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DOES MATERNAL EDUCATION CURB FEMALE GENITAL MUTILATION? EVIDENCE FROM A NATURAL EXPERIMENT IN EGYPT

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Does Maternal Education Curb Female Genital Mutilation? Evidence from a Natural experiment in Egypt

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Abstract

In this study, we exploit a natural experiment, an education policy change reducing compulsory schooling from nine to eight years in Egypt, to estimate the causal impact of maternal education on mothers' attitude toward female genital mutilation (FGM), the probability that their daughters undergo FGM, and their intention to perform FGM to her daughters in the future. We use a nationally representative sample of 16,572 ever-married women aged between 15-49 from the 2008 Egypt's Demographic and Health Survey and utilize a fuzzy regression discontinuity (FRD) framework to estimate the causal impact of maternal education on the three FGM outcomes. Our main findings suggest that maternal education did not discourage the actual implementation of the FGM practice in Egypt. It did not reduce either the probability of having a circumcised daughter or weaken the motivation to perform FGM in the future. However, our results suggest maternal education had a favorable impact on the sentiment toward the FGM practice. The unexpected results maybe explained by the poor quality of schooling in Egypt on human capital protection and the power of traditionalism versus education,

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JEL classification: I12; I26; J10; J13

1. Introduction

Female Genital Mutilation (FGM) (also known as female circumcision), defined as partial or total removal of the external genital organ of young girls and women for cultural or non-medical reasons, is a violation human rights. The procedure is normally performed between the ages of six and eight, with some societies preferring to cut at birth, menarche, or before marriage (Morison et al., 2004). According to the World Health Organization (WHO), around 200 million women have been circumcised worldwide. This practice is widespread in developing countries and traditionally conservative societies, with the highest prevalence reported in sub-Saharan Africa, the Middle East, and Asia. The social and religious norms and cultural conventions in these societies place pressure on parents to perform FGM on their daughters to prepare them for marriage.

There is extensive medical evidence that FGM has short-term and long-lasting adverse health effects, both physical and psychological, on circumcised women and their children. The short-term health consequences of the practice include death, urinary problems, excessive bleeding, genital tissue swelling, infections, and severe pain [For a review of the literature on the impact of FGM on physical health outcomes, see Berg et al., 2014]. FGM could also cause chronic genital, urinary tract, reproductive tract infections, obstetric complications, sexual problems, and increased risk of newborn deaths (Jones et al., 1999; Larsen & Okonofua, 2002; Banks et al., 2006; Utz-Billing and Kentenich,2008). Several studies also reported that girls who get circumcised are more likely to experience post-traumatic stress disorder, depression, and anxiety [For a review of the psychological impact of FGM on girls/women's mental health, see Mulongo et al., 2014].

In recognition of the importance of ending FGM, the United Nations has included it as one of the targets of the Sustainable Development Goals (SDGs) to be achieved before 2030. Target 5.3 of the (SDGs) calls for "*Eliminating all harmful practices, such as child, early and forced marriage and female genital mutilation (under Goal 5: Achieve gender equality and empower all women and girls)*".

Egypt has the world's highest number of circumcised women (28 Too Many, 2017). The practice has been a tradition in the country since the Pharaonic period. According to the 2014 Egypt Demographic and Health Survey (EDHS), around 92% of the Egyptian adult women had been circumcised. Despite that female circumcision is outlawed in Egypt, it is expected that more than half of the daughters between ages 0 to 19 will be circumcised in the future based on reported mothers' intention (Ministry of Health and Population [Egypt] et al., 2015).

Education is widely viewed as a vital determinant of an individual's health (Grossman, 2005). Education can improve an individual's efficiency in health production (Grossman, 1972) and could serve a protective role against health risk behaviors. The benefits of education are not limited to the person's health. However, it may also influence children's health via knowledge of healthy behaviors (Desai & Alva, 1998) and the adverse health consequences of harmful practices such as FGM. Education has been consistently considered a protective factor that can reduce women's and girls' exposure to risky health practices such as FGM (Yount, 2002).

This study aims to investigate the causal impact of education on the actual practice, attitude towards, and the mother's intention to perform FGM to her daughters in the future in Egypt. We hypothesize that a higher level of maternal education reduces the likelihood of female circumcision practices. This paper augments the existing literature on two fronts. Firstly, although the current literature is abundant with studies investigating the impact of education on the actual practice of FGM, studies that explore the causal impact of education on attitudes toward FGM and the intention to perform FGM remain sparse. The literature in epidemiology and public health have explored the correlates of female circumcision using standard regression models such as logistic regression in most of the studies (Dalal et al., 2010; Gage & Van Rossem, 2006; Gele et al., 2012; Masho & Matthews, 2009; Mitike & Deressa, 2009; Tamire & Molla, 2013). One fundamental limitation of the standard regression models is that they do not account for the potential endogeneity of education, which would yield biased estimates, and their results should be interpreted as correlation rather than causation. We rely on a natural experiment setting, an education policy change reducing compulsory schooling from nine to eight years in Egypt, to estimate the impact of maternal education on FGM using a fuzzy regression discontinuity (FRD) approach.

This study addresses a very critical question from the policy point of view. It assesses the validity of education's protective role on intentions to practice and attitudes toward FGM, which exposes women to substantial risk in the future. If education does lower the acceptance of female circumcision in society; then, education can serve as a policy instrument to curb the prevalence of female circumcision. However, if the education has no impact on the attitude regarding the female circumcision practices or the intentions to perform it; then, increasing access to education will not protect girls and women from circumcision, which might indicate that the impact traditionalism is stronger than education and would require the search for other effective intervention measures.

The rest of the paper is organized as follows: Section 2 presents a brief review of the empirical literature. Section 3 provides a background on the structure and significant changes in Egypt's compulsory schooling system. Section 4 presents a conceptual framework on the education-FGM linkage. The data and methods are discussed in Section 5. Section 6 summarizes the results. Section 7 gives a discussion and summary of the paper.

2. Literature review

FGM has been largely characterized as a prerequisite for marriage (Chesnokova & Vaithianathan, 2010), which reflects local ideologies about femininity and the sexuality of a woman. Feminist theories postulate that FGM facilitates and enhances marriage, enabling a woman to acquire a social identity, protection, and economic security through engagement to a preferable man and acquire some intra-family authorities' measures. These theories predict that alternative opportunities, aside from marriage, available to women would discourage the FGM practice. Accordingly, increased education and other factors such as urbanization and economic development are expected to reduce the value of the husbands' inherited wealth and alter women's position and marriage and hence reduce the importance and relevance of FGM (Yount, 2002).

There is a substantial literature in epidemiology and public health examining the impact of education, in a noncausal fashion, on FGM (Dalal et al., 2010; Gage & Van Rossem, 2006; Gele et al., 2012; Masho & Matthews, 2009; Mitike & Deressa, 2009; Tamire & Molla, 2013). Nonetheless, these studies have largely ignored the potential endogeneity of maternal education when examining its impact on FGM, which may result in biased estimates, and their results should be interpreted as a correlation rather than causal. As such, the current study augments the sparse extant literature that investigates the relationship between maternal education and daughters' vulnerability to circumcision causally.

Changes in compulsory schooling legislation are natural policy experiments and are commonly used in the literature to instrument education (Glymour et al., 2008; Güneş, 2015; Kemptner et al., 2011; Schneeweis et al., 2014). For instance, Dinçer et al. (2014) used Turkey's 1997 Education law that increased compulsory schooling from 5 to 8 years, within an instrumental variable approach, to study the effect of education on women's fertility, reproductive health, and empowerment and their children's health. They found the increase in compulsory schooling lowered pregnancies, improved the reproductive health of women, including an increased proportion of women who make antenatal visits during the first

trimester, use modern family planning methods, and improved the ovulation cycle knowledge. They also found weak evidence that schooling decreased child mortality and no evidence that it changed women's attitudes toward gender equality. Using the same natural experiment of the change in compulsory schooling law, Güneş (2015) examined the causal relationship between maternal education and child health in Turkey.

The same education reform that reduced the length of primary school in Egypt has been used by several earlier studies, within a regression discontinuity design, to estimate the causal impact of maternal education on several health and labor market outcomes with mixed findings regarding the effect of education. For example, using DHS data and a nonparametric regression discontinuity approach, Ali and Elsayed (2018) utilized the reduction in the length of primary schooling that took place in 1988 in Egypt to identify the causal impact of parental education on child mortality and nutritional status. They found maternal education not affecting child health and that, except for stunting, father's education also does not affect child mortality or nutritional status. In another study, and using the same methodology, Ali and Gurmu (2018) applied the same natural experiment exercise. They exploited the reduction in the number of primary schooling years from six to five years in 1988 to estimate the causal impact of female education on several fertility outcomes in Egypt. They found that female education significantly reduces the number of children born per woman, increases women's age at marriage while does not increase women's labor force participation or affect their usages of contraceptive methods. In a recent study, Elsayed (2019) examined the impact of a policy reform in Egypt that extended the compulsory schooling duration from eight to nine years in 2004 on the long-term educational and labor market outcomes. The study found no effect for the expansion of compulsory education on individuals' literacy skills, schooling beyond the primary education level, or labor market outcomes. At the same time, it increased total years of schooling mainly for males. In another study, using data from the 2006 and 2012 rounds of Egypt Labor Market Panel Survey, Elsayed and Marie (2015) examined the effect of the decrease in the years of compulsory schooling from nine years to eight years that took place in 1988 on further educational attainment and labor market outcomes. They found the policy reform significantly increased the probability of finishing compulsory education and increased the total years of education while hurting labor market outcomes. The effects of the policy were more marked for males than for females.

The extant literature remains sparse with studies that examine the relationship between education and FGM causally and are also with mixed findings (Nesje, 2014; De Cao and La Mattina, 2019). For example, using DHS data and an instrumental variable strategy, Nesje

(2014) estimated the causal effect of education on FGM in Kenya by exploiting an education reform that extended primary school length by one year. They found that receiving an additional year of schooling decreases the probability that the eldest daughter of the respondents complying with the reform was circumcised. In a recent study, De Cao and La Mattina (2019) used the introduction of the Universal Primary Education program in Nigeria as a natural experiment to identify the causal effect of mothers' education on the probability that their daughters are cut and found no statistically significant impact of the reform on the probability that daughters undergo FGM.

   In the next section, we present an overview of the structure of Egypt's education system and its evolution over time.

3. Structure of the education system in Egypt: A brief overview

   The education system in Egypt comprises of three stages. The first stage is compulsory basic education, which involves six years of primary schooling, followed by three years of preparatory schooling. The second stage is secondary schooling for three years, and the third stage is tertiary education. Students have to pass a standardized test in each level's final year to proceed to the higher education level. Basic education, both primary and the three-years preparatory, has only one track, while secondary education has two tracks; general and vocational (technical). Admission into the general track requires a higher score in grade nine as it qualifies for joining a university. Students have limited control over school choice where enrolment in a public school is determined based on geographical residence in the corresponding catchment's area. The freedom of choice is granted to students whose standardized exam score exceeds 85% (Elbadawy,2009).

   The Egyptian constitution of 1953 guarantees free public education from primary education to university. Though public education is free, and Law 139 of 1981 obliged parents to send their children to schools, the law is not fully enforced, and many children either do not join or drop out of schools. Education in Egypt is mostly publicly provided. The Ministry of education has the ultimate control over the general educational policies, setting curricula and allocating educational funds and resources, including teachers, to individual schools based on official enrolment counts. The Ministry of education supervises all the private and public schools in Egypt except the international and religious (Azhari) schools which represent less than seven percent of the entire student enrolments.

The Egyptian education system has undergone several policy amendments due to successive ministerial changes and the country's changing economic and social circumstances. One significant policy change that took place was the reduction in primary schooling length based on law No.233 of 1988. Starting from the school year 1988–1989, the Egyptian Ministry of education reduced the number of years of schooling from six to five years. Herby switched to an 8-year instead of a 9-year compulsory education system. All students born on or after October 1, 1977, were exposed to this policy reform in the education system. Several justifications have been presented for this policy transformation in the education system. These include the governmental desire to follow the same pattern in several developed education system, reducing the cost of financing primary education for the poor households, and the inadequate infrastructure such as insufficient schools, teachers and other education facilities which cannot cope with the high enrolment rate in primary education all of which placed a considerable burden on the existing education system and forced the Ministry of education to cancel grade six to free its classes to be used by the other grades and to eventually eliminate running schools on a daily two-shift basis (Eldahshan 1992).

A critical limitation of this policy change that directly affects students' amount of knowledge is that any modification or extensions did not compensate for the decrease in the duration of primary education in the school curriculum in subsequent education levels (Abdel-Kareem, 2009). Nonetheless, the Ministry of Education defended the policy change. It argued that the reduction in the length of the compulsory basic education would not affect the total number of schooling hours and the academic content as this is compensated by stretching the academic year from 32 to 38 weeks and increasing the hours of a school day (Eldahshan 1992).

In this paper, we benefit from this exogenous change in the length of compulsory schooling, which provides a natural experiment setting by comparing the cohort of students born before October 1977 and after 1978 to evaluate the impact of education on FGM. From the school year 2004-2005, the 9-years compulsory schooling system was restored to its pre-1988 structure by adding back grade six to the primary schooling level.

4. A Conceptual framework on the education-health linkage

Several theoretical models that examine the education-health/human capital in general, linkage suggest a bi-directional causality between parent's education and their children's health (Grossman,2006). More educated parents are considered to be more efficient producers of their children's health. Higher education increases the parents' knowledge about the real effect of the

health inputs on the health outcomes of their children, "Allocative efficiency." More educated parents can process information related to their children's health, such as the consequences of some health risk behaviors. More educated parents are also more productive in converting the health inputs into outcomes "productive efficiency" (Chou et al., 2010). Endogenous taste models also suggest a causality from education to health, where highly educated parents have higher motivations to make investments that make their children more future-oriented (Becker and Mulligan, 1997). More education also increases the family's income, which would enable parents to invest more in their children's health (Handa, 1999).

On the other hand, causality may run from children's health to parent's education when parents consider more education as a mechanism to achieve better health outcomes for their children. Accordingly, given that education and health are endogenous variables, a third unobserved variable, such as time preference, may influence both (Fuchs, 1982). Parents with a lower preference for the present tend to invest more in their education and their children's health. Hence, ignoring this unobserved factor would bias the estimated effect of parents' education on children's health outcomes. For a detailed discussion of the mechanisms through which maternal education affects child health, see (Handa,1999).

FGM has been modeled in several studies as a pre-marital health investment that leads to better marital outcomes (Molitor, 2014; Allen et al.,2015; Wagner, 2015). It has been observed that several societies that implement this practice consider FGM as a prerequisite for marriage (Mackie, 1997). There is empirical evidence that women's circumcision is associated with a higher marriage chance and a higher bride price. For example, using data from 13 countries in Africa, Wagner (2015) found that circumcised women are more likely to be married and have a higher bride price than their uncircumcised peers.

To show how parental education affects the decision on FGM, we present a simplified unitary model in which the economy is populated by households where each household is comprised of a father (f) and a mother (m), and two children, a daughter (d) and a son (s). We consider a two-period- two generations model. In period 1, the old generation (parents) work and decide on their consumption and the circumcision of their daughters, which is considered a pre-marital investment. The young generation (children) live with their parents in period 1, and they make no choices. In both periods, the parents supply their labor inelastically and receive a fixed wage income. Both parents are altruistic toward their children, where the parents' utility is a function of their children's discounted expected utility in period 2. In this model setup, a bride price (BP) is transferred from the groom to the bride's parents in the

marriage market in the second period as a marriage transfer. We consider BP to be a function of the FGM status of the bride, where BP(FGM=1)>BP (FGM=0).

The objective of a household is to maximize its lifetime utility given as:

$$\max_{\{C_1, C_2, FGM \in \{0,1\}\}} u = C_1 + \frac{C_2}{1+r} + \gamma\beta[u^d(C, \alpha(e)\,FGM) + u^s(C, \alpha\,G)]$$

Subject to the following lifetime budget constraint

$$C_1 + \frac{C_2}{1+r} + \sigma(e)FGM = Y_1 + Y_2 + BP(FGM)$$

Where C_1 and C_2 are the parents' consumption in periods 1 and 2. u^d and u^s are the discounted utilities of the daughter and the son, respectively. FGM has a cost, σ. An example of such cost is the penalty in terms of the time spent in prison, which would reduce the time devoted to work. It is expected that the cost of FGM is a direct function of the parental level of education. The higher the parental education level, the greater the economic loss, in the form of lost salary, due to being punished for undertaking the FGM. This assumption is realistic in the Egyptian context where according to Article 242 of the Egyptian Penal Code, individuals who accompany the victim girls to the perpetrators are punished by imprisonment for between one and three years and up to 15 years' imprisonment if the practice of FGM leads to the death of the victim or a permanent deformity. Y_1 and Y_2 are the parental wage income in period 1 and 2. G is the FGM status of the spouse of the son in period 2. α is the utility cost of FGM, which could be interpreted as the long term adverse health or social effect of the FGM practice on the daughter as perceived by the parents. Here we consider that the parent's perception of the adverse health effects of the FGM is a direct function of their education level. We believe that this assumption is realistic given the substantial empirical evidence on education's role in raising people's awareness. An increase in education would increase the parent's knowledge and awareness of the adverse health effects of FGM practice (Yount, 2002). An increase in education level would also raise awareness of the potentially negative social consequences of FGM. Several studies documented higher risks of divorce due to infertility associated with severe FGM (Balk, 2000).

Here we will only present and discuss the optimal decision rule for the circumcision variable (FGM). Equation (1) shows the rule that governs whether the parents will circumcise

their daughter or not. The left side of the equation is the parents' expected utility if they circumcise their daughter, while the right side is the expected utility to the parents in the case of no circumcision. A family will circumcise their daughter if the left side of equation (1) is higher than the right side.

$$BP - \sigma(e) + \gamma\beta[u^d(C, \alpha(e))] > \gamma\beta[u^d(C)] \qquad (1)$$

An increase in the parental education level, e, increases the cost of performing FGM, σ, and increases the parental perception of the potential long-term adverse health and social consequences of FGM, which lowers both the daughter's utility and the parents. As a result, an increase in the parental education level would lower the expected relative utility to the parents from circumcising their daughter and discourage the FGM practice.

In this model's setup, circumcised women are more likely to receive a higher bride price than uncircumcised counterparts. Instead of considering bride price as the marriage market outcome of FGM, we could also have modeled the marriage market outcome of FGM as the quality of the husband, or even the chance of marriage in the first place, similar to several previous studies (see, e.g., Molitor,2014), without altering the general predictions of the model.

5. Data and Methods

The data of this study is drawn from 2008 Demographic and Health Survey (DHS) of Egypt. The DHS program is a regular survey conducted in 90 countries, which provide data for monitoring and impact evaluation indicators in the areas of health, nutrition, and population. The DHS program is funded by the U.S. Agency for International Development (USAID) and is commonly used to assess the UN Sustainable Development Goals' progress. The DHS surveys are publicly available for legitimate academic research at no cost. The 2008 Egypt's DHS includes information on a nationally representative sample of 16,572 ever-married women aged between 15-49 (reproductive age). The survey contains information on a broad set of health and social indicators, including female circumcision and the survey participants' educational status. With the stratification technique, the DHS survey covers the 26 Egyptian governorates in proportion to each governorate's population weight. The non-response rate is less than 1%. The details of the DHS sampling methodology can be found at the https://dhsprogram.com/.

The DHS presented three questions to the interviewed women related to FGM. Each of these questions captures a different dimension of the FGM practice. We utilize these three

questions to examine the causal impact of maternal education on FGM. These questions are related to the actual practice of FGM, the respondent's attitude towards FGM, and the mother's intention to perform FGM on her daughters in the future. The respondent's answer to these questions are used to generate three binary variables, which takes the value of 1 if the respondent/mother has a daughter whoever been circumcised, the respondent believes that FGM practice should continue, the respondent is planning to perform circumcision for her daughters in the future, and equals zero otherwise.

To achieve a credible causal identification, we rely on a natural experiment setting to estimate the impact of maternal education on FGM status where the education reform policy represents an exogenous variation in education. We use a fuzzy regression discontinuity (FRD) approach since the respondents' years of education are not entirely determined by the respondent's birth date relative to the education reform's timing. The merit of the FRD is that it allows us to account for the cohort effect by exploiting a narrower cohort-variation in exposure to different compulsory years of education. Therefore, the identification strategy relies on comparing women born just before October 1977 with women born just after this date. The FRD can be conceptualized as a local instrumental variable model (that is, an instrumental variable regression with weights that decline as observations move away from a pre-specified bandwidth). The bandwidth specifies the width of the window around the cutoff to use. Kernel-weighted local polynomial regression is used to estimate the outcome as a function of the eligibility variable at each side of the threshold for the numerator of the ratio. We estimate the treatment variable as a function of the eligibility variable. Therefore, we instrument the year of education by a dummy variable for being above the cutoff, while controlling for the running variable (birthdate relative to the cutoff date) and the interaction of above-the-cutoff dummy and the running variable.

The IV approach involves estimating the Two-stages regression model, $\forall\ k$, as presented in Equations (2) and (3):

$$Education_i = \beta_0 + \beta_1 reform + \beta_2\ Z_i + \beta_3\ reform \times Z + \varepsilon_i \tag{2}$$

$$y_i = \gamma_0 + \gamma_1\ \widehat{Education}_i + \gamma_2 Z_i + \gamma_3\ reform \times Z + \omega_i \tag{3}$$

Where y_i refers to the FGM outcome k for the interviewed women i. The reform variable is the instrumental variable, which is a binary variable indicating whether the respondent was born at or after October 1977; thus, affected by the education reform. Z is the respondent's age relative to the cut off date, which equals the running variable (the age in months) minus the cutoff date.

The results may likely depend on the width of the window around the cutoff. Accordingly, we run a sensitivity analysis by changing the bandwidth of the kernel function and the window's width to calculate the mean outcomes and mean probability of treatment.

6. Results

Insert Table 1 here

Table 1 presents descriptive statistics of the sample covered by the analyses. The average years of schooling of the respondent women is 6.8 years, and their average age is 33. About 95 % of the respondents are Muslims. 31% of the interviewed women reported ever circumcised their daughters, 43.5% intend to circumcise their daughters in the future, and 62.3% believe that FGM should continue. 94.5% of the respondent women were circumcised, 57% believe that husbands prefer to have a circumcised wife, 56% believe that the religion requires FGM, and 44.65% believe that FGM could lead to a girl's death. Notably, this awareness of the adverse health risk of FGM is higher among women with higher education levels. 29% of the respondents reside in rural upper Egypt, 29% in rural lower Egypt, and 5.5% in frontier governorates.

Before presenting the regression results, we first explore the discontinuity in FGM outcomes using graphical representation as displayed in figures 1 to 3.

Insert Figure 1 here
Insert Figure 2 here
Insert Figure 3 here

Figure 1 shows a discontinuity in the support of the continuation of the FGM practice, and figure 2 also shows a discontinuity in the intention to perform the practice in the future. This indicates that women who attended fewer years of primary education and consequently fewer

schooling years seem to support the FGM practice. However, there is no visible evidence for discontinuity in performing FGM as depicted in figure 3.

Insert Table 2 here

Table 2 presents the results of the FRD for the three outcomes for different bandwidths. The first outcome related to the support for the continuation of FGM collected responses from all the survey participants whether they have daughters or not. The other two outcomes that are concerned with the implementation of the practice targeted only mothers with daughters. We used three different mean squared error (MSE)–optimal bandwidths. The first one, mserd, uses one common MSE-optimal bandwidth selector for the RD treatment effect estimator. The second bandwidth, msetwo, develops two different MSE-optimal bandwidth selectors (below and above the cutoff) for the RD treatment effect estimator. The last one, msesum, relies on one common MSE-optimal bandwidth selector for the sum of regression estimates.

The first stage regression shows the discontinuity in education after the exogenous education reform policy. As predicted, the education reform policy always reduces education years by almost one year across different models with different outcomes and bandwidths. The impact of the education reform is highly significant at a 99% level of significance. Looking at the impact of education on having a supportive view for the continuation of the FGM practice in Egypt shows that education has a favorable impact on reducing the support for the FGM practice by almost four percentage points, regardless of the used bandwidth. However, the impact is barely significant at the 10% level of significance for the MSERD and MSESUM bandwidths, and it is significant at the 5% level of significance for the MSETWO method.

For the second FGM outcome, the intention to perform FGM practice in the future, the second stage results suggest that the mother's education did not have a statistically significant impact on the intention to perform FGM in the future. Although the coefficient has the expected negative sign across different bandwidths, it is not significant at any standard level of significance across different bandwidths.

Regarding the effect of education on the probability that a daughter/s is/are cut, our findings suggest that education did not play a significant role in reducing the implementation of the practice across Egypt. The coefficients are statistically insignificant and have unexpected positive signs across the chosen bandwidths.

7. Discussion

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In traditional societies, FGM is used as a marker of femininity, purity, and marriageability, and families compete to attract high-ranking men by enforcing this practice over their daughters.

There is considerable evidence that maternal education is a strong predictor of FGM outcomes. Nonetheless, most of this evidence in the literature is not causal, as earlier studies mostly ignored maternal education's potential endogeneity. In the current study, we revisit this evidence by attempting to avoid earlier studies' methodological limitations. We utilize a change in compulsory schooling duration law in Egypt that took place in 1988 as a natural experiment to disentangle the causal impact of maternal education on mothers' attitudes toward FGM, the actual practice of, FGM and intention to practice FGM within a fuzzy regression discontinuity framework.

Theoretically, education is expected to have a negative impact on FGM. Increased education is likely to reduce the value of the husband's inherited wealth and alter the attitudes about women's position and marriage and hence reduce the importance and relevance of FGM (Yount, 2002). An increase in education would increase the mother's knowledge and awareness of the adverse health effects of the FGM practice. Also, mothers with higher education levels have broader ideas about their daughter's life options, aside from marriage. Education would also help change mothers' perceptions about FGM as a marker of femininity and purity (Yount, 2002). An increase in education level would also raise awareness of the potentially negative social consequences of FGM. Several studies documented higher risks of divorce due to infertility associated with severe FGM (Balk, 2000).

Several studies have modeled FGM and education as substitutable competing for human capital investments for the daughter (see, e.g., Chesnokova and Vaithianathan, 2010; Molitor,2014; Hombrados and Salgado, 2018). In these models, education increases the economic opportunities available to a daughter. It enhances her chances in the marriage market, while FGM merely improves the marriage market prospects by increasing the likelihood of marriage or attracting a high type husband (Chesnokova and Vaithianathan, 2010). Accordingly, low educated women will lose more if they do not support undertaking the FGM. They also perceive FGM as a lower-cost investment than education. In contrast, women with more education levels have other opportunities in the labor market and depend less on marriage and hence are expected to have less support for undertaking the FGM procedure (De Cao and Lutz,2018).

Consistent with the apriori theoretical expectation, our results reveal that maternal education has a statistically significant negative impact on the FGM practice's supportive attitude. In contrast, the impact on the actual practice or the intention to perform FGM in the future were not statistically significant. The results are not in line with the findings of several earlier studies that examined maternal education's effect, in a noncausal fashion, on FGM in Egypt. For example, Yount (2002) and Tag-eldin et al. (2008) examined the prevalence and the correlates of FGM in Egypt. They found a negative correlation between the female's parents' education and the practice of FGC. In another study, using three measures of maternal education level; area- and cohort-specific educational attainment for women, in addition to the individual mother's realized education level, Modrek and Liu (2013) found robust evidence that increases in women's education are associated with decreases in FGC status in Egypt. They also found that maternal education showed a graded relationship and with a greater magnitude with FGM, where the more education a mother has, the less likely she circumcise her daughter.

Unlike the negative impact of education on the respondents' attitude and the future intention to circumcise their daughters, the impact of education on having a circumcised daughter has an unexpected positive sign. However, the impact is not statistically significant. Social psychologists have found that attitudes and actual behavior are not always perfectly aligned with the relation between the two may not be symmetrical (Chaiklin, 2011). For instance, we may observe a mother who does not support FGM but opt to continue the practice if they lack the empowerment or the bargaining power within the household to decide that deviates from the social norms.

In Egypt and many of the Middle East countries, women may lack the autonomy or the bargaining power to enforce their preferences into the household decisions. However, women might be more independent in expressing their views that may not have any consequences on the family.

FGM is outlawed in Egypt. Article 242 of the Egyptian Penal Code criminalizes the act of FGM. According to Law No.126 of 2008, FGM is considered a misdemeanor with a penalty of imprisonment for between three months and two years on practitioners who commit the offense. In 2016, an amendment was undertaken to article 242, strengthening the penalty, in which individuals committing FGM will be punished with a period of imprisonment of between five and seven years. The new amendment extended the punishment to individuals who accompany the victim girls to the perpetrators with imprisonment for between one and three years and up to 15 years' imprisonment if the practice of FGM leads to the death of the victim or a permanent deformity. Although FGM is outlawed, there is evidence that the prohibition laws of FGM are

not adequately enforced. Hassanin et al. (2008) examined the prevalence of FGM in Upper Egypt after six years of putting prohibition law into action and found these laws did not alter the prevalence of this procedure in Upper Egypt.

The current study is not free from limitations. One limitation common in similar studies that use survey self-reports is that the dependent variables, FGM indicators, are based on self-reported answers, which might be subject to recall bias or underreporting. It has been shown that if sensitive outcomes are measured, such as sexual and reproductive health outcomes, the potential bias in the survey responses is higher. Using data from Ethipoia, De Cao, and Lutz (2018) found answers to direct survey questions underestimated the FGC support by about ten percentage points. The underreporting is more pronounced among uneducated women.

While in this study we focused only on the impact of the quantity of mothers' education on FGM of their daughter, further research is needed to assess the impact of education quality and the extent to which the mother is gaining health knowledge and awareness through the public education system in Egypt which is known with its poor quality of education.

A key policy message based on the findings of the current study is that reducing the school dropout rates and increasing years of schooling could have a beneficial effect on changing the supportive attidudes that would supplement other policy measures implemented to discontinue the FGM practice.

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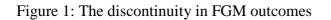
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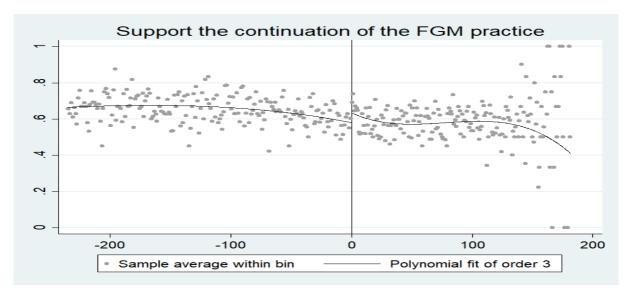Chaiklin, H. (2011). Attitudes, behavior, and social practice. *J. Soc. & Soc. Welfare*, *38*, 31.

Figure 1: The discontinuity in FGM outcomes

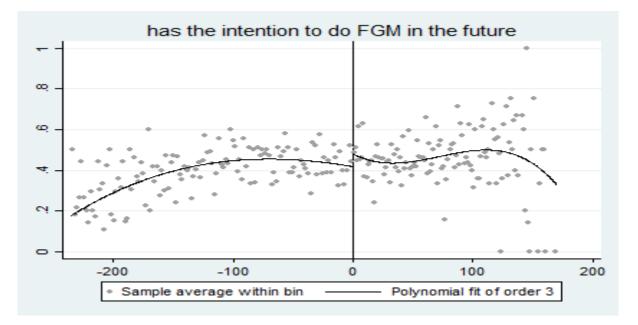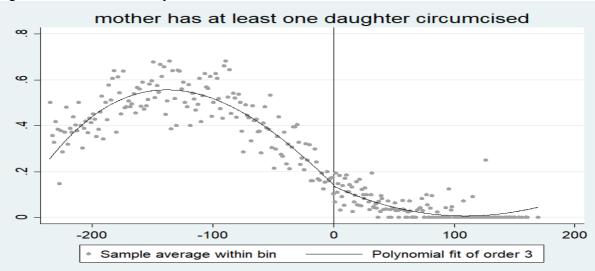Figure 2: The discontinuity in FGM outcomes

Figure 3: The discontinuity in FGM outcomes

mother has at least one daughter circumcised

- Sample average within bin
- Polynomial fit of order 3

Table 1: Descriptive statistics

Variables	Mean
Respondent's years of schooling	6.8
Respondent's age	33.11
Muslims	95
Respondent was circumcised	94
Ever circumcised her daughter	31.34
Husband will prefer his wife to be circumcised	57.43
Have intention to circumcise daughters in future	43.52
Circumcision should continue	62.27
FGM is required by the religion	56
FGM could lead to girl's death	44.65
Lower Egypt	14.64
Lower Egypt urban	10.52
Lower Egypt rural	28.9
Upper Egypt urban	11.62
Upper Egypt rural	28.81
Frontier governorates	5.51

Table 2: FRD estimates of the causal impact of education on FGM outcomes for different bandwidths

The impact of education	Bandwidth method=mserd	Bandwidth method=msetwo	Bandwidth method= msesum
FGM outcome			
Support of the continuation FGM practice			
Reform variable -1st stage regression	-1.0543*** (.32624)	-1.5021*** (.31024)	-1.0604*** (.32918)
Education years	-.04566* (.02747)	-.0433** (.01772)	-.04705* (.02768)
Local N=	5450	6407	5354
Intention to perform the practice in the future			
Reform variable -1st stage regression	-1.1106*** (.40389)	-1.3718*** (.42152)	-1.1285** (.47579)
Education years	-.03581 (.03277)	-.03695 (.02768)	-.04683 (.0392)
Local N=	3328	3009	2418
Daughter/s is/are cut			
Reform variable -1st stage regression	-.99501*** (.34604)	-1.1382*** (.34823)	-.99481*** (.34874)
Education years	.0175 (.02501)	.01725 (.02186)	.01696 (.02512)
Local N=	4616	4534	4539

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