

# Republic of Sudan Education System Reform: The Causal Effect on Welfare of Women and Children

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## Abstract

This paper explores a change in education law in the Republic of Sudan, also known as Northern Sudan, to estimate the causal effect of compulsory education on the welfare of women and children. The aim is to investigate the impact of education policies on women and children's well-being and point out the limitations of these policies in conservative societies. The policy extended the duration of primary education from five years to eight, made it compulsory and reduced the entry age from seven to six. It was proposed in 1995 and implemented in 1998, affecting individuals born from July 1993 onwards. The birth-date Regression Discontinuity Design is implemented as the main methodology to investigate the engagement with education and outcome variables of interest after versus before the cut-off point, by using the UNICEF Multiple Indicator Survey Data. This methodology enables overcoming the endogeneity problem when dealing with observational data. The results suggest that the policy increased completion rates of primary education and participation of women in the labour force but did not increase participation in education. Moreover, there is limited evidence of any welfare effect of the policy. The paper also investigates possible reasons for the policy being ineffective in increasing participation rates. The paper recommends that before taking an essential step towards the goal of universal primary education, the government failed to address existing problems such as the unavailability of schools, long distances to schools, school fees and child labour, which discourage families from sending their daughters to school to increase the effectiveness of the policy. In Muslim societies where informal institutions dominate written rules, compulsory education policies are not likely to yield the expected outcomes, such as equal access for girls to education, unless they are accompanied by huge

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investment. This paper contributes to the existing literature by highlighting the impact of educational reform policies, discussing issues that limit their effectiveness and making propositions to improve the impact of these policies in such societies.

**Keywords:** Republic of Sudan; education; compulsory schooling; women empowerment; welfare; children's well-being; regression discontinuity design; economic development

## Introduction

Women make up 60% of the world's population, and educating women is the key to development and prosperity as it creates awareness of their rights and confronts the gender roles shaped and imposed by the society's norms and traditions (Channawar 2016). This paves the way for empowerment; especially women's economic empowerment is a source of income generation and also helps to overcome the vicious cycle of poverty. When women have greater control over resources in the family, they are more likely than men to allocate more resources to food, children's health care, and education. Therefore, the empowerment of women is fundamental for economic growth, development and poverty reduction (Tembon and Fort 2008). The role of education in women's empowerment is very well established. Education is strongly associated with the formation of women's identity, decision-making capability, mobility and contribution to the socio-economic development of households, communities and nations (Dahal 2016). Development can be achieved when a nation is able to manage its available resources in an efficient and effective manner. Human capital is one of the most important resources and women make up more than half of it; therefore, educating women is the key to utilising this resource. Education also plays a pivotal role in eliminating gender inequalities. Without removing the barriers for girls to access education, no country can fully make progress in economic and social development (Jackson 2009).

Almost every country continuously reforms its education system in order to attain better outcomes. Achieving gender equality in education has been one of the ultimate goals, yet progress is slow, especially in low-income countries (Antoninis, Delprato, and Benavot, 2016). Progress has been made in the Middle East and North African countries (MENA) in terms of increasing primary school enrolment, attendance and completion for girls (Roudi-Fahimi and Moghadam 2006). In most MENA countries, the improvements in education outcomes are the results of reforms such as centralised management of education and vocational training (Kirchberger 2001). The effect of reforms concerning education leads to different outcomes in every country. In Tunisia, where 6% of the GNP is dedicated to education, school attendance has been mandatory until the age of 16 since 1991, and free at all levels (Akkari 2004). By 2009, the enrolment rate of girls was 98% (UNICEF 2011). In Algeria, which serves as a unique example, education has been free and compulsory since 1962 for children aged between six and 16, and the girls turned out to take full advantage of this policy. For instance, in

1995, the number of girls enrolled in high schools exceeded the number of boys; also, girls are more likely to attend university than boys due to their success rates (Zahia 2018). In Morocco, compulsory education has been in place since 1963, and today, in urban areas, the enrolment rate of girls is almost 86% (boys are 93%). Yet, there are huge disparities between urban and rural areas and only 22% of girls and 50% of boys can participate in education (Al-Bataineh and Nur-Awaleh 2005). The governments in some countries like India, Pakistan, Sri Lanka, and South Africa have implemented funding schemes. For instance, the government in India prioritises funding to the regions with high out-of-school ratios, which has led to an improvement in girls' access to primary education. As a result, the primary school completion rate of girls from poor households living in rural areas was only 42% in 2006, and this number increased to 80% in 2016. On the contrary, in countries such as Cameroon and Malawi, the participation of girls from poor households in education has decreased over time (Gordon et al. 2019). Tembon and Fort (2008) indicate that low income countries have also witnessed an increase in primary enrolment rates (87% to 94%) from 1990 to 2004. However, the progress has not been equal, as in some countries, more boys than girls were enrolled in education. In 2005, 72 million children were recorded as out-of-school, of whom 41 million were girls, mainly from sub-Saharan Africa and South Asia.

UNICEF (2015) reports that Sudan, as one of the low-income countries, is the third country with the highest gender gap after Yemen and Djibouti. Despite significant efforts to improve the education system and having reduced the gender gap in education in collaboration with UNICEF, World Bank and Global Partnership for Education, the progress has been slow. The importance of primary education in children's development is an undeniable fact. Millennium Development Goal (MDG) 2 calls for universal primary education, which targets the completion of a full course of primary education, regardless of the country and gender of the children. In line with that, in 1995, a symposium was organised in Barcelona where the problems of Sudan were identified, and the participants agreed to extend their help in providing basic health, education and training. The Sudanese government reformed the education system in 1998, making primary education free and compulsory from the age of six to 13. In highly conservative societies (which shape their laws and regulations largely relying on informal institutions such as their customs, traditions and social norms) the encouragement of women's education may be quite challenging—even by introducing laws and regulations. Also, educating women may have little or no impact on obtaining results favouring development. This paper attempts to answer this question by looking at a highly conservative society that functions on Islamic foundations as well as the informal institutions that is Sudan, where one of the strictest forms of Sharia Law is implemented. This is often criticised for deviating from Islamic precepts of tolerance, forgiveness and equality. Sudan serves as a good example to outline the impact of education policies in encouraging girls' education in a highly conservative Muslim society where informal institutions are dominant.

The study that directed this paper commenced with a literature study and background motivation for the research. It explored the education system in Sudan, followed by a description of the data and identification strategy, as well as the estimation framework for the study. In the first phase, the paper seeks to analyse the impact of policy on participation in and completion of basic education. The first stage results suggest that the policy failed to encourage participation in primary education, but led to a significant increase in the completion of basic education. The second phase looks at the impact of more participation in education on other women and children, including the attitudes towards domestic violence, participation in the labour force, tendency to live in wealthier households and the health of the children, such as the birth weight and mortality rates. The study uses as a sample both ever-married and never-married women aged between 15 and 24. The UNICEF Multiple Indicator Cluster Data (UNICEF 2014b) provides the information required to conduct the analysis and allows for the implementation of birth-date-related Regression Discontinuity Design (RDD). It assigns treatment based on whether an individual's month and year of birth were before the July 1993 threshold, and controls if the individual's birth date is before July 1993. Implementation of this identification strategy allows for the comparison of cohorts born one month apart, and it counts on the assumption that the treatment and control should exhibit no systematic differences other than being subject to different compulsory schooling laws. The results suggest that the policy played an effective role in increasing the completion rates, so the likelihood of those who are able to attend school to complete primary education has increased. However, the impact of policy on increasing participation rates remained quite limited. Thus, in the second stage outcomes do not offer any improvement in empowerment or welfare outcomes, which paves the way for further analysis to understand the reasons why the policy remained ineffective in increasing the enrolment in primary education.

## Literature Review

The effect of education on women's empowerment has received much attention from researchers. Empowerment enables women "to take control of their lives, set their agenda, organise to help each other and make demands on the state for support and on the society itself for change" (Young 1993). The World Bank defines empowerment as the process of increasing the capability of individuals to be able to make choices leading to preferred actions and outcomes. Empowerment is a process of change, and empowerment of women involves the transformation of power relationships in favour of women (Batliwala 2007). Moghadam and Senftovan (2005) define the empowerment of women as a process of developing basic capabilities, legal rights and involvement in economic, social, political and cultural fields. Yet, before the term "empowerment" became popular, women were claiming their rights in possessing control over their lives, participating in decisions that affected their lives (both within the household and public as well as the government and international policies), all of which provide a very simple overview of what the "empowerment of women" means (Rahman 2013). On the one hand, it is argued that education is an important channel for empowering women;

therefore, the United Nations (UN) provides training programmes for women to acquire practical skills to empower them economically and increase their awareness of women's rights (UN 2015). Yet, on the other hand, another line of research suggests that educational opportunities are unlikely to bring about direct and immediate empowerment, but certainly, they generate opportunities for women to increase their consciousness (Kabeer 1999).

Education has always been considered an effective way to disseminate the purpose of women's empowerment. It helps women to notice the important role they play within society and brings about occupational success, self-awareness, self-esteem, the ability to make decisions, and equality of women's rights compared to the rights of men (Ajvani 2019). Two out of eight MDGs are focused on stimulating development by educating girls. MDG 2 proposes universal education for all, and MDG 3 is about empowering women and eliminating gender inequality, which includes the elimination of discrepancies in education. The Sustainable Development Goals (SDGs), which later replaced MDGs 4 and 5, also suggest equal access to quality education, gender equality and the empowerment of women (UNESCO 2019).

Education empowers women in every aspect of life. It leads to better health and well-being outcomes for women, equips them with the necessary skills to participate in the labour force, and increases their decision-making power. Furthermore, it leads to better development outcomes (Turquet, Watt, and Sharman 2008). Roudi-Fahimi and Moghadam (2006) also indicate that educating women contributes to development and well-being; it reduces child mortality, improves family health, and increases secondary school enrolment and participation in the labour force, which contributes to household and national income. When the earnings of women increase, this improves child nutrition and their children, and then especially girls are more likely to be educated. Last but not least, education encourages women to be more active in politics and informs them better about their rights and how to implement them.

Women stay with their violent husbands due to a lack of access to some basic resources such as housing, legal support, employment, funds, education, childcare and social support (Pyles 2008). Sen (1998) indicates that women's education beyond just being literate has a strong association with the termination of violent relationships. Her results suggest that women who have progressed in formal education for more than five years will not endure a violent relationship, as education enables such women to deal with violence because they can exert control over their lives. She also highlights the importance of women's employment status as it provides an opportunity for an independent life in the case of leaving (or being left by) an abusive husband. Education plays a major role in attaining better employment outcomes for women, both in developed and developing countries. In countries where the social norms are strong and dominant, the acceptable behaviour for women is to stay at home and only engage in unpaid housework. This approach is particularly common in Northern Africa, the Arab States and Southern Asia (OECD 2018). Taylor and Perezniето (2014) define economic

empowerment as a power which enables women to obtain access to economic resources and increased control over decision-making. Economic empowerment is one of the most effective routes for women to achieve their potential and advance their rights (Golla et al. 2011). Hunt and Samman (2016) identify the factors which directly influence women's economic empowerment. These include education; skills development and training; access to quality, decently paid work; access to property, assets and financial services; collective action; and leadership. Keats (135) indicates that free primary education in Uganda has reduced the rate of teen pregnancy, which in turn increases female participation in the labour force. Mbugua et al. (2014) have found that, in Kenya, maternal education has led to health improvements. Children of mothers without education are three times more likely to experience childhood diarrhoea than the children of mothers with higher education. Nagar, Bamkar, and Tønnessen (2017) define child marriage as a form of official or unofficial union where one or both sides are under the age of 18. They report that each year, 15 million girls get married before the age of 18. It is a human rights issue with significant negative consequences for social and economic development, and is generally the case in poor countries and rural regions. Out-of-school girls who marry at early ages are regarded by their husbands as incapable of making decisions and have limited bargaining power within the household (Parsons et al. 2015). Making education compulsory, monitoring participation in compulsory education closely, and preventing school drop-out can be powerful in reducing child marriages. If a girl stays in education for longer, she is less likely to get married before the age of 18 (*Girls not Brides* 2017).

Kim (2016) highlights the importance of education in making fertility decisions for women. Educated women are more likely to be knowledgeable about their health and physical condition, aspects of giving birth, and the availability of contraception methods. Propper and Salvanes (2008) indicate that increased education reduces the likelihood of teenage motherhood. However, their results do not indicate any significant evidence on the number of children that educated women are likely to have. This may be because their study was based in Norway, where the government provides all sorts of support for child raising, including financial support and public day care. Fertility rates in Norway are not as high as in other countries. In developing countries like Turkey, compulsory schooling laws have led to a reduction in fertility rates as well as a reduction in teenage marriage (Kırdar, Dayioğlu, and Koç 2011).

Investing in women and empowering them economically and socially is essential for their development as it leads to a rise in human capital. A state of Brazil, Pernambuco, enacted a programme addressing the plight of rural women, because public policies were not sufficient to promote gender equality. The programme has trained more than 50 000 women and consists of three components. The women must participate in a compulsory three-month course on "public policies," which will inform them about their rights. Then they can choose from the available vocational training courses, including non-traditional skills like welding, soldering, electrical work and taxi driving, which could provide them access to a growing employment market. Also, the state

government negotiated with training colleges to lower the bar for women's entry into courses, citing their historic disadvantage and exclusion, giving thousands of women access to an education previously denied to them (Cornwall 2016).

Gulesci and Meyersson (2013) explore the impact of a compulsory education law in Turkey, which was implemented in 1998. This law increased the mandatory years of education from five to eight years for individuals born from September 1987 onwards. The policy increased the average years of schooling by one year. It employed birth-date-related Regression Discontinuity, using Turkey Demographic Health Survey Data 2003. The effect of increased years of schooling varied, depending on the socio-economic background of the women. In rural regions, increased years of schooling led to significant empowerment in decision-making, household wealth, and conservatism in social and religious terms. In urban regions (additional to these factors), women's labour market participation also increased. Overall, their results suggest that the reform reduced the gender gap in education by half and had a significant effect on secularism, reducing women's tendency to wear a headscarf, attend Qur'anic study and pray regularly. The increase in average years of schooling did not have an effect on welfare outcomes like the age of marriage or birth rates, or even on the number of children. However, it increased women's decision-making power about marriage and fertility, and led to increased labour market participation. The study provides a clear overview of how education changes the attitudes of women toward religion within a society regarded as a 99.8% Muslim country. Their results also suggest that women with increased years of education tend to live in wealthier households.

Odunowo (2019) highlights the large number of out-of-school students in Nigeria, despite the increase in educational attainment. He employed fuzzy RDD by a Nigerian Demographics and Health Survey (NDHS) to estimate the effects of maternal education on child education in Nigeria. He assessed the Universal Primary Education (UPE) reform of the Nigerian government implemented in 1976, which aimed at providing free primary education and reducing the school-start age from seven to six. The reform caused a discrete jump in the educational attainment of women born in 1970. The results suggest that maternal education improves child well-being because it increases the value that the parents place on their children's schooling and education.

Samarakoon and Parinduri (2015) employed fuzzy RDD to estimate the reform which changed the academic year of 1978 by using the Indonesia Family Life Survey (IFLS). The academic year (from January to December) was changed to be from January to July. To achieve this, the 1978 academic year lasted until June 1979, and for this extended academic term, tuition fees were reduced by 50% for students in public schools. The women who were born in 1971 or earlier were exposed to the longer academic year. The study showed significant effects of increased years of schooling in terms of a reduction in women's fertility, the use of contraceptives, and improvement in reproductive health. It also increased the likelihood of breastfeeding by 16% and getting a tetanus injection by 57%.

## Background and Motivation

Sudan has long been suffering from chronic underdevelopment, and the process of development has been interrupted by multiple events. Natsios (2012) indicates that the first civil war (from 1955 to 1972) and the second civil war (from 1983 to 2005) led to the establishment of South Sudan, followed by the independence of that country in 2011. There was also a persistent problem of famine from the 1980s into the 1990s (Teklu, Von Braun, and Zaki 1992). During the civil wars, Sudanese women acquired the role of the household head and now, women's leadership is considered essential for family survival (Duany and Duany 2001). During the coup d'état on 11 April 2019, women again played an active role with 70% participation, which shows that women can be effective in changing undesired political conditions.

There are many studies which highlight the position of women in Sudanese society. For instance, Islam and Uddin (2002) highlight the power of traditions in Sudan by focusing on Female Genital Mutilation (FGM). The World Health Organisation (WHO 2018) defines FGM as a cultural practice which has no medical application and involves partial or total removal of external female genital. 97% of Sudan is Muslim, and FGM does not have a place in Qur'an. It is purely a social norm, and it is done to promote premarital chastity by controlling women's sexuality. The WHO (2012) also classifies this practice as a form of violence. Their paper uses DHS data from 1989/1990, which show that the prevalence of FGM was 89.9% and today the prevalence is still 87%. FGM has no health benefits; rather, it may lead to severe bleeding, cysts, infections, complications in childbirth and increased new-born deaths (UNICEF 2014a).

In terms of the education of women, Sudan again performs poorly, and this has not changed over time. UNICEF reports that 49% of the girls are missing from primary schools in Sudan, mainly because the unequal views on women's roots form the legal system, which is a very strict form of Sharia that shapes the culture and customary laws (Lehewych 2018). Another very important factor that keeps girls out of school is child marriage, which is considered a human rights violation that is adversely influencing women and children's rights to access education, and freedom from violence and exploitation (Nagar, Bamkar, and Tønnessen 2017). Sudanese family law was codified in 1991 and is founded on Islamic rules. The minimum age for marriage is when both parties have reached puberty, so child marriage is legal by law, and there is no regulation which provides protection against early or forced marriage. Also, the husband is obliged to give the bride a dowry and the law stipulates that the dowry is the property of the wife and her family (Roald and Tønnessen 2007). The law encourages families to marry their daughters at early ages instead of sending them to schools, so they will have one less mouth to feed and can also get a dowry from the groom. Sudan is currently ranked the 29th country with the "highest rate of child marriage"; almost 38% of girls get married before the age of 18, and 11% before the age of 15 (Nagar, Eljack, and Tønnessen 2017). Another important issue is that of mixed-gender schools. Due to the lack of infrastructure, there are no separate latrines in most mixed-gender schools, which



discourages families from sending their daughters to school. The opportunity cost must also be considered: labour foregone due to a girl in school versus what she can contribute at home (UNICEF 2015).

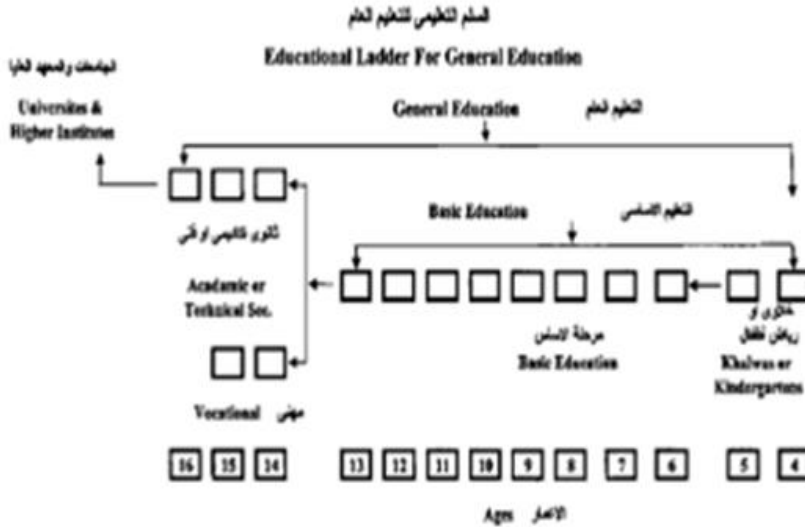
Although now the North Sudanese government is providing free education for children aged between six and 13, there are still many costs associated with education, such as the cost of uniforms, books, and examination fees, which are significant barriers to enrolment, particularly for larger families. Achieving gender equality in all aspects of life is not just a gender issue, but a development issue. Sudan is suffering from poverty, inequality and underdevelopment. The country is making progress towards development, but it is important to underline the issues which also slow down the development of a country where nearly half of the population lives in poverty, varying vastly from region to region. The main focus of this paper is education, which is one of the most significant factors that contribute to the empowerment of women. The education of women became one of the key development objectives in the 1990s. As indicated by Medel-Anonuevo (1993), it is crucial to examine the policies, programmes and projects that are formulated toward the accomplishment of this goal. Despite significant efforts of the government and other organisations, girls' participation in education has not increased significantly. Notwithstanding the importance of women in attaining economic growth and development, scant attention has been paid to the position of women and how the position of women can be improved in such a conservative society where customary laws are strong and cannot be shaped by formal institutions. Ethnic and religious groups are strong and dominant in Sudan. They devalue education, particularly when compared to the need for labour on family farms/herds, so the girls are kept out of school or not encouraged to attend (UNICEF Sudan 2014). Women in Sudan have to confront many difficulties rooted in Sudanese norms and traditions. For instance, they consider reproduction as the primary role of women, where a childless woman is regarded as a failure. The prerequisite for women to gain employment in an urban-based economy is formal education, yet, women lag far behind men in terms of school education (House 1988).

## Education System and Reform in Sudan

Sudan witnessed a series of reforms in education, but the reform of interest is the Act of 2001, which instructs the right to education for all children of eligible age without discrimination. It introduced compulsory basic education that was initially planned for 1995, guided by a UNESCO-organised symposium in Barcelona that aimed at identifying and solving the fundamental problems of Sudan. The reform took effect in 1998 (UNESCO 2018).

In Sudan, pre-schooling lasts two years for those aged four to five; it is neither compulsory nor free (World Data on Education 2011). Structural changes were introduced to the primary level, which was intended for children between the age of six to 13. The old system of 6+3+3 grades (in effect since the 1970s) was replaced by 2+8+3 to include two years of pre-school, eight years of basic stage, and three years of

secondary school, followed by three years of optional vocational high school. As can be seen in figure 1, currently the education system in Sudan includes pre-school education for two consecutive years (that is neither compulsory nor free), targeting children aged four to five years. This is followed by basic education that includes eight consecutive



years of schooling for those aged six to 13, at the end of which students sit for the basic level certificate examination that qualifies them for admission to secondary school, which offers two programmes; the first programme is three years and is about preparing the students for higher education, and the second programme is a two-year vocational training course (UNICEF Sudan 2014).

**Figure 1:** Current education system in Northern Sudan

In terms of improving the education system and participation in education, despite all the efforts, Sudan has been making progress at a very slow rate. Five main reasons are identified by UNICEF (1999) as being the main impediments to school attendance. These include difficulty of access to the schools; lack of teacher training; obtaining textbooks, learning and teaching materials; retaining teachers in the education system due to low income; timing of schools; as well as the timely distribution of the teaching material. There is still a strong need to focus on teacher policies, literacy policies and out-of-school children as well as sector-wise policy and planning (UNESCO 2018).

**Data and Identification Strategy**

This study used the women dataset from UNICEF’s Multiple Cluster Indicator Survey (UNICEF 2014b), which includes ever-married and never-married women aged between 15 and 49. The dataset provides information about the educational background of women, their position within society, family life, fertility, life satisfaction, health issues, and so forth. The data source proves a good opportunity for assessing to what

extent developing countries are able to achieve the MDGs. To obtain the results, I have appended the two datasets 2010 and 2014 MICS survey waves, which provided more observations for more accurate analysis. For the main results, I have only used the women's dataset, which contains the data collected at the women's level. For the second stage estimates, I have used the children and household datasets.

The new law was introduced in 1998 and became effective in the 1999/2000 academic year, bounding individuals born after 1993 because they would have to start primary school at the age of six and were subjected to compulsory basic schooling. This allows the implementation of birth-date-related discontinuity as an instrument for the Regression Discontinuity Design (RDD) to examine the effectiveness of the compulsory and free education law as treatment. RDD relies on analysing the effect of any policy that causes displacement of the regression line at a given point in a forcing variable, which causes differences in a treatment group that is exposed to this policy change, and a control group that is not subjected to the policy implementation. Employing RDD helps to overcome difficulties in the estimation of the impacts of education on empowerment and welfare due to unobserved factors such as the background of the family, features of the society, and women's preferences. RDD provides more robust evidence for causal inference due to its ability to provide a counterfactual for treatment and control groups (Smith 2014). As the study was using the date of birth as the instrument for discontinuity, by its nature, the set up will be fuzzy Regression Discontinuity. In fuzzy RD there may be members of the treatment group who do not receive treatment, and members of control groups who receive treatment (Jacob et al. 2012). So, in this case, some of the individuals born after July 1993 may not have received the treatment of completion of primary education, and some of the ones born before July 1993 may have completed primary education.

$$P[D_i = 1|x_i] = \begin{cases} g_0(x_i) & \text{if } x_i \geq x_0 \\ g_1(x_i) & \text{if } x_i < x_0 \end{cases}, \text{ where } g_1(x_0) \neq g_0(x_0).$$

In fuzzy RD design, it is not enough to compare the average outcomes of the people on one side of the cut-off to the other side of the cut-off. The non-compliance problem is solved by using the instrumental variables. In fuzzy RD, the reason for discontinuity becomes an instrumental variable for treatment status (Angrist and Pischke 2008, 192). The model assumes that the samples on each side of the cut-off are similar, and their treatment status differs because of the policy change.

## Estimation Framework

One of the fundamental assumptions of RDD is that the determinants of outcome variables differ across the threshold determined by the reform (Odunowo 2019). In this paper, the threshold is July 1993, which is 1123 in CMC format. The reduced form of the equation is as follows:

$$\gamma_i = \alpha + \beta t_i + f(x_i) + \epsilon_i$$

where  $\gamma_i$  is the outcomes chosen for the education output, women and children;  $\beta t_i$  is the treatment; women born on and after July 1993; and  $f(x_i)$  is the running variable, which is the birth date. A reduced form of estimation is used for the robustness checks.

The studies mentioned earlier used birth-date-related RDD as an instrument for educational attainment. The paper initially tabulates some descriptive statistics to provide an overall picture, followed by illustrating the discontinuous jumps on RDD graphs. The final phase of estimation includes non-parametric regressions for the first stage of estimation and non-parametric Instrumental Variables (IV) regressions for the second stage of estimation. Lee and Lemieux (2010) suggest that parametric estimations may lead to biased estimations, but the non-parametric estimations cannot substitute the parametric estimation; so parametric, non-parametric and graphical representation must be used together for a sound RD Design so that the parametric and reduced form of estimations are conducted for robustness checks.

The paper employs fuzzy RD design where some observations in the treatment group may not receive treatment, and some observations in the control group may receive the treatment, that is, the completion of primary education (Jacob et al. 2012). Hence, the running variable (date of birth) only determines the probability of receiving the treatment, as represented in the equation. This design leads to an instrumental variables set-up. It can be estimated by using the two-stage least squares and the reason for discontinuity becomes an instrumental variable for treatment status (Angrist and Pischke 2008, 189). The first stage includes regressing the outcome variable, which is expected to directly be influenced by the policy change that is the reason for discontinuity, and will then become the instrument for the second stage such as participation in education, completion of primary education, and literacy rates.

$$Y_i = \beta_0 + \beta_1 X_{ei} + \beta_2 W_s + u_s$$

$$X_i = \pi_0 + \pi_1 Z_i + \pi_2 W_i + v_i$$

- $Y_i$  is the education outcome
- $\beta_1 X_{ei}$  is the sample born on and after July 1993
- $\beta_2 W_s$  is the birth date
- $Z_i$  is the completion of primary education

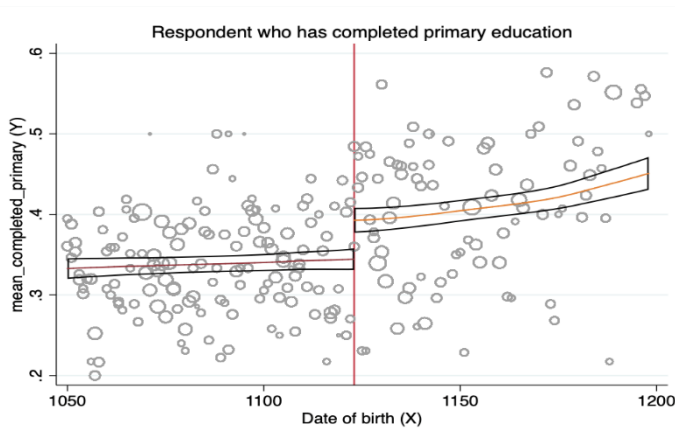
## Results

In this section, for the first stage estimates, I look at the effect of the reform on women's educational attainment, the completion of primary education, if participation in education has increased, and the illiteracy rate among women. The first stage analysis is followed by the second stage estimates, which explore if increased years of education as a result of the reform resulted in better welfare outcomes for women and children.

Yaylali

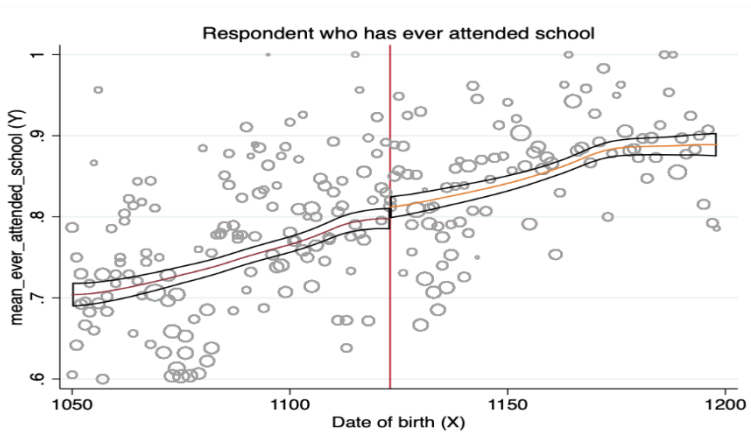
### The Effect of Compulsory Education Reform on Women’s Education

Panel B shows that approximately 33% of women complete primary education. Figure 2 shows a discontinuous jump at the cut-off, confirming that the policy change increased completion rates among women. The policy was thus successful at addressing the drop-out issue. The drop-out issue is worth dwelling on because it is classified as a “burning issue” (Obiakor 2010) as it has been one of the main concerns of educators, schools and government agencies. Mike (2008) highlights that low completion rate is a difficult problem to address because it is a composition of factors such as early marriage, the opportunity cost of education, considering education as a waste of money, and parental education.



**Figure 2:** Respondent who has completed primary education

Panel B shows that participation in education (ever attended school) is almost 68% but figure 3 does not illustrate any discontinuous jump, meaning that the policy was not effective in promoting participation in education, which limits the effect of this policy on the second stage outcomes.



**Figure 3:** Respondent who has ever attended school

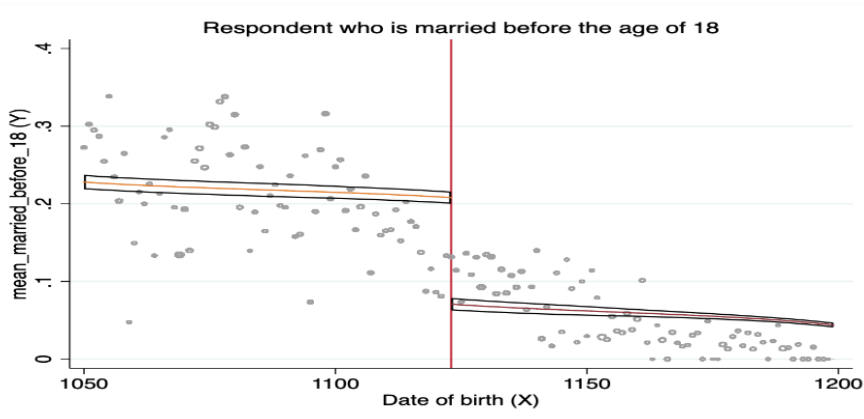
Illiteracy among women is 61%, which means that 61% of the respondents of the survey cannot read at all. Despite the negative jump at the cut-off in figure 4, showing a decrease in illiteracy among women bound by the policy, this is not a significant decrease, probably caused by increased years of education. The regressions on Panel G show that the women bounded by the new compulsory education policy are almost 9% more likely to complete primary education, while the coefficients for participation in education and illiteracy do not present any significant results, despite the positive and negative coefficients respectively.



**Figure 4:** Respondent who cannot read at all

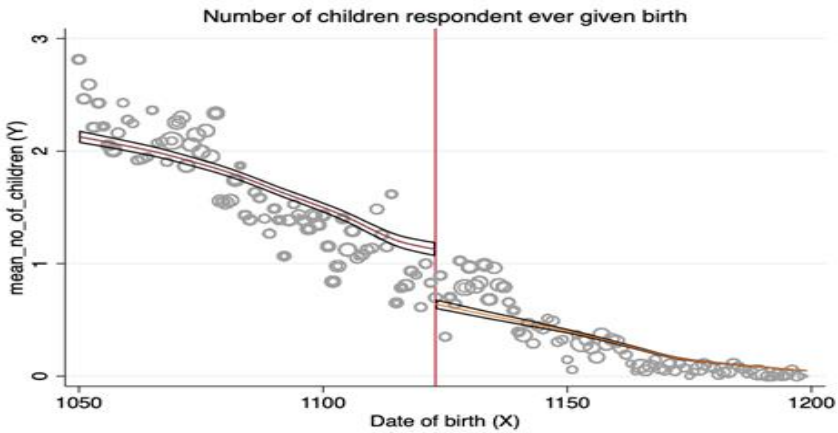
### The Effects of Increased Years of Schooling on Women’s Welfare

The longer the girl stays in education, the less likely she is to get married before the age of 18. Panel A shows that the average age of marriage for women in Sudan is 18, and that 27% of women are likely to get married before the age of 18. Figure 5 shows the negative discontinuous jump, indicating that the women exposed to the compulsory education policy are less likely to get married before the age of 18. On Panel H, which shows the fuzzy IV estimates, it can be seen that the women who completed primary education are 40% less likely to get married before the age of 18.

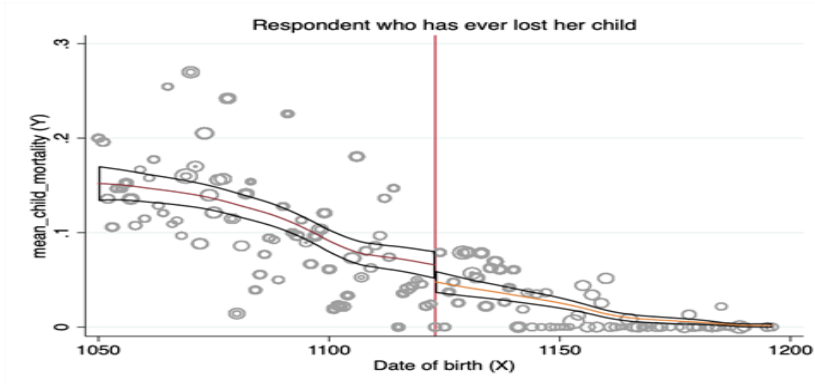


**Figure 5:** Respondent who is married before the age of 18

MGD 5 lays down the improvement of maternal health as a condition. High fertility rate and frequent births (like giving births at short intervals), and every year 600 000 maternal deaths occur—most of them taking place in developing countries, which highlights the importance of family planning (Ali et al. 2011). Ali et al. (2011) used a community-based cross-sectional survey to study family planning in Eastern Sudan. Maternal mortality rates are very high in Sudan, and their findings suggest that couples who acquire eight or more years of education are more likely to use family planning methods. Panel C indicates the high fertility rates among the women with an average of four children; 26% of the women have lost at least one child, which is a high rate indicating low maternal health. The regression results on Panel H indicate that the policy has not had any impact on changing the fertility and mortality rates; therefore, the negative discontinuous jump in figure 5 can be interpreted as an interruption of a trend.



**Figure 6:** Number of children respondent ever gave birth to

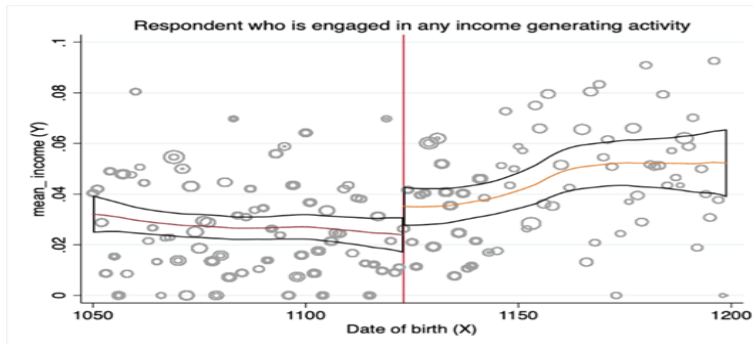


**Figure 7:** Respondent who has ever lost her child



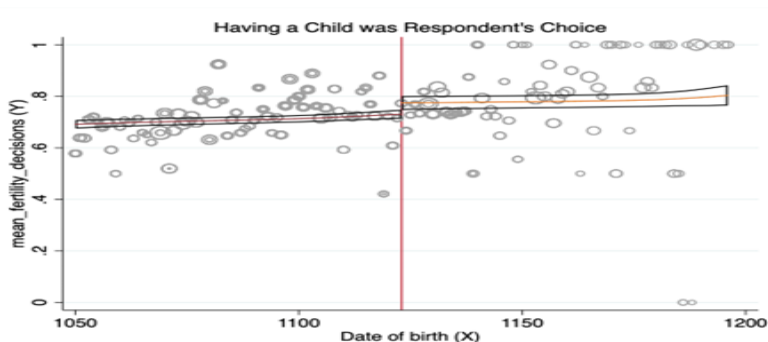
## The Effects of Increased Years of Schooling on Women's Empowerment

This is in line with the definition of economic empowerment, which implies increased access to economic resources, being able to earn an income, and significantly increasing economic empowerment. As summary statistics suggest, only 6% of the women are engaged in an income-generating activity. Being subjected to increased years of schooling, women may have come to realise that working is the most important way of dealing with the poverty that Sudanese people have been experiencing. Figure 8 shows the small discontinuous jump, which indicates that the participation of women in the labour force has been increased by the policy implementation.



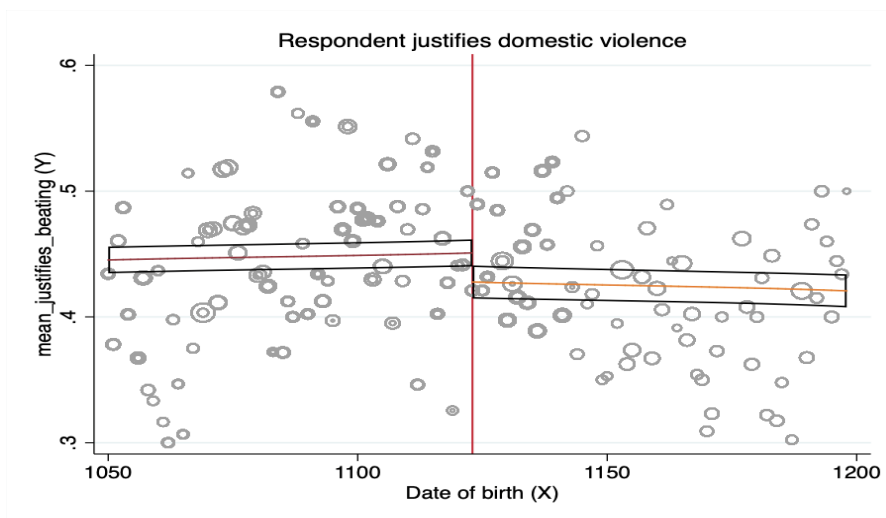
**Figure 8:** Respondent who is engaged in any income-generating activity

The variable that is used as a proxy for women's decision-making power is the fertility choice, which assesses whether having a child was the women's or husbands'/partners' decision. Decision-making power is an important indicator of empowerment. Educated women are more likely to have power over having a child or not, rather than their husbands/family or society. However, today women still bear the role constructed around being a wife and mother. Appendix 1, Panel D shows that 48% of the women who have ever had kids reported that this was their own decision. The policy seems to empower women in terms of fertility decisions due to the positive coefficient, yet the positive jump in figure 9 is not significant. This may be because the dominant norms, which consider motherhood as the primary responsibility of the woman, have not been challenged by this education policy.



**Figure 9:** Having a child was respondent's choice

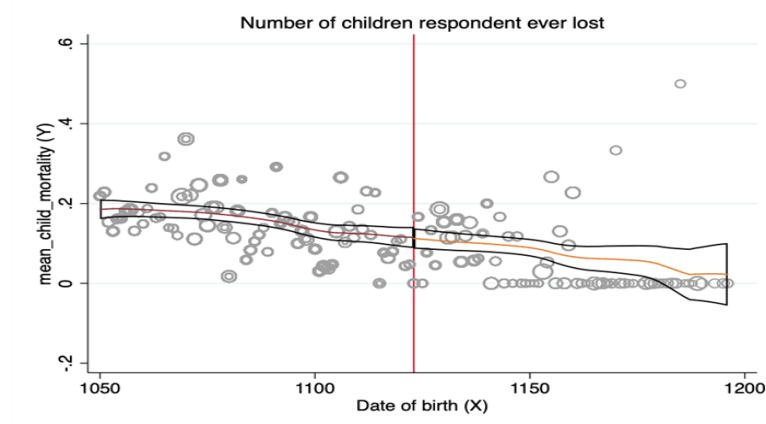
Another variable of interest in assessing women's empowerment is whether they justify being beaten for any of the reasons, such as arguing with their husbands, neglecting children, going out without permission, burning the food, or refusing to have sex. Appendix 1, Panel G shows that 38% of women justified domestic violence for at least one of the reasons stated above. Educated women should not agree with domestic violence as they are better aware of their rights, yet, this policy which encouraged completion of primary education, managed to keep some girls in school longer, but failed to change the attitudes of women toward domestic violence. As seen in figure 10, there is a discontinuous jump at the border; hence the regression results on Panel H show a negative coefficient. Despite the negative coefficient, the regression results on Panel H do not present any significant results despite the negative coefficient indicating less tolerance of women with increased years of education.



**Figure 10:** Respondent justifies domestic violence

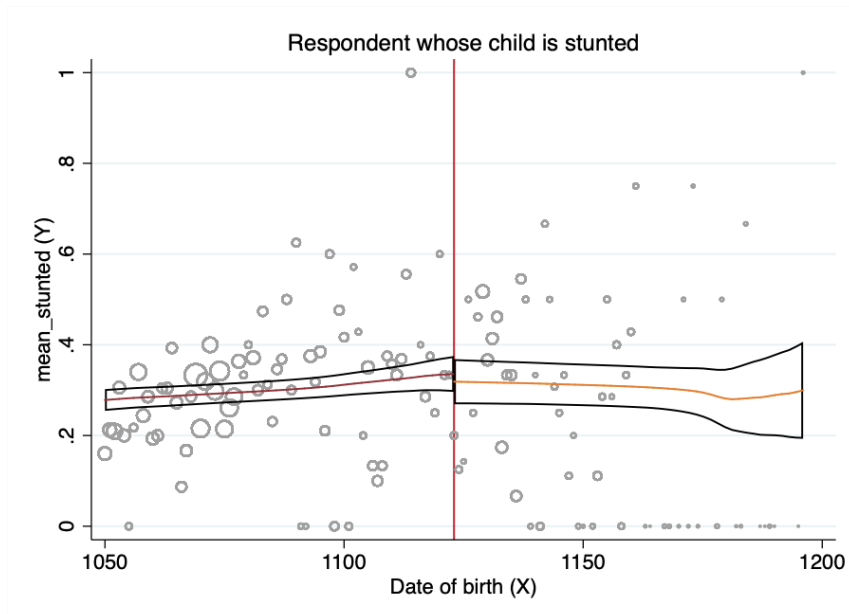
## The Effects of increased Years of Schooling on Children's Well-being

Maternal education is an important determinant of children's well-being. Farah and Preston (1982) conducted a comparative study and investigated the regional variations in Sudan. Their results show that education has a strong and persistent impact on reducing child mortality, and their model implies that achieving 10 years of schooling reduces child mortality by 36%. According to World Bank Data (2018) the mortality rate for children under age five in Sudan is almost 60%. This paper used the number of children who had died as a proxy for child mortality, and Panel H shows that this rate is almost 50%. The education reform did not have a positive effect in reducing child mortality rates, as there is not a discontinuous jump in figure 10 and regression results also do not provide any significant coefficient.



**Figure 11:** Number of children respondent ever lost

Low birthweight is an indicator of a public health problem caused by maternal malnutrition or poor healthcare during pregnancy. Just like in most developing and underdeveloped countries, low birthweight is common in Sudan. The WHO defines low birthweight if the weight at birth is less than 2500 grams. The occurrence of low birthweight is 14% in Sudan, and the mothers' increased years of schooling seem to be of limited effect. Stunting should be effectively addressed in Sudan, where the child mortality rate is high, as stunting problems put children at a greater risk of death. Stunting is a persistent problem in Sudan. Panel F shows a 36% prevalence in stunting among children aged between 0 and five. The measure of stunting is the height-for-age ratio, and when this ratio is below -2 standard deviations or a z-score of less than -2. Unfortunately, the paper does not find any evidence that the education policy has reduced the prevalence of stunting among Sudanese children, neither as indicated by figure 12 nor by the regression analysis.



**Figure 12:** Respondent whose child is stunted

## Discussion and Conclusion

The reason why the education policy in Sudan has not led to improved outcomes, can be the result of failure to encourage participation in education. The poverty rate in Sudan is high and differs substantially between urban and rural regions. Urban regions are wealthier, but 26.5% of the population lives below the poverty line. In the rural areas, 57.6% of the population lives below poverty. These regional disparities are the strongest predictor of participation in education due to poverty. Moreover, most of the people live in rural regions, but the schools are located in urban areas (IMF 2013). Long travel distances to schools in rural areas are one of the most prominent factors that hinder girls' access to education (World Bank 2012). The inability of parents to afford the fees also impedes participation in education. Although education is free in Sudan, there are costs associated with going to school, such as uniforms, textbooks and stationery. Besides, government spending on primary education is particularly low in Sudan, which means that households have to contribute to schools' maintenance, water and electricity and payments of teachers; these costs may vary between 12 to 15 Sudanese pounds (SDG) per student. Currently, however, the government is investing in building schools. Between 2008–2009 the number of schools increased to 16 290, but in 2004–2005 (shortly after the introduction of the compulsory schooling academic year) the number of primary schools was only 13 125 (Demombynes 2011). Just like many other sub-Saharan countries and countries of conflict, Sudan also has a high instance of child labour. This number dramatically varies across the states; 49.4% of children are engaged in child labour in East Darfur, while 11.2% are engaged in River Nile. In total, UNICEF Sudan (2015) reports that a quarter of children are missing out on education due to child labour.

Education reform in Sudan has successfully addressed the drop-out issue, which is highly complex as it occurs after the children have gained access to education; however, its effectiveness on the well-being of women and children is limited. This may be because the government still needs to address existing issues that hinder participation in education. In Sudan, most of the people live in rural areas, and the schools are located in urban areas, so more investment is required in providing access to schools, free textbooks and uniforms. This, along with complementary policies such as the marriage law and prohibition of child labour, can increase participation in education. It may even increase completion rates and lead to better empowerment outcomes, such as more engagement in income-generating activities and a drop in the marriage rate before the age of 18. This indicates that with more focus on education policies and the provision of adequate infrastructure, better development outcomes can be attained. Development policies may remain ineffective in countries like Sudan, where customary laws are dominant, and gender roles are determined by the norms. There is a role for non-governmental organisations to play in such cases. They can provide training that opens new doors for women to participate in employment because the development policies require the norms and traditions to be challenged.

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## Appendices

<b>Appendix 1: Summary Statistics</b>			
<b>Panel A: Age &amp; Marriage</b>			
	<b>Mean</b>	<b>S.d.</b>	<b>Obs</b>
Age of the Respondent	28.397	9.100	35,476
Ever Married	0.708	0.455	35,476
Never Married	0.292	0.455	35,476
Age at marriage	18.475	4.707	25,119
<b>Panel B: Education</b>			
Illiterate	0.609	0.488	25,165
Ever Attended School	0.678	0.467	35,476
Completed Primary	0.325	0.469	35,476
<b>Panel C: Welfare</b>			
Ever Lost a Child	0.269	0.444	22,541
Number of Children Born	4.406	2.677	22,540
Married before the age of 18	0.271	0.445	29,141
<b>Panel D: Empowerment</b>			
Respondent earns income	0.064	0.245	20,327
Having a child was her own decisions	0.479	0.500	22,541
Justifies Beating	0.386	0.487	38,941
<b>Panel F: Child's Health</b>			
Smaller size than av. At birth	0.205	0.404	5,684
Stunting	0.330	0.470	25,775
Number of Children Died	0.437	0.894	22,540

<b>Appendix 2: Regression Results</b>							
<b>Local Linear Approach</b>							
<b>Panel G: First Stage Sharp RD Estimates</b>							
Indicator	Treatment	s.e.	N	N left	N right	h left	h right
Completed Primary	.087 ***	0.021	35476	3053	2900	28.812	28.812
Ever Attended School	0.019	0.029	35476	1747	2225	17.108	17.108
Illiterate	-0.030	0.051	25165	1547	1814	24.622	24.622
<b>Panel H: Second Stage Fuzzy RD Estimates</b>							
Indicator	Treatment	s.e.	N	N left	N right	h left	h right
<b>Women's Welfare</b>							
Married before the age of 18	-476**	0.175	35476	1956	2377	18.794	18.794
Number of Children Born	-0.241	0.974	22541	1081	1430	19.068	19.068
Ever Lost a Child	0.1999	0.33955	22541	1091	817	33.824	33.824
<b>Women's Empowerment</b>							
Respondent earns income	0.421*	0.17535	9,687	1008	1512	21.038	21.038
Justifies Domestic Violence	-0.074	0.299	35476	2487	2690	23.897	23.897
Fertility Decisions	1.036	0.966	22541	959	736	29.042	29.042
<b>Children's Welfare</b>							
Smaller size than av. at birth	0.245	0.376	5684	355	471	20.927	20.927
Mortality	0.347	0.464	22540	1033	789	31.200	31.200
Stunting	-0.12419	0.3467	23622	2016	1926	28.233	28.233

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001. Standard errors are clustered according to the running variable.