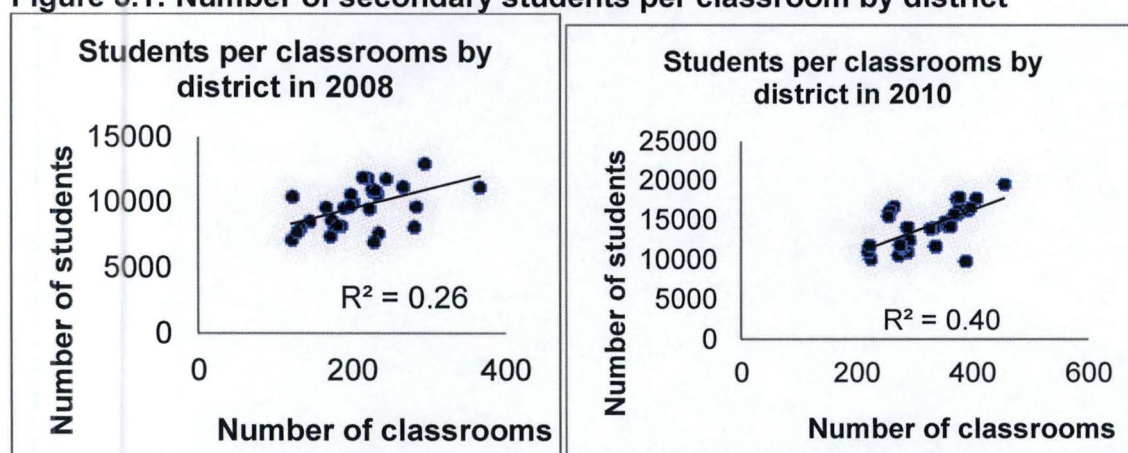
The table 5.1 shows that individuals in the age of being in primary school attend more than those in the age of being in secondary. For instance, in the last wave 91.5 percent of individuals aged between 7 and 12 years were attending primary education while only 20.5 percent of individuals aged between 13 and 18 years were attending secondary education. But, when looking only on secondary education we find a notably increase between the two last waves 9.0 percent in 2005/06-before the program- to 20.5 percent in 2010/11- after the program.

The difference between sex indicates that female are more likely to attend primary and secondary school than male, this is particular case of Rwanda when compare to other Sub-Saharan African countries, where -as mentioned in the literature- female are less attending schools.

Looking at the discrepancy between rural and urban population, we find that urban population are more likely to attend primary and secondary school rural population. For example, in the last waves 37.5 percent of individuals in urban area were attending secondary school compare to 17.5 percent in rural area. This correlate with highest percentage find in Kigali city because this province is almost located in urban area. In general people living in Kigali city are more likely to attend primary and secondary than in any other provinces, except in 2010/11 where Northern Province has the highest percentage in attending for primary.

The result could be more interesting if we could analyze the discrepancy between districts, but for time constraint let us illustrate the ratio of student enrolled in secondary per classroom, before<sup>10</sup> and after the program per district.

**Figure 5.1: Number of secondary students per classroom by district**



Source: Author's own produced graph using data from Ministry of Education

The graph 5.1, illustrate that the dispersion observed among district on student per classroom in 2008, decrease when compare with the ratio in 2010. The R squared increased from 0.26 in 2008 to 0.40 in 2010. Intuitively we can argue that the activity of school construction decreases the dispersion between districts

## 5.2 Effect of the program on secondary education enrolment

To estimate the effect of the program on secondary education enrollment, we run a linear regression on the dependent variable "ever been to secondary education". The model is composed by 27370 observations from the two waves -before and after the

<sup>10</sup> Due to lack of disaggregated data at district level in 2005, we consider 2008 as reference year before the program

program- of which 14110 are male and 13260 are female. The results are presented in table 5.2

**Table 5.2: Difference-in-differences estimation**

Difference in differences estimation: the effect of the program on secondary education enrolment

Ever attend	Female		Male		Overall	
<b>Period: base level "before"</b>						
After	0.075	[0.00] <sup>***</sup>	0.058	[0.00] <sup>***</sup>	0.066	[0.00] <sup>***</sup>
<b>Age group: base level "control"</b>						
Treated A	0.11	[0.00] <sup>***</sup>	0.12	[0.00] <sup>***</sup>	0.11	[0.00] <sup>***</sup>
Treated B	0.16	[0.00] <sup>***</sup>	0.21	[0.00] <sup>***</sup>	0.18	[0.00] <sup>***</sup>
Treated C	0.13	[0.00] <sup>***</sup>	0.16	[0.00] <sup>***</sup>	0.15	[0.00] <sup>***</sup>
After # Treated A	0.14	[0.00] <sup>***</sup>	0.085	[0.00] <sup>***</sup>	0.11	[0.00] <sup>***</sup>
After # Treated B	0.092	[0.00] <sup>***</sup>	0.078	[0.00] <sup>***</sup>	0.085	[0.00] <sup>***</sup>
After # Treated C	-0.0092	[0.59]	0.046	[0.01] <sup>**</sup>	0.017	[0.16]
Constant	0.037	[0.00] <sup>***</sup>	0.029	[0.01] <sup>**</sup>	0.033	[0.00] <sup>***</sup>
<i>R</i> -squared	0.073		0.076		0.072	
Adjusted <i>R</i> -squared	0.073		0.075		0.072	
F	209.3		235.2		437.7	
Model degree of freedom	7		7		7	
Residual degree of freedom	14102		13252		27362	
<b>Observations</b>	<b>14110</b>		<b>13260</b>		<b>27370</b>	
Control	3874		3850		7724	
Treated A	3858		3638		7496	
Treated B	3320		2995		6315	
Treated C	3058		2777		5835	

*p*-values in brackets, linear regression model, robust standard error

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Dependent variable: Ever attend secondary,

After is a dummy equal one for EICV 3, and zero for EICV2 period before the program

Control group: Aged 13-15 years, Treated A: Aged 16-18 years, Treated B: Aged 19-21

years, Treated C: Aged 22-24 years

Source: Author's computation using EICV2 and EICV3 data

The table shows that the difference is strongly ( $p < 0.001$ ) statistically significant of 0.11 and 0.085 respectively for treated A and Treated B, meaning that keeping the assumption that other program has not differently affected the selected group, the program has increased secondary enrolment rate by 11 and 8.5 percent, respectively for individuals aged between 16-18 and 19-21. The effect of the program was 2.5 higher for the treated A than the treated B, hence individuals aged between 16-18

years benefited more from the program than the individuals aged between 19-21 years.

The result of the simple main effects shows that treated B have the highest mean of attending secondary education, 18 percent higher than the control group (base level). In the other words, the probability of being in secondary school is higher for the individuals aged between 19-21 years than those aged between 13-15 years.

Looking on the effect of the program on the male and female, we find that the increase in the enrolment rate for female is larger than the one for male in the same age group. The difference is statistically significant for both group with treated A and treated B, while for treated C is only statistically significant for male. The program has increased the enrolment rate of individuals aged between 16-18 years by 14 percent for female and by 8.5 percent for male.

## **6. Conclusion**

Nine-year basic education program affect positively secondary enrolment rate. Female are more benefiting from Program. Rwanda needs to continue expanding secondary education to maintain the access gained in primary school and improve the welfare of the youth by giving them a promising future based on quality education.

The main hindrance to secondary education in Rwanda is the late starting; low completion rate and high repetition rate which are illustrated with the low percentage of net enrolment rate. Additional to this strategy of school construction, government would elaborate strategy to eradicate the problem of over aged student.

For further studies, we recommend to exploit the effect of the program across social economic characteristics such as: economic status, differences between rural and urban, and also differences across district. The use of the dataset of EICV4 (Year: 2013/14) which will be soon released, could be also interesting to evaluate the impact of the program after 5years.

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## 8. Annexes

### Annex 8.1: Secondary gross enrolment rate from 2000 to 2013

Series	High income	Low income	Rwanda	Sub-Saharan Africa
2000	97.7	30.2	10.7	26.5
2001	98.3	31.3	10.8	27.8
2002	98.5	32.6	11.6	28.9
2003	99.2	33.3	12.9	30.1
2004	97.5	33.8	14.5	31.7
2005	97.9	34.6	16.0	32.6
2006	97.2	36.2	18.1	33.7
2007	97.3	37.3	20.7	34.7
2008	97.9	38.9	22.7	36.8
2009	98.2	40.7	27.2	38.7
2010	99.2	42.2	32.8	40.6
2011	99.7	43.3	36.3	41.5
2012	100.5	44.6	38.4	42.3
2013	104.2	44.6	40.2	42.8

Source: World Bank data

### Annex 8.2: Secondary net enrolment rate from 2000 to 2013

Series	High income	Low income	Rwanda	Sub-Saharan Africa
2000	86.7	26.5	9.1	20.8
2001	87.0	27.3	9.5	21.6
2002	87.0	28.3	9.9	22.5
2003	88.1	28.7	10.2	23.4
2004	87.8	29.0	10.6	24.7
2005	88.0	29.6	9.0	25.5
2006	87.8	30.9	10.1	26.3
2007	87.7	31.8	13.1	27.1
2008	88.2	33.0	13.9	28.9
2009	88.6	34.3	13.2	30.3
2010	88.9	35.5	22.6	31.9
2011	89.3	36.2	25.7	32.6
2012	89.8	37.1	28.0	33.2
2013	90.4	37.1	36.4	33.7

Source: World Bank data and Ministry of Education in Rwanda

**Annex 8.3: Transition rate from Primary to secondary from 2000 to 2013**

Series	High income	Low income	Rwanda	Sub-Saharan Africa
2000	96.6	66.9	42.0	70.5
2001	95.8	68.7	37.0	70.7
2002	96.1	68.7	43.0	71.0
2003	96.2	70.8	45.0	72.8
2004	96.6	73.5	60.8	74.8
2005	96.7	74.3	65.3	75.3
2006	96.8	75.9	58.5	76.6
2007	97.1	77.0	54.7	78.0
2008	97.3	74.2	87.9	76.2
2009	97.3	76.0	95.0	78.2
2010	97.1	75.6	93.8	78.1
2011	96.9	76.5	86.2	78.7
2012	97.1	76.2	74.4	78.6

Source: World Bank data and Ministry of Education in Rwanda

**Annex 8.4: Rooms constructed and purchased materials under 9YBE program**

	PHASE I	PHASE II	PHASE III	PHASE IV	PHASE V
PERIOD	2009/10	2010/11	2011/12	2012/13	2013/14
Classrooms	3072	2936	2679	1725	2000
Latrines	9175	5714	5424	2919	3000
Desks	70656	67528	61617	39675	46000
Chairs	3072	2936	2679	1725	2000
Tables	3072	2936	2679	1725	2000

Source: Rwanda Education Board

**Annex 8.5: Selected programs implemented between 2000 and 2009.**

<b>Sector</b>	<b>Intervention/ Program</b>	<b>Starting Year</b>	<b>Brief description</b>	<b>Effect on secondary education</b>
Education	Catch up program	2002	People who had little or no education; have given a chance to go back to school, they participate in an accelerated program of P1-6 in three years with qualified teachers.	This program filled a gap over the first decade for young people who had missed out on schooling during the mid-1990s.
Health	Health insurance <sup>11</sup>	2005	In Rwanda the health insurance started with civil servant health insurance, "Ia Rwandaise d'assurance maladie, RAMA in 2001; but in 2005 community-based health insurance schemes (mutuelles de santé) was implemented national wide.	This contributed to the increase in secondary school, through the decrease of absenteeism because of sickness; when sick parents and children take treatment on time.
Social protection	one cow per family "Girinka"	2006	The objective of the Girinka Programme is to enable every poor household to own and manage an improved dairy cow to support the family to improve their livelihood (milk and meat) and soil fertility	The improve of living condition of the poor family result to sending their child to school
Social protection	Vision 2020 umurenge program	Initiated in February 2007	The Program was initially piloted in 30 poorest sectors in each of Rwanda's 30 districts; and it will be scaling up nationwide. The program was also underpinned by training and sensitization with the aims of improving living condition of poor family.	The program has 3 Components: remunerated public works:2008, direct support 2009 and financial support: 2010; this also contribute in any way to the increases in access to education.
Education	Double shift program in primary	2009	"Double shift" means that pupils learn in two groups: using one and only one classroom, the first group learns in the morning and the second group in the afternoon.	This intervention reduces class size and increase access to primary schools, and also increase the number of primary graduate eligible for secondary education.

<sup>11</sup> In Rwanda, according to the law from 2008, all Rwandans must be covered by health insurance