



UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Master Degree Project in Economics

Universal Primary Education Program and Educational Outcomes in Rwanda

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Master Degree Project No. 2016:163
Graduate School



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In fulfillment of MSc in Economics, 2016

19th September, 2016

Abstract

To evaluate the impact of the "Universal Primary Education" (UPE) policy on primary schooling outcomes in Rwanda, which was adopted in 2003 and consists of free school fees to enroll in primary education, I merge two cross-sectional surveys, being EICV 2000/01 and EICV 2005/06 collected before and after the onset of the UPE respectively. The identification strategy uses linear probability model for completion and attendance in primary education with age and region fixed effect and also with a combination of the use of interaction terms regression. Also given that advanced age at school entry which has been historically associated with early primary school dropout, I check whether the enactment of the UPE leads to delayed enrollment in primary school in Rwanda. I find that UPE has increased overall attendance and especially for the poor children. In contrast, the completion in primary school decreases in the post-UPE but I find no evidence of the UPE effect on poor children to complete primary education. I also find that UPE program has increased late enrolment in primary education and which might be the reason behind the negative effect of the UPE on completion in primary school. In conclusion, I argue that UPE is prone to be a good policy but needs some complementary policies such as free lunch program, subsidizing uniforms to retain children in primary school until they finish. The results are robust to the use of binary logistic regression estimates.

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Keywords: Universal Primary Education Program; Primary school attendance; Primary school completion; Delayed enrollment; Rwanda

JEL Classification: I22, I28, I38

Acknowledgements:

First of all, thanks be to God for achieving my goal. Second, I honestly owe Nadine Ketel a great debt of the gratitude for her enthusiastic and insightful guidance throughout the project.

Furthermore, I would like also to extend my appreciations to my family, mother, brothers, and sisters for always being beside me from the very start to the end of my pursuit. Also, great thanks to the Swedish Institute (SI) for granting me a scholarship to undertake this master of economics. I am also grateful to Dr. Nkurunziza Emmanuel who provided me with datasets that I have used for this master thesis. I finally thank my lecturers, employees in the economics department at Graduate School, Vianney, Martin, Josephine as well as my classmates for your encouragement and good discussions throughout my master's program. Your great support will always come in my mind. May God bless you all.

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List of acronyms

UPE: Universal Primary Education

MINEDUC: Ministry Education in Rwanda

MINECOFIN: Ministry of Economic Planning and Finance

IMF: International Monetary Fund

EICV: Enquête Intégrale sur les Conditions de Vie des Ménages or IHLCS: Integrated Household Living Conditions Survey

MDGs: Millennium Development Goals

UNESCO: United Nations Educational, Scientific and Cultural Organization

UNECA: United Nations Economic Commission for Africa

ADB or AFDB: African Development Bank

GDP: Gros Domestic Product

SFC: Security and Future Commission

PRA: Participatory Rural Appraisal

FARG: Fond d'assistance de rescapés du Génocide

TTCs: Teacher Training Colleges

OECD: Organization for Economic Cooperation and Development

OED: Operations Evaluation Department

WFP: United Nations World Food Program

” And if you think education is expensive, wait until you see how much ignorance costs in the 21st century.” President Barack Obama, 2013

I. INTRODUCTION

The development of human capital in Sub-Saharan African countries is still an important issue in development economics. Usually, the development of human capital starts with education. Many least developed countries are still struggling to build up their human capital through making education more accessible for all people. Particularly, the Rwandan human capital stock deteriorated massively after the Genocide against Tutsi and war in 1994. Due to the genocide, more than 800000 mostly young and educated people died and many others were left injured (inactive). Besides, due to the exposure to the Rwandan Genocide in 1994, there is a decline of 18.3 percent among children to complete primary education. This indicates how the Rwandan human capital was spoiled by that tragedy (see Richard et al. 2008, Agüero et al. 2012).

Furthermore, owing to this issue of education in developing countries, Rwanda included, the prime target of the United Nations’ Millennium Development Goals (MDGs) in 2000 is to reduce the number of uneducated people among African youth. This converges to 2015 as the target year for all children in the world to complete primary school, and for boys and girls to have equal access to education at all levels (MINEDUC, 2003). In the past ten years, several Sub-Saharan African countries, including Rwanda, have instituted measures aimed at this goal by eliminating primary school fees in government-aided (public) schools and this is referred to as Universal Primary Education (UPE) program. The goal of my study is to evaluate the impacts that the universal primary education policy might have had on schooling outcomes in Rwanda.

This is very important for the case of Rwanda because, in Rwanda as in other low-income countries, the school fees are commonly considered as a potent deterrent to attending and complete primary school. Understanding the outcomes of the universal primary education in Rwanda is of paramount importance for policy makers to design and supply adequate policies to strengthen the education system not only in Rwanda but also in other developing countries. Moreover, the UPE program got a lot of attention from various scholars in the economics of

education. (see Deininger, 2003, Nkurunziza et al.2012, Grogan, 2009 and Theunynck, 2009). Reviewing to what extent UPE has also benefited poor children will thus be informative for policy makers and academicians alike.

In recent years, the efficacy of the universal primary education policy, in particular, has received increasing attention, especially in the context that it leads to attendance, completion and late enrollment in primary education. Furthermore, evidence from Uganda shows that the adoption of the universal primary education policy induces delayed enrollment in primary school (see, for instance, Grogan, 2009, Nishimura et al. 2008, Deininger, 2001). This leads one to ask the same question for the case of Rwanda. To the best of my knowledge, no research so far has been done to investigate whether UPE leads to late enrollment in Rwanda, which turns out to be a problem since delayed enrollment leads to high dropout rate according to different studies (see for instance Admassie, 2003, Nishimura, 2008).

Nkurunziza et al. (2012), tries to touch upon the question with regard to only attendance among cohorts of 8 to 14 years old, and finds that the Universal primary education policy in Rwanda improves attendance in primary school among children of age 8 to 14 but poor children are still being discriminated despite the policy. Though their study is restricted to the attendance of the cohorts 8-14 in primary education in Rwanda, the question regarding the relationship between the introduction of the UPE and late enrollment in Rwanda remains unanswered.

Therefore, by using the same datasets with Nkurunziza et al. (2012), but considering different cohorts, I examine the UPE's effect on attendance in primary education among children aged from 7 to 20. This allows me to get more information about the UPE's effects on educational outcomes in Rwanda since by extending the cohorts from 8-14 to 7-20 years old, enables to extract useful information among the cohorts (15-20 years) which are excluded from the study by Nkurunziza et al. (2012). The contribution of my study is thus to find out if there has been delayed enrollment due to the UPE adopted in 2003 , and besides this will allow to know whether poor children benefited or not, since the evidence in Uganda shows that the majority of poor children didn't attend before the introduction of the UPE due to limited financial means but enrolled when school fees were abolished (see for instance Deininger, 2003, Nishimura et al.2005 & 2008).This suggests that in Rwanda also the majority of poor children are

concentrated among cohorts of 14-20 years old since I believe that due to poverty, they couldn't afford to pay school fees and enroll before the introduction of the UPE and enroll late in the post-UPE. Additionally, my study aims at extending the analysis to completion in primary education such that I investigate the UPE impacts on overall completion in primary school as well as for the case of poor children in particular.

In this analysis, the linear probability model for completion and attendance with age and region fixed effects and with a combination of the use of interaction terms regression, was carried out and based on the results, there is late enrollment among 16 to 18 and 20 years old cohorts followed by the onset of the UPE and the effect is significant as far as attendance in primary education is concerned. There is an increase in the probabilities to attend primary education among children who have been exposed to the UPE in 2003 and the effect is large among children from poor families. Besides, there is a decline in the probabilities to complete primary education due to the enactment of the UPE and also I find no evidence of the effect of the UPE on poor children to complete primary education in Rwanda.

The rest of the paper is structured as follows: section II provides a background of the education sector in Rwanda while section III reviews existing empirical evidence. Section IV outlines key research questions with data and methodology, followed by in section V empirical results and discussion, and finally, section VI draws conclusion and policy implications.

II. EDUCATION SECTOR IN RWANDA: Comparative Review

This section involves three parts with firstly the background of the Rwandan education sector in general and a comparative review of the two different education policies reviewed separately (the 1998 policy and UPE in 2003) that took place after the 1994 Rwandan Tutsi genocide to improve the Rwanda education system and thus rebuild the human capital stock which was reported to be undermined (MINEDUC, 1998-2000, MINEDUC, 2003).

II.1. Rwandan education policy background

Rwanda is a landlocked country, located in central Africa with currently a total population of 11 Million and high population density of 460 inhabitants/sq.Km. Females count a large share of the total population compared to males with 52.1% and 47.9% respectively (World Bank, 2014).

The structure of the Rwandan education system consists of a 6-years primary cycle, a 3-year common basic program (TC-lower secondary) cycle, a 3-year upper secondary cycle, and a 4-year higher education cycle in various fields. Rwanda has gone through a period of growing instability, particularly from 1990 to 1994, which culminated in the war and 1994 Tutsi genocide. Therefore, the Rwandan education sector was affected and went through an emergency situation due to the massive killings of educated people (loss of human capital: see for instance Agüero et al. 2012, 2014, 2015) and a considerable destruction of infrastructure.

By recognizing this crisis, in 1998 a new education policy (see details in the following section 2.2) was adopted and implemented with a new orientation as to achieve significant changes towards a more stable and better education system. Progress was made in terms of increasing access to primary education since then. The gross enrollment rates in primary school (which according to UNESCO, is the number of children enrolled in a level of primary education regardless of age, divided by the population of the age group that officially corresponds to the same level) gradually grew over time reaching 103.27 and 110.58 percent in 1999 and 2000 respectively (MINEDUC, 1998-2000).

In the period of the 1998 policy, Rwanda was engaged in the international development targets. As regards to education, through the 2000 United Nations Millennium declaration, the international community has agreed upon working to ensure that by 2015 children (boys and girls) everywhere will equally be able to fully complete primary schooling. This agreement provided the government of Rwanda with a strong momentum to further strengthen its education system by stepping on further policies (Education for All and UPE) as the purpose of developing other levels of education which remained at a low point. To attain these international development targets, Universal primary education as stipulated in vision 2020 was more importantly envisaged (MINECOFIN, 2000)

According to vision 2020 (which is a Government development program to achieve 2000 United Nations Millennium declaration, launched in 2000 by the Rwandan president Paul Kagame), the Rwandan economy is being transformed to a knowledge-based economy. Human resource development and knowledge based economy is one of the six pillars of vision 2020. The main

objective of the government in vision 2020 as regards to education, is to provide Universal Primary Education (UPE) by 2010 (MINECOFIN, 2000).

The goal of the UPE is to ensure that by the year 2015 children everywhere, boys and girls alike, complete a full course of primary schooling in the sense that is connected with providing educational opportunities for girls who left behind since a long time ago in developing countries and also ensuring a good policy in place which spurs rapid education advances (ADB, 2011, UNECA, 2012).

II.2. The 1998 education policy review: Recovery and development

The 1998 policy is considered in this study as the pre-UPE policy which was launched in 1998 and covers a period of three years from 1998 to 2000 by taking into account and compensating for the consequences that the war and genocide in 1994 have had on the Rwanda education sector. As far as primary education is concerned, the objective of the policy is to achieve a net enrolment rate¹ of 80 percent by the year 2000 in order to ensure a compulsory primary education in place by the year 2005 (MINEDUC, 1999-2000).

The annual cost per head of one child in primary school during the year 1998 estimated to be 14.37 US Dollar (RWF 11,010) per child (see table 1) is high compared to the GDP per capita estimated to be 277.47US Dollar in the same year period. However, the amount of school fees itself per child is obviously not very high reaching approximately 2.72 % of the total cost of having a child in primary school. Considering the fact that according to the World Development Indicators (2016) the Poverty headcount ratio² at the national poverty lines (expressed as % of the population) in Rwanda, was estimated to be 56.7 percent until 2005 and in addition to that, until 2000 the fertility levels in Rwanda have been more than six children per women (see Bongaarts,2011), indicating that the majority of the Rwandan total population can't afford enrolling and retaining their children in primary school since the burden per family to afford paying cost of school fees for six children in primary schools is relatively high. Thus, this

¹ Net enrollment rate in primary school is the number of children enrolled in primary school who belong to the age group that officially corresponds to primary schooling, divided by the total population of the same age group, expressed as percentage (UNESCO, 2003-2006).

² National poverty headcount ratio is measured as the percentage of the population living under the national poverty lines. The national estimates are based on population-weighted subgroup estimates from household surveys (World Bank).

suggests that the fees cost might be the main deterrent for the poor children to enroll and complete the six years primary education.

Table 1: estimated cost in primary education per person, 1998

Items	Quantity per year	cost per Item	Total cost in RWF
Textbooks	8	545	4,360
Exercise books	20	140	2,800
Pen	15	50	750
Pencils	3	50	150
Rubber	1	50	50
Fees	3	300	900
Uniforms	1	2000	2,000
Total			11,010

Source: SFC, 1998, reporting PRA poverty update 1998 by Obura: UNESCO (2003), p.144

Furthermore, during this period, due to the fact that the war and genocide in 1994 left a large number of school-age children orphaned, disabled and destitute, a special education fund (Fond d'assistance de rescapes du Genocide (FARG): Fund for assisting the 1994 Genocide survivors in Rwanda) was set up for orphaned and destitute children to provide them with books, money transfers and sometimes school uniforms. Through the 1998 policy, schools and infrastructures (4,062 classrooms to be rehabilitated and 5,400 new classrooms to be built and equipped.) were provided and material and learning methods were developed and applied to cater for disabled children. Competent teachers were recruited and trained as well which left a proportion of qualified teacher at 81 percent in 2002 (Obuna, 2003).

According to the Rwandan education sector policy there were promising but unsatisfactory results in increasing enrollment such that the net enrollment has been steadily increasing at the point of 78.3% (2002-2003) for both girls and boys but still far from the 1998 policy's target to reach 80 percent in 2000 despite the high gross enrollment rates due to high number of Rwandan refugees who returned after the genocide, whose majority were beyond the normal age to start

primary education in Rwanda and didn't have the opportunity to study in the refugee camps, though took the chance to enroll in primary school. The rate of dropout and repetition in (2002-2003) are still high at 16.6% and 17.2% respectively. (MINEDUC, 2003, 1998)

However, outcomes attained in terms of growth in primary enrolment, various challenges were observed to be the main causes of poor achievements of the 1998 policy in primary education such as overcrowding in classrooms, inappropriate infrastructures, insufficient teaching material and unqualified teachers (MINEDUC, 1999-2000).

II.3. UPE in Rwanda: Analytical review

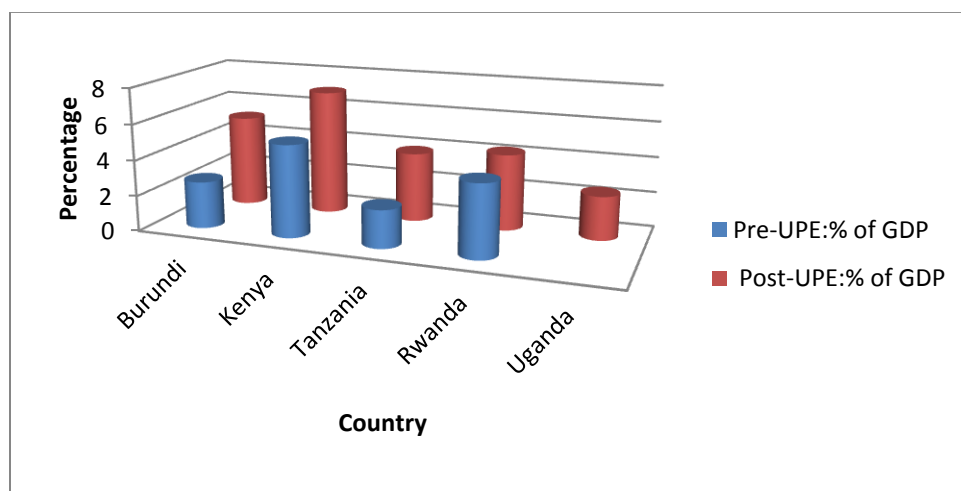
The Universal Primary Education (UPE) program in Rwanda, took place in 2003 and consists of a six years' free school fees and became a compulsory education in public primary schools for all children to enroll and complete primary education in Rwanda, which wasn't the case in the pre-UPE period (see previous section). The prime objective is to ensure that all children complete at least primary education by the year 2010.

Before UPE program, parents used to pay school fees of 900 RWF per year equivalently to 1.2 USD in public primary schools for every child to enroll. This amount is high compared to GDP per capita in the same year equivalently to \$277.47 especially for poor families with more than six children attending primary school. The tuition fees were abolished when the UPE was introduced in 2003 and replaced by a capitalization grant from the government to public schools of the same amount per pupil (see IMF, 2005, p.88). Evidence that children still have difficulties despite the tuition fees abolition is that the cost to achieve Universal primary education by 2010 was estimated to be RWF 218 billion (: 284, 675, 300 US Dollar) for the period 2000-2005. The central government contributes 63percent and the rest 37 percent is handled by parents, communities, donor agencies and eventually local governments (IMF, 2005). Obviously, the schooling related costs which remained unchanged after UPE and which still parents have to pay for, such as uniforms, education materials except for school fees and textbooks, remained an obstacle for children to enroll and complete their last grades in primary education.

Within the region, various countries also adopted the Universal Primary Education policy as to achieve the UN millennium development goals. Uganda in 1997, Tanzania in 2000, Kenya as well as Burundi in 2003. Rwanda spent on education 4.1 percent of the GDP in the pre-UPE

(2000) while in the post-UPE (2007), the education expenditure grew to 4.3 percent (World Development Indicators 2013). This indicates that barriers to primary attendance and completion are being addressed by increasing the investment in the education such as the construction of classrooms (See Serge, 2009). Nevertheless, there is still a long way to go in terms increasing access to primary education since obviously the increase in the education expenditure as a percentage of the GDP from pre- to post-UPE in Rwanda is still smaller than in other neighboring countries which have implemented UPE (See figure1).

Figure 1: Expenditure on education in % of the GDP



Source: World Bank (2013).” World Development Indicators 2013”

Generally, in countries from East African region which have adopted UPE, the education expenditure as a percentage of the GDP in the post-UPE has been higher compared to the pre-UPE case except for Uganda whose pre-UPE data are missing (see figure 1).

The policy’s target is to increase both enrollment and completion in primary schools for males and females. The teacher/student ratio was still very high at 59.9 in 2003 because the country was still recovering from the war and Genocide in 1994 (MINEDUC, 2003). To mitigate this problem, the practice of double shifting was introduced where teachers teach one-half of the class in the morning and the other half in the afternoon. And this effectively reduced the time on task for pupils while increasing the workload for teachers which at the end ruined the education quality that children receive and thus discouraged children from attending and completing primary school. Eleven Teacher Training Colleges (TTCs) created to augment the number of

teachers, helped to increase both the amount of teachers and improvement in the quality of teaching staff. Through TTCs, the proportion of qualified teachers has increased from 49 percent in 1998/1999 to 85 percent in 2003, although there are still wide disparities among regions (IMF, 2005, MINEDUC, 2003). The improvement in the proportion of qualified primary school teacher was again confirmed by AFDB/OECD (2006) in their report where there was an increase from 81percent in 2002 to 87 percent in 2004. This provides evidence that education quality might have been improved in the post-UPE than in the pre-UPE case. However, this ratio is still higher than what is required to ensure quality teaching.

III. EXISTING EMPIRICAL EVIDENCES: Critical review

This chapter gives two sections, first a theoretical framework (which is an economic theory including a simple discussion about the model of the decision to go to school) as well as evidence of the UPE in other countries.

III.1. Theoretical framework

In economics, education is viewed as an investment where people incur both indirect and direct costs (such as school fees, books, uniforms, pens, pencils; the value of the student's time, measured as earnings forgone) in return for a higher future wage. The theoretical framework model of human capital by Becker (1964) which is the basic foundation of investment in education, provided a tremendous empirical work which supported the human capital framework by Freeman (1986). By recognizing that high level of knowledge and skills determines the future success, individuals and nations are spending collectively on education and thus investment on education competes with limited private and public resources. But there are some challenges of expanding education opportunities while retaining their quality and their equitable distribution which is a matter of finance of education. Essentially, education is considered as an investment since it entails a direct cost in the present while expecting returns in the future due to the increase in capacity and production.

The model by Richard et al (2001) regarding the cost and benefit of education, also argues similarly that investment in education made by individuals or by society is viewed as the use of resource (money) for the purpose of increasing production as well as income in the future. They further claim that considering "the opportunity cost" being the value of the alternative uses of the

same resources, investment is made only when the value of the costs anticipated is less than the value of the expected benefits resulting from that investment. In the same context, education is considered as an investment since it causes costs in the present thereby increasing production capacity and income of the educated individual but also of the society as whole in the future. From an economic perspective, it is important to have a framework that allows estimation of all costs and all benefits of any educational investment. Therefore, this is very important during the decision-making process to undertake any education program such that families need to consider the private costs and benefits while choosing how to allocate their scarce resources. This is not only restricted to the private decision-makers but also concerns the society entirely. Thus, from the public policy perspective, governments also need to look into the social costs and benefits of education vis-a-vis the various alternative uses of the same scarce public funds.

In the private decision particularly made by the individual or the individual's families to whether or not to pursue a specific education program more importantly the cost that the individual (or his or her family) bears and benefits that the individual (or family) gets are considered. The same holds for the social decision of whether a particular educational investment makes sense for the society, all the costs and all benefits that accrue to individuals in the society are also considered.

Rwanda is an under-developed country and a large amount of its population (56.7%) is under the poverty line (See World Development Indicators 2016). This means that many parents have limited resources that can be invested in the education of their children and hence face difficulty to enrol their kids in primary school. Admassie (2003) claims that poor parents are sensitive to a decline in schooling costs. This leads to parents facing a tradeoff between direct and indirect costs of schooling and first, the future returns from the education as well as the indirect cost of education forgone (the income that the family can receive from the child labor market if a child is not sent to primary school). It means that when there is a reduction in the direct cost of schooling in primary education holding child labor market conditions constant, the opportunity cost of schooling gets higher thereby increasing the demand for schooling in terms of attending primary school.

Obviously, the elimination of the school fees in primary schools removes that tradeoff faced by parents and permits sending kids to primary schools in Rwanda. Following the objective of the Rwandan government to have knowledge based economy by 2020 as stipulated in Vision 2020

economic plan (see MINECOFIN, 2000), education in Rwanda is becoming a crucial investment that parents can rely on while growing up their children. I thus expect parents to send their children to school given the benefit that UPE offers as well as the future returns that they can anticipate from their's children education.

Basically, this indicates that people base their decisions on direct cost and indirect cost to attend and complete school. Obviously, the UPE policy might have reduced direct costs that parents have to incur in order to enroll their children. It is important to mention that the UPE program is not only the only key for children to enroll and complete their primary education, in addition there are some other different factors that are either negatively or positively affecting attendance and completion in primary school. Therefore, based on the previous empirical studies, in this section I critically discuss evidence on the UPE in connection with attendance and completion in primary education from other countries which might also be the case in Rwanda.

III.2. Evidence on the UPE in other countries

Recently the abolition of primary school fees is taking place in various countries in Africa. Malawi eliminated fees in 1994, Uganda in 1997, Tanzania in 2000, and Cameroon, Burundi, Ghana, Rwanda, and Kenya in 2003. And in all of these countries under the policy of universal primary education, the elimination of the direct costs of schooling leads to an instantaneous large increase in school enrolment. This is an important step for low developed countries to achieve sustainable economic development. In Uganda, the UPE policy was implemented in 1997. Grogan (2009) has found that a 3.4 percent increase in the probability of child to enter primary school before her or his ninth birthday in Uganda was associated with the enactment of UPE program in 1997. The effects of the school fees abolition are very large for girls in rural areas. The results make sense because poorer families are found in rural areas and they can't afford to pay the school fees for their children, the elimination of school fees allows many children from poor families to easily access on at least primary education. It is worth to mention that this increase in the probability to enroll primary school was only observed in public schools while there were no effects of the UPE in the private schools where school fees were still payable.

Furthermore, Deininger (2003) found barely different results for the case of Uganda. In his paper about the impact of Universal Primary Education on enrollment in primary, the results show that the abolition of school fees in primary education induced a tremendous increase of attendance in

schools and inequalities with respect to gender, income and region were dramatically declined. In 1995 just prior to the UPE in Uganda, the primary school tuition fees were formally about 2,000 shilling (Equivalent to 0.60 US Dollar) per pupil and was being charged by the end of the century while Rwanda charged 0.39 US dollar per term (World bank,2009). This clearly demonstrates the importance of fees abolition in determining whether parents will be able to enroll and retain their children till they finish primary school. Obviously, parents in Uganda might be more sensitive to the elimination of fees than parents in Rwanda due to this large difference in school fees and this suggests that the effects of UPE in Uganda might be larger than in Rwanda.

While few studies have examined the effects of the UPE policy beyond school enrolments, the research by Nishimura et al. (2008) found that UPE in Uganda has reduced late enrolment³ at 22.2 and 25.1 percent for both girls and boys respectively. Grade completion rates became higher (12 percent increase) up to grade 5 and its impacts are huge for girls in the poor household. This indicates that the problem of poor access to education in developing countries is worse for females in rural areas and the UPE policy proves to effectively mitigate this issue. Diminishing delayed enrollment in primary schools is advantageous for the Ugandan case since by doing so, dropouts rates in primary education declines.

Furthermore, Banya (1997) finds for the case of Sierra Leone, that the success of education programs such as free education program rely on investments or subsidies from the government or international donors. Within this context, the outcomes are remarkably significant in some countries with good institutions and low level of corruption while on the other hand this is a very tough obstacle for most of the countries with limited financial means; bad institutions and corrupted government where results are barely significant. More specifically, the evidence that reducing corruption has significant and positive impact to increase the primary school enrollment and improve student learning was encountered in Uganda. In the paper by Reinikka & Svensson (2005), they used an unusual policy experiment to evaluate the newspaper campaign in fighting against corruption and the results confirmed the positive effects of the campaign to reduce corruption and effectively boost primary school enrollment and student learning.

³ Late enrollment occurs when a child with age beyond the official age of starting primary school, enrolls in primary education.

Rwanda is ranked fourth least corrupt countries on the continent and first among countries in the East Africa with a score of 53 while Tanzania, Kenya, Uganda and Burundi got scores⁴ of 33, 27, 26 and 21 respectively (Transparency International Rwanda, 2013). This suggests that in countries with low levels of corruption, the implementation as well as results of the UPE policy is more effective. The UPE in Rwanda is therefore expected to increase both enrollment and completion in primary education since the less corrupt a country is the better outcomes from UPE will probably be.

Evidence that to have sufficient amount of infrastructures in place can lead to the success of education programs was observed in Indonesia in the research by Duflo (2001). The government of Indonesia has engaged in a very extensive project of school construction between 1973 and 1978. The results suggest that on average each primary school constructed per 1,000 children induced an increment of 0.12 to 0.19 years of education which is a quite huge amount of increase for children to attend primary school. Increasing infrastructures can not only lead to higher enrolment but even the quality of education gets higher. In the same paper by Duflo the primary school construction also led to an increase in wages from 1.5 to 2.7 percent which proves that since then children received education of higher quality.

The average classroom size is still an issue in most of the African countries which adopted UPE policy, the exception is Ethiopia with much smaller classroom size and Burundi, Malawi with a larger size of classrooms. However, the building of classrooms in countries like Chad, Burundi, Madagascar, Mozambique, Rwanda and Uganda is still in progress, school buildings actually accommodate more than 45 students in one classroom which is still high and negatively affect the quality of education in primary (Serge, 2009). In Rwanda, the average classroom area is 48sq.m from 2001 to 2006 while in Uganda is 48. 2sq.m from 1996 to 2000. This suggests that classrooms size stayed unchanged both before and after UPE in both countries while the number of students enrolling, increased substantially in the post-UPE. The effect is thus very significant due to overcrowding in classroom. The reason is that the number of students enrolling in primary school has considerably increased while the size of classrooms remained the same. This has been

⁴ The countries' scores indicate the perceived level of public sector corruption on a scale of 0(highly corrupt) to 100 (very clean) by transparency international corruption perception index

encountered in Uganda and led to a high number of early drop out (See for example Grogan, 2009).

The double shift program was introduced to alleviate the problem, for instance in Ethiopia 44 percent of public schools operate in two shifts (World bank 2004o cited by Serge, 2009) while in Burundi 61 percent in public primary schools utilize double shifts program in 2003-2004 (World bank 2006c cited by Serge, 2009). Albeit, the double shifts system was proved to be a deterrent factor for teachers to deliver an education of good quality since the latter increases the hardship as well as distorts the curriculum. In Rwanda two shifts system is performed in grade one and two of the primary schools, which represents the difference between the need for 730 new classrooms per year and the three times as many if the use of double shifts is phased out (Ahita, 2004a cited by Serge, 2009).

Besides, the distance from and to school is still an obstacle to attending and completing primary education. An empirical study was carried out in Ghana and has proved that constructing a school in the community located in more than 1 hour's walk distance from the closest school, might increase enrollment by 5percent in that community (OED, 2004 cited by Serge). Further, the classroom construction project in Rwanda has been slow in producing results, only constructing 240 rooms per year between 2002 and 2005 which is still far from the actual need of 730 classrooms each year.

According to various reseaches (see for example Amassie, 2003, Nishimura, 2008) there is a negative correlation between school entrance age and retention in school. The later a child enters school, the more she or he is likely to substitute school time for work due to the child labor market that prevails in developing countries. This means that the older a child gets the higher the opportunity cost of schooling is. This is the reason why dropout rates are very high among cohorts with a late entrance in primary school. This is an important issue for low income countries including Rwanda, since delayed enrollment is very common and considered to be the main reason for the low overall education attainment (both attendance and completion).

This was again confirmed by Grogan (2009) for the case of Uganda where the abolition of tuition fees caused a very high enrollment rate of children and most of them were adults or far away from the normal age to start primary school, which finally led to dropout before the completion

of primary school. This suggests that UPE leads to high enrollments in primary school and thus may hinder completion in primary education. This indicates that what happened in Uganda after UPE is expected to occur in Rwanda given that both countries have similar education systems as well as economies.

Studies (see for instance Mika, 2007) have tried to figure out some relevant factors behind the poor schooling outcomes despite the school fees abolition in developing countries. As regards to children further, there are various hindrances associated with children schooling in Rwanda particularly and which are expected to negatively affect children's schooling outcomes either by low completion rates or attendance rates even if there is free education. It's been found that parental death negatively affects economic development through impacting the human capital accumulation of the next generation and empirical evidences for this is found in Uganda (see Yamano et al. 2006).

Evidence suggests that in general, schooling outcomes of children depends on the presence of their parents. In Rwanda many of the children lost one or all of their parents due to the genocide and war in 1994 and which still have negative impacts on education. The study by Kevin (2009) conducted to investigate the relationship between orphan status and schooling disruption in the post-genocide in Rwanda came up with evidence that the non-orphan children have better schooling outcomes than orphan of at least one parent. The effects are very huge to the extent that some of them can enroll but not finish or can't even start their primary school (see also Case et al.2006; David et al. 2007).

As regards to the impact that UPE might have had on the education attainment in Rwanda, the outcomes might be poor in the post-UPE due to the reason that most of the orphan children are head of their families, taking care of their siblings and most of their time is spent on child labor market trying to earn income to feed their relatives even if they receive financial transfers from the government but still those transfers are barely enough .The children sometimes don't have lunch or breakfast due limited income which leads to a very high absenteeism in classes and finally they drop out or can't terminate their education (IMF, 2005 & 2008).

The study by Peter et al (1999) provides pretty much similar results about the importance of parents on the children's schooling outcomes. In the West Africa, the research has shown that an

increase in household income is highly associated with a large amount of investment in the girls' schooling while there was no evidence that the boy's education is affected. Within the same context, schooling outcomes are very sensitive to families' income as much of the previous literature has supported this argument and as for the evidence from Rwanda suggested that in spite of free primary education, the family still has a large contribution to the children's schooling costs (see IMF, 2005). This suggests that a child from a low-income family will not attend and complete or even enroll a primary school in the post-UPE.

Surprisingly, the father's education favors the schooling of both boys and girls while on the other hand the mother's education only affects girls' education outcomes. In Guinea, the results indicate that the enrollment and attendances of girls are positively correlated with mother's education while father's education has impacts on both genders (Peter et al. 1997). Rwanda as underdeveloped country unlike Guinea, after the 1994 Genocide and war, many children lost their father, while others went to exile and were jailed due to the genocide crimes. Thus this is differently affecting children's educational attainment in both prior and after the free tuition fees.

Another important factor is the distance from the place of residence to the place of schools. In low-income countries, many children (disabled included) especially in rural areas spend a lot of time a long way from their homes to schools and vice versa (see Christian et al. 2006 cited by Theunynck, 2009). Some of them get to school late and tired which gradually has negative effects on their attendance as well as completion rates in primary. In Rwanda more than 53 percent of the pupils live more than 30minutes walk from a school (World Bank, 2003c and 2005s cited by Serge, 2009) while in Uganda 57 percent of families live at 2km or more away from primary school in 2005 (Group 5 2006d cited by Theunynck, 2009), in Malawi only 34 percent of the children travel more than 2km to school (World Bank, 2004e cited by Serge, 2009).

With a combination of the effects of the Universal Primary Education Program, in this study I am looking at the impact of various factors on education outcomes such as the abolition of school fees in primary education, household income, gender of the child, Distance to school , poverty index, age, financial transfer received, education of household head, existence of parents in the household, time spent on chores per week, which I believe will provide me with full

information about what truly determines the education outcomes in Rwanda and to what extent for both before and after the introduction of the UPE.

IV. KEY RESEARCH QUESTIONS, DATA AND METHODOLOGY

This section includes details about the key research question of this study, descriptive statistics of the data as well as the identification strategy being applied in this study.

IV.1. Key Research Questions

This study extracts data from two surveys: Rwanda integrated household living conditions surveys (EICV) 2000/01 and 2005/06 that cover both attendance and completion patterns in primary school, in fact 2 years before and 2 years after the Universal primary education program in Rwanda. Since data from both surveys include children of 7 years old and above when the UPE was introduced, it is straightforward to evaluate the UPE impacts by comparing the pre- and post-UPE cohorts.

Importantly, the study questions the following research question:

- **Does UPE affect schooling outcomes in primary education?**

This key research question includes the following five sub-questions in order to effectively capture the effect of UPE on schooling outcomes:

- 1. How much did UPE increase attendance in primary school?*
- 2. Does UPE affect attendance by the poor?*
- 3. Did it increase late enrollment?*
- 4. How much did UPE affect completion in primary school?*
- 5. Did UPE impact completion in primary education by the poor?*

I believe that, by answering the above questions, provides us with a better assessment of the UPE policy not only for Rwanda but also for other least developed countries that have adopted or are planning to adopt it.

IV.2. Data

This research takes advantage of the datasets first used by Nkurunziza et al. (2012) to evaluate the Universal primary education in Rwanda. These datasets are taken from 2000-2001 and the

2005-2006 Enquête Intégrale sur les Conditions de Vie des Ménages (EICV) or integrated household living conditions survey in Rwanda.

IV.2.1. Household Survey Data

The integrated Household Living Conditions Survey or Enquête Intégrale sur les Conditions de Vie des ménages (EICV, or the English acronym IH LCS), is a repeated cross-sectional survey, conducted by the National Institute of Statistics of Rwanda every five years. This survey provides useful information on changes in the well-being of the population such as poverty, inequality, employment, living conditions, education, health and housing conditions, household consumption, among others.

The sample during the survey is determined such that the sampling plan is designed following the objectives of the survey and fieldwork methodology given the amount of logistical resource available. Due to the fact that the survey's objective is for the government to obtain statistically reliable results at the level of each province, Kigali and other urban sectors, this objective aims for 13 domains for analysis and according to the experience of conducting such kind of survey, at least a sample of 500 households per domain of study is required (EICV-Rwanda).

Table 2: Data description by gender

Gender	EICV2000/01	EICV2005/06
Males	47.43%	48.17%
Females	52.57%	51.83%

Source: Own calculations using EICV2000/01 and EICV2005/06

The 2002/01 and 2005/06 EICV being respectively the first and the second survey undertaken in Rwanda, contains information on education situation just in the pre- and post-Universal Primary Education program in Rwanda. Both datasets are merged in one dataset and fit the need of this study well since they include comparable modules on both attendance and completion in primary before and after the onset of the UPE in 2003.

Due to the reason being that, my study restricts attendance in primary school, to children aged 7 to 20; I narrow down the datasets since datasets are merged for all individuals regardless of their age. Therefore, in this study, a group of 8547 children were taken from EICV2000/01 and

comprising 47.43 and 52.57 percent for males and females respectively. On the other hand, another group of 8547 observations was gathered from EICV2005/06 with 48.17 percent for males and 51.83 percent for females.

This study takes into account for children of age 7 to 20 before and after UPE since the official starting age in Rwanda is 7 years old and takes 6 years to complete primary education and thus a kid finishes at the age of 13. I take the advantage to include children with age being 13 till 20 years old to well capture the effects of the UPE among poor children. This is because children who couldn't afford to enroll before the UPE, took the chance to enroll after UPE and I expect them to have had surpassed the normal starting age in primary school when the school fees were abolished. Thus, this will allow me to examine whether the enactment of the UPE induces delayed enrollment that is observed in the post-UPE. Furthermore, as regards to the age and time of exposure to the UPE in Rwanda, I am not able to present in this analysis, the age and time of exposure to the UPE as far as attendance is concerned. The reason is that, neither the EICV 2000/01 nor the EICV 2005/06, contain the information about which grades in primary school that children were attending during the survey. On the other hand, the time of exposure and age for completion case are presented in table 2.

Table 3: The role of age and the time of exposure to UPE: Completion

Age	EICV2000/01	Years	EICV2005/06	Years
13	Not exposed	-	Exposed	3
14	Not exposed	-	Exposed	2
15	Not exposed	-	Exposed	1

Source: Own calculations using EICV2000/01 and EICV2005/06

The idea is to take children of 13 years old finished in 2006 and 14 years old in 2005 while 15 years old completed primary education in 2004 and this information is found the EICV 2005/06. As can be seen, cohorts of 13, 14 and 15 years old are exposed to UPE for three, two and one year respectively (see table 2).

Table 4: Descriptive statistics for attendance in primary education

Variable	Mean	SD	Min	Max
Poor	0.5848	0.4928	0	1
Females	0.5220	0.4995	0	1
Distance to school	1.7264	0.7928	1	3
Non-Education	0.5421	0.4982	0	1
< 5 primary education	0.2096	0.4070	0	1
>5 primary education	0.2483	0.4320	0	1
Non-income: 0\$	0.3674	0.4821	0	1
Low-income: 0.51\$-128\$	0.3674	0.4821	0	1
High-income: >128\$	0.3327	0.4712	0	1
Non-transfer: 0\$	0.1865	0.3895	0	1
Low-transfer: 0.13\$-6.38\$	0.3484	0.4765	0	1
High-transfers: >6.38\$	0.4651	0.4988	0	1
Both parents present	0.2483	0.4320	0	1
Only father present	0.0460	0.2095	0	1
Only mother present	0.2525	0.4345	0	1
None	0.2120	0.4088	0	1
Labor market	0.0825	0.2751	0	1
Attendance	0.7002	0.4582	0	1
Total of the observations	17094			

Source: Own calculations using EICV2000/01 and EICV2005/06. Notes: Attendance is restricted to children with age 7 to 20.

Table 5: Descriptive statistics for Completion case in primary school

Variable	Mean	SD	Min	Max
Poor	0.5999	0.4900	0	1
Females	0.5221	0.49956	0	1
Distance to school	1.7264	0.7935	1	3

Non-Education	0.5440	0.4981	0	1
< 5 primary education	0.1970	0.3977	0	1
>5 primary education	0.2591	0.4382	0	1
Non-income: 0\$	0.3703	0.4830	0	1
Low-income: 0.51\$-128\$	0.3703	0.4830	0	1
High-income: >128\$	0.3232	0.4678	0	1
Non-transfers: 0\$	0.1890	0.3916	0	1
Low-transfers: 0.13\$-6.38\$	0.3394	0.4736	0	1
High-transfers: >6.38\$	0.4716	0.4993	0	1
Father & mother present	0.4673	0.4990	0	1
Only father present	0.0560	0.2300	0	1
Only mother present	0.2726	0.4454	0	1
None	0.2041	0.4031	0	1
Labor market	0.0552	0.2285	0	1
Completion	0.0776	0.2676	0	1
Total of the observations	3524			

Source: Own calculations using EICV2000/01 and EICV2005/06. Notes: Completion is restricted to children with age 13, 14, 15.

Table 2 and 3 describe descriptive statistics for attendance and completion in primary education respectively. Since both attendance and completion target children of different levels of age, in this study, I make two separate samples for either case and both are taken from the merged EICV 2000/01 and EICV 2005/06 dataset. The first sample, for effects on attendance, consists of 17094 observations and is restricted to cohorts of age 7 to 20 years old. The second sample, for effects on completion, consists of 3524 observations, comprising children of age 13, 14 and 15.

My primary outcome of interest is constructed using data from the EICV2000/01 and EICV2005/06, where attendance is defined as the children of age 7-20 who are still attending primary school while completion relating to children of age 13-15. The attendance variable is further constructed in the survey such that there are four categories: Not attended primary school, attended primary school but not completed, not attended primary school but completed and attended primary school with successful completion. To simplify, I condense the attendance into

a binary variable with only attend and not attend. The completion variable is coded into a dummy with two possible outcomes (completed or not completed primary school) from the survey questionnaire and it is held similarly in my study. I make up two separate dummies: one for attendance and the other for completion, which are considered as the dependent variables in my study. The merged EICV2000/01 and the EICV2005/06 dataset being used in my analysis, indicates that 70.02 % attended primary school while only 7.76 % completed (see table 3 and 4). As for explanatory variables, a number of control variables were included in the model as indicated in table 3 and 4 above. To examine whether children from poor families have benefited from the policy in attending and completing primary education over time, the poverty index⁵ variable which is formed by three categories of poverty: extremely poor , poor and non-poor children in the household were taken from the survey, and condensed as well such that poor and extremely poor categories are merged as to obtain a poverty index variable as a dummy variable with two possible outcomes: poor with value of 1 and non-poor children with value of 0. An investigation of other important determinant factors of attendance and completion in primary education before and after the introduction of the UPE in Rwanda, allows me to identify various effects of the UPE policy to remove some important barriers to both attendance and completion in primary education and what constraints still prevent children from attending and completing primary education in Rwanda, whose future policies should target.

Furthermore, gender is coded as a binary variable in the survey, taking the value of 1 if male and 0 otherwise but to check whether females access to education differs from males, I turn the gender variable so that it takes the value of 1 if female and 0 if male. Distance to school is kept as a continuous variable in my study, comprising three categories: children living in less than 0.5Km, 0.6 to 2Km and more than 2Km from the school's location. Education of the household head is continuous in the survey (such that parents with no education, up to 5 years of primary

⁵ The poverty line was calculated basing on the level of household consumption expenditure including purchases but also including won production and payment received. The approach utilized follows international standard practices by adjusting for prices variations (price deflator) that Households face and also considering the household composition (household size measured with respect to adult equivalents). Following the prices in January 2001, the poverty line was set at RWF 64,000 (\$86 currently) per adult per year, and an extreme poverty was RWF 45,000 (\$60) per adult per year. But following the prices indicators in January 2006 these poverty lines changed into RWF 90,000 (\$120 currently) and RWF 63,500 (\$85 currently) per adult per year, respectively (Cited by Nkurunziza et al,2012).

education and more than 5 years of primary education and other education) whereby this continuous variable is converted into three dummy variables (non-education, up to 5 primary educations and above 5 primary education) in my analysis. The first dummy is coded non education taking value of 1 if not educated at all and 0 otherwise and second dummy consists of up to 5 primary educations with value 1 if educated up to 5 years in primary education and 0 otherwise and the same applies for above 5 primary education. The same holds for the variables income with three dummies (non-income:0\$, low income: 0.51\$-128\$ and high income: >128\$). Each of these dummies for income takes a value of 1 if none, low or high income and zero otherwise. Also, existence of the parents variable is continuous in the survey but is constructed into four separate dummies (both parents present, only father present, only mother present and none is present) every dummy takes respectively value of 1 if both parents are present or only father present or only mother or none is present and 0 otherwise. Again transfers received variable is coded similarly with three different binary variables (non-transfers:0\$, low transfers: 0.13\$-6.38\$ and >6.38\$). The labor market variable is taken from the survey as dummy and is held similarly in this study. The purpose of utilizing these dummies is to make the inference of my results more straightforward and easy to understand.

According to literature, I expect the negative impact of the poverty, living in a far away distance from school, gender of a child as well as labor market on both dependent variables⁶. While on the other hand, dummies for income, existence of the parents, transfers received and education of the household head leads to positive effects on schooling outcomes.

IV.3. Methodology

The dependent variables in my study represent the choice to attend or complete primary education and both take value of 1 if attended or completed and zero otherwise. Hence, given the binary nature of the dependent variables, linear probability model (LPM) fits in to determine at what extent different factors affect the probability of attending or completing primary education in Rwanda.

I use therefore OLS to estimate parameters of the two models⁷ and to predict attendance and completion using the estimated parameters. For the OLS to be my estimator of choice (the best

⁶ Attendance and completion in primary school.

⁷ Attendance and completion regression models

linear unbiased estimator) I would need to assume that the error terms are supposed to be homoscedastic and normally and independently distributed with mean 0 (otherwise OLS is not efficient), the error terms are independent of all the dependent variables (otherwise there is endogeneity), there is no multicollinearity, i.e. linear or approximately linear relationship between the explanatory variables and the model is linear in its parameters.

Furthermore, my variable of interest which is the abolition of school fees in primary education or UPE is exogenously determined while households choose only public primary schools; an individual child must be enrolled in either one system or the other (before or after UPE); demand for schooling among individual children is downward-sloping in public primary schools (the fee abolition yields an increase in public primary schools enrollments and completion compared to the pre-UPE). My study assumes further that there are unobserved factors such as local cultural attitudes towards valuing education and these factors are constant among cohorts and regions but may differ from one cohort to another and from one region to another during the period from 2000 to 2005.

Therefore, in the following section, I estimate two baseline linear probability regression models and the first and second regressions are for attendance and completion respectively. This allows answering the research questions in section 3 of this study. The both dependent variables (attendance and completion) are dummy variables, taking a value of 1 if attend or complete and 0 otherwise. The variable “level of poverty” will be the control variable of interest in order to capture the effects of the UPE among poor families. The attendance is restricted to children with age 7 to 20 while completion comprises children with age 13, 14, 15 who were exposed to the UPE impacts

IV.3.1. Empirical Specification

1. Baseline models:

IV.3.1.1. Determinants of Attendance

To examine the determinants of the attendance including the effects of the UPE, I employ **Aprimary_{ij}** which is an outcome variable for attendance. The attendance variable is a binary taking a value of 1 if a child *i* of the household *j* attends primary school and zero otherwise. Therefore, I estimate the following model using OLS estimator at the child level aged 7 to 20.

Baseline model:

$$A_{primary_{ij}} = \beta_0 + \beta_1 UPE + \beta_2 X_{ij} + \beta_i Dage_i + V_i + \varepsilon_{ij} \quad (1)$$

In equation (1) $A_{primary_{ij}}$ is the attendance in primary school of an individual i in household j and UPE is the treatment variable which indicates the effects of UPE on attendance in primary education. It takes value of 1 if EICV2005/06 and zero if EICV2000/01. β_1 is my coefficient of interest since it measures the changes in the likelihood to attend primary school due to the abolition of school fees. $Dage$ is the age fixed effect while V_i is the regions fixed effects. X is a vector of control variables such as dummies for gender of the child, transfers received, education of the household head, poverty index, income, distance to school, labor market and the existence of the parents. The reason why I include these factors in the attendance model is that they all affect the household's decision to enroll their children in primary education.

Furthermore, to be able to answer my research questions about whether poor children benefited from the UPE policy, I extend model (1) by including an interaction term of UPE which is the product of the UPE with poverty index variable (which is a dummy variable). The interaction term allows the UPE effect on attendance for poor kids who were exposed to the abolition of the school fees in 2003. Thus, I estimate the following interaction regression model:

$$A_{primary_{ij}} = \beta_0 + \beta_1 UPE + \beta_2 POVERT_{ij} + \beta_3 (UPE * POVERT_{ij}) + \beta_4 X_{ij} + \beta_i Dage_i + V_i + \varepsilon_{ij} \quad (2)$$

$UPE * POVERT_{ij}$ is a vector of the interacted regressors while $(\beta_1 + \beta_3)$ is my coefficient of interest in model (2) which measures the effects of the UPE on poor children to attend primary education. $POVERT_{ij}$ is a vector of poverty index variable, measuring the effect of being poor on attendance. X is the vector of the control variables while $Dage_i$ and V_i are age fixed effect and region fixed effect respectively and ε_{ij} is the error term.

IV.3.1.2. Delayed enrollment

Baseline model:

$$A_{primary_{ij}} = \beta_0 + \beta_1 UPE + \beta_i Dage_i + \beta_2 X_{ij} + V_i + \varepsilon_{ij} \quad (3)$$

Where UPE is the variable of interest and $Dage_i$ (Age fixed effects) is a dummy for age and takes value of 1 if individual has age n and zero otherwise and the same hold for all cohorts from

age of 7 to 20. V is the region fixed effects while X is a vector of control variables and the error term ε . It is worthy to mention that in order to avoid the problem of “dummy variable trap” due to perfect multicollinearity in the age dummy regressors. I arbitrarily omit the dummy age variable for 7 years old cohort.

As for the purpose to explore delayed enrollment after the introduction of the UPE, I use age fixed effect regression model by extending model (3) to interaction between two binary variables regression model by the product of the treatment variable(UPE) with each of the age dummy variable of my interest (14-20 years old). The reason is that, the official age to attend primary school in Rwanda is 7 to 13 years old. Therefore, for those who are still attending primary school and whose age is beyond 13 years, are considered as late enrolled cohorts in this study. The cohorts of 14 to 20 years are hence the group that interests my study to check whether there has been an increase of attendance among cohorts of age 14 to 20 years after the enactment of the UPE.

Thus, to identify this, I estimate the following regression model:

$$A_{primaryij} = \beta_0 + \beta_1 UPE + \beta_i Dage_i + \beta'_i (UPE * DAge_i) + \beta_2 X_{ij} + V_i + \varepsilon_{ij} \quad (4)$$

In this regression, the coefficient of interest is $(\beta_1 + \beta'_i)$ and measures the effect of the UPE on the age of a child to attend primary education. The interacted regressors $(UPE * DAge_i)$ are restricted to individuals with age from 14 to 20, while $Dage_i$ is the age dummy variable and includes age of 7-20 years old. β_i measures the effect of each child to have a certain age on attendance while β'_i indicates additional effect of the UPE on the age of a child to attend primary education. The comparison between the two coefficients β_i and $(\beta_1 + \beta'_i)$ indicates whether there is a link between delayed enrollment and the introduction of the UPE in 2003. V_i is the region fixed effects. UPE is the treatment variable and ε_{ij} is the error term.

IV.3.1.3. Determinants of Completion

Given that I have repeated cross-sectional survey data with two time periods EICV 2000/01 and EICV2005/06 just before and after the enactment of the UPE in 2003, the interaction regression model fits with the data being used for the case of completion in this study. The same holds as for the case of attendance. By combining the interaction regression with both age and region fixed effects, the effects of unobserved factors that differ from one group to another but which

are constant over time within cohorts and regions are eliminated. Analyzing the UPE effects on completion in primary school, I estimate the following baseline model:

Baseline model:

$$C_{primary_{ij}} = \beta_0 + \beta_1 UPE + \beta_2 X_{ij} + \beta_i Dage_i + V_i + \varepsilon_{ij} \quad (5)$$

Where $C_{primary_{ij}}$ is the completion in primary school of an individual i in household j and the UPE is a dummy variable and β_1 is the coefficient of interest in my study, measuring the effect of the UPE on completion in primary school. $Dage_i$ and V_i are age and region fixed effect while X_{ij} is a vector of control variables, including gender, poverty index, income dummies, distance to school, transfers received dummies, education dummies of the householdhead, labor market, as well as dummies for the existence of the parents in the household, to control for omitted variable bias.

I furthermore extend the baseline model to the interaction model with respect to poverty index variable. The idea is in fact to explore the effect that UPE program might have caused to poor children as they complete their primary education in Rwanda.

$$C_{primary_{ij}} = \beta_0 + \beta_1 UPE + \beta_2 POVERT_{ij} + \beta_3 (UPE * POVERT_{ij}) + \beta_4 X_{ij} + \beta_i Dage_i + V_i + \varepsilon_{ij} \quad (6)$$

Where $UPE * POVERT_{ij}$ is the interacted term while X is a vector of control variables and $Dage_i$ and V_i are age and region fixed effects respectively. In this part I have two coefficients of interest, β_2 indicating the effects of being poor on completion in primary education and $(\beta_1 + \beta_3)$ which measures the effects of the UPE on poor children to complete primary education. The comparison of the two coefficients enables to answer the question of whether UPE has benefited poor children while completing primary education in Rwanda.

- **Variables**

Dependent variables:

$A_{primary_{ij}}$: is referred to as a dummy dependent variable for attendance, taking value of 1 if attending and 0 otherwise. This variable includes children of age from 7 to 20 from both groups with and without effect of the universal primary education program, since from the data point of

view, attendance is observed among these cohorts. The symbol i represents individual child and j is for the household.

C_{primary_{ij}}: stands for a binary dependent variable for the completion model and is restricted to children of age 13, 14 and 15 who have been affected by the policy while completing their primary school. The pre-UPE and post-UPE data will be taken from the EICV2000/01 and EICV2005/06 respectively. The two outcome variables will comparatively generate very insightful information to answer the research questions of my study in section 3.i.

Explanatory variables:

Regarding the attendance regression, there are three key explanatory variables used for identification in the regression estimates. The treatment variable, interacted regressors and a vector of age fixed effects which captures children of age 7 to 20 but the cohorts of interest are those of 14 to 20 years old who are considered to be late in attending the school, since they are beyond the normal age to attend primary school in Rwanda. The age fixed effect enables to examine delayed enrollment such that the summation of the both coefficients for UPE dummy and interaction of the UPE dummy variable with each of the age dummy from 14 to 20 years old cohorts, is compared with the age dummy without interaction at each age level (14-20). The two coefficients are compared to find out whether there has been an increase in attendance after the UPE at age level. The same holds for the completion case.

The variable “level of poverty” is controlled to well identify the effects of UPE among poor children. More importantly, it takes 6 years to complete primary school in Rwanda and a child starts at 7 years old and finishes at 13 years old. To investigate the UPE effect on completion, this study takes into account children of 13, 14 and 15 years old since they should have benefited from UPE while completing their Primary school.

Control Variables:

X in both models, stands for a vector including all control variables such as: Distance to school, dummies for income, poverty index, financial transfers received⁸, education of household head,

⁸ Financial transfers are provided by the government to poor household to incur their living cost including education (MINECOFIN, 2000).

existence of parents in the household, labor market (if worked for wages for the last 12 months) and gender of the child (see data part in section IV). $Dage_i$ and V_i age fixed effect and region fixed effect respectively.

There are various hindrances associated with children schooling in Rwanda and which are expected to negatively affect children's schooling outcomes despite the abolition of school fees. In general, schooling outcomes of children depends on the presence of their parents. Many of the children lost one or all of their parents due to the genocide and war in 1994 and which still negatively impacts their education outcomes.

The interest of my study is not to check whether the orphans benefited from UPE but rather the explanatory variable of interest in this case is the poverty index. Thus, I interact the treatment variable(UPE) with poverty index variable within attendance and completion model in order to detect whether UPE increase the number of poor children who attended and completed primary school after the enactment of Free education policy in 2003.

VI.3.2. Delimitations, Potential Problems and Mitigation

Nevertheless, it is important to note that there are various threats which may lead to biased results in the estimation of parameters for the regression models being considered in my study. Due to the dichotomous nature of both dependent variables (*Aprimary_{ij}* and *Cprimary_{ij}*) the OLS assumptions are unlikely to hold and OLS is no longer BLUE due to the problem of heteroscedasticity, which might mislead the hypothesis testing as well as the inference of my results. Problems with using OLS to estimate both models in this study are, first as other binary variables, both completion (*Cprimary_{ij}*) and attendance (*Aprimary_{ij}*) take value of 0 or 1, there is no guarantee that the estimated outcome values⁹ will necessarily lie between 0 and 1 but some may take negative values or exceed 1. Second, the error term is binary since the dependent variables are binary, as consequence, the error term (in models, both completion and attendance) is not normally distributed but rather follows the binomial probability distribution. Clearly, such predictions cannot be allowed to stand, since the probabilities should lie within the range (0, 1). Third, the error term is heteroskedastic since they will depend on the value of the independent

⁹ The specific parameters which are expected to be biased are: β_1 in model 1, β_1 and β_2 in model 2 β_i and β'_2 in model 4, β_1 in model 5, β_3 in model 2

variables. Moreover, my study is likely to confront with the problem of omitted variable bias due to the effect of unobserved factors such as local cultural attitude towards valuing education and which are not constant over time and within cohorts as well as among regions across the country and additionally, the general increase trend in education even in the absence of the introduction of the UPE

According to Watson et al. (2007) there are two solutions to overcome these shortcomings of the linear probability model which I employ to alleviate these problems in my study. I use heteroscedasticity-robust standard errors to infer my results since errors are heteroskedastic, and secondly, an obvious solution besides is to truncate the probabilities at 0 or 1, so that a probability of negative values would be set to zero, and a probability of values greater than 1, would be set to 1. Besides, to address the problem of nonsensical features in the results which are inevitable consequence of the linear probability regression, while checking the sensitivity of my results (Robustness check) I introduce nonlinear model specifically designed for binary dependent variables and this model is referred to as “Binary logistic regression model”. Further, Damodar N. (2006) also argued that if the sample size is reasonably large, the binomial distribution converges to the normal distribution. This guarantees that even if the biasedness in my results can’t be completely eliminated, but by using these remedial measures can alleviate the problem.

The idea to investigate whether the adoption of the UPE induced delayed enrollment in primary school and the issue of omitted variable bias, I use age and region fixed effects as well as control variables to control for the effect of unobserved factors (local culture attitudes towards valuing education) among cohorts and across regions. Fixed effects regression is a method for controlling omitted variable bias and assumes the same assumptions as OLS estimator in this study. For this reason, I use age fixed effect and region fixed effect to controlling for permanent differences among cohorts and across regions in Rwanda. Since, fixed effect estimator, relies on within-group action, I need repeated observations for each group, and a reasonable amount of variation of the explanatory variables within each group.

I therefore merge the two datasets to get the control group and I also get the treatment group by assigning the treatment effect (the UPE effects) such that I interact by multiplying the treatment

variable (UPE) with some of the key explanatory variables¹⁰ within the control group. Through this way, I compare the outcomes of the two groups to see the percentage changes among variables from each of the two groups. In fact, by using fixed effect alleviates the effect of omitted variable bias in the results of my study.

V. EMPIRICAL RESULTS AND DISCUSSION

By using the EICV 2000/01 and EICV2005/06 merged, in this section, I present and discuss about the progress that Rwanda has made towards achieving Universal Primary Education (UPE) in both attendance and completion in primary school. Also the sensitivity of the result this study is discussed in this chapter.

V.1. Attendance patterns in primary education

The results from the first step of the estimation procedure are given in Table 5¹¹. I thus predict the probability of attending primary education if children are exposed to the Universal Primary Education (UPE) policy. The universal primary education program has had a considerable impact on attendance. The results indicate that a child who has been exposed to UPE has 9.74 percentage points higher probabilities to attend primary school than a child who has not been exposed, holding other factors constant (*Ceteris parbus*).

Table 6: The effects of the UPE on attendace in primary education

VARIABLES	(1)	(1)	(1)
	Coefficients		Odds ratio
	LPM	Logit	Logit
UPE	0.0974*** (0.00782)	0.888*** (0.0718)	2.4313*** (0.1746)
Females	-0.0133** (0.00573)	-0.0283 (0.0508)	0.9721 (0.0494)
Non-transfers received	0.00983 (0.00874)	0.0528 (0.0731)	1.0542 (0.0771)

¹⁰ Poverty index and age dummies

¹¹ Table 4 demonstrates the outcomes of the UPE on attendance in primary education

High-transfers received	0.0154** (0.00699)	0.118* (0.0619)	1.1255 * (0.0697)
Non-education	-0.0266*** (0.00766)	-0.363*** (0.0768)	0.6957 *** (0.0534)
>5 primary education	-0.0180** (0.00841)	-0.307*** (0.0816)	0.7359*** (0.060)
Poor	-0.0625*** (0.00657)	-0.614*** (0.0593)	0.0600 *** (0.0321)
Non-income	0.0217** (0.00862)	0.0649 (0.0721)	1.067 (0.0769)
High-income	0.0648*** (0.00913)	0.506*** (0.0784)	1.6580*** (0.1301)
Distance to school	-0.0135*** (0.00414)	-0.0935*** (0.0352)	0.9107 *** (0.0321)
Labor market	-0.424*** (0.0103)	-3.388*** (0.149)	0.0338*** (0.0050)
Father & mother present	0.0527*** (0.0152)	0.513*** (0.114)	1.6711 *** (0.1902)
Only mother	0.0476*** (0.0159)	0.374*** (0.118)	1.4537*** (0.1720)
None	-0.00985 (0.0166)	-0.122 (0.123)	0.8851 (0.1085)
Constant	0.927*** (0.0214)	3.747*** (0.283)	42.3829*** (11.9784)
Child age fixed effect?	Yes	Yes	Yes
Region fixed effect?	Yes	Yes	Yes
Observations	14,747	14,747	14,747
R-squared	0.452		

Source: Own calculations using EICV 2000/01 and EICV 2005/06

*Notes: Robust standard errors are in brackets in case of LPM while Standard errors are in brackets in case of Logit. * significant at 10%, ** significant at 5%, *** significant at 1%. UPE*

is dummy for UPE. Regressions are restricted to children of age 7 to 20.

Since the interaction terms enable to the UPE effects on attendance for children who are exposed to the UPE, I use the interaction regression model for attendance to answer the question of whether poor children have gained from the introduction of the UPE while attending primary education and results are presented in table 6. According to the results, in the absence of UPE, the effect is that, being poor declines attendance in primary education by 8.83 percentage points while the effect of the UPE on a poor child to attend primary education is 11.95 percentage points and the effect is positive. This suggests that the adoption of the UPE program mitigates the issue of poverty as an important barrier to attend primary school in Rwanda but the effect is minimal. This converges to what Present Kagame warns while on his Visit to Rubavu district on 24th of March, 2016 that, there are still street children around the Rubavu city in the western province despite the efforts that government has made to facilitate them accessing primary education¹². My results also reflect the relationship between dependent variables and control variables. According to the results of my study, there is a negative relationship between attendance and being a female, distance to school, labor market parents without education as well as being orphan of both parents. More importantly, in the post-genocide, many children lost their parents to an extent and I find that being an orphan child of both parents leads to a very poor schooling outcomes in Rwanda, which again converges to what other studies have discovered (see Thomas, 2009, Glick & Sahn, 1999, Shinamura, 2006, Ueyama, 2007). The literature argues that education of the parents increases schooling outcomes of their children (see Glick et al. 1997) but the results of my study show that the relationship between attendance and education of the parents turns out to be negative. Furthermore, attendance is positively correlated with transfers received, income and having parents in the household. This suggests that income level and received transfers, in the household is still vital for children to attendance primary education since parents still have to contribute to schooling expenses despite the abolition of school fees (see IMF, 2005).

¹² www.igihe .com, on 27th, March 2016, 08:48'

Table 7: The effect of the UPE on attendance by the poor

VARIABLES	(2)	(2)	(2)
	Coefficients		Odds ratio
	LPM	Logit	Logit
UPE	0.0682*** (0.0103)	0.688*** (0.0959)	1.9895*** (0.1908)
Females	-0.0134** (0.00572)	-0.0294 (0.0508)	0.9711 (0.0494)
No-transfers received	0.00662 (0.00876)	0.0362 (0.0734)	1.0368 (0.0761)
High-transfers received	0.0177** (0.00701)	0.136** (0.0623)	1.1456** (0.0714)
Non-education	-0.0303*** (0.00769)	-0.387*** (0.0773)	0.6790 *** (0.0525)
>5 primary education	-0.0250*** (0.00854)	-0.351*** (0.0828)	0.7039 *** (0.0583)
Poor	-0.0883*** (0.00930)	-0.765*** (0.0769)	0.4652*** (0.0358)
Poor*UPE	0.0513*** (0.0119)	0.338*** (0.108)	1.4026*** (0.1515)
Non-Income	0.0159* (0.00873)	0.0325 (0.0728)	1.0330 (0.0752)
High-income	0.0602*** (0.00920)	0.482*** (0.0789)	1.6192*** (0.1277)
Distance to school	-0.0130*** (0.00414)	-0.0898** (0.0353)	0.9141** (0.0322)
Labor market	-0.424*** (0.0103)	-3.366*** (0.149)	0.0345*** (0.0051)
Fother & mother present	0.0522*** (0.0152)	0.507*** (0.114)	1.6601*** (0.1891)

Mother only	0.0483*** (0.0159)	0.376*** (0.118)	1.4569*** (0.1725)
None	-0.0111 (0.0166)	-0.130 (0.123)	0.8779 (0.1077)
Constant	0.947*** (0.0218)	3.877*** (0.286)	48.2826*** (13.8100)
Child age fixed effect?	Yes	Yes	Yes
Region fixed effect?	Yes	Yes	Yes
Observations	14,747	14,747	14,747
R-squared	0.452		

Source: Own calculations using EICV 2000/01 and EICV 2005/06

*Notes: Robust standard errors are in brackets in case of LPM while Standard errors are in brackets in case of Logit. * significant at 10%, ** significant at 5%, *** significant at 1%.*

*UPE*Poverty: is a vector of interacted regressors. Regressions are restricted to children of age 7 to 20.*

V.2. Delayed enrollment

Having identified that the introduction of the UPE in Rwanda has increased attendance in primary schools, this raises the question of whether UPE caused late enrollment among cohorts with age beyond the normal age (7years old) to start primary school. Therefore, I use interaction between age dummy variables (Children of age 14 to 20 years are the cohorts of interest in this study in order to detect late enrollment associated with UPE. The reason is that, these cohorts are beyond the normal age (7 to 13 years old) to attend primary school in Rwanda) with the treatment variable (UPE), and I include region fixed effect to control for omitted variable bias and the results are presented in table 7.

According to my results, there is delayed enrollment due to the introduction of the Universal primary education. As can be seen, there has been a significant increase in delayed enrollment among cohorts of the age 16 to 20 years old just after the onset of the UPE. Furthermore, the effect of being 16,17,18, and 20 years old to attend primary education is 17, 8.26, 2.30 and -4.25 percentage points respectively while the effect of the UPE reaches to 24.02 percentage point for a child being 16 years old; 22.82 is for 17 years old and 20.32 as well as 16.32 percentage points

for children of 18 and 20 years old to attend primary school. But on the other hand there is huge decline in attendance among the cohorts of age 14 and 15 years old respectively from 43.6 and 32.1 percentage points in the pre-UPE to 17.32 and 17.72 percentage points in the post-UPE (see table 7). This provides an indication that, even though not all of the impact of UPE can be explained via the cost of education, but such factor (UPE) did indeed have an important impact on schooling outcomes.

Table 8:Regression results for the delayed enrollment in primary school after the UPE in 2003.

	(3)	(3)	(4)
VARIABLES	LPM	Logit	LPM:Interaction
UPE	0.112*** (0.00750)	0.971*** (0.0669)	-0.0408*** (0.0105)
Females	-0.0167*** (0.00597)	-0.0653 (0.0507)	-0.00882 (0.00595)
Non-education	-0.0311*** (0.00810)	-0.353*** (0.0761)	-0.0332*** (0.00798)
>5 primary education	-0.0277*** (0.00879)	-0.354*** (0.0810)	-0.0305*** (0.00869)
Poor	-0.0603*** (0.00682)	-0.562*** (0.0589)	-0.0617*** (0.00675)
Non-income	0.0218** (0.00899)	0.0609 (0.0717)	0.0246*** (0.00890)
High-income	0.0697*** (0.00955)	0.518*** (0.0788)	0.0731*** (0.00949)
Distance to school	-0.0149*** (0.00433)	-0.104*** (0.0355)	-0.0135*** (0.00430)
Labor market	-0.438*** (0.0103)	-3.525*** (0.166)	-0.447*** (0.0106)
DAge14	0.443*** (0.0183)	2.705*** (0.115)	0.436*** (0.0271)

UPE*DAge14			0.214*** (0.0254)
DAge15	0.331*** (0.0190)	2.057*** (0.108)	0.321*** (0.0274)
UPE*DAge15			0.218*** (0.0279)
DAge16	0.212*** (0.0191)	1.456*** (0.104)	0.170*** (0.0269)
UPE*DAge16			0.281*** (0.0282)
DAge17	0.123*** (0.0193)	0.988*** (0.105)	0.0826*** (0.0272)
UPE*DAge17			0.269*** (0.0290)
DAge18	0.0434** (0.0182)	0.580*** (0.105)	0.0230 (0.0245)
UPE*DAge18			0.244*** (0.0262)
DAge20	-0.0418** (0.0178)		-0.0425* (0.0242)
UPE*DAge20			0.204*** (0.0256)
Constant	0.387*** (0.0225)	-0.761*** (0.169)	0.352*** (0.0253)
Child age fixed effect?	Yes	Yes	Yes
Region fixed effect?	Yes	Yes	Yes
Observations	13,963	13,963	13,963
R-squared	0.442		0.452

Source: Own calculations using EICV 2000/01 and EICV 2005/06

*Notes: Robust standard errors are in brackets in case of LPM while Standard errors are in brackets in case of Logit. * significant at 10%, ** significant at 5%, *** significant at 1%.*

Regressions are restricted to children of age 7 to 20. Cohort of age 7 is arbitrarily omitted to escape the dummy variable trap

V.3. Completion patterns in primary education

I use the linear probability regression model with region and age fixed effect, to predict the impact of the UPE in increasing the probability to complete primary education in Rwanda. The analysis takes into account children aged of 13, 14 and 15 from the EICV2000/01 and EICV2005/06 merged, who have been exposed to the UPE since 2003. The overall effect is negative. Results are given in table 8, whereby a child who has been exposed to the UPE is less likely to complete primary education than a child who has not been exposed. By using interaction with the poverty index variable¹³ to investigate the effects of the UPE on completion in primary education by the poor, I find no evidence that UPE has had on poor children to complete primary education in Rwanda (see table 9).

I also find further no evidence about the relationship between completion and being a female, transfers received, distance to school as well orphan status of a child, whereas on the other hand education of the household head and labor market are negatively correlated with completion in primary school in Rwanda while income affects completion positively.

Regression results for the effects of the UPE on completion in primary education:

Table 9: Baseline model for completion

	(5)	(5)	(5)
VARIABLES	Coefficients		Odds ratio
	LPM	Logit	Logit
UPE	-0.0295** (0.0133)	-0.567*** (0.207)	0.5672 *** (0.1172)
Females	-0.00511 (0.00876)	-0.0735 (0.145)	0.9291 (0.1350)
No-transfers received	-0.0278** (0.0121)	-0.370 (0.229)	0.6905 (0.1584)
High-transfers received	0.0134	0.219	1.2445

¹³ Poor variable is binary variable indicating whether child is poor or not

	(0.00981)	(0.197)	(0.2454)
Non-education	-0.0759***	-0.994***	0.3700***
	(0.0139)	(0.192)	(0.0712)
>5 primary education	-0.0608***	-0.735***	0.4796***
	(0.0154)	(0.201)	(0.0966)
Poor	-0.0593***	-1.011***	0.3637***
	(0.00980)	(0.176)	(0.0640)
Low income	-0.00409	-0.157	0.8551
	(0.0124)	(0.243)	(0.2080)
High income	0.0322**	0.468**	1.597**
	(0.0154)	(0.223)	(0.3556)
Distance to school	0.00782	0.156	1.1691
	(0.00541)	(0.121)	(0.1412)
Labor market	-0.0911***	-1.294***	0.2741 ***
	(0.0221)	(0.359)	(0.0984)
Father & mother present	0.000409	0.0180	1.0182
	(0.0191)	(0.321)	(0.3272)
Only mother	0.0153	0.310	1.3634
	(0.0199)	(0.334)	(0.4548)
None	-0.00585	-0.0719	0.9306
	(0.0215)	(0.350)	(0.3256)
Constant	0.194***	-1.206**	1.9641**
	(0.0332)	(0.480)	(0.4463)
Child age fixed effect?	Yes	Yes	Yes
Region fixed effect?	Yes	Yes	Yes
Observations	3,376	3,376	3,376
R-squared	0.127		

Source: Own calculations using EICV 2000/01 and EICV 2005/06

*Notes: Robust standard errors are in brackets in case of LPM while Standard errors are in brackets in case of Logit. * significant at 10%, ** significant at 5%, *** significant at 1%. The estimation is restricted to children aged 13, 14, 15 but Cohort of age 14 is arbitrarily omitted to*

escape the dummy variable trap. *Dage* is Age dummy variable

Table 10: Regression results for the effect of the UPE on completion by the poor

VARIABLES	(6)	(6)	(6)
	Coefficient		Odds ratio
	LPM	Logit	Logit
UPE	-0.0178 (0.0208)	-0.534** (0.230)	0.586** (0.135)
Females	-0.00514 (0.00876)	-0.0740 (0.145)	0.929 (0.135)
No-transfer received	-0.0263** (0.0121)	-0.362 (0.231)	0.696 (0.160)
High-transfers received	0.0126 (0.00988)	0.217 (0.198)	1.242 (0.245)
No-education	-0.0746*** (0.0137)	-0.990*** (0.193)	0.372*** (0.072)
>5 primary education	-0.0582*** (0.0153)	-0.724*** (0.204)	0.485*** (0.099)
Poor	-0.0499*** (0.0135)	-0.960*** (0.235)	0.383*** (0.090)
UPE*Poor	-0.0197 (0.0198)	-0.107 (0.328)	0.898 (0.295)
Low income	-0.00212 (0.0122)	-0.140 (0.248)	0.869 (0.216)
High income	0.0338** (0.0152)	0.480** (0.226)	1.617** (0.365)
Distance to school	0.00742 (0.00540)	0.154 (0.121)	1.166 (0.141)
Labor market	-0.0913*** (0.0221)	-1.293*** (0.359)	0.274*** (0.098)

Both parents present	0.000377 (0.0191)	0.0182 (0.322)	1.018 (0.327)
Only mother present	0.0151 (0.0199)	0.311 (0.334)	1.364 (0.455)
None	-0.00506 (0.0214)	-0.0673 (0.350)	0.935 (0.327)
Constant	0.191*** (0.0332)	-1.163** (0.475)	0.313** (0.149)
Child age fixed effect?	Yes	Yes	Yes
Region fixed effect?	Yes	Yes	Yes
Observations	3,376	3,376	3,376
R-squared	0.127		

Source: Own calculations using EICV 2000/01 and EICV 2005/06

*Notes: Robust standard errors are in brackets in case of LPM while Standard errors are in brackets in case of Logit. * significant at 10%, ** significant at 5%, *** significant at 1%. The estimation is restricted to children aged 13, 14, 15 but Cohort of age 14 is arbitrarily omitted to escape the dummy variable trap. Dage is Age dummy variable*

V.4. Robustness Check

Since my analysis uses interaction terms regression and owing to the nature of my datasets, I can't hold the treatment and control group separately since I can't control the time trend such that to have post and pre-treatment group is not possible and the same holds for the control group. Besides, due to the huge imbalance between observations from urban and rural areas, with rural counting 79.08 percent of the total observations, whatever results coming up in this study indicate the effects of the UPE in rural areas. I expect this not to be a problem about the sensitivity of my results since the imbalance appears equally in both datasets (EICV 2000/01 and EICV 2005/06)

Furthermore, despite the two datasets bracketing the time period of the adoption of the universal primary education in 2003 (one dataset two years prior and one dataset two to three years post), there could have been other changes or events occurring during this time interval that might be

correlated with changes in schooling, and I would incorrectly be attributing the observed increment in educational attainment to the universal primary education policy in Rwanda

Since again, the participant to the UPE program (EICV2005/06) differ from non participant (2000/01), the selection problem or bias of my sample is likely to set in which makes more complex to identify the real program effects, and which on the other hand might mislead my hypothesis testing as well as the inference of my results. I therefore merge the two dataset and use the interaction terms to effectively assess the UPE program effect and thus minimise that selection bias problem.

Moreover, as noticed by Watson et al (2007) the linearity that makes linear probability model simple to estimate and intuitively interpret, is also its major flaw. Due to this reason, I test the sensitivity of my results by using binary logistic regression model which is designed for binary dependent variables. Since the attendance and completion variables model the probability that either attendance or completion in primary education equals 1, it makes sense to adopt nonlinear formulation that forces the forecasted values to be between 0 and 1.

Therefore, the robustness of the LPM results for attendance and completion in primary education, are provided in tables with their corresponding LPM results. In this study, I use the logit as a robustness check for attendance and completion results and age and region fixed effects are included in both regression models. In the logistic regression, the odds ratio for attendance and completion represents the relative influence of one independent variable on the odds of being attending or completing primary school holding other variables constant. A β coefficient of the odds ratio that is less than one indicates a negative effect which means that the odds are reduced. As regards to attendance, the logit results show that a child in Rwanda is more likely to enroll following the onset of the UPE program such that a child who has been exposed to UPE has high odds ratio (1.9895) to attend primary education relative to a child who has not been exposed. Similarly, a poor child who has been exposed to UPE is more likely to attend primary school than a poor child who has not been exposed and odds ratios are 3.3921 and 0.4652 respectively (See table 5 and 6). The odds ratio of completion seems following a declining trend in the sense that the likelihood of a child who has been exposed to the UPE is less than the one for a child who has not been exposed and the odds ratio reaches 0.5672 while my study finds no evidence

about the effect that UPE might have had on poor children to complete primary education (see table 8 and 9).

Looking at the odds ratios, it is found that although the magnitude of the estimated coefficients is not exactly the same as with results from previous linear probability models, all estimates follow the same trend as regards to answering the research questions of my study in section 3.i. The significance of the odds ratios in terms of declining or otherwise is consistent with the estimates of the original LPM. In conclusion, the estimates of the logit model are consistent with the original findings of the linear probability model in the sense that all estimates have their hypothesized effect on the probability to attend or complete primary education in Rwanda.

VI. CONCLUSIONS AND POLICY IMPLICATIONS

The first important finding of my study is that the introduction of the Universal Primary Education in Rwanda in 2003 has had a positive impact on the overall attendance in primary education and the effect is large among poor children but still barely enough. The exception is completion in primary school where the overall impact on completion is negative whereas I find no evidence about its effect on poor children to complete primary education. Delayed enrollment which is found to be induced by the UPE is prone to be the prime factor behind this negative impact, since late enrollment leads to early drop-out. Therefore, I would recommend for further research to find out more about what the factor determinants behind this high drops out rate. Another reason is prone to be the overcrowded of classrooms which has been found to still be still a challenge in the Rwandan education. Yet, I find that UPE has barely reduced the wealth bias that had characterized access to primary education in the pre-period but I only see positive effect on attendance while poor children are still being discriminated by the policy as far as completing primary education is concerned.

Despite the elimination of school fees, school uniforms still seem to be a great deterrent to enrolling a child in school. Even IMF (2005) recognized that parents still have to contribute about 37 percent of the total education expenditure in Rwanda. In reference to the experiment conducted in Kenya, providing free school uniforms to poor children declines school absenteeism (see Miguel et al, 2007), I argue that a better policy option would be for the government to subsidize school uniforms for children from extremely poor families could be a

better policy option. Furthermore, I am not able to find evidence about the determinant factors of completion and attendance in primary school before and after the UPE in Rwanda. Thus, pointing the need for further research.

For the reason to motivate and encourage parents to enroll their children and help them to retain in school till they finish primary school, several pilot schemes started to be implemented such as farming programmes as to provide children with lunches at school while textbooks are provided for free from grade 1 to 7 (Kattan, 2006). Within this context, in 2002, the UN World Food Program (WFP) also launched a school canteen and food-for-education program in districts with food-insecurity problem and these districts were selected from both southern and eastern provinces as to support the school lunch program. In partnership with the government and various donors, this program served meals to 160,000 students for 4 years (see WFP: 2004). But it was reported by the online local news paper¹⁴ that children have been waiting for the MINEDUC to release free lunch program funds and hence leads to high drop out rates in primary school. This free lunch program proved to be a better policy and should be strengthened and expended around the country. The free lunch program may complement the UPE to further improve the primary education outcomes in Rwanda but further research is needed to well investigate its real impacts. Finally, I therefore would recommend that further research to identify important determinant factors for completion and attendance in primary school, just before and after the adoption of the UPE in Rwanda. And also the government of Rwanda should put more efforts on handling barriers such as limited amount of classrooms compared the actual number of rooms needed, still high qualified teacher ration, the contribution of the parents to enroll their children, Child labor market and uneffective free lunch programs by MINEDUC, as to achieve Universal Primary Education policy targets

¹⁴ www.igihe.com, on 3rd, May 2016, 06:58'

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