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ORIGINAL PAPER

Education, marriage, and banning female genital cutting: evidence from Benin

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Abstract

Using the 2003 ban of female genital cutting in Benin as a natural experiment, I estimate the effect of the ban on women's human capital accumulation. The ban decreases the likelihood of a woman undergoing genital cutting despite inconsistent enforcement. Banning female genital cutting has a counter-intuitive effect on women's education. A difference-in-differences estimation indicates that the ban decreases women's years of education, the probability of completing primary school, and the probability of starting secondary school. I show that the decrease in educational outcomes is accompanied by an increase in marriage and increased spousal match quality. The negative effect on women's education dissipates following the implementation of free primary education in Benin.

Keywords Female genital cutting · Education · Marriage · Free primary education · Benin · Sustainable development goals

JEL Classification I15 · I25 · J12 · O12 · I18

1 Introduction

Over 200 million women and girls alive today have undergone female genital cutting (FGC) in Africa, Asia, and the Middle East (World Health Organization 2024). This practice is a violation of the human rights of women, and as a result in 2012, the United Nations General Assembly called on the international community to increase efforts to end FGC (United Nations Children's Fund 2016). The fifth sustainable development goal of the United Nations aims to eliminate all harmful practices by 2030, which includes FGC (United Nations Children's Fund 2016). FGC is seen as

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marriageability preparation because it is believed to show a woman's faithfulness to her future husband. Some elders erroneously believe FGC has health benefits for young women even though the World Health Organization explicitly states there are no positive health externalities resulting from the practice. FGC's negative health effects include bleeding, urinary tract and vaginal issues, cysts, and problems during child birth, such as increased risk of death for newborn children and birth complications for the mother (World Health Organization 2024). The costs associated with treating FGC-related health complications are approximately $1.4 billion annually across the 27 nations with the highest prevalence of the practice (World Health Organization 2024).

Over the past few decades, governments have passed legislation banning the practice of FGC. Understanding the short-run and long-run impacts of the ban is critical to inform public policy in an effort to improve the lives and well-being of women. While FGC bans can avoid the health complications, what happens to other human capital investments? A legal ban could have several effects on educational attainment. In Benin, a girl begins to undergo genital cutting at age nine. If health complications or child marriage follow this event, a girl might stop her education. A ban could then increase schooling. However, if being cut has value in the marriage market, then an FGC ban may lead families to send girls into the marriage market at a younger age to make up for the loss in marriage market value resulting from not being cut.

I use a 2003 law in Benin banning the practice of FGC as a natural experiment to estimate the effect of anti-FGC legislation on women's education. I rely on the 2011–12 and 2017–18 rounds of the Demographic and Health Survey data (2012; 2018) from Benin to estimate these effects. Using a difference-in-differences identification strategy, I find that banning FGC has a counter-intuitive negative effect on education.[1] To estimate this effect, I compare cohorts "affected" by the ban vs those "unaffected" as defined by age, ethnic group, and department.[2] I exploit this ethnicity-department and time variation to show the law leads to a decrease in a women's education by 0.34 years on average, which is an 11 percent decrease in years of education. Women are 5.3 percentage points less likely to complete primary school and 6.9 points less likely to start secondary school as a result of the FGC ban. Additionally, I present evidence that the pure existence and exposure to a law banning FGC lowers the prevalence of the practice, regardless of enforcement. One concern that arises is the potential misreporting of FGC status due to the FGC ban. Women may not report whether they have undergone the practice because it was illegal at the time of the survey. I show misreporting is not a concern as the probability of reporting FGC status is invariant to treatment.

I explore the mechanism through which the educational decrease takes place. The decrease is accompanied by earlier marriage in the marriage market. I show that the age gap between a husband and wife decreases by 0.6 years. The value of

[1] A similar line of reasoning with respect to a ban on child labor was shown in Dessy and Pallage (2005).

[2] Benin is geographically divided into 12 administrative units known as departments.

youth compensates for not being cut in the marriage market, which is shown by the increase in the quality of marriage matches resulting from the FGC ban. Women are less likely to be emotionally and physically abused by their husbands and are more likely to be able to ask their husbands to use a condom and decline having sex with their spouse. These factors contribute to the better match and marriage quality for women in the marriage market.

In 2003, when the anti-FGC legislation was passed in Benin, primary school was not free. The Beninese Government provided free primary education beginning in 2006 by eliminating tuition and fees in all public schools. I examine the impact of the combination of the FGC ban and free primary education in Benin on women's educational attainment. The negative impact of the FGC ban on education was overcome following the implementation of free primary education in Benin. Women's educational attainment increased as a result of free primary education after the decrease in educational attainment caused by the FGC ban. Women received more education, were less likely to never attend school, but were neither more likely to complete primary school nor start secondary school. This is similar to the impact of the FGC ban on education in Senegal, where free primary education was introduced prior to the FGC ban (García-Hombrados and Salgado 2023).

This paper contributes to the literature on FGC and its prevalence. The prevalence of FGC can be attributed to household factors, individual factors, community factors, weather shocks, anti-FGC legislation, and both historical and modern Western institutions (Becker 2019; Bellemare et al. 2015; Boyle et al. 2002; Congdon Fors et al. 2024; Corno et al. 2021; Engelsma et al. 2020; Novak 2020; McGavock and Novak 2023), and beliefs that FGC is necessary to control female sexuality and generate morally acceptable behavior (Jirovsky 2010; Shell-Duncan et al. 2017). There are mixed results on the effectiveness of legal bans. Some researchers find that anti-FGC legislation is unsuccessful due to bans being implemented without input from communities practicing FGC (Boyle and Corl 2010; Boyle and Preves 2000; McChesney 2015; Muzima 2016; Winterbottom et al. 2009). Mesplé-Somps (2022) shows that there are issues with anti-FGC information campaigns and legal bans. Other authors have concluded that FGC bans, intermediate alternatives, and intergroup collaboration are effective in reducing the prevalence of the practice (García-Hombrados and Salgado 2023; Gulesci et al. 2025; Khalifa 2023; Mackie 2000). Implementing a legal ban on FGC requires substantial state capacity for compliance and enforcement (Akbar and Ostermann 2015; Hendrix 2010; Meroka-Mutua et al. 2021; Weber 2009). However, some bans have unintended consequences, such as girls being cut at an earlier age and in secret (Camilotti 2015). In light of the mixed record, more evidence is needed. This paper shows that a legal ban can be effective in decreasing the prevalence of FGC in states with limited state capacity and weak legal enforcement.

This study is closely related to the literature on FGC and its impact on education and the marriage market. Women who are cut tend to drop out of school early and thus have less education (Kipkulei et al. 2012; Ondiek 2010). However, education can be an effective way to end the practice of FGC and increase educational attainment for women (García-Hombrados and Salgado 2023; Ondiek 2010; Rawat 2017). In settings where education is not valued or free, anti-FGC legislation may need to

be paired with incentives to keep girls in school. Cash transfers, education subsidies, and free primary education have increased educational outcomes for women and reduced pregnancy and marriage rates (Benhassine et al. 2015; Duflo et al. 2015; Lucas and Mbiti 2012a) but did not close educational gender gaps (Lucas and Mbiti 2012b). In the marriage market, women who are cut have a higher bride price and better marriage market outcomes, which could entice parents to cut their daughters (Ashraf et al. 2020; Boyden et al. 2013; Karumbi et al. 2017; Khalifa 2023; Wagner 2015). This paper shows that the FGC ban led to decreases in education for women, which was accompanied by earlier marriage and better marriage match quality.[3] Additionally, the negative educational effects of the ban dissipated following the implementation of free primary education.

The rest of the paper is structured as follows. Section 2 provides background on FGC and education in Benin. Section 3 discusses the Demographic and Health Survey data, and Section 4 explains the difference-in-differences empirical strategy. Section 5 presents the main results of the paper. Section 6 concludes the paper.

2 Women's status in Benin

2.1 Female genital cutting (FGC)

Certain ethnic groups in Benin believe FGC is good for the health of women and is a ritual that prepares older girls to be married (United States Department of State 2001). FGC is seen as a gateway to adulthood for older girls and shows one's faithfulness to their future husband by preventing premarital sexual intercourse (Mackie 1996; United States Department of State 2001). In 1992, approximately 30% of women in Benin had undergone FGC, but the World Health Organization stated the number may be as high as 50% due to under-reporting (World Health Organization 2024). The 2011 Benin Demographic and Health Survey data show, on average, about 12% of women have been cut.

There are four types of FGC performed in different areas of the world. Type II is performed in Benin (Nour 2008; 28TooMany and The Orchid Project 2021). This type of FGC is referred to as excision, in which the clitoris is removed with part or all of the labia minora. This procedure is generally done without the use of anesthesia and can cause major health problems requiring further surgery. The age at which a girl undergoes FGC can vary by location, ethnic group, and religion (28TooMany and The Orchid Project 2018, 2021; United States Department of State 2001). Some believe FGC originated as a religious practice; however, the practice dates back prior to Christianity and Islam and is not required by either religion (Boyle et al. 2002). Christian missionaries in Africa have historically tried to eliminate the practice. Despite their efforts, Christians in parts of Africa still undergo the procedure. Muslim religious officials concur that FGC is neither required nor prohibited by Islam, and it is not mentioned in the Quran.

[3] See Jelnov (2022) for a review on age at marriage and its relationship to economic development.

The FGC procedure can cost up to 500,000 West African CFA francs, which is between 800 and 1,000 United States dollars, and many families will go into debt to have their daughters cut (United States Department of State 2001). Either a member of the family or a traditional birth attendant conducts the procedure (28TooMany and The Orchid Project 2018, 2021; United States Department of State 2001). In 2001, the government of Benin contacted local health officials to discuss and disseminate information about the harmful effects of FGC; however, there was no law to prevent the practice. In 2003, the National Assembly of Benin passed a law banning the procedure entirely. Penalty for failing to report FGC under the law was a fine ranging from 50,000 to 100,000 francs (Ras-Work 2009). Assisting or performing the procedure would result in imprisonment for a maximum of five years (Ras-Work 2009). If the procedure resulted in the death of a girl, the people who assisted and performed FGC would be subject to five to twenty-five years of forced labor (Ras-Work 2009). Even with these penalties in place, there has only been one documented case of the laws being enforced (Ras-Work 2009).

2.2 Education

Education in Benin has undergone many reforms since the fall of the communist government in the late 1980s (Midling et al. 2005). The structure of the Beninese education system begins with six years of primary education, four years of junior high, three years of senior high school, three years of undergraduate education, and four years to complete a master's degree. To move on from junior high school to senior high school, students are required to take the O-Level exam or *Brevet d'Etudes du Premier Cycle*. To complete senior high school, students must pass the A-level exam or *Baccalauréat*. Prior to 2006, families had to pay for their children to attend school, meaning wealthier and higher educated parents were more likely to send their children to school. Benin's GDP per capita was $994.60 in 2007, and primary education cost approximately $20 annually; however, this does not account for other out-of-pocket costs such as school supplies, teacher salaries, and school maintenance. In 1996, the gender gap in primary school enrollment was 32.7 percentage points; after many programs and reforms in Benin, the net admissions rate difference between boys and girls was only 4 percentage points in 2015 (United Nations Children's Fund 2015). Education levels in Benin have steadily increased since the late 1980s, when the communist government was replaced. Boys born in 1993 or earlier receive 4.7 years of education on average, whereas girls receive 3 years of education. In 2006, the Government of Benin introduced free primary education nationwide by eliminating tuition payments for all public schools.

2.3 Channels through which less FGC could affect education outcomes

The effect of an FGC ban on a woman's education is ambiguous *ex-ante* and can have direct or indirect effects on educational outcomes. The direct effect of the FGC ban on education is through improved health. If women are no longer being cut, they will not have the associated adverse health effects, allowing them to stay in school

to obtain more education. The indirect effect of the ban could work through the marriage market in one of two ways. The first avenue is through delayed marriage. Since FGC is valued in the marriage market (Chesnokova and Vaithianathan 2010; Gibson et al. 2023; Khalifa 2023; Ouedraogo and Koissy-Kpein 2012), not being cut could lead to a reduction in marriageability and therefore delayed marriage. Getting married later may then allow for longer time in school. The second marriage avenue through which an FGC ban affects education is earlier marriage. If FGC can no longer be a signal of virtue, women might get married at even younger ages to compensate. Earlier marriage could lead to dropping out of school and thus decrease the education a woman would receive. This early marriage pathway would work against the mechanisms raising education mentioned above. I will examine through which of these pathways banning FGC has affected education for women in Benin.

3 Data: Demographic and Health Surveys

I use 2011 and 2017 Demographic and Health Survey (DHS) data from Benin, accessed through IPUMS (Boyle et al. 2024). The data used is from large, nationally representative surveys answered by women aged 15 through 49 in each household surveyed. I use 14,633 women from the 2011 survey and 14,780 women from the 2017 survey. All of these women in this study were born in 1970 or later. For the analysis, I pool the 2011 and 2017 samples. The questions about a woman's FGC status are only asked in the 2011 round of the DHS. Thus, all of the analysis done with the prevalence of FGC only uses the 2011 survey. Looking at the intensity of FGC by Beninese Department, on average approximately 12% of individuals in the data have undergone genital cutting. The Borgou Department has the highest incidence rate of FGC; over 47% of women have undergone the procedure. On the other end, the Kouffo Department had no reported cases of FGC.

The Bariba and Peulh ethnic groups practice FGC at a younger age than the other ethnic groups in Benin, as shown in Appendix Figure A.1. Girls in the Bariba and Peulh ethnic groups begin to undergo FGC at age nine on average, whereas girls in other ethnic groups undergo FGC beginning around age ten. Therefore, most girls face FGC beginning at age nine. I will define birth cohorts that are most impacted by the FGC ban as those who are less than nine (cohorts born after 1994) at the time of the law (2003).

Appendix Figure A.4 shows the prevalence of FGC by birth cohort. The prevalence of FGC is declining over time, and after the 1994 birth cohort (cohorts affected by the FGC ban) less than 5% of women were cut. The 1997 cohort has a 0% prevalence in the DHS. This is likely due to the small sample size of the 1997 cohort. This cohort only has 21 individuals compared to between 300 and 400 for the 1994 through 1996 birth cohorts. Using the Multiple Indicator Cluster Survey (MICS) from Benin in 2014, I can examine FGC status for women born between 2000 and 2014. The prevalence of FGC for women born in 2000 was 1.6% and in 2003 it was 0.8%. Since there is a decline over time (Appendix Figure A.4), the true FGC prevalence for the 1997 birth cohort is likely between 2.8% (1996 cohort in the

DHS) and 1.6% (2000 cohort from the MICS). I address differential non-reporting in Sect. 5.1.

The principal education outcome variables are years of education, completed primary school, and started secondary school. Years of education, taken from the DHS, is measured in full years of education starting from 0 years until 21 years. "Completed Primary School" is an indicator variable equal to one if a woman completed sixth grade. "Started Secondary School" is also an indicator variable that equals one if a woman began seventh grade. "Completed Primary School" and "Started Secondary School" are constructed based on the highest educational attainment level measured in the DHS.

The average years of education of a woman in Benin is approximately 3.01 years, which indicates the average woman is not completing her 6 year long primary education. There could be other compounding factors for why women are not attending school such as the necessity to work inside of the home, the proximity to the nearest school, or marital practices of the ethnic groups. Wealth could also be a reason why women were not attending school, especially because primary school was not a free public good until 2007 in Benin. One can see the average age of a woman's first birth is almost 20 years old, so birthing children should not impact primary or secondary education levels unless an individual begins her education later in life. Childbearing could lower the years of education if an individual is pursuing higher education, however. One last issue is that at the time of the survey; the younger women might not have completed their education. Those who were 15 years old might still have been in secondary school and possibly pursue higher education. However, I expect the decision to complete primary school (or not) and attend secondary school would have been made by age 15. In my sample, all of the women have completed their primary and/or started their secondary education by the time of the survey.

Women are, on average, almost 8 years younger than their husbands, who also have approximately 5.6 years more education. Over 85% of women have been physically abused by their husbands, and close to 90% have been humiliated or threatened by their husbands. Despite the physical and emotional abuse, around 80% of women are able to refuse to have sex with their husbands and ask their husbands to use a condom during sexual intercourse. The main proxies for marriage quality are in Appendix Table A.7. The majority of these variables are indicator variables or indices; the variables describing the husband's demographic information are discrete variables. Many factors can affect the education of women and their marriage matches, including religion and age. These variables are thus included in the list of control variables in the regressions in Sect. 5. Appendix Table A.1 shows the summary statistics for observable variables.

4 Empirical strategy: comparing affected cohorts across ethnicity-department groups

I examine the effect of anti-FGC legislation on educational outcomes for women. The innate problem in estimating the effects of banning FGC on years of education is determining the direction of causality and the effect of unobservable cultural and geographic

factors. Being cut is not the decision of the girl, but rather her parents, and the girl's education would not impact her FGC status. Thus, one should not be concerned about reverse causality. Ethnic group and department traditions and culture also affect the rate of FGC, and there is significant pre-ban variation in FGC across ethnicity-department groups. To address these challenges, I include fixed effects for each ethnicity-department group in the model described below. I define cohorts exposed to the ban as those who had not yet attained age nine by 2003. I conduct a comparison between ethnicity-department groups more and less affected by the ban. I define affected by the law as those ethnicity-department groups with a prevalence of FGC that is higher than the average, 10.6 percent, in Benin. "Affected" is defined in this way because FGC practices are closely tied to ethnic and local identities with little variation at subnational levels determined by ethnicity and geography (Becker 2019; Corno et al. 2021; Shell-Duncan and Hernlund 2000; McGavock and Novak 2023). The DHS data in Appendix Table A.3 shows the prevalence of FGC by ethnicity-department group.

I use a standard difference-in-differences specification to identify the effect of the ban on the practice of FGC:

$$y_{ijrt} = \beta_0 + \beta_1 Post_t \times Affected_{jr} + \delta_{jr} + \delta_t + X_{ijrt}\prime\Gamma + \varepsilon_{ijrt} \quad (1)$$

where y_{ijrt} is the selected outcome of person i in ethnic group j living in department r who was born in year t. $Post_t$ is an indicator variable equal to 1 if a woman was born after 1994, because they would be less than nine years old at the time of the FGC ban. The post-period contains individuals born after 1994 through 1997 for the analysis of the prevalence of FGC and women born after 1994 through 2003 for the education analysis. $Affected_{jr}$ which is an indicator equal to 1 if an individual i in ethnic group j living in department r with an above average prevalence of genital cutting. These ethnic-department groups are more affected by the ban as they have a high exposure to FGC. δ_{jr} are ethnicity-department fixed effects. δ_t are birth year fixed effects, which is used instead of $Post_t$ to account for other events that occurred over time in Benin which would also affect the outcome variables, such as regime changes, strikes, and changing political ideologies. $X_{ijrt}\prime$ is a vector of covariates including religion and age dummies. Robust standard errors are clustered at the ethnicity-birth year level, following García-Hombrados and Salgado (2023). The coefficient of interest is β_1 which captures the intent to treat effect of the law.

4.1 Identification assumptions

The difference-in-differences identification strategy requires certain assumptions for the model to show causality between the banning of FGC and educational outcomes. First, there should not be concurrent programs that would differentially affect education levels across ethnicity-department groups and across cohorts in Benin. Secondly, identification relies on parallel trends between the education of women in affected and unaffected ethnic groups before 1994.

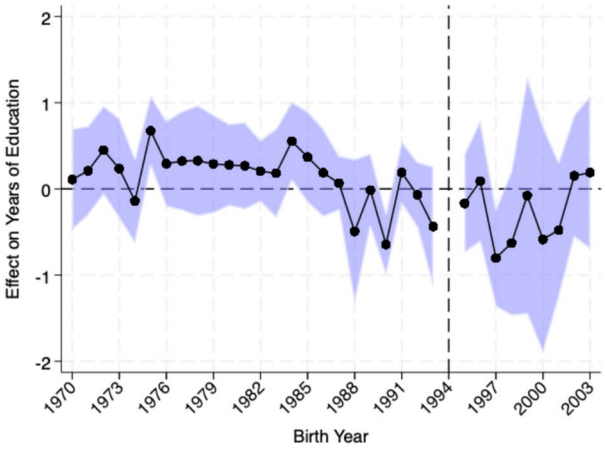
Several education reforms were undertaken in Benin including the United States Agency for International Development (USAID) funded new study program (NPE)

and the Benin Education Project III. The NPE developed new textbooks in addition to teaching materials and teacher training programs (Midling et al. 2005). The Education Project III provided teaching aids, textbooks, and teacher handbooks to schools while constructing new and renovating existing laboratories and hiring new science teachers with the goal of improving the quality of primary education; improving science education at the secondary level; developing agricultural, technological, and industrial education; and promoting women's education (Bayemi et al. 2011). Due to the education reforms in the 1990s, primary school enrollment increased from 418,000 students in 1990 to 1.3 million enrolled students in 2004 (Midling et al. 2005). These programs were implemented across the entire nation and available to every student in Benin. Thus the estimated effect will not be biased due to these programs because the programs' effects are captured by the inclusion of the birth year fixed effects, δ_t.

In 2004, Benin adopted legislation outlawing new polygamous relationships. Polygamous relationships already recognized by the government at the time of the law would continue to be recognized. This could impact my analysis if there is variation in polygamy in ethnic groups. The data shows there is not much variation in polygamy across ethnic groups. The *Adja* and *Yoruba* groups have polygamy rates of 60 and 61 percent, respectively, and the other six ethnic groups have rates between 54 and 56 percent. In the analysis, 51.6% of women in affected ethnicity-department groups are in polygamous relationships compared to 49.6% in unaffected ethnicity-department groups. While polygamy does not vary much across ethnicity-department groups, the polygamy law would apply to both the affected and unaffected groups. The impact from the FGC ban would not be biased due to the polygamy ban. The effect of the anti-polygamy law is captured by the inclusion of the birth year fixed effects, δ_t, in the analysis.

Another assumption necessary to a difference-in-difference empirical strategy is the parallel trends assumption. Figure 1 is the event study for educational outcomes. I conduct a joint-F test to determine whether the pre-FGC ban estimates are zero for the three education variables. For years of education, the joint F-statistic is 0.89 (p-value 0.62); for completing primary school and starting secondary school, the F-statistics are 1.09 (p-value 0.36) and 1.34 (p-value 0.14), respectively. None of the joint F-statistics are significant, which shows the pre-FGC ban estimates are statistically equal to zero. The event studies along with the joint F-tests provide evidence that the parallel trends assumption holds for the education outcomes. For years of education, the effect of the ban was zero for those born before the ban took effect and was significantly negative for cohorts born right after the ban. The same is true for completing primary school and starting secondary school.

The raw data corroborates the evidence of the parallel trends assumption holding displayed in Fig. 1 (Appendix Figure A.6). Due to the education trends between the treatment and control groups remaining the same prior to 1994 and no concurrent programs differentially impacting the affected groups, the empirical strategy is able to identify the intent to treat effect of the law banning FGC in Benin.


Effect on Years of Education
2
1
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-1
-2
1970
1973
1976
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1991
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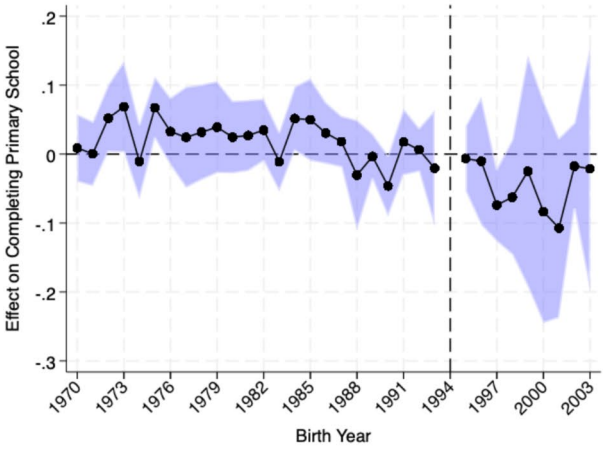
Birth Year


Effect on Completing Primary School
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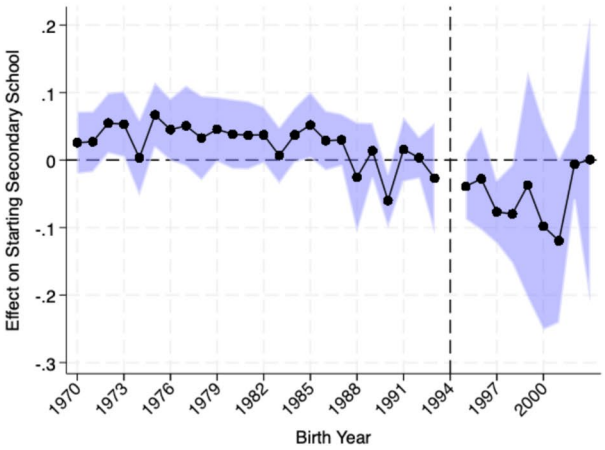
Effect on Starting Secondary School
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0
-.1
-.2
-.3
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
Birth Year

◂**Fig. 1** Each point represents the coefficients from a regression. The point indicates the average effect of the law on the outcome variable for a birth year cohort. The shaded region represents the 95% confidence interval for each point. The vertical line is at 1994 which is when the FGC ban would begin to affect cohorts. The horizontal line is at 0. The 2011 and 2017 rounds of the DHS are used for the education graphs. The sample includes individuals born between 1970 and 2003

4.2 Free primary education

To analyze how the effects of the FGC ban on education change after the implementation of free primary education in Benin, I utilize the following triple difference-in-differences specification to estimate the impact of both free primary education (FPE), and the FGC ban on women's education.

$$y_{ijrt} = \theta_0 + \theta_1 Post_t \times Affected_{jr} \times FPE_r + \delta_{jr} + \delta_t + \delta_r + \delta_{rt} + \delta_{jt} + X_{ijrt}\prime\Lambda + \nu_{ijrt} \tag{2}$$

where y_{ijrt}, $Post_t$, $Affected_{jr}$, δ_t, δ_{jr}, and $X_{ijrt}\prime$ are the same as described above. δ_r are department fixed effects, δ_{rt} are department-birth year fixed effects, and δ_{jt} are ethnicity-birth year fixed effects. The inclusion of these additional fixed effects account for the additional interaction terms in the standard triple-difference-in-differences identification strategy. The measure of free primary education, FPE_r, is determined based on the proportion of women in each department who have never attended school. Departments with a higher percent of women who have never attended school will be more affected by the free primary education law enacted in 2006 by the Government of Benin. The coefficient of interest is θ_1 which measures the impact of both free primary education and the FGC ban.

5 Effects of the FGC ban

5.1 Reporting FGC status and the prevalence of FGC

Survey questions about FGC were only asked in the 2011 round of the DHS. In the 2011 DHS, the number of women who report either being cut or not is 9,808, which leaves 4,825 individuals who did not answer the question. This potentially is a concern about selection into reporting FGC status. If there is selection into reporting, then this would bias the results of the impact of the anti-FGC legislation on the prevalence of the practice. I examine selection into non-reporting by estimating Eq. (1) with the probability of non-response as the outcome variable. If this outcome is invariant to treatment, this is evidence of an absence of selection into reporting status. Table 1 displays the effect of the FGC ban on non-reporting of FGC status. The dependent variable in this analysis is an indicator equal to 1 if an individual did not report their FGC status. The analysis is done for the 1990 through 1997 birth cohort sample as it is the one used for the analysis of the prevalence of FGC. The results show the probability of not reporting FGC status is invariant to treatment as all of the estimates are close to zero and not statistically significant. The effect on the ban on non-reporting

Table 1 Effect of FGC ban on not reporting FGC status

	(1)	(2)
Affected × Post	−0.008	−0.013
	(0.032)	(0.030)
Observations	4,179	4,179
Adjusted *R*-squared	0.106	0.118
Controls	No	Yes
Avg of dependent variable	0.368	0.368

Controls include religion and age dummies. The dependent variable is an indicator that equals one if an individual did not answer the question about undergoing FGC. The sample consists of the 1990 through 1997 birth cohorts. Data is from the 2011 round of the DHS. Robust standard errors in parentheses are clustered at the ethnicity-birth year level. $^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

of FGC status is −0.013. Women are 1.3 percentage points more likely to report their status due to the FGC ban. However the estimates are not statistically significant, and I cannot rule out a zero nor null effect. Thus, this is evidence of reporting status being invariant to the treatment, which does not suggest selection into reporting.

FGC is a sensitive topic that a woman may not be comfortable sharing with a DHS enumerator, especially if FGC was illegal at the time of the interview. This raises the concern that FGC status might be misreported in the data. Misreporting of FGC status could result in measurement error and thus create additional concerns about causal identification. Misreporting of FGC status is not a concern using DHS data, including from Benin, as shown in McGavock and Novak (2023). McGavock and Novak (2023) show that FGC prevalence rates are not systematically different for the same cohort of women in the same country across survey rounds. Additionally, recall bias in the age at which a woman is cut does not exist within the DHS data despite whether a woman herself reports FGC status or a mother reports her daughter's FGC status (McGavock and Novak 2023). The findings in McGavock and Novak (2023) are consistent with other research that shows minimal strategic misreporting of FGC status in Sub-Saharan Africa (Elmusharaf et al. 2006; Novak 2020). Thus, one should not be concerned that FGC status is being misreported and driving the results in this paper.

Now, I begin by testing if the anti-FGC law affects the prevalence of genital cutting. Table 2 shows the effect of the anti-FGC law on the prevalence of FGC. This table only uses data from the 2011 round of the DHS because the 2017 survey did not include questions about FGC. The sample is restricted to women born after 1989 due to local officials denouncing the practice between 1998 and 2000. The statement by local officials affects everyone born in 1990 onward as they would have been under the age of nine; thus, restricting to this sample allows me to isolate the effect of the FGC ban on the prevalence of the practice. Appendix Figure A.4 shows overall the prevalence of FGC over time. Table 2 Column 1 is the estimate without controlling for individual demographics. Column 2 includes the controls to provide a more precise estimate of the effect. Both Columns 1 and 2 exclude women who did not report their FGC status. The effect of the ban on FGC prevalence is a 10.2

Table 2 Effect of FGC ban on the prevalence of FGC

	Excluding missing		Manski bounds	
	(1)	(2)	(3)	(4)
Affected × Post	−0.114***	−0.102***	−0.008	−0.005
	(0.034)	(0.035)	(0.040)	(0.039)
Observations	2,643	2,643	4,179	4,179
Adjusted R-squared	0.201	0.205	0.296	0.298
Controls	No	Yes	No	Yes
Avg of dependent variable	0.117	0.117	0.102	0.102

Controls include religion and age dummies. Underwent FGC is an indicator variable that equals one if the respondent has been cut. Columns 1 and 2 exclude individuals who did not disclose their FGC status. Columns 3 and 4 use Manski bounds to determine the worst case scenario impact of the law on the prevalence of FGC. Only DHS data from the 2011 round is used because the FGC questions were only asked during this survey. The sample consists of birth cohorts from 1990 onwards. Robust standard errors in parentheses are clustered at the ethnicity-birth year level. *$p<0.10$, **$p<0.05$, ***$p<0.01$

percentage point decrease, which is significant at the 1 percent level. Even without consistent legal enforcement of the ban, the FGC ban had a large negative effect on the prevalence of the practice. This effect is slightly smaller than the impact of the anti-FGC radio campaign in Egypt studied in Khalifa (2023), which saw a 13% decrease in the likelihood a girl is cut.

To address the concern about individuals not reporting their FGC status, I conduct a Manski-style adjustment to account for potentially non-random non-reporting of FGC status. The Manski-style adjustment provides a worst-case scenario for the effectiveness of the ban. This adjustment assigns an FGC status to every woman who did not report their FGC status in the survey. For women in the affected group, they were assigned as having undergone FGC. Women in unaffected ethnicity-department groups were assigned to not having been cut. Table 2 Columns 3 and 4 present the estimates from the Manski-style adjustment. These estimates provide lower bounds on the effect of the ban and show how large the impact of non-response of FGC status might be. Columns 3 and 4 show the worst-case scenario is the FGC ban decreased the prevalence of FGC by only 0.5 percentage points and is insignificant. Even with the Manski-style adjustment, the FGC ban decreased the prevalence of the practice, although it is statistically insignificant. Thus women are less likely to undergo FGC if they were born after 1994 and in an affected ethnic group. This suggests legal changes can be an effective intervention to prevent harmful practices regardless of the state's ability to enforce the legal changes.[4]

[4] More than 13% of women would need to be misreporting their FGC status after the treatment to explain away the results in Table 2. 11.7% of women in the data are cut, so more people than who report being cut need to have misreported their status. This seems unlikely, given Novak (2020) which finds misreporting as a result of an FGC ban is very unlikely. Additionally, women responding to the DHS were assured of the confidentiality of their responses to the questions asked in the DHS. This should have eased concerns about truthfully disclosing their FGC status. However, there may be feelings of shame or other psychological factors beyond the cost–benefit calculation and potential legal consequences influencing the decision to accurately report FGC status.

Table 3 Effect of FGC ban on educational attainment

	Years of education		Completed primary school		Started secondary school	
	(1)	(2)	(3)	(4)	(5)	(6)
Affected × Post	−0.403**	−0.338**	−0.061***	−0.053***	−0.078***	−0.069***
	(0.171)	(0.170)	(0.019)	(0.020)	(0.018)	(0.018)
Observations	29,413	29,413	29,413	29,413	29,413	29,413
Adjusted *R*-squared	0.254	0.288	0.202	0.232	0.200	0.227
Controls	No	Yes	No	Yes	No	Yes
Avg of dependent variable	3.01	3.01	0.265	0.265	0.238	0.238

Controls include religion and age dummies. "Years of education" is measured in single years. "Completed primary school" and "Started secondary school" are indicator variables. Robust standard errors in parentheses are clustered at the ethnicity-birth year level. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

5.2 Women's education

The anti-FGC legislation is an effective way to combat genital cutting, but are girls able to be in school more now that they are being cut at lower rates? Table 3 shows the effect of the law banning FGC on educational outcomes of women in Benin. Columns 1 and 2 show the effect of the law on a woman's years of education. One can see the law decreases the average years of education by 0.34 years for those born after the imposed law and are a part of an affected ethnic group, which is significant at the 5 percent level. This is an 11% decrease in women's years of education. Columns 3 and 4 show the effect of the law on completing primary school. Women are 5.3 percentage points less likely to complete primary school due to the FGC ban. This effect is significant at the 1 percent level. Columns 5 and 6 show the effect on the probability of starting secondary school. The law decreases the probability of starting secondary school by 6.9 percentage points and is significant at the 1 percent level. While the FGC ban was effective in reducing the prevalence of FGC, the ban has a counter-intuitive effect on women's education. Girls are getting less education as a result of the ban.

I verify that the results on education are neither driven by a specific birth cohort nor the definition of the affected group. Since there are not as many birth cohorts affected by the ban, a singular cohort could be driving the results. To test this concern, I re-estimate Eq. 1 and drop each birth cohort from 1994 through 2003 one at a time. The results are robust to this test and extremely similar to the results in Table 3. Appendix Figure A.7 shows the results of dropping each birth cohort one at a time. A second concern may be using the average FGC prevalence to define affected ethnicity-department groups. To test whether this definition is driving the results, I use different thresholds to define the affected group. I use the median and the 40th, 60th, and 75th percentiles as alternative definitions. The results from these alternative cutoffs are in Appendix Table A.5. The alternative cutoffs provide very similar estimates to those presented in Table 3 which uses the mean to define the

affected group. Thus, one should not be concerned that the definition of the affected group is driving the results.

5.2.1 Mechanism: marriage market

I examine if the decrease in education is accompanied by changes in marriage market investments. To do this, I estimate the effect of the law on marriage-related variables, including marriage quality indicators and spousal demographics. Women are more likely to get married and at younger ages as a result of the FGC ban (Table 4 and Appendix Table A.7). One would expect marriage quality to increase because women are getting married earlier, which is valued in the marriage market. The FGC ban caused the probability of getting married to increase by approximately 11 percentage points (Table 4 Column 2). Additionally, the probability of getting married by age 16 increases by 3.7 percentage points (Table 4 Column 4) and 4.9 percentage points by age 18 (Table 4 Column 8). On average, the age at first marriage is 18.8 years old for women in Benin. After the FGC ban, women in the affected ethnicity-department groups got married at 16.1 years old, on average.

FGC is viewed as a preparation for a girl to be married (Orchid Project, n.d.) and is valued in the marriage market (Chesnokova and Vaithianathan 2010; García-Hombrados and Salgado 2023; Khalifa 2023; Rai and Sengupta 2013). Girls who do not undergo the practice are deemed not ready for marriage as the practice "ensures [the girl's] virginity until marriage" (Orchid Project, n.d.). Khalifa (2023) finds that when FGC signals chastity, the practice increases her value in the marriage market. Due to the practice being legally banned in Benin, parents need to signal value in the marriage market in alternative ways. By pulling girls out of school, parents are imposing a form of pre-marital confinement which limits their daughter's growth in an effort to signal traditional feminine values and improve marriage market prospects (Rai and Sengupta 2013).

Table 4 Effect of the FGC ban on marriage

	Ever married		Married by age 16		Married by age 17		Married by age 18	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Affected × Post	0.126***	0.110***	0.048***	0.037**	0.052***	0.037*	0.068***	0.049**
	(0.023)	(0.023)	(0.016)	(0.017)	(0.019)	(0.020)	(0.021)	(0.022)
Observations	29,413	29,413	29,413	29,413	29,413	29,413	29,413	29,413
Adjusted *R*-squared	0.468	0.572	0.074	0.082	0.092	0.105	0.115	0.136
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Avg of dependent variable	0.744	0.744	0.244	0.244	0.317	0.317	0.397	0.397

Controls include religion and age dummies. All dependent variables are listed above the columns. "Ever Married" is an indicator variable. "Married by Age 16" is an indicator equal to one if an individual's first marriage was at age 16 or earlier. "Married by Age 17" and "Married by Age 18" are constructed the same way. Robust standard errors in parentheses are clustered at the ethnicity-birth year level.*$p<0.10$, **$p<0.05$, ***$p<0.01$

Other indicators of marriage quality are shown in Appendix Table A.7. Following the FGC ban, the age gap between men and women decreases. Additionally, women are less likely to be emotionally abused by their husbands and less likely to be physically abused by their husbands. The law also increased the probability that a woman is able to decline having sex with her husband and increased the probability that a woman can ask her husband to use a condom when having sexual intercourse. This has a significant impact on people's marriage because, on average, 90% of women are humiliated or threatened by their husbands, 87% are hit or kicked by their husbands, and 93% of women are afraid of their husbands.

I conduct a Sobel mediation analysis to determine the proportion of the education effects explained by the marriage channel (Sobel 1982, 1986). 30.5% of the effect on women's years of education is explained by earlier marriage. Whereas 24.5% and 20.4% of the effect on completing primary school and beginning secondary school, respectively, can be attributed to earlier marriage.

Table 4 combined with the mediation analysis and Appendix Table A.7 suggest the decreases in education are accompanied by increases in early marriage. This switch provides compensating value in the marriage market due to not being cut. This added value is associated with better marriage market matches and quality. Welfare effects are therefore ambiguous. The education of women has decreased on average as a result of the anti-FGC law, which is accompanied by early marriage.

5.3 Free primary education

In October of 2006, the Beninese Government announced that primary schooling would be free and no longer require tuition payments for all public schools in the country. Women born after 1994 are impacted by the anti-FGC law and could also be impacted by free primary education. In Fig. 1, the FGC ban is shown to have had an immediate negative impact on education, but the impact dissipated for later birth cohorts. These later birth cohorts are the ones who would be most impacted by free primary education. To test if this is the case, I estimate Eq. 2. Table 5 displays the estimate of θ_1- the impact of free primary education and the FGC ban on women's education.

The negative effects on education resulting from the ban on FGC dissipate following the implementation of free primary schooling. Table 5, Columns 1 and 2 estimate the effect on single years of education. Columns 3 and 4 have the outcome variable as an indicator for primary school completion, and Columns 5 and 6 examine starting secondary school. Panel A is the results from Table 3. Panel B estimates Eq. 2 and uses a discrete measure for those impacted by free primary education. The discrete measure equals one if a department has a higher-than-average percent of women who never start school and equals zero otherwise. Panel C uses a continuous measure of departments impacted by the free primary schooling law. The measure is the percentage of women who have never attended school in each department.

The ban on FGC combined with free primary education has a positive but statistically insignificant impact on women's education. With both policies, women

Table 5 The effect of the FGC ban and free primary education on educational attainment

	Years of education		Completed primary school		Started secondary school	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Original Estimates						
Affected × Post	−0.403**	−0.338**	−0.061***	−0.053***	−0.078***	−0.069***
	(0.171)	(0.170)	(0.019)	(0.020)	(0.018)	(0.018)
Observations	29,413	29,413	29,413	29,413	29,413	29,413
Adjusted *R*-squared	0.254	0.288	0.202	0.232	0.200	0.227
Panel B: FPE–Discrete						
Affected × Post × FPE	0.417	0.562	0.048	0.062	0.033	0.046
	(0.380)	(0.370)	(0.040)	(0.039)	(0.040)	(0.039)
Observations	29,413	29,413	29,413	29,413	29,413	29,413
Adjusted *R*-squared	0.264	0.297	0.211	0.240	0.209	0.234
Panel C: FPE–Continuous						
Affected × Post × FPE	0.520	0.644	0.061	0.073	0.054	0.065
	(0.485)	(0.464)	(0.053)	(0.050)	(0.052)	(0.050)
Observations	29,413	29,413	29,413	29,413	29,413	29,413
Adjusted *R*-squared	0.264	0.297	0.211	0.240	0.209	0.234
Controls	No	Yes	No	Yes	No	Yes
Avg of dependent variable	3.01	3.01	0.265	0.265	0.238	0.238

Controls include religion and age dummies. "Years of education" is measured in single years. "Completed primary school" and "Started secondary school" are indicator variables. FPE stands for Free Primary Education. Panel A is the results from Table 3. Panel B is the results from the triple difference-in-differences estimation with a discrete measure of regions affected by free primary education. Panel C is the results from the triple difference-in-differences estimation with a continuous measure of regions affected by free primary education. To measure the impact of free primary education, proportion of women who never attended school is utilized. Robust standard errors in parentheses are clustered at the ethnicity-birth year level. *$p<0.10$, **$p<0.05$, ***$p<0.01$

get 0.56 years more education (Table 5, Panel B, Column 2) and complete primary school 6.2 percentage points more (Table 5, Panel B, Column 4) while only starting secondary school 4.6 percentage points more (Table 5, Panel B, Column 6). However, the impact is noisily estimated and thus not statistically significant. Free primary schooling can help explain why the impact of the FGC ban for later birth cohorts, seen in Fig. 1, dissipates. Alone, free primary education likely would increase education levels. However when paired with the FGC ban, there is a positive, not statistically significant, impact on women's education.[5]

[5] Free primary education explains why there is only a short-run impact of the FGC ban on women's educational attainment, as shown in Fig. 1. For a full analysis of the impact of free primary education on educational outcomes in Benin see Fatoké Dato (2022). Additionally, see Lucas and Mbiti (2012a) and Keats (2018) for analyses of free primary education in Sub-Saharan Africa.

6 Conclusion

To estimate the impact on human capital as a result of banning FGC, I use a law criminalizing the practice in Benin in 2003 as a natural experiment. Using a difference-in-differences model, I find a negative effect of the FGC ban on the number of years a woman is in school, the probability of women completing primary school, and the probability of starting secondary school. The law decreases education by 0.34 years, which would put the average years of education at 2.67 years of schooling. The ban decreases the number of women who have completed primary school by 5.3 percentage points. Following the law, the percentage of women who start secondary school decreased by 6.9 percentage points. This decrease in education is accompanied by earlier marriage. Women are more likely to be married by age 16. However, following the ban, marriage match quality improved. Women are also less likely to be emotionally and physically abused by their husbands and have a healthier sex life. While there are increases in marriage match quality, education decreases. The negative impact of the ban on education can be eliminated through free primary education. The anti-FGC law and free primary education in Benin have positive but null effects on completing primary school and starting secondary school.

Despite harsh punishments written into the FGC ban, there has only been one documented case of enforcement of the law. The law still decreases the prevalence of FGC in Benin, even without punishments being widely enacted. Thus states with limited capacity to enforce the law can still enact legal changes as effective interventions to fight harmful practices. Ending FGC is a goal of the United Nations and World Health Organization, as it is a human rights violation and causes health complications. Evidence from Benin suggests the ban on FGC has other externalities, including decreasing educational outcomes, and increasing the quality of marriage market matches. However, the negative impacts on education can be overcome by free primary education policy.

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Data Availability The data comes from the 2011 and 2017 rounds of the Demographic and Health Surveys in Benin. Researchers can request access to this data at https://dhsprogram.com/data/available-datasets.cfm. Stata 18.0 was used for the empirical analysis. The replication codes are available in the supplementary materials.

Declarations

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