Marriage Market Returns of Female Genital Cutting

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Abstract

This study contributes to our understanding of the relationship between female genital cutting (FGC) and the marriage market. FGC is one of the most brutal forms of sexual violence against children, and yet more than 200 million women alive today have undergone FGC. While existing studies focus on the role of normative forces, I propose a novel approach in which marriage market returns are a key driver of practice. I start by developing a simple model of parental decision to circumcise their daughter and show that in a context where circumcision allows parents to signal desirable but unobservable traits such as chastity, FGC acts as a premarital investment and increases the marital surplus receive in the marriage market. I test the model's predictions on Egyptian data and use a difference-in-difference approach to identify the effect of FGC on bride price. I exploit the variation within-cohort and within-villages of women's parents' exposure to an anti-FGC campaign broadcast on the radio in 1994. Village level coverage of the campaign is obtained using an Irregularity Terrain Model (ITM) software and archive information on radio transmitters. I find that cohorts fully exposed to the campaign are 13% less likely to be circumcised and receive a 20% lower bride price at marriage. Exploring mechanisms, I find additional evidence that FGC increases matching quality in the marriage market. Finally, I find that, consistent with the model, the practice of bride price is associated with a higher likelihood of being circumcised across Africa. This paper emphasizes the importance of understanding the economic role of FGC in order design successful policies aimed at eradicating the practice.

Keywords: Female Genital Cutting, Marriage Market, Bride Price, Norms

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1 Introduction

From social conformity motives to incomplete information about higher-order beliefs, a variety of economic theories competes to uncover the underlying rationalities behind the persistence of harmful social norms. Female genital cutting (FGC) is a paroxysm of this complexity: not only is it the most brutal form of sexual violence against children, but it is also a salient health hazard.[1] Nonetheless, more than 200 million women worldwide are circumcised (WHO, 2019). So far, the existing literature has mainly emphasized the role of normative forces letting alone the possible interaction with a key economic variable: transfers at marriage. Yet, there is a striking pattern in the spread of FGC across Africa: ethnic groups with the highest rates of FGC are those who engage in bride-price payment at marriage (Figure 11).

In most of developing countries, it is customary for bride's parents to receive large financial transfers from the groom at marriage, namely the bride price. In such a context, parents use various ways to increase their daughter's competitiveness in the marriage market. From its origins in Pharaonic times to the present-day practice, FGC is believed to promote female chastity, a valuated but unobservable trait in marriage.[2] Can female genital cutting generate marriage market returns and affect the bride price received at marriage? At first glance, it is not clear whether existing believes linking FGC and chastity could alone affect the marriage market. Even if such belief existed, they may have become obsolete, not translate into a demand in the marriage market and FGC could persist only due to misperception of preferences and sticky norms.

To investigate this question, I begin by modelling the relationship between the marriage market, the bride-price and parents' decisions to circumcise their daughters and then empirically test the implication of the model. In the model, imperfectly altruistic parents face a trade-off between a believed health cost of cutting and an expected return on the marriage market. The return, the bride price, is the marital surplus transferred to the daughter once adult and is endogenously determined in a frictionless marriage market based on cutting and wealth. Transferable utility and complementarity of attributes in the marital output function leads to a unique stable equilibrium characterised by positive assortative matching. Therefore, in equilibrium, the marital surplus, and hence the bride-price, is higher for circumcised women. As a result, and because of imperfect altruism, the bride-price custom provides an additional monetary incentive for parents to circumcise their daughter.

To test the implications of the model, I focus on the cradle of the practice: Egypt. Egypt is a fascinating context where strong restrictive norms regarding female sexuality, the third

[1] Female genital mutilation (FGM) is a traditional practice that involves the partial or total removal of external female genitalia for non-medical reasons. Health consequences ranges from severe bleeding and problems urinating, and later cysts, infections, complications in childbirth and risk of newborn deaths. Treatment of FGC related health complications is estimated to USD 1.4 billion annually. (WHO, 2019)

[2] Anthropological studies have suggested FGC as a technology used to reduce the risk of extramarital affairs by making intercourses painful and overcome a fundamental asymmetry of information about offspring's paternity.

highest rate of FGC in the world, and a comprehensive practice of bride price coexist.[3] It also provides the opportunity to exploit a unique source of variation stemming from a massive anti-FGC health campaign that aired on the radio from 1994 to 2003, as a natural experiment. In 1994, under increasing international pressure, the then Minister of Health, sponsored a daily 10-minute show in the morning. The program aimed to increase awareness about the health consequences of FGC using radio, a primary source of information at the time, and exclusively owned by the government (ERTU). Policy studies have strongly suggested the role of the campaign in the sharp turnaround in the FGC trends in Egypt: FGC rates stagnated for decades, cohort in age to be cut after the introduction of the campaign experience a steep decline of 10%.[4]

To exploit the local variation in exposure to the program, I build a unique village-level dataset of the anti-FGC radio signal reception. To do so, I use archives data from ERTU containing technical information about the radio transmitters broadcasting the campaign and a radio propagation software to implement an irregular terrain model (ITM). The ITM algorithm predicts the variability of terrestrial radio wave propagation based on distance and topographical relief on Earth. This method of telecommunications engineering, which has recently become popular among economists, enables me to calculate the coverage of the radio program at high spatial resolution and to generate a data set containing the reception areas within each of the 1248 villages in Egypt.[5] I link the village-level data of the radio campaign with two individual sources of data. Information on FGC comes from the five Egyptian waves of the Demographic and Health Survey (EDHS, 1992 to 2014). The extensive module on FGC allows me to assess the accuracy of the ITM prediction and the impact of the campaign on FGC for more than 60,000 women. Individual information on the bride price received at marriage comes from the Egyptian Labor Market Survey 2018 (ELMPS, 2018). I use this data to explore the effect of the campaign on bride price and marriage market outcomes for more than 10,000 women.

To better understand the causality of the relationship between cutting and bride-price, I leverage the plausible exogenous variation generated by differential exposure to the anti-FGC radio campaign across birth-villages and across cohorts, *similaris* to Duflo (2001). More specifically, I exploit the fact that in Egypt, age at circumcision is naturally upward bounded by 15, as cutting is practice before puberty. Hence woman's exposure to the campaign is jointly define by the strength of the anti-FGC messages in her village and her age at the time the broadcast started. This allows me to identify the effect of the campaign (treatment) on FGC and bride price by comparing both within villages (treated and untreated cohorts) and within cohorts (comparing treated and untreated villages) using a difference-in-difference approach.

The main results indicate that women exposed to the anti-FGC messages are 13% less

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[3] In more than 83% of marriages a bride price is paid and their magnitude can reach 7 years of income.

[4] See figure **??**

[5] See for instance: Olken (2009); Enikolopov et al. (2011); DellaVigna et al. (2014); Yanagizawa-Drott (2014); Adena et al. (2015); Durante et al. (2019); Gagliarducci et al. (2020); Armand et al. (2020)

likely to be circumcised and the value of their bride price is 20% lower. These results are consistent with the model's predictions, that is, exposure to anti-FGC causes parents of daughters to revisit their priors about FGC health cost, reducing their likelihood of being circumcised, and consequently once they are adults, the value of the bride price received at marriage. Different results allow me to substantiate this mechanism as the main explanatory mechanism underlying the campaign's effect on bride price.

First, I introduce an additional source of variation in a woman's circumcision status, which stems from a specific characteristic of a woman's sibling composition: having an older sister who is ineligible for treatment, ie, older than 15 years at the beginning of the campaign. The intuition being that, since daughters are more likely to be circumcised when older sisters are circumcised (Yount, 2002), parent's response to treatment should be lower for daughters whose sisters are likely already circumcised. Therefore, there is a testable assumption: if the effect of treatment on bride price identifies a change in the woman's circumcision status, the effect should be mediated for women with ineligible sisters. In a triple difference analysis, I exploit the variation in radio signal strength at the village level, the variation in women's exposure based on age, and variability in whether she has an ineligible sister. I found that the effect of treatment on bride price has a considerably differential effect: being treated and not having ineligible sisters lowers a woman's bride price by 24%, while being treated and having at least one ineligible sister increases her bride price by 30%. These results allude that when the probability of being circumcised changes due to characteristics of sibling composition, holding constant changes in the structure of the marriage market induce by the campaign, *ceteris paribus*, the value of the bride price changes.

Second, I contend that the campaign's effect on bride price is unlikely to be driven by alternative explanations such as changes in gender or marriage related norms. In a context where the marriage postdates the circumcision by many years - this gap being even more important considering husbands who are older on average - both untreated and treated cohorts within the same village would have been exposed to the same radio content prior marital decisions were made. The difference is that for the control cohort, decision of circumcision would have already been taken. To discard this alternative mechanism, I perform a simple falsification exercise. I limit my sample to a subsample of women who were not yet married but were over the age of 15 at the start of the campaign. Because they were above the natural threshold age for circumcision, it would be unlikely that a campaign impact on bride price result from a change in FGC. Testing the effect of their exposure on the bride price by exploiting the variation in anti-FGC radio strength across villages and within regions, I find no statistically significant association, which allows me to overrule alternative mechanisms.

Finally, to corroborate my main results, I employ an alternative empirical strategy to study how FGC affects the bride-price. Using the pooled Egyptian DHS for which GPS coordinates are available, I construct an indicator of FGC prevalence by village and age cohort. I then merge this indicator on the ELMPS data, which contains individual information on bride-price. This allows me allows me to test how the prevalence of FGC in a woman's birth cohort and village affects the value of her bride-price by exploiting within-village and within-cohort variation. I find that an increase in 10% of FGC prevalence in a woman's cohort and village lead to 12% increase in the value of the bride-price received at marriage. Furthermore, this approach allows me to take advantage of the segregate structure of the marriage market in Egypt to assess that these effects are not driven by remaining unobservable cofounders. Both the Coptic and Muslims communities practice FGC, but marriage is highly homogamous and bride-price is paid only among Muslims. Therefore, as expected, I found that a woman's bride price is not affected by FGC prevalence among Coptic women in her cohort and village.

In addition, I employ different approaches to further study the underlying the interplays between FGC and Bride-price and their consistency with the setup of the model.

First, I examine the behavioural response of the bride's parents following their exposure to the campaign. From my theoretical framework, I expect that if FGC is a premarital investment, a relative increase in the cost of FGC would induce a substitution effect with alternative technologies available to parents to increase daughters' competitiveness in the marriage market. I estimate the impact of a woman's circumcision, instrumented by her exposure to the campaign, on her likelihood of having to undergo a premarital gynecological exam, a practice that is gaining ground in Egypt recently and aim to testify of a bride's virginity. I find a substantial effect: circumcised women are 90% less likely to undergo a virginity examination at marriage. This result provides additional support that through cutting, parents respond to an entrenched demand for virginity on the marriage market. Additionally, the increase in the relative cost of FGC leads to a substitution effect with human capital, an important premarital investment. The IV estimates of the effect of FGC on education show that cutting reduces educational attainment by 0.22 years.

A second part of the analysis focuses on the marriage market's response to female circumcision. As predicted by the model, FGC would increase bride price in a context of positive assortative matching. I find evidence that circumcision increases the quality of women's matching, as measured by the husband's educational level or the differences in the spouse's schooling years. The results are striking: IV estimates show that circumcision increases the husband's educational attainment by 6.06 years (43%) and the spouse's educational attainment by 1.34 years (34%). Consistent with the argument that FGC is valued by men in marriage because it reduces perceived asymmetric information about women's sexual behavior, reduced form estimates show that a woman exposed to the anti-FGC program is 12% more likely to marry a relative (relative) and that the engagement duration increases by 1.38 months. These results suggest that in the absence of the observable signal that circumcision status sends out, men engage in marital practices that allow more information to be inferred about the bride's characteristics.[6]

[6]These two technologies are commonly practice to reduce this agency problem in the Middle East (Anderson, 2007; Casterline and El-Zeini, 2003; Weimer, 2019).

I dedicate the last part of my analysis to a testable assumption of the model, namely: the practice of bride price increase woman's probability to be circumcised. To test this, I take advantage of the substantial variation in bride-price practice across ethnic groups in Africa. I pool together the 57 waves of the Demographic and Health Surveys for the 17 African countries where cutting is practiced. I link the individual DHS data to information about the women's ethnic group using the Murdock Ethnographic Atlas, which contains information about the ancestral practice of bride price for 1,265 ethnic groups around the world. I obtain a comprehensive database of more than 400,000 nationally representative observations with information on FGC status and practice of bride-price in the ethnic group. Exploiting variation across ethnic groups and within countries, I find that belonging to an ethnic group that practices the bride price is associated with 16% increase in the likelihood of being circumcised. Conditioning on observable socio-economic characteristics of the woman and marriage patterns of the ethnic group does not affect the estimates. These results support that expected returns on the marriage market for parents, the bride price, generates an additional incentive to circumcise their daughters.

The contribution of this paper is threefold. First, my paper relates to a strand of economic literature that, since Becker (1973), has engaged in the economic analysis of the marriage market and its importance for economic development. An extensive literature has focused on the return of education on the marriage market its role in explaining the gender gap in human capital investment.[7] So far, FGC has been suggested as valued in the marriage market (Chesnokova and Vaithianathan, 2010; Rai and Sengupta, 2013) but lack of data has made it difficult to support such assumption, let alone causally. In addition, the relationship between FGC and financial transfers at marriage have been overlooked. My paper aims to fill that gap by providing the first study on the impact of FGC on the marriage market outcomes and bride-price. By showing that female circumcision increases the marriage surplus women get from their match, I contribute to advancing the understanding of the economics of marriage markets in developing countries.

Second, this paper speaks to a literature that highlight the importance of culture and gendered norms for economic development. A growing literature has highlighted the role of norms such as trust, or family ties, patrilinearity, inheritance rules, son preference, and polygyny in influencing a wide range of economic outcomes.[8] Focusing on gender norms, an expending literature has shown that female labour force participation is highly affected by existing normative beliefs affecting fertility (Fernández and Fogli, 2006) household production (Fernández and Fogli, 2009) the desirability of traits such as ambitions (Bursztyn,

[7]See for a not exhaustive list: Chiappori, Iyigun, and Weiss (2009); Bailey and Dynarski (2011); Wiswall and Zafar (2015); Attanasio and Kaufmann (2014); Lafortune (2013); Ashraf, Bau, Nunn, and Voena (2020); Eckstein and Lifshitz (2011); Chiappori, Oreffice, and Quintana-Domeque (2012); Becker, Hubbard, and Murphy (2010); Doepke and Tertilt (2009); Blundell, Costa Dias, Meghir, and Shaw (2016); Adda, Dustmann, and Stevens (2017); Wiswall and Zafar (2015)

[8]See among others: Nunn and Wantchekon (2011); Algan and Cahuc (2010); Alesina, Algan, Cahuc, and Giuliano (2015); Algan and Cahuc (2014); Aghion, Algan, Cahuc, and Shleifer (2010); La Ferrara (2007); La Ferrara and Milazzo (2017); Jacoby (1995); Tertilt (2005); Jayachandran and Pande (2017)

Fujiwara, and Pallais, 2017) or religiosity in the case of veiling (Carvalho, 2013). So far, the literature on FGC has focused on the health and social costs associated with this norm. By showing that non-compliance with the norm results in sizable financial losses through the marriage market, this paper shed the light on an important economic cost of social norms for women.

Finally, this paper also adds a new perspective to the growing debate about the impact of marriage payments on the well-being of women. Although the payment of a dowry is prohibited, it still prevails and has been linked to alarming consequences on women's well-being.[9] The bride-price was lately criticized for reducing women's access to divorce, increasing domestic violence and contributing to early marriages.[10] This criticism has been contrasted with findings showing that bride price plays a crucial role parent's decision to invest in their daughter's human capital, as education generates positive returns in the marriage market (Ashraf, Bau, Nunn, and Voena, 2020). In line with this mechanism, this paper finds that across Africa, the bride-price practice is associated with an increase in FGC. This underlines the unexplored negative effects of bride price in addition to shedding light on a harmful form of premarital investment, Female Genital Cutting.

The paper is structured as follows. I begin by providing an overview of the custom of bride price and FGC (section 2), which is followed by the model of the marriage market with premarital FGC investments and bride price (section 3). I then provide a description of the empirical setting (section 4), the data (section 5) and the empirical strategy (section 6). I present the main results in section 7 and discuss the mechanisms in section 8.

2 Background on Bride-Price and FGC

2.1 Bride-Price

Although the historical origins of the bride price are not exactly known, the custom can be traced back to 3000 BC. Brideprice was practiced in many important ancient civilizations such as Egyptians, Mesopotamians, Hebrews, and Aztecs (Quale, 1988). For the marriage to be legally valid, the payment of a bride price was required under the rule of the Germanic tribes China (Davis, 1994). The bride price has been almost ubiquitous in the countries of sub-Saharan Africa: more than 90% of the ethnic groups in sub-Saharan Africa traditionally paid the bride price (Goody, 1973). The historical records show that these payments can be large enough to affect savings and the distribution of wealth across families and generations. The bride price is usually viewed as a payment to the bride's parents in exchange for the right to her labor and reproductive capabilities. The amount required is fairly uniform

[9] Such as: domestic violence Srinivasan and Bedi (2007); Menon (2020), age at marriage Corno and Voena (2016); Field and Ambrus (2008), bargaining power Anderson and Bidner (2015) and sex-selective abortion Bhalotra, Chakravarty, and Gulesci (2018)

[10] See for instance Platteau and Gaspart (2007); Gaspart and Platteau (2010); Corno, Hildebrandt, and Voena (2020).

within society and depends directly on the number of rights transferred, rather than the families' wealth. For instance, the bride price was higher among Bedouin tribes when the bride married a more distant relative to compensate for the groom's right to expand his lineage. Women who reach puberty earlier receive a higher bride price to compensate for higher expected fertility (Dekker and Hoogeveen, 2002; Borgerhoff Mulder, 1995). Finally, the ancient bride price was often viewed as a direct payment for a bride's virginity (Anderson, 2007). In today's practice, the woman's virginity remains a key determinant of the bride price , especially in a society with restrictive norms about female sexuality. Using Palestinian data, Papps, Davis, Grossbard-Shechtman, Mair, Pryor, Reyna, Gratton, Schneider, Tapper, and Wilder (1983) shows that a virgin bride receive significantly higher bride price than a non-virgin. Virginity would be a way of ensuring that the woman's fertility is not compromised, and thus a guarantee of the paternity of future offspring. Similarly, in the early 2000s, the Saudi government had to put a legal cap on the bride price for virgins to encourage marriage of previously married women Hudson and Matfess (2017). Similarly, evidence that virgin brides receive higher bride prices have been found in many ethnic groups across Africa (Mangena, Ndlovu, et al., 2013; Sankar and Rajeshkannan, 2014; Ademiluka, 2021).

2.2 Female Genital Cutting

Historically, FGC in its most invasive form, called infibulation, originated in ancient Egypt to control women's sexuality. Infibulated women have had their entire clitoris, labia minora, and most or all of the labia minora removed. Additionally, opposite raw sides of the vulva are then sewn together to form a physical barrier over the vaginal opening. This procedure aims to make vaginal penetration painful and therefore undesirable. In a recently working paper, Corno, Hildebrandt, and Voena (2020) trace the spread of the practice across Africa to the route of the African slave trade on the Red Sea. Infibulated female slaves were sold at higher prices in the market because the infibulation ensured chastity and loyalty to the owner and prevented unwanted pregnancies. As the practice solidified through the slave trade and became associated with virginity and purity, the adoption of the practice spread among the rest of the population and gradually took on less severe forms. FGC remains a practice today that is characterized by a strong demand for chastity and control of female sexuality and it's prevalence of infibulation is higher among ethnic groups characterized by restrictive norms about premarital sex. In the same line, Becker (2018) shows that the current practice of infibulation is intensified in ethnic groups who practice pastoralism, a form of agriculture characterized by frequent and prolonged absence of men from the settlement. She shows that in a context where the behavior of women is less observable for men, the central function of infibulation is to reduce paternal uncertainty. In current practice, FGC also persists in its least invasive form as it is believed to offer evolutionary fitness benefits by reducing the risk of non-paternity for men (Howard and Gibson, 2019; Catania, Abdulcadir, Puppo, Verde, Abdulcadir, and Abdulcadir, 2007). Therefore, parents would presumably continue the practice to reduce risks of pre-marital sex, a signal for chastity, and secure or improve their daughters' marriage prospects Mackie (1996); Nour (2008); Becker (2018); Hombrados and Salgado (2018).

3 Model

I now describe a theoretical framework that helps us understand the relationship between FGC and bride-price. To do this, I draw on seminal models by Chiappori, Iyigun, and Weiss (2009) and Ashraf, Bau, Nunn, and Voena (2020), where in their setting, individuals (or parents) choose their own (or children's) education investment before they match in a friction-less marriage market with transferable utility, without or with a bride-price payment.

3.1 Set-up

The model has two periods. There are multiple ethnic groups e, and there is a unit mass of women (daughters) and a unit mass of men (sons) in each ethnic group. Parents have only one child and enjoy utility from consumption $\{c\}_{t=1}^{2}$ and from the well-being of their child. A daughter's utility is denoted as v, and the weight parents place on this utility is given by $\gamma \in [0;1]$. A son's utility is denoted as u and the weight parents place on this δ. Let y be the parents' income in each period, and let r $\geq$ 0 be the discount rate. There is no borrowing or saving.

In the first period, parents choose consumption (c_1) and also decide whether to circumcised their daughter ($F \in [0, 1]$), at a perceived health cost (α_i). Parents are heterogeneous in their prior beliefs about the health cost due to different environmental factors (eg access to information). α_i is a normal random variable $\alpha_i \sim$ N $(\mu_\alpha, \sigma_\alpha^2)$ of probability density function g() and a cumulative distribution function G(). Daughters, indexed i, are affected by the perceived health cost in their first period utility, in a multiplicative way ($\alpha_i Fi$). Sons are randomly assigned a wealth (ω) which is uniformly distributed over the interval [0,1] with a probability density function f() and cumulative distribution function F(). In the second period, parents consume (c_2), daughters marry and marriage market transfers are made. the bride-price, denoted BP_e, is the marriage market transfers paid by the groom and given to the bride parent's in ethnic groups that engage in this custom. The indicator I_e denotes bride price ethnic groups in which the groom pays a bride price to the bride's family at marriage ($I_e = 1$) as opposed to non–bride price ethnic groups in which he does not ($I_e = 0$).

3.1.1 The Household Problem

Parents choose whether to circumcised their daughter to maximize their utility, their problem is

$$\begin{aligned} \max_{F_i, c \geq 0} \quad & c_1 + \frac{c_2}{1+r} + \gamma \left[-\alpha_i F_i + \frac{v_2(F_i, BP_e)}{1+r} \right] \\ \text{subject to} \quad & c_1 \leq y \quad \text{and} \quad c_2 \leq y + BP_e \end{aligned}$$

The program of parent's of a son can be expressed as following:

$$\begin{aligned} \max_{c \geq 0} \quad & c_1 + \frac{c_2}{1+r} + \delta \left[\omega_j + \frac{u_2(\omega_j, BP_e)}{1+r} \right] \\ \text{with} \quad & c_1 \leq y \quad \text{and} \quad c_2 \leq y \end{aligned}$$

For ethnic groups that do not practice the bride-price tradition ($I_e = 0$), $BP_e = 0$, while for ethnic groups that practice the bride-price ($I_e = 1$), the bride-price is an equilibrium object $BP(F_i, \omega_j)$ that depends on the bride's FGC status, the groom's wealth and the health cost of FGC. However, even though the son's utility u enters the utility of parents, it can be neglected in the optimization problem, since there is no relevant decision on the son's side.

3.1.2 The Marriage Market

I consider ethnic groups with a bride price tradition ($I_e = 1$), where the bride's parents appropriate the marriage market transfer, and ethnic groups without a bride price tradition ($I_e = 0$), where the bride and the groom share the marriage surplus through the intrahousehold allocation of resources (Choo and Siow 2006; Iyigun and Walsh 2007).
I define ξ_i and ξ_j to be the woman's and man's respective payoff if the remain single and z_{ij} the total value of a marriage between i and j. Marriage surplus is defined as $z_{ij} = \xi_{ij} - \xi_i - \xi_j$. Since payoffs depend on each spouse characteristics, namely, the FGC status for the woman and the wealth for the man, they can be indexed by F_i and ω_j such as $\xi_{ij} = \xi_{F_i \omega_j}$, $\xi_i = \xi_{F_i}$, $\xi_j = \xi_{\omega j}$ and $z_{ij} = z_{F_i \omega_j}$ with F_i and $\omega_j \in \{0, 1\}$. I assume that the marriage surplus is always positive $z_{ij} > 0$, which ensure that everyone marries in equilibrium and that the marriage surplus is increasing in spouse characteristics such that $z_{11} - z_{10} > 0, z_{11} - z_{01} > 0, z_{10} - z_{00} > 0$ and $z_{01} - z_{00} > 0$. I also make the standard supermodularity assumption on the form of the household output function that specifies the marital output $z_{ij} = h(x_i, y_j)$ which captures the idea of complementary between the spouses characteristics and implies that $z_{00} + z_{11} > z_{10} + z_{01}$.[11]

To generate the predictions of the model, I solve the model backward, starting with the marriage market.

[11]The household output function is such that $h(x, y) : h(x', y') + h(x, y) \geq h(x', y) + h(x, y')$.

3.2 Matching in the marriage market

A match in the marriage market is an equilibrium outcome if it is stable. That is, no man and woman can be made better off by leaving their respective spouses and marrying one another, and, no man (woman) who is matched with a woman (man) would receive a strictly higher matching payoff if he (she) were to remain single. When utility is transferable, a stable equilibrium maximizes aggregate surplus (Shapley and Shubik 1971; Becker 1973). Hence, under the conditions I have imposed on the marriage surplus, everyone marries in equilibrium and matches assortatively.[12]

Prediction 1. The unique stable equilibrium is characterised by a positive assortative matching in FGC and wealth.

Lets defines V_i, respectively U_j, the share of the marital surplus that women, respectively men, receive in equilibrium in the marriage market, with $V_i + U_j = z_{F_i\omega_j}$. The equilibrium marriage market returns to FGC is defined as $\Delta V_i = V_i(F_1 = 1) - V_i(F_i = 0)$. The marriage market return to FGC enjoy by daughters is $v_2(F_i = 1) - v_2(F_i = 0) = (1 - I_e)\Delta V_i$ and the FGC returns enjoy by the parent's is the bride price returns $\Delta BP = BP(F_i = 1) - BP(F_i = 0) = I_e \Delta V_i$. Under positive assortative matching, the equilibrium share of marital surplus are defined such as some rich men marry circumcised women and some poor men marry not circumcised women which implies: $V_1 + U_1 = z_{11}$ and $V_0 + U_0 = z_{00}$. I consider a general framework in which the equilibrium number of circumcised women and wealthy men can be different and classify the different possible matching patterns. Lets denotes P_F the fraction of circumcised women among the female population and P_R the fraction of rich men among the men population.

Case a. The equilibrium number of rich men exceeds the number of circumcised women ($P_R > P_F$). This implies that some rich men marry un-circumcised women while all circumcised women marry rich men. This condition implies that spouse participation constraint are such that $V_0 + U_1 = z_{01}$ and $V_1 + U_0 > z_{10}$. Subtracting these conditions, we obtain the following expressions for the returns to FGC in the marriage market $\Delta \overline{V} = z_{11} - z_{01}$. Thus, when circumcised women are relatively scarcer than rich men, they receive their marginal contribution to a marriage with a rich man. If $I_e = 1$, the bride belongs to an ethnic group that practice the bride-price, the marriage market return to FGC is $\Delta \overline{BP} = z_{11} - z_{01}$ which is strictly positive.

Case b. The equilibrium number of rich men is lower than the number of circumcised

[12] These result can be explained intuitively. Sub-modularity of the household production function implies that men with higher wealth will be willing to pay marginally more for circumcised women. Since I assume transferable utility, wealthy men can bid away circumcised women by offering a larger share of their private consumption. For a formal proof of existence and uniqueness, see the online appendix of Chiappori et al. (2009).

women ($P_R < P_F$). This implies that rich men only marry circumcised women while some circumcised women marry poor men. The marriage surplus shares satisfy the following conditions: $V_1 + U_0 = z_{10}$ and $V_0 + U_1 > z_{01}$, circumcised women receive their marginal to a marriage with poor men independently of whom they actually marry. The marriage market returns to FGC $\Delta \underline{V} = z_{10} - z_{00} > 0$ if $I_e = 0$ and $\Delta \underline{BP} = z_{10} - z_{00} > 0$ if $I_e = 1$, where $\Delta \underline{V} = \Delta \underline{BP} > 0$

Case c. The equilibrium number of rich men equate the number of circumcised women ($P_R = P_F$). This implies that rich men only marry circumcised and poor men only marry not circumcised women. The marriage surplus shares is such that $V_0+U_1 \geq z_{01}$ and $V_1+U_0 \geq z_{10}$ implying that $\Delta V \in \{\Delta \overline{V}; \Delta \underline{V}\}$ and $\Delta BP \in \{\Delta \overline{BP}; \Delta \underline{BP}\}$ when $I_e = 1$.

The return to FGC that a woman can obtain through marriage is defined by the upper bound $\Delta \overline{V} = z_{11} - z_{01}$ which is the contribution of a circumcised woman to the marriage surplus with a rich man and the lower bound $\Delta \underline{V} = z_{10} - z_{00} > 0$ which defines her contribution to a marriage with a poor man. The FGC marriage market returns and bride-price are always positive since that under transferable utility, women can appropriate a part of the additional surplus they provide to a match with a rich (in case a) or a poor (in case b) man. If they do not, another man would outbid the initial match by offering slightly more the circumcised woman, convincing her to marry him instead and the initial match would not be stable (Chiappori et al., 2009).

The marriage returns to circumcision when $I_e = 1$ is the bride-price and is given by:

$$\Delta BP = \begin{cases} \Delta \overline{BP} = z_{11} - z_{01} & \text{if } P_R > P_F \\ \Delta \underline{BP} = z_{10} - z_{00}, & \text{if } P_R < P_F \\ \in \{\Delta \overline{BP}; \Delta \underline{BP}\}, & \text{if } P_R = P_F \end{cases} \tag{1}$$

Prediction 2. Circumcised women command a higher bride price payment at marriage than not circumcised women.

3.3 Household decision about FGC

I next examine the implications of the returns to circumcision for the household decision to circumcised the daughter. Substituting the budget constraints into the objective function, I find that parents choose to circumcised their daughter as long as the return to FGC exceed the costs associated with FGC:

$$\alpha_i \leq +\frac{\Delta V_i}{1+r}(I_e \frac{1-\gamma}{\gamma} + 1)$$

This implies that there exist a perceived health threshold $\alpha^*_{I_e}$ which determine the parent's decision to circumcised the daughter in the first period.

$$\alpha_i \leq \alpha^*_{I_e} \equiv \frac{\Delta V_i}{1+r}(I_e \frac{1-\gamma}{\gamma} + 1) \tag{2}$$

Parents will circumcise their daughters as the health cost faced by their daughter (α_i) is lower than the equilibrium threshold ($\alpha^*_{I_e}$), where $\alpha^*_{I_e}$ is the health cost of FGC face by daughters of parents on the margin of circumcising their daughter, which depends on I_e. Therefore the probability for a daughter i to be circumcised is given by $P_{I_e}(F_i = 1) = P(\alpha_i \leq \alpha^*_{I_e}) = G(\alpha^*_{I_e})$.

Comparing the health cost threshold for a daughter from ethnic groups with and without bride-price, the health cost threshold for a daughter from an ethnic group that practice the bride-price is $\alpha^*_{I_e=1} = \frac{\Delta V_i}{1+r}(\frac{1-\gamma}{\gamma} + 1)$ while the health cost threshold for a daughter from a non-bride price ethnic group is $\alpha^*_{I_e=0} = \frac{\Delta V_i}{1+r} + 1$. Imperfect altruism, ($\gamma \in \{0, 1\}$), implies that $\alpha^*_{I_e=1} > \alpha^*_{I_e=0}$, hence $G(\alpha^*_{I_e=1}) > G(\alpha^*_{I_e=0})$. The bride-price provide an additional incentive for parent's to circumcised their daughter.

Prediction 3. The probability that a daughter is circumcised is higher among ethnic groups that engage in bride price payments.

The intuition behind this prediction is illustrated by the Figure 1

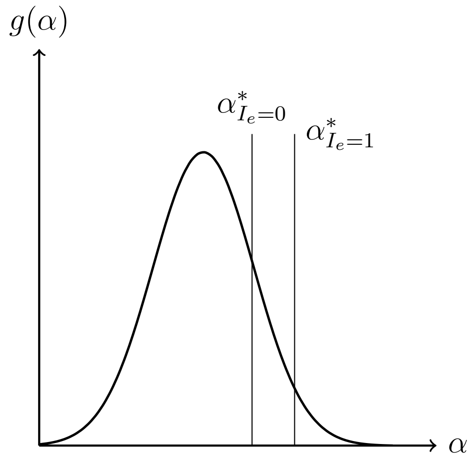


Figure 1: Distribution of the perceived health cost ad the different equilibrium threshold

The figure 1 shows a hypothetical normal distribution of the parents perceived health cost α_i and the two equilibrium threshold $\alpha^*_{I_e}$ for parents belonging to an ethnic group with bride-price $\alpha^*_{I_e=1}$ and those without bride-price $\alpha^*_{I_e=0}$. The structure of the distribution implies that there is more density at $\alpha^*_{I_e=1}$ than there is at $\alpha^*_{I_e=0}$. The probability of a daughter being circumcised is given by the density, it follows that the probability of being circumcised is higher for girls belonging in bride-price groups than for those who belong to a non-bride-price ethnic group.

3.4 Information and Bayesian Learning

I consider a Bayesian framework where parents update their prior about the health cost associated with FGC after receiving some information through the campaign.

Suppose parents sees a signal s that contains an information on the health cost associated with FGC and denote the signal

$$s = \alpha + \eta, \eta \sim N(\mu_\eta, \sigma_\eta^2)$$

The signal is an unbiased piece of data about α (the health cost and η a normally distributed noise term. Consistent with the purpose of the anti-FGC campaign which is to reveal that the cost of health care is higher, I consider the case where $\mu_\eta > \mu_\alpha$. Bayes Rule then gives the posterior belief

$$g(\alpha|s)d\alpha = \frac{p(s|\alpha)p(\alpha)}{p(s)} = \frac{p(s|\alpha)g(\alpha)d\alpha}{p(s)}$$

Given the prior information and the signal, the parents forms a posterior belief about the value of α using Bayes' law that is normally distributed $\widehat{\alpha} \sim N(\widehat{\mu}, \widehat{\sigma})$.

It follows that the posterior distribution of α is given by the cumulative distribution function $\Phi(\widehat{\alpha})$:

$$G(\alpha|s) = \frac{1}{\sqrt{2\pi\widehat{\sigma}^2}} \int_{-\infty}^{+\infty} e^{-\frac{1}{2}\frac{(\alpha-\widehat{\mu})^2}{\widehat{\sigma}^2}} d\alpha \tag{3}$$

with

$$\widehat{\mu} \equiv \mathbb{E}[\alpha|s] = \frac{\tau_\alpha \mu_\alpha + \tau_\eta s}{\tau_\alpha + \tau_\eta} \quad \text{and} \quad \widehat{\sigma} \equiv \text{Var}[\alpha|s] = \frac{1}{\tau_\alpha + \tau_\eta}$$

where $\tau_\alpha^{-1} = \sigma_\alpha$ and $\tau_\eta^{-1} = \sigma_\eta$. The posterior belief is a weighted average of the prior belief and the signal, where each information is weighted by its relative precision. If a signal contains no information about the health cost, the posterior belief would be the same as the prior belief. The posterior variance is lower than the prior variance, which illustrate that additional information reduces uncertainty about the health cost (α).

3.5 Equilibrium

3.5.1 Equilibrium Threshold of Perceived Health Cost

Consistent with the empirical setting, I consider the equilibrium characterised by $P_R < P_F$ and derive the corresponding equilibrium condition. Substituting the corresponding equilibrium marriage market returns to FGC (Eq.1) into the equilibrium threshold (Eq.2), it follows that the FGC-health cost threshold of daughters becomes

$$\alpha^*_{I_e} = \frac{z_{10} - z_{00}}{1+r}\left(I_e \frac{1-\gamma}{\gamma} + 1\right) \tag{4}$$

with the probability of a daughter to be cut depends on $P_{I_e}(F_i = 1) = G\left(\alpha_i < \alpha^*_{I_e}|s\right)$ which depends on I_e and s (the campaign). Equation 4 in turns implies that the equilibrium conditions characterising the stable marriage market equilibrium where more circumcised women than rich men at equilibrium if and only if

$$G\left(\alpha_i < \alpha^*_{I_e}|s\right) > 1 - F(\omega) \tag{5}$$

which can be re-write

$$G\left(\frac{z_{10} - z_{00}}{1+r}\left(I_e \frac{1-\gamma}{\gamma} + 1\right)\right) > 1 - F(\omega) \tag{6}$$

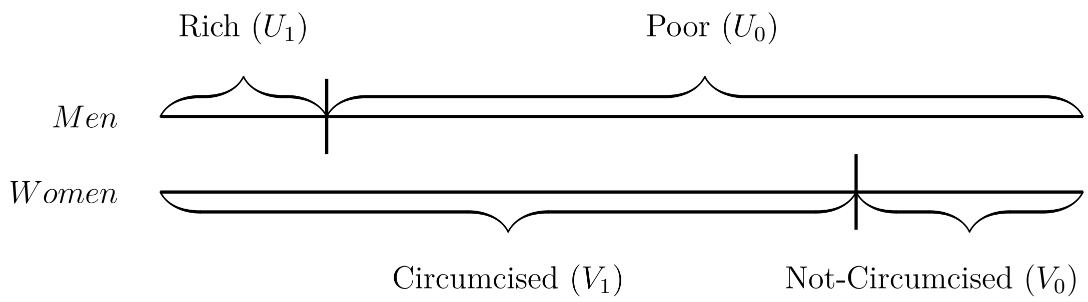
As long as (2) is satisfied before and after the program, the marriage market equilibrium is as derived in section 3.2.

3.5.2 Equilibrium share of marriage surplus and bride-price

The correspond marriage market structure in this equilibrium is represented by Figure 2.

An important result to draw from Chiappori et al. (2009) is that in equilibrium, all women from the same type receive the same share of the marriage surplus, no matter whom they marry, because all the men on the other side rank them in the same manner. If a women was to ask for a higher share the the one defined by the market, she cannot obtain it because she can be replaced by an equivalent alternative. Hence, the marriage market equilibrium do not depends on the absolute supply of circumcised women and rich men, but only on their relative scarcity. The allocation of marital surplus in the lowest quality match is indeterminate, due to finite number ad consequently, the whole set of possible sharing rules differ by a constant, v_0.

Structure of the marriage market when $P_R < P_F$



$U_1 = z_{11} - z_{10} - (z_{00} - v_0)$ $\quad\quad$ $V_1 = z_{10} - (z_{00} - v_0)$

$U_0 = z_{00} - v_0$ $\quad\quad$ $V_0 = v_0$

Figure 2: Structure of the Marriage Market and Equilibrium Share of Marital Surplus. Case with more circumcised women than rich men.

It follows that the individual share of marital surplus that a woman i receives in that equilibrium are

$$V_i = \begin{cases} z_{10} - (z_{00} - v_0) & \text{if } F_i = 1 \text{ and } I_e = 0 \\ v_0 & \text{if } F_i = 0 \text{ and } I_e = 0 \end{cases}$$

$$BP_i = \begin{cases} z_{10} - (z_{00} - v_0) & \text{if } F_i = 1 \text{ and } I_e = 1 \\ v_0 & \text{if } F_i = 0 \text{ and } I_e = 1 \end{cases}$$

and depends only on whether she is circumcised or not.

3.6 Information, Perceived Health Cost and Bride-Price

3.6.1 Campaign and Probability of Cutting

I now turn to the main comparative statics of interest: what is the effect of the campaign on the probability of cutting and the equilibrium bride-price.

The effect of parents exposure to the campaign on the probability of circumcising their daughter is given by the partial derivative:

$$\frac{\partial P_{I_e}(F_i = 1)}{\partial s} = \frac{\partial G(\alpha_i < \alpha^*_{I_e} | s)}{\partial s} < 0$$

The probability of parents circumcising their daughter their decrease with the signal transmitting information about the health cost associated with FGC.

Prediction 4. Parent's exposure to the anti-FGC health information decreases the probability that they circumcised their daughter.

The intuition behind this prediction is illustrated by the Figure 3

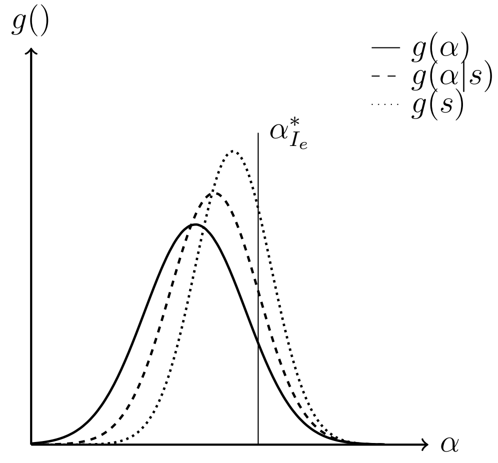


Figure 3: Unconditional and conditional distribution of the perceived health cost associated with the cutting

The figure 3 shows a hypothetical normal distribution of the parents perceived health cost prior before and after the campaign. The signal (the campaign) is represented by the dotted line ($g(s)$) and is distributed around the true value of the FGC-health cost (α). The prior beliefs about ($g(\alpha)$) are represented by the solid line and centered around a lower average. It follows that the posterior perceived health cost for parents, represented by the dashed line, is now centered around a closer value to the real health cost. The equilibrium threshold that determines the probability of a girl being cut is represented by $\alpha^*_{I_e}$. As illustrated, for a given $\alpha^*_{I_e}$ the density below the posterior distribution is lower than the density below the prior distribution of α_i.

3.6.2 Campaign and Bride-Price

I now turn to the effect of the campaign on the equilibrium share of marital surplus received at marriage. Lets denote $E(BP_i)$ the expected bride-price received at marriage by a woman i.

$$E(BP_i) = P(F_i = 1)(z_{10} - (z_{00} - v_0)) + (1 - P(F_i = 1))v_0$$

The effect of the campaign on the bride-price is given by the following partial derivative

$$\frac{\partial E(BP_i)}{\partial s} = \frac{\partial G(\alpha_i < \alpha^*_{I_e}|s)}{\partial s}(z_{10} - z_{00}) < 0$$

The direct effect of the campaign on bride-price is to decrease the probability of belonging to the category of circumcised women and therefore decrease the average bride-price received at marriage.

Prediction 5. Exposure to the campaign reduces the expected bride-price

received at marriage.

As represented in graph 4, the marriage market net surplus do not depend on the share of circumcised women. This is because under transferable utility, any change in V_0 will be repercuted on V_1.

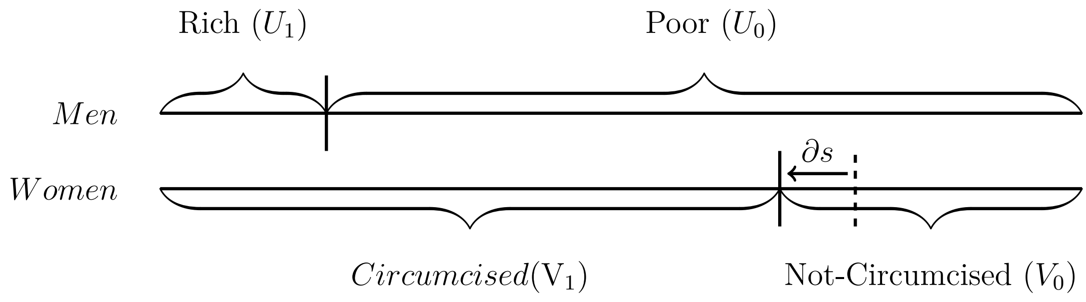


Figure 4: Structure of the Marriage Market and Equilibrium Share of Marital Surplus. Case with more circumcised women than rich men, after the campaign

4 The Empirical Setting: FGC and Marriage Market in Egypt

4.1 Background

4.1.1 The Egyptian Context

Egypt is a fascinating context to study the return of FGC on the marriage market. The institution of marriage in Egypt has recently attracted increasing attention in economics. Marriage is considered a major turning point among young Egyptians, and transfers at marriage are among the highest in the Middle East (Assaad et al., 2010). Their value can exceed 7 years of the groom's income (Singerman and Ibrahim, 2003; Salem, 2015). Marriage in Egypt comes under Personal Status Law, based on the Sharia, Islamic Law who mandates the payment of a bride-price for the validation of the marriage. More importantly, the value of the bride price is largely governed by marital gender norms. Anderson et al. (2020) show that husbands willingness to pay a higher value is largely determined by his expected authority and control that he will have over the bride.

Meantime, the prevalence of FGC is among the highest in the world, and the practice is strongly believed to reduce sexual desire: recent focus groups showed that both men and women believe that FGC reduces the risk of women having the in the absence of the Husband has extramarital affairs (Fahmy et al., 2010). The prevalence of FGC stagnates in about 94% of the cohorts born between 1950 and the late 1970s and then drops to 85% for the younger cohort born after the early 1990s (Figure **??**. While this decline might be thought to involve a change in norms regarding virginity, the opposite is observed. The decline in FGC is accompanied by an upsurge in virginity tests at marriage. Virginity testing in an inspection performed by a medical practitioner, of the female genitalia meant to determine whether a woman had a vaginal intercourse. Hymen examination and two-finger test are the most commonly forms of examination.[13]

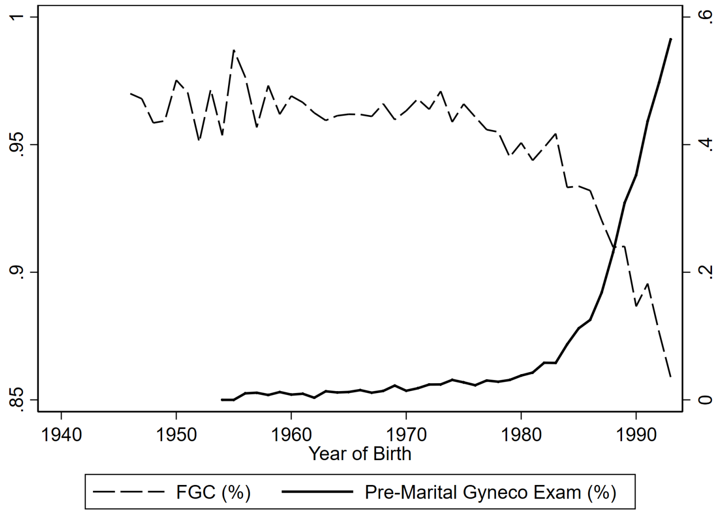


Figure 5: FGC and Pre-marital Virginity Examination by cohort. Source EDHS

Figure 5 shows the trends in FGC and premarital virginity examination over time. We can observe that for cohorts born after the end of 1970 there is a noticeable transition that reverses the trend between FGC and exams. Virginity tests were rarely performed in cohorts born before 1980, but increased from near 0 to 45% in cohorts born between 1980 and 1995.

4.1.2 The 1994 Anti-FGC Radio Campaign

The decline in FGC rates seen in the cohort born after the late 1970s is believed to be the result of a concerted effort against the practice that began in 1994. 1994 was a turning point for FGC: the International Conference on Population and Development (ICPD), coordinated by the United Nations, took place in Cairo in 1994. Several NGOs met in preparation for the conference, and the FGC National Task Force was founded. In total, around 60 organizations, including feminist groups, human rights activists, doctors, academics and civil society organizations, have come together to denounce the high FGC rate in Egypt (UNPF, 1994). In response to growing international pressure, the then incumbent health ministry, Ali Abdel Fattah Al-Makhzanji, decided in autumn 1994 to sponsor a radio campaign to reduce FGC (El-Shazly, 2010). The program was aimed to raise awareness of the health effects of FGC. The programme "Al-Rabat El-Byout" was presented by a couple of female

[13]Both methods rely on "*no scientific merit or clinical indication the appearance of a hymen is not a reliable sign of intercourse and there is no known examination that can prove a history of vaginal intercourse*" World health organisation (2019).

presenters, Sofia El-Mohandes and Gamalat el Zbady. During the show, the host answer live questions that are mailed by women and some episodes featured special guests, mostly doctors (Ministry of Communications, 1995). The show aired 5 minutes daily in the morning, a time slot strategically chosen to reach a predominantly female audience, as mothers are the decision makers in the FGC decision (Ministry of Communications, 2006) . The show was broadcast on the radio until 2003, since radio was the main source of information at the time and was entirely state-owned, the show was broadcast on television after 2003 (Ministry of Communications, 2005). It is worth noting that at the time of broadcasting, the radio was widespread in Egypt, making a radio program the best way to reach a large audience (28TooMany, 2018). For instance, 84,56% have a radio and 63,49% listen to the radio daily (Egypt DHS 1995/2000).

Extensive public policy research has examined the temporal relationship between the decline in FGC and the introduction of the program in 1994. The analyzes indicated a structural change after 1994: an increasing awareness among mothers of the health risks of having their daughters circumcised and a significant decrease in the prevalence of FGC in cohort in age to be circumcised after 1994 (El-Gibaly et al., 2002; Afifi et al., 2010; Fahmy et al., 2010; Modrek and Liu, 2013; Naomi et al., 2020). Exposure to the anti-FGC message in the media has been documented and has been linked to a decrease in intent to circumcise a girl and to change beliefs about FGC (Suzuki and Meekers, 2008). Taken together, these policy change reviews point to the anti-FGC campaign as the prime candidate for the 1994 trend reversal.

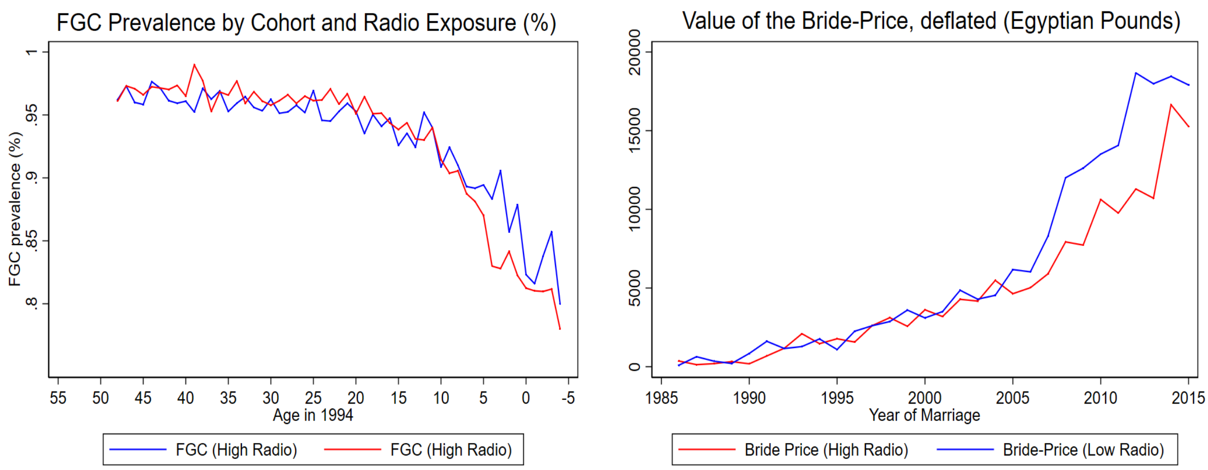


Figure 6: FGC rates and Bride price over time by low and high radio villages

Using unique data specific to exposure to the anti-FGC radio program - described below in section 4.2 - I plot the evolution of FGC prevalence over time combined with a comparison of villages with high exposure to the program and low exposure. Figure 6 shows that the prevalence of FGC is falling for cohort in age to be cut after the introduction of the program in 1994, and this decrease is more pronounced in the highly exposed cohorts. In addition, in the figure 6 I also show the evolution of the bride price's value over time as a function of the high or low exposure to the program. The graph shows that the bride price rises evenly in all cohorts and then, at a concurrent time with the introduction to the program, the trends split. The bride price rises more sharply for cohorts with low exposure to the program. Figure 6 illustrates that there is a link between the development of FGC and the introduction of the program, and that this could later have influenced the value of the bride price received on marriage.

4.2 Data: Anti-FGC Radio Campaign

In this section, I describe source of data and the construction of the Anti-FGC radio program data.

4.2.1 Anti-FGC Radio Archives and ITM Software

The radio coverage is obtained using two data sets and is built up in several steps. The first data set are archives provided by the Egyptian Radio and TV Union Network (ERTU). They contain technical specifications for the existing radio stations in 1994 and the frequency on which each program was broadcast. At the time, radio stations were owned by the Egyptian government. The anti-FGC program radio was broadcast from 4 radio transmitter (Cairo, Sharm-El-Sheikh, Nuweiba, El-Tur). The data set includes the latitude, longitude, height of the antenna base, antenna height, transmission power, frequency for each program and polarization of the transmitter. In addition, I use digital topographical data about the elevation of the earth's surface provided by the Shuttle Radar Topography Mission (SRTM - NASA). With an Irregular Terrain Model (ITM) software I implemented a Longley-Rice algorithm that predicts the signal strength of the radio frequency according to the irregularity of the terrain. The high resolution of the topographic data enables a prediction of the radio coverage at a 90X90 meter. The average radio signal strength of anti-FGC radio broadcasts by village is determined using a digitized map of Egypt's administrative borders. This method is used by radio and television engineers to assess broadcast signal strength and has recently been used in the economics literature on media (Olken, 2009; Enikolopov et al., 2011; DellaVigna et al., 2014; Yanagizawa-Drott, 2014; Adena et al., 2015; Durante et al., 2019; Gagliarducci et al., 2020; Armand et al., 2020). Accordingly, the final measurement is a continuous variable in the range from 0-100, which indicates no to full radio coverage in the village.

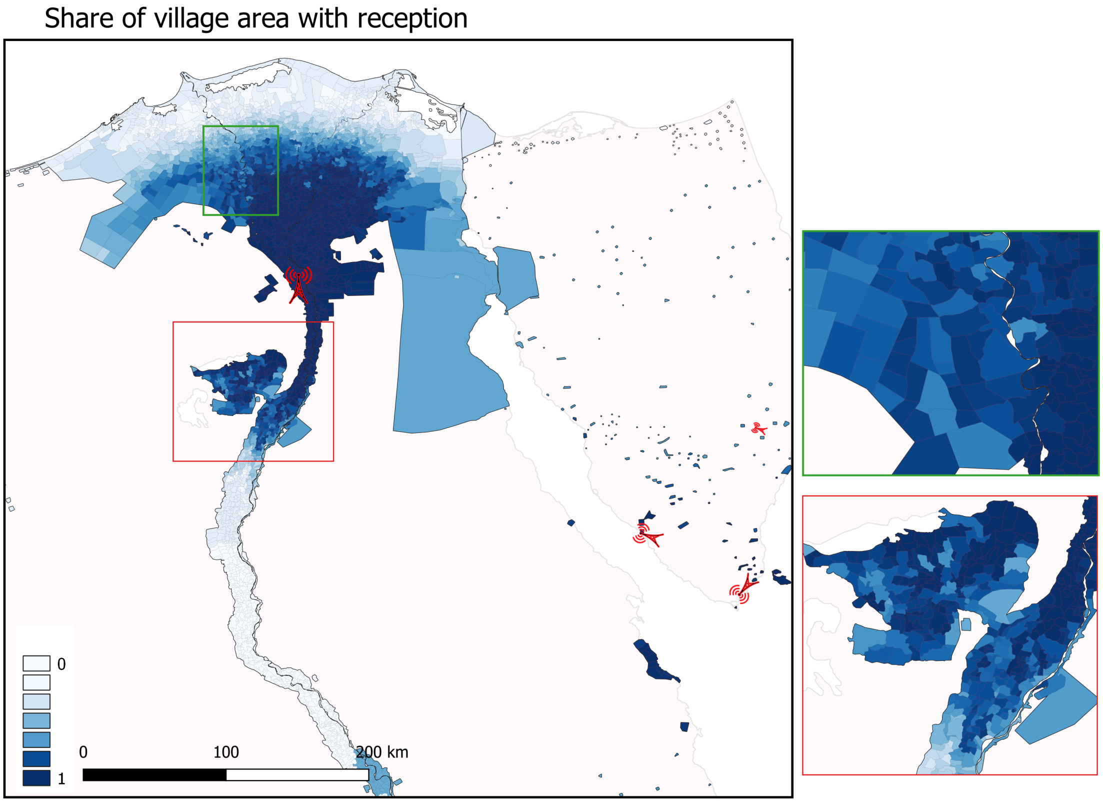


Figure 7: Map of the radio coverage

The average coverage of the villages in the sample is 71%. 14.88% of the villages had no reception. Figure 7 shows the geographic variation in radio coverage. Within villages at the same distance from a transmitter, the variation in the signal comes from differences in the elevation of the earth's surface, which intercepts the radio waves.

4.2.2 Validity and Accuracy of the Measurement

In this section, I use the available information on women's exposure to FGC-related radio content from the different waves of the Egyptian Demographics and Health Survey to assess the accuracy of the anti-FGC radio measurement. The 2000 and 2003 EDHD waves were collected at the time the campaign was broadcast on radio (1994-2003). The 2005, 2008, and 2014 were collected after the program was discontinued. Therefore, I expect an association between the measurement of anti-FGC radio signals and women's exposure to anti-FGC-related content on the radio in 2000-2003, but not in the other waves. In addition, DHS asks these same women if they heard about family planning on the radio, which I use as a placebo to assess that my measurement of the anti-FGC program is not an artifact of wider radio reception. To provide a robust estimate of the relationship between the Anti-FGC radio coverage and women's exposure to anti-FGC content on the radio, I estimate the following equation:

$$Y_{ivc} = \Phi_1 Anti\text{-}FGCradio_{ivc} + \Phi_2 X_{ivc} + \Phi_3 \Pi_{vc} + + \Phi_4 \zeta_c +_{igt} \quad (1)$$

where Y is the variable of interest for a woman i who lives in a village v and a commune c. *Anti-FGC radio* is the anti-FGC radio coverage of village v in a commune c. X is a vector of individual covariates that controls age, religion and education of wives and husbands, number of daughters and sons, and household wealth. Π is a vector of village v covariate that controls the latitude and longitude of the village, the population density, the distance to the nearest transmitter squared and the radio coverage of other programs broadcast at that time (Coran, music, sports). ζ the commune is fixed effects.[14].

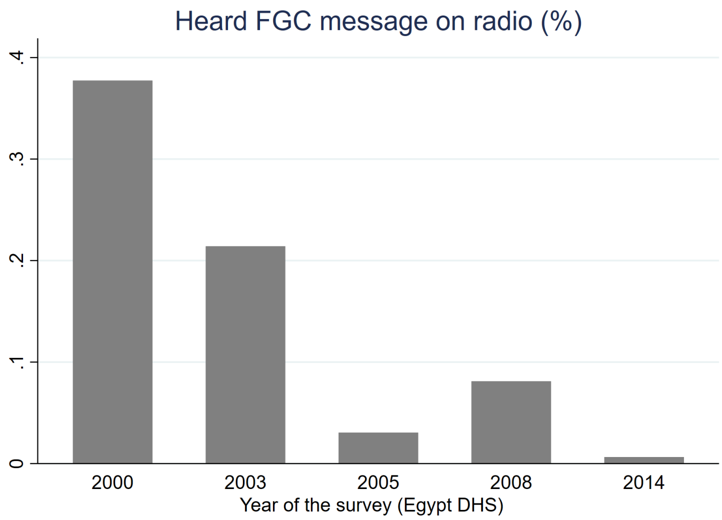


Figure 8: Distribution across DHS waves of the percentage of women declaring having heard of FGC messages in the radio within the last year

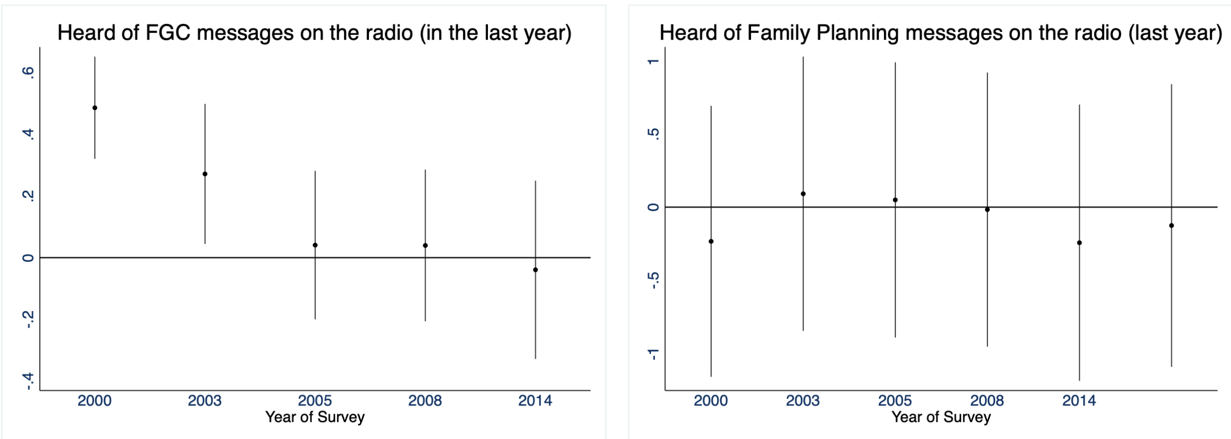


Figure 9: Estimates: Anti-FGC radio coverage on exposure to Family Planning Messages on the radio

[14]There is 351 commune - "*Qism*"- in Egypt

Figure 8 plots the estimates of the equation 1 with having heard of FGC on the radio in the last year as dependent variable. As expectedn the likelihood of women declaring yes is positively and significantly associated with the Anti-FGC radio measurement when asked in 2000 and 2003, but not when asked in 2005, 2008, 2014. When estimating the similar equation for probability that a woman declare having heard of family planning on radio in the last year, the resulting coefficients are not statistically insignificant and are close to zero in all the EDHS waves. Although these results are not causal, they provide robust support for the accuracy of the anti-FGC measurement.

4.3 Individual Level Data

4.3.1 Female Genital Cutting

Data on female genital cutting (FGC) are from the Egypt Demographic and Health Survey (EDHS). EDHS are subnationally representative surveys at the individual level that were collected in several waves. For this study, I have pooled together all EDHS for which GPS data is available: 1992, 1995, 2000, 2003, 2005, 2008 and 2014. The total sample consists of 62,305 women who were randomly selected for the FGC module. GPS information are important to merge the EDHS data with data on radio broadcasting. Information on FGC is collected retrospectively during the woman's interview. Women are first asked if they have been cut: "Have you yourself ever been circumcised?". A major benefit of this dataset is that it allows me to identify adult women who are in age be circumcised before and after the program was launched. Using adult women enables me to use self-reported information about circumcision rather than using mothers' responses about their daughters. This will significantly reduce concerns about misreporting as the declaration of mothers is more sensitive to bias of social desirability and fear of legal sanctions (De Cao and Lutz, 2018; De Cao and La Mattina, 2019).

4.3.2 Bride-Price

I am using data from the 2018 Egyptian Labor Market Survey (ELMPS-2018). ELMPS is a large nationally representative survey with individual modules on marriage and individual socio-economic characteristics. Each household fills out a household questionnaire and at least one individual questionnaire. The data for the household questionnaire is collected from the household head and includes information about the household members, their relationship with the head, and household demographics. The individual questionnaire is applied directly to all persons aged 15 and over, with modules on education, work, marriage and women's status. The variable of interest is the value of the bride price received on marriage. As this information is collected retrospectively from both spouses, I affirm the accuracy of the information by excluding women who report a value other than that given by their husband (163 observations). I also correct the value with the consumer price index (source IMF). The final sample consists of 10.000 women who were married between 1985 and 2018. A key benefit of ELMPS is that it provides accurate information about each person's place of birth and current location. This information is essential for the connection of the radio signal to the place of birth of the woman.

5 Empirical Strategy

To examine the effects of FGC on the bride price, I will use the variation generated by the Anti-FGC campaign. My empirical strategy is twofold: First, I examine how the campaign affected a woman's likelihood to be circumcised (FGC). Second, I use campaign exposure as a proxy for FGC and examine its impact on bride price. I will also discuss the main identification assumption.

5.1 Difference-in-Difference

My main empirical strategy is a difference-in-difference exploiting the plausible exogenous variation generated by differential exposure to the anti-FGC radio campaign across birth villages and across cohorts, *similaris* to Duflo (2001). The first source of variation captures the different intensity of exposure to treatment using anti-FGC radio coverage in the place of birth. The second source of variation is defined by the woman's year of birth. Women are circumcised between the ages of 5 and 15 years. Therefore, all women born in 1979 or earlier were 15 or older in 1994 and did not benefit from the program. That is because their parent's decision to circumcised would have already been taken. Women born after 1979 were younger than 15 and therefore could benefit from the program.

My difference-in-difference specification is

$$Y_{ivkt} = \lambda_1(Treat_v \times Post_k) + \lambda_2 X_{ivt} + \alpha_v + \alpha_k + \alpha_t + \xi_{ivkt} \tag{2}$$

where i denotes a woman, v her birth-village[15], k her birth-year and t the year of marriage. The outcome of interest, Y_{iva}, consist of an indicator of wheter the woman declares being circumcised or the value of the bride-price she received at marriage. $Treat_v$ is the continuous measure of program intensity as measured by anti-Fgc radio signal coverage at the birth-village level. $Post_i$ is a dummy variable that takes the value one if the woman belongs to the young cohort who was below 15 years old at the time of the campaign and zero if she belongs to the control group (older than 15 years old at the time the campaign). I substitute village of birth fixed effect α_v for the main effect of the campaign ($Treat_v$) and α_k year of birth fixed effect for the main effect of cohort ($Post_i$). Including the fixed efforts accounts for unobserved persistent heterogeneity across villages of birth and unobserved shocks that are common to all women belonging in the same age cohort. α_t are year of marriage fixed effect that I include when the outcome of interest is the bride-price value and accounts for time-variant shocks to the marriage market that could affect marriage quality. In additional

[15]Birth-Village are available in ELMPS only, not in the Egyptian Demographic and Health Survey.

specifications, I include X_{ivk}, a set of individual covariates that are predetermined to the outcome of interest. When the dependent variable is FGC, X_{ivk} controls for the woman's religion while when it is the bride-price, X_{ivk} controls for the woman's education.

5.2 Identifying Assumptions

The main identifying assumption is that without the anti-FGC radio campaign, trends in FGC and bride price would have been similar across states with different exposure intensities. In Figure 6, I provide a simple descriptive statistic that allows these trends to be visualized. I plot trends in FGC and bride price and compare women who received low and high anti-FGC radio signals. The figure shows that the evolution of FGC and bride price over time followed a similar trend between groups until they separate, at a time coinciding with the launch of the campaign.

In this section, I apply several approaches to provide robust evidence supporting the parallel trend assumption.

First, the parallel trend assumption could be violated if the treatment is endogenous. That is, if receiving the anti-FGC campaign correlates with other determinants of changes in outcome variables (FGC and bride price) over time. That would imply that in counterfactual, the area exposed to the anti-FGC campaign would have diverged anyway, regardless of whether they were exposed or not. A noteworthy piece of information is that the campaign was broadcast on pre-existing radio transmitter whose locations were chosen decades ago based on technical specificities. However, to mitigate concerns about endogenous treatment, I estimated at the village level the determinants of anti-FGC radio reception. The testable assumption is that if the treatment is endogenous, the determinants of FGC and bride-price should predict anti-FGC radio reception in the village. I first regress the anti-FGC radio coverage on a number of variables related to the geographical situation of the village, such as: the latitude, longitude, altitude and distance to the transmitter. I then use the 1992 EDHS to construct village-level variables that capture the evolution of norms about violence against women and marriage: average school years for girls, boys, age at marriage for women, prevalence of domestic violence. Unfortunately, the 1992 EDHS does not include this information for all villages, reducing the number of villages in our sample. In addition, it contained no information about FGC. The FGC module was added starting with the 1995 waves. In an additional specification I add the prevalence of FGC, support for FGC (support FGC, yes/no) at village level as regressor, measured from the 1995 EDHS. Finally, I create a variable from the 1998 ELMPS data that measures the prevalence of bride price in marriages before 1992 as the proportion of marriages where a bride price was paid).

I report the results table ??. The results support the contention that variables related to the geographical characteristics of the village are the only predictors of anti-FGC radio reception. In particular, villages at a higher altitude and are closer to the station are more likely to receive the radio. All pre-campaign indicators of violence against women and marriage norms are statistically insignificant. Depending on the suitability of the terrain, reception of the program is therefore assumed to be as good as random. In all specifications, difference in terrain suitability will be capture by the village-level fixed effect.

Second, I conduct a placebo test to show that the pre-campaign outcome variables are balanced between the treatment and control groups. For this test, I drop the women living in the villages that were exposed to the campaign and were young enough to be recipient of the treatment (under 15). Then I falsely consider as treated the group of women who live in the treated villages but were too old to be recipient of the treatment (above the 15 years threshold). I then compare the results of this group to the control groups, defined as the women living in villages that never received the campaign. The testable assumption here is that since both groups are in fact untreated, I should not find any statistical difference in outcome if they were comparable in terms of the dynamics of their pre-treatment period. I list the result in Table 3. None of the estimates are statistically significant, suggesting that the pre-campaign outcome variables are balanced between the treatment and control groups.

Finally, I run another placebo test where I launch a fake campaign that would be introduced before the actual one. In this placebo test, I limit the sample to those who are above the circumcision threshold (15 years old) at the time of the program and thus belong to the pre-treatment group. I then compare 17-25 year olds to 25-30 year olds in 1994, mimicking the launch of a fake campaign that falsely treat the 17-25 year olds. The testable assumption is the following: since these two groups belong to the pre-campaign group, if they evolved differently before treatment, I should be able to observe a difference in outcome when comparing them at a pre-treatment time point. I report the results table B.2.1. The results show a small (0.002) and statistically non-significant ($p>3.4$) difference in outcome between groups, suggesting that the dynamics of outcomes are not different between these two groups prior to the treatment period.

As a generalization of this test, I estimate in section 6.1.2 a regression model that includes treatment leads and lags. This event study analysis allows both treated and control groups to be compared at multiple time points in the pre-treatment and post-treatment periods.

6 Main Results

In this section I present the main finding: exposure to the anti-FGC campaign during childhood reduces the likelihood of being circumcised and decreases the bride price received at marriage. I then discuss the main mechanism behind the variation in bride price. I provide a discussion that substantiate that the decline in bride price can be attributed to variation in the bride's circumcision status.

6.1 Impact of the Anti-FGC Radio Program on Female Genital Cutting and Bride-Price

6.1.1 Difference-in-Difference Analysis

Table 1 reports the main results. The estimates of Equation 2 show that exposure to the Anti-FGC messages reduces a woman's likelihood to be circumcised by 13.6 percentage points (column 1). This result represents a 14.46% decrease in the probability to be circumcised with respect to the sample mean. The results are robust to the inclusion of religion dummies (column 2).

As predicted by the theoretical model, exposure to the program reduces the value of the woman's bride-price. The results show that the program has a significant impact on the bride price: the bride price paid for a woman exposed to the anti-FGC program is 23.45% (0.211 log points) lower. The magnitude of the effect is large as expected given that bride price varies significantly with the characteristics of the brides.[16]. In the main estimates, I use the log-transformed value of the bride-price (adding 1 to accommodate zero values) as the dependent variable. In Table, I focus on alternative functional forms of the dependent variable: an alternative log transformation (adding 0.1 instead of 1 to accommodate zero values), another one where I add 0.01 instead of 1, an inverse hyperbolic sine (IHS) transformation of the bride-price value and the value of the bride-price in level. All the results are robust to the use of the different aforementioned dependent variable form.

[16]There is no existing study allowing to compare similar results. In (Ashraf et al., 2020) the completion of secondary schooling level is associated with an 86 percent increase in the bride price and brides whose parents graduated from secondary school receive a bride price that is 211 percent higher.

Table 1: Impact of the anti-FGC radio program on FGC (respondent is cut) and Bride-Price: Difference-in-Difference Analysis

Dependant Variable	EDHS Survey Respondent is Cut		ELMPS Survey log(Bride-Price)	
	(1)	(2)	(3)	(4)
Post X Treat	-0.136***	-0.133***	-0.211**	-0.213**
	(0.0197)	(0.0197)	(0.101)	(0.101)
Observations	68,339	60,756	12,121	12,121
Cohort FE	Y	Y	Y	Y
Village FE	Y	Y	Y	Y
Year of Marriage FE	N	N	Y	Y
Individual Controls	N	Y	N	Y
Mean Dep. Var.	0.940	0.940	1.418	1.418
Clusters	2272	2039	1020	1020
F-Stat	47.34	122.6		

Notes: Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

6.1.2 Leads and Lags Analysis (Event Study)

The identification strategy discussed in section 5 can be generalized to an interaction terms analysis that estimate cohort-by-cohort contrasts. To do so, I estimate the following equation:

$$Y_{ivtm} = c_1 + \beta_1 \sum_{m=1}^{45} Treat_v \times P_m \mathbb{1}[t = m] + \beta_2 X_{ivk} + \alpha_{1v} + \alpha_{2k} + \epsilon_{iva} \quad (3)$$

The dependant variable Y_{ivtm} is the outcome variable for a woman i, in village v, age t and at event-time m. $Treat_v$ is the Anti-FGC radio coverage in the village v where woman i is born. This treatment variable did not change during the time the program was broadcasted, thus, is a time-invariant variable. It is interacted with event-year dummies, $\mathbb{1}[t = m]$, that measure women's age relative to 1994, to investigate the dynamic impact of the program. The campaign operates for women who's age in 1994 $m < 15$ (leads) and did not for women who's age in 1994 $m >= 15$ (lags). The omitted category is t = -1 which means that the dynamic impact of being exposed to the campaign is estimated with respect to one year prior to woman being at risk to be circumcised (older than 15). Therefore, each estimate of β_1 provides the change in outcomes in treated villages relative to non-treated villages for woman who were of age t in 1994, as measure from one year before the campaign starts.

There is a testable restriction on the pattern of the coefficient of β_1. Because women above 15 years old at the time of the campaign did not benefit from the campaign, the coefficient should be near zero and start decreasing at an age t concurring with when women

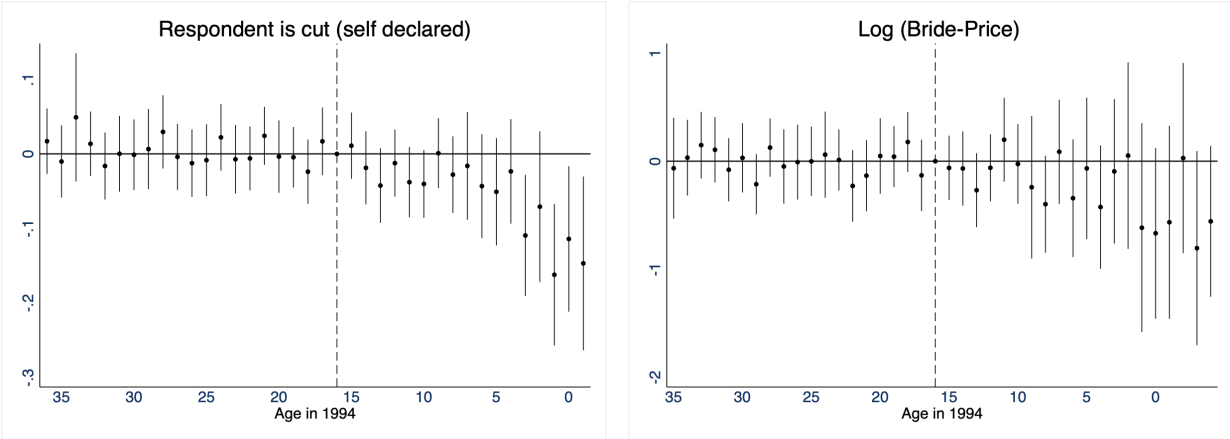


Figure 10: Event Study Graphs of the effect of the Anti-FGC campaign on FGC and Bride-Price

could potentially start benefiting from the campaign (under 15).

Figure 10 shows the β_1 coefficient. There are several takeaways from these figures. First, the coefficients for FGC and bride price are very close to zero throughout the pre-treatment period. This shows that at any point in time before treatment, the difference in outcome between women in villages receiving treatment and women in villages not receiving treatment is very close to zero. Second, not only are these differences small in point estimate, but their standard errors are also very small. This implies that these are very precisely estimated zero differences between individuals in the two groups of women before the beginning of the campaign. Second, we can see that treatment stars to generate a difference in outcomes among women younger than 15 at the time the campaign launched. These differences in FGC and bride price are statistically significant from a cohort aged 11 or younger when the campaign was launched, which corresponds to the modal age of circumcision. This is because, on average, more women in each cohort will benefit from the campaign. For similar reasons, and as expected, the effect of the program is an increasing function of women's date of birth. These figures show that the identification strategy is reasonable and that the program had an impact on FGC and bride price.

6.2 Mechanism: FGC and Bride-Price

I this section, I explore the mechanisms behind the decline of the bride-price. I provide a discussion substantiating that the decline of bride-price can be attributed to the variation on the bride's circumcision status.

6.2.1 Differential effect of the treatment on bride-price, by sisters characteristics.

In this section, I will use different proxy's that captures a variations in woman's FGC status and discuss their effect on bride-price.

To better isolate the effects of FGC on bride price, I introduce an additional source of variation in circumcision status at the individual level. I exploit the fact that in the Egyptian context the probability of female circumcision is a positive function of the number of previously circumcised sisters (Yount, 2002). Given this pattern, I expect that parents who have been exposed to anti-FGC and have already circumcised their earlier daughters will be less likely to comply with treatment and therefore more likely to still circumcise their younger daughters. Therefore, I use this sibling feature as a mitigating factor for the effect of the anti-FGC campaign on bride price and discuss several hypotheses. I limit my sample to women with at least one sister and estimate the following triple difference-in-difference:

$$\begin{aligned} BridePrice_{ivk} = & \lambda_1(Post_i \times Treat_v \times SIS_{ivk}) + \lambda_2(Post_i \times Treat_v) \\ & + \lambda_3(Post_i \times SIS_{ivk}) + \lambda_4(Treat_v \times SIS_{ivk}) + \lambda_5 SIS_{ivk} \\ & + \lambda_6 X_i + \alpha_{ivk} + \alpha_v + \alpha_k + \xi_{ivk} \end{aligned} \tag{4}$$

where, SIS_{ivk} is the number of sisters older than 15 years (circumcision threshold) at the time of the campaign. Since the ELMPS data do not contain information on FGC, I use the number of sisters who belong to the high-risk circumcision pre-treatment cohort. α_{ivk} is a total number of sisters FE that keeps the number of sisters constant. This allows to compare women of different birth rank to their sisters within families with similar numbers of girls. I also control for the total number of siblings. λ_5 captures the direct impact of having a sister at high risk of circumcision on the bride price, such as a potential differences in liquidity constraint that parents might have face when marry them. The λ_1 is coefficient is the interest coefficient and captures the differential effect of treatment on bride price for women of different sister feature (SIS_{ivk}).

The estimates of this equation are reported Table 2. These results allow to discuss two main mechanisms.

Table 2: Differential effect of the Anti-FGC radio program on Bride-Price by birth ranking among sisters (reduced form analysis)

Dependent Variable	log(Bride-Price)		
	(1)	(2)	(3)
(λ_2) Post X Treat	-0.224**	-0.227**	-0.230**
	(0.107)	(0.106)	(0.106)
(λ_5) SIS	0.108	0.101	0.101
	(0.0880)	(0.0872)	(0.0878)
(λ_1) Post X Treat X SIS	0.613*	0.572*	0.575*
	(0.326)	(0.325)	(0.324)
Observations	11,020	11,004	11,004
R-squared	0.649	0.650	0.650
Cohort FE	Y	Y	Y
Village FE	Y	Y	Y
Year of Marriage FE	Y	Y	Y
Number of Sisters FE	N	Y	Y
Individual Controls	N	N	Y
Mean Dep. Var.	5.527	5.527	5.527
Universe	$\geq$ 1 sister	$\geq$ 1 sister	$\geq$ 1 sister
Clusters	944	944	944

Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

A. First, there is a testable assumption about the effect of circumcision on bride price and the effect of SIS_{ivk} on the likelihood of being circumcised. If SIS_{ivk} did not affect circumcision probability, the effect of treatment on bride price should be independent of SIS. That is, because the effect of the composition of the sisters on the bride price is already accounted for by λ_5 and the effect of the campaign on the structure of the marriage market is captured by λ_2. Therefore, in comparing two treated women, any difference in bride price between a woman with the sister feature and one without a sister feature is attributed to the effect of that particular characteristics on the treatment. I find that, compared to an un-treated woman: a treated woman who does not have a high risk sister receives a 23% lower bride price (λ_2) while a woman who has an already circumcised sister receives a 34% higher bride price (λ_2 + λ_1). These results suggest that the effect of the treatment on bride-price is driven by a change in woman's circumcision status, and, that FGC affects the value of the bride-price at marriage.

B. Second, exploiting individual variation with village-level variation in FGC allows to discuss possible general equilibrium effects. When comparing two women with the same number of at high risks sister, one was exposed to the anti-FGC campaign and the other was not, we can expect two effects. In the absence of general equilibrium effect, the value of a woman's bride price with a high-risk older sister should decrease, if not remaining unchanged, with the treatment. In other words, when comparing two women with an at high risk sister, the one exposed to the campaign is just as likely or less likely to be circumcised compared to the unexposed woman. However, in the presence of an overall equilibrium effect, the treatment could produce an additional effect stemming from a relative scarcity of circumcised women available in the local marriage market. That is, when comparing two women with the similar sister's feature, a treated woman competes in a local marriage market where circumcised women are relatively scarcer than in the village of the untreated woman. This competitive effect creates an increase in the equilibrium share of the marital surplus that a circumcised woman can receive from a marriage. I find that for a woman with an at high risk of circumcision sisters, the treatment increases the bride price received at marriage by 57 log points (λ_1). A net positive effect suggests that marriage market equilibrium is generating additional surplus to circumcision.

6.2.2 Alternative explanations

Direct effect of the Anti-FGC radio content on Bride-Price.

A first alternative explanation could be that women exposed to the anti-FGC program receive a lower bride price because their parents were exposed to content that directly affects the value of the bride price asked at marriage. In other words, the content of the anti-FGC program directly affects the bride price. I offer a simple placebo test that allows test for such an effect. I use a specific sub-sample of women for whom I regress the value of the bride price they received at marriage to the anti-FGC radio signal in their birth village. These women were over 15 years old at the time of the campaign but not yet married. The reasoning is simple: Since circumcision takes place before the age of 15, the FGC status of these women could not change even with treatment. However, since they were not yet married, if the campaign had a direct impact on their bride price, other than through a change in FGC status, I should observe a variation in the bride price they received at marriage.

Table 3: Placebo: Anti-FGC Radio Program on Marriage Outcomes: Sample not married and likely cut at the time of the program

Dependant Variable	log(Bride-Price)	Education		Age at marriage	
		Wife	Husband	Wife	Husband
	(1)	(2)	(3)	(4)	(5)
Anti-FGC radio program	0.215	-0.140	0.0474	0.419	-0.558
	(0.421)	(0.108)	(0.104)	(0.598)	(0.826)
Observations	601	601	601	601	601
R-squared	0.770	0.847	0.773	0.836	0.782
Controls	✓	✓	✓	✓	✓
Municipality FE	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓
Model	OLS	OLS	OLS	OLS	OLS

Data are from ELMPS. Universe: Women married between 1995 and 2016 and aged between 17 and 31 years old in 1994. Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

Results are listed in Table 3. I find no statistically significant effect of the anti-FGC radio signal on the bride price received at the marriage (column 1). Additionally, I estimate a similar regression for alternative dependent variables and display the results in Table 3. The dependent variable in column 2 is the woman's educational level, in column 3 the husband's educational level, in column 4 the woman's age at marriage, and in column 5 the husband's educational level. Similarly, the testable hypothesis is that if the campaign directly affects outcomes such as education and age at marriage, that correlates with the bride price, rather than affecting those outcomes via a change in FGC, I should observe it in this subsample of women. In none of the above specifications does the anti-FGC campaign generate a statistically significant change in the dependent variable. These results provide supporting evidence that the anti-FGC is unlikely to impact bride price or alternative marriage market patterns through a vector other than FGC.

Direct effect of the Anti-FGC radio content on marriage related norms.

I also provide additional evidence that address concerns that the anti-FGC radio program affects the bride price by changing the bride's parents' attitude toward marriage, rather than by changing the bride's FGC status. I use information on women's attitudes towards marriage relaed norms as measured at the time the campaign aired, ie from EDHS 1995, 2000 and 2003. Mothers play a crucial role in influencing their daughters' marital outcomes (Sieverding and Hassan, 2016). Therefore, if the campaign triggers a change in bride price by challenging prevailing norms about marriage, a change in attitude should be observed in adult cohorts exposed to the campaign. I regress various indicators available in these EDHD waves on the anti-FGC radio coverage in the village women are living. Women were asked what is the ideal age to marry a girl, what is the ideal age to marry boy, and what is the ideal number of children. I find no statistically significant association between anti-FGC radio reception and women's response to these questions (Table 4, columns 1-3). These results provide additional support that the campaign did not affect bride price by changing expectations about marriage.

Table 4: Anti-FGC Radio Program on indicators of fertility and marriage from DHS 1995 and 2000

Dependant Variable	Ideal age to marry a girl	Ideal age to marry a boy	Ideal number of kids
	(1)	(2)	(3)
Radio-FGC-Coverage	0.467	3.483	-0.0635
	(0.360)	(3.788)	(0.100)
Observations	12,483	12,066	21,208
DHS Universe	1995	1995	1995/2000
MeanDEP	19.92	25.24	2.92

+ in the last year

[INSERT TABLE 4]

Decline in the Bride-Price practice.

Finally, I provide further evidence aimed at allaying concerns that bride price declines for women exposed to the anti-FGC campaign are due to weaker interest in the practice. In other words, if some families exchange a lower bride price in all marriages, on average, after the campaign, regardless of whether the bride is circumcised or not. If this is a mechanism explaining the decline in bride price, one should also observe a decline in the prevalence of bride price after the campaign. As interest in the practice wanes, more families would agree to pay no bride price at all, or make a small symbolic payment. To test this hypothesis, I regress an indicator of whether or not bride price was paid at marriage on the anti-FGC radio coverage and present the results in a table 5, column 1. I also regress a similar specification in which I consider that a bride-price is not paid if it's value is lower than 5 Egyptian pounds (symbolic payment). The results are display in column 2. I perform a similar exercise where I expand my definition of a symbolic payment to a bride price below 10 EGP and present the result in column 3. In all of this specifications, there is no statistically significant association between exposure to anti-FGC campaign during childhood and not receiving or receiving a symbolic bride-price at marriage. These results support the contention that the effect of the campaign on bride price is not triggered by a change in the practice of this custom.

Table 5: Effect of the campaign on the probability that a bride-price was paid at marriage

	A bride-price was paid at marriage		
Exluding payments of more than	> 0 LE	> 1 LE	> 10 LE
	(1)	(2)	(3)
Post X Treat	0.000997	0.00440	0.00311
	(0.00219)	(0.00856)	(0.0138)
Observations	12,505	12,505	12,505
R-squared	0.994	0.947	0.710
Cohort FE	Y	Y	Y
Village FE	Y	Y	Y
Year of Marriage FE	Y	Y	Y
Individual Controls	Y	Y	Y
Mean Dep. Var.	0.764	0.634	0.499
Clusters	1025	1025	1025

Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

[INSERT TABLE 5]

7 Alternative Strategy

7.1 Female Genital Cutting prevalence in age cohort and village.

In an alternative strategy, I use information available in EDHS and create an indicator of the proportion of circumcised women in a women's age cohort (groups of 5 years) and village. Therefore, I can take advantage of significant cross-sectional and temporal variations in female genital cutting prevalence and merge this indicator with available individual bride price data. I estimate the following equation:

$$BridePrice_{ivkt} = \eta_1 FGC_{vk(i)} + \eta_2 X_i + \eta_q + \eta_k + \eta_t + \epsilon_{iqat} \quad (5)$$

where $BridePrice_{ivkt}$ is the value of the bride-price received by a woman $\boldsymbol{i}$, born in a village $\boldsymbol{v}$, at year $\boldsymbol{k}$ and married at year $\boldsymbol{t}$. $FGC_{vk(i)}$ is FGC prevalence in her village and age cohort. X_i is a set of controls that includes the education of husband and wives, spouses parent's education; wife and husband's age at marriage. η_q η_k η_t are municipalities (qism), cohort and year of marriage fixed effect. I report the result in table **??**. As expected, the coefficient η_1 is positive and statistically significant: one percent increase in FGC prevalence in woman's birth cohort and village increases the value of the bride-price by 1.02 log points.

Table 6: Bride-Price and FGC Prevalence by cohort and municipality of birth - OLS with FE

Dependent Variable	Log (Bride-Price)				
	(1)	(2)	(3)	(4)	(5)
FGC prevalence	0.980***	0.980***	0.977***	1.130***	1.027***
	(0.314)	(0.314)	(0.314)	(0.327)	(0.345)
Observations	10,075	10,075	10,075	10,075	10,075
Individual controls	✓	✓	✓	✓	✓
Cohort FE		✓	✓	✓	✓
Municipality FE		✓	✓	✓	✓
HH Wealth & Assets			✓	✓	✓
Age at marriage FE				✓	✓
Time Trend					✓

FGC prevalence is the average prevalence of cut women belonging to the same cohort and born in the same municipality. Data on cutting are from the EDHS and are merged to the ELMPS. Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

7.2 Segregated marriage market.

An interesting feature of the Egyptian context is that marriages are rarely exogamous, despite the fact that multiple religious communities lived together. Less than 1% of the marriages in our sample are exogamous. Therefore, this provides an opportunity to exploit differences in women's age cohort and village prevalence of FGC to conduct a simple placebo test. The idea is the following: FGC is a practice among Muslims and Copts women. However, both communities marry in two separate marriage markets and the bride price is only paid among Muslim communities. Hence, there is a testable assumption: if the equation 5 identifies the effect of FGC on the marriage market, a Muslim woman's bride price should not be influenced by the prevalence of FGC among Coptic women of her cohort and village. However, if the η_1 coefficient of Equation F is driven by co-founders, such as for example, traditional norms in the village that affects both FGC and bride price, then the prevalence of FGC among Copts and Muslims should have similar effects on bride price.

I construct an indicator that measures for a woman the prevalence of FGC among Coptic women FGC_{Coptic} in her age cohort and village, and the analogous indicator of the prevalence of FGC among Muslim women belonging to her age cohort and village belong (FGC_{Muslim}).

I regress the value of the bride price on the woman's FGC prevalence in age cohort and village measured among Muslim communities FGC_{Muslim}. The coefficient is positive and statistically significant: a percentage increase in FGC prevalence among Muslim women of the woman's age cohort and village increases her bride price by 1.7 log points (column 3). The effect is larger than the baseline measure of FGC prevalence (FGC), where FGC is measured without distinguishing between communities (column 1). This difference can be explained by measurement errors leading to attenuation bias of the coefficient associated with FGC. As expected, when regressing FGC_{Coptic} on the value of the bride price, the associated coefficient is smaller, with the opposite sign and not statistically significant (column 2). In an additional specification, I add both FGC and FGC_{Coptic} when estimating the equation5. The coefficient associated with FGC remains positive and statistically significant, while the coefficient associated with FGC_{Coptic} is not statistically significant. Similarly, in an alternative specification, I include both FGC_{Muslim} and FGC_{Coptic}. FGC_{Muslim} is a positive and statistically significant determinant of the value of the bride price while FGC_{Coptic} has no statistical significance. These results suggest that the woman's FGC status is a strong predictor of the value of the bride price received at marriage.

Table 7: Bride-Price and FGC Prevalence by cohort and village (Muslim and Copte)

Dependant Variable	Value of the bride-price				
	(1)	(2)	(3)	(4)	(5)
FGC rates (0-1)	1.130**			1.156**	
	(0.483)			(0.501)	
FGC_{copte} rates (0-1)		-0.329		-0.367	-0.387
		(0.406)		(0.412)	(0.407)
FGC_{muslim} rates (0-1)			1.707**		1.738**
			(0.741)		(0.740)
Observations	11,518	11,518	11,529	11,518	11,518
R-squared	0.205	0.204	0.205	0.205	0.206
Controls		✓	✓	✓	✓
Municipality FE	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓
Year of Marriage FE	✓	✓	✓	✓	✓
Age at Marriage FE	✓	✓	✓	✓	✓

- Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

FGC prevalence is the average prevalence of cut women belonging to the same cohort and born in the same village. Data on cutting are from the EDHS and are merged to the ELMPS. Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

8 FGC: Pre-Marital Investment?

8.1 FGC and Pre-marital virginity examination

The advantage of having the information on gynecological examination from the DHS is that it is obtained where the information on cutting is available. This allows me to test directly whether the two practices substitute using an IV framework. I will estimate by

2SLS how the probability of being examined varies with the cutting status, which will be instrumented by exposure across age cohorts and villages to the radio program. In short, the first stage is the estimation of equation 2, the model in reduce form.

Table 8: Impact of the program and FGC on Virginity testing: Difference-in-Difference Analysis

Dependant Variable	Had a virginity testing at marriage			
	(1)	(2)	(3)	(4)
Post X Intensity	0.0468*		0.0513*	
	(0.0279)		(0.0292)	
FGC (Respondent is Cut)		-0.132**		-0.139**
		(0.0607)		(0.0603)
Observations	12,926	12,924	12,847	12,846
R-squared	0.481	0.474	0.495	0.487
Controls	✓	✓	✓	✓
Village FE	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Village-cohort trends	✓	✓	✓	✓
Year of Marriage FE	✓	✓	✓	✓
Mean dep var	14.55	14.55	14.03	14.03
Model	RF	2SLS	RF	2SLS

Table B.3.1 is the analogous table including the corresponding first stages. Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

[INSERT TABLE 8.1]

Table 8.1 displays the results of the reduced form and IV estimates. Likelihood of having a premarital virginity testing increase by 4.68 percentage point - which corresponds to an increase 31.48 % with respect of our mean sample (column 1). The 2SLS estimates presented column 2 can be interpreted as the local average treatment effect of being cut for the women who where not cut because of the program (compliers). They indicate that being cut reduces the probability to had a premarital examination by 13.2 percentage points (90.72 % with respect to our mean sample). The magnitude of this results suggest that the campaign introduce pre-marital virginity testing as a strong substitution practice for women who hasn't been cut. Column 3 and 4 present the results of the reduce form estimates and IV (2SLS) on the probability of having a premarital virginity testing excluding women who had their examination within the two months after the marriage. While virginity testing are done by families before marriage to ensure bride's virginity, tests perform post marriage consummation are usually ask at the demand of the husband in case of doubts concerning the bride's virginity. Excluding them did not affect the robustness of the results.

8.2 FGC and Human Capital Investment

Table 9: Impact of FGC on Woman's Education and age at marriage (2SLS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Woman's Education						
	Years of Schooling	Had Schooling	Primary	Secondary	>Secondary	Age at Marriage	
Post X Intensity	0.936***	0.0581**	0.0673*	0.0565	0.00839	-0.180***	-0.201***
	(0.360)	(0.0295)	(0.0358)	(0.0354)	(0.0234)	(0.0592)	(0.0564)
Observations	68,164	68,113	68,179	68,179	68,179	68,179	68,179
Cohort FE	Y	Y	Y	Y	Y	Y	Y
Village FE	Y	Y	Y	Y	Y	Y	Y

Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

Table 10: Impact of FGC on Woman's Education and age at marriage (Reduced Form)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Woman's Education						
	Years of Schooling	Had Schooling	Primary	Secondary	>Secondary	Age at Marriage	
FGC	-5.629**	-0.348**	-0.403*	-0.338	-0.0501	1.076***	1.224***
	(2.364)	(0.177)	(0.227)	(0.221)	(0.139)	(0.375)	(0.375)
Observations	68,164	68,113	68,179	68,179	68,179	68,179	68,179
Cohort FE	Y	Y	Y	Y	Y	Y	Y
Village FE	Y	Y	Y	Y	Y	Y	Y

Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

9 FGC and Marriage Matching quality

In this section, I explore the effect of the campaign on marriage market outcomes. More particularly, in a setting where cutting serve as a pre-martial investment, one would expect parents to find less costly substitute to the cutting. Among them, premarital testing but also human capital. In section 9.0.1 I test whether the campaign had an effect on woman's level of education using the difference in difference and IV strategy described above. Additionally, I explore how characteristics of the groom changes. I use husband's level of education and spouses difference in education as proxy for better match in the marriage market. Finally, in section 9.0.2 I explore whether variation in the cutting induced by the campaign had an effect on characteristics of the marriage. I use endogamous marriage, define as marriage with blood relatives and the duration of engagement as technologies aiming to reduce asymmetric information on the quality of the bride. I also explore effect of the campaign on leaving arrangement with families in law and the household wealth.

9.0.1 Husband's Education

In Table **??** I present results of the difference-in-difference and IV analysis of the effect of FGC, through exposure to the campaign, on bride and grooms education. Education is measured in years of schooling. I find that brides exposed to the campaign receive 0.83 additional year of schooling (column 1). In addition, women who are exposed to the campaign are married to men who have received 0.79 fewer years of education than women not exposed to the campaign (column 3). Finally, women exposed to the campaign are married to men who receive 0.05 years of education than they did. IV results allows us to interpret the effect of being cut on education level for the compliers to the treatment. the results suggest that the girls who were cut received 1.92 years less education (column 2). Being cut increase husband's education by 6.06 years (column 4). Finally, cut woman married with a husband educated 1.91 years more than them. The results suggest that parents affected by the campaign substitute the cutting to an investment in human capital. Cutting remain valuable on the marriage market: the cutting status increase the quality of the match (education difference) and the quality of the groom (level of education).

Table 11: Impact of FGC on Husband's Education and Spousal education differential (2SLS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Husband's Education					Spousal Difference	
	Years of Schooling	Had Schooling	Primary	Secondary	>Secondary	Years Difference	Husband is more educated
FGC	5.763**	0.443**	0.443**	0.377*	0.0206	1.338**	0.569**
	(2.519)	(0.202)	(0.202)	(0.220)	(0.166)	(0.537)	(0.241)
Observations	68,048	68,113	68,113	68,113	68,113	68,113	47,634
Cohort FE	Y	Y	Y	Y	Y	Y	Y
Village FE	Y	Y	Y	Y	Y	Y	Y

Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

Table 12: Impact of FGC on Husband's Education and Spousal education differential (Reduced form)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Husband's Education					Spousal Difference	
	Years of Schooling	Had Schooling	Primary	Secondary	>Secondary	Years Difference	Husband is more educated
PostXtreat	-0.780**	-0.0599**	-0.0599**	-0.0510*	-0.00278	-0.116***	-0.0761**
	(0.332)	(0.0275)	(0.0275)	(0.0288)	(0.0225)	(0.0442)	(0.0310)
Observations	68,048	68,113	68,113	68,113	68,113	68,113	47,634
Cohort FE	Y	Y	Y	Y	Y	Y	Y
Village FE	Y	Y	Y	Y	Y	Y	Y

Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

9.0.2 Wealth, Kinship and Engagement duration

In this section, I explore how the characteristics of the marriage are affected by FGC through exposure to the anti-fgc campaign using the difference-in-difference approach. Existing anthropological literature on kinship marriage in North Africa and Middle Eastern culture described endogamous marriage (with blood relative) as a way to reduce the asymmetry of information on the quality of the partner (Hoodfar, 1997; Casterline and El-Zeini, 2003). The marriage module of the ELMPS survey also include information on the number of months between the engagement and the actual marriage. I use this information as an indicator for a higher demand from the couple to better learn about each other attribute. The surveys also include information on living arrangement such as whether the couple was leaving alone (nuclear household) or with the family in laws (stem family). Finally, to explore how the probability of marrying a richer husband is affected by the campaign, I use a measure of the position of the household in the wealth distribution of the country. It relies on a standard relative measure that divides household within a country into 10 even groups ranging from the poorest 10% to the wealthiest 20%. Table 13 shows results of the program effects on this different marriage characteristics. Likelihood of women marrying a blood relative increase by 6.35 percentage points with the exposure to the campaign (column 1). Similarly, the campaign increase by 1.38 months the duration of the engagement between couples (column 2). I find that the campaign decrease by 2.55 percentage points the probability of the couple living with their family in law. However, this effect is not statistically significant. Finally, the exposure to the campaign increase the probability of women marrying in a household belonging to a higher decile of the population by 5.72 percentage point (column 4).

Table 13: Impact of the program and Marriage Characteristics : DD Analysis

Dependant Variable	Blood-relative	Engagement duration	Stem Family	HH Wealth decile
	(1)	(2)	(3)	(4)
Post X Intensity	0.0635**	1.385*	-0.0255	0.0572*
	(0.0264)	(0.801)	(0.0455)	(0.0313)
Observations	5,971	5,596	5,975	5,975
R-squared	0.139	0.194	0.244	0.973
Controls	✓	✓	✓	✓
Village FE	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Year of Marriage FE	✓	✓	✓	✓
Village-cohort trends	✓	✓	✓	✓

Standards errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

10 Bride-Price: An incentive to FGC? Cross Africa Evidence

In this section I investigate if the contemporary practice of FGC is explained by the practice of bride price. I exploit heterogeneity in marriage payment across ethnic group in different countries of Africa.

10.1 Data

I pooled different waves of DHS for 17 African countries that elicit information on FGC and on respondent's ethnicity. In total 57 waves of DHS are pooled together from 1993 to 2018. Table **??** provide a list of countries and years of survey. I match the DHS data with the ethnographic atlas of Murdock using information on ethnicity available in the DHS. The ethnographic Atlas is a worldwide ethnicity level database assembled by George Peter Murdock that contains pre-industrialization information for 1,265 ethnic groups including ancestral practice of bride price. More information on the matching process are given in the section **??** of the data appendix.

10.2 Empirical Strategy

I exploit heterogeneity across ethnic groups and within country to test whether ethnic groups characterised by the bride-price practice have a higher prevalence of female genital cutting. I estimate the following model:

$$FGC_{iec} = \lambda BridePrice_e + X_{iec} + \theta_e + \kappa_c + \xi iec \quad (6)$$

where FGC is taking the value one if a woman i, belonging to an ethnic group e and living in a country c declare being cut, zero otherwise. $BridePrice$ is a dummy variable taking the value one if the ethnic group practice the Bride-price. X is a vector of individual covariates controlling for woman's age, education, a set of religion dummies, a dummy for urban residence and an index of household wealth. θ is a set covariate controlling for ethnographic characteristics such as marriage patterns (stem families, monogamy) and subsistence activities: dependence on gathering, hunting , fishing , agriculture, animal husbandry. κ are countries fixed effects. Standard errors are clustered at the ethnicity level.

10.3 Results

Results are given Table 14. Column 1-5 displays the coefficient of the main variable of interest (bride-price) for five specifications: first without controls or fixed effect, then adding country fixed effects, individual socioeconomic controls, controlling for other marriage patterns of the ethnic groups, and finally the subsistence activities. Overall, the results are consistent with our hypothesis. Women belonging to an ethnic groups that practiced the bride price transfers at marriage are more likely to be cut. Interpreting λ requires consideration. Endogeneity problems due to reverse causation are unlikely to be a concern as the bride-price practice is pre-determined to the spread of female genital cutting through sub-Saharan Africa (La Ferrara et al., 2020).[17] Results column 4-5 mitigate concerns about unobservable confounding at the ethnicity level. When controlling for additional marriage patterns and subsistence activities that could be correlated with both female genital cutting and bride price, the coefficient remains similar in magnitude and significance.[18]

Table 14: Correlation: female genital cutting and bride-price

Dependent Variable	Female genital cutting				
	(1)	(2)	(3)	(4)	(5)
Bride-Price	0.100	0.0730*	0.0854**	0.0936**	0.104***
	(0.102)	(0.0403)	(0.0389)	(0.0386)	(0.0377)
Observations	433,703	433,703	433,664	433,664	433,664
Country FE	no	yes	yes	yes	yes
Wife's Controls	no	no	yes	yes	yes
Ethno-marriage Controls	no	no	no	yes	yes
Ethno-Agri controls	no	no	no	no	yes

*** p<0.01, ** p<0.05, * p<0.1

[17]The custom of bride-price dates back as far as 3000 BCE (Anderson, 2007) while female genital cutting would have spread through the African continent with the African slave trade in the 15th century (La Ferrara et al., 2020).

[18]Estimates are also robust when controlling for male circumcision and pastoralism.

11 Figures and Tables

11.1 Figures

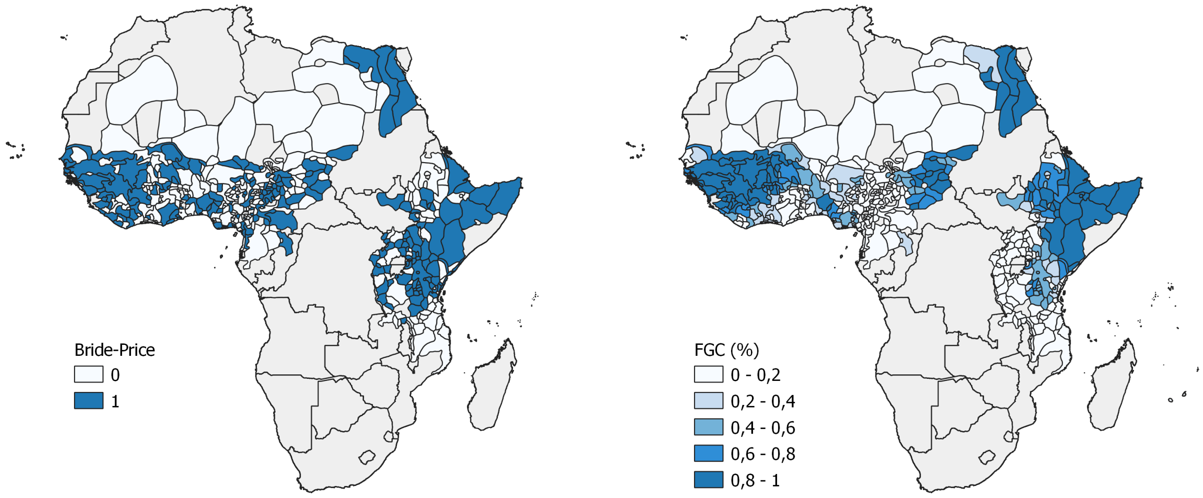


Figure 11: Bride-Price and Prevalence of FGC by ethnic group

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A Theoretical Appendix

A.1 Comparative Statics on the effect of the campaign

A.1.1 Effect of the campaign on the probability to be cut

The effect of the campaign on the probability to be cut is given by the following partial derivative:

$$\frac{\partial P_{I_e}(F_i = 1)}{\partial s} = \frac{\partial G(\alpha_i < \alpha^*_{I_e}|s)}{\partial s}$$

Recall that $G(\alpha_i|s) = \frac{1}{\sqrt{2\pi\widehat{\sigma}^2}} \int_{-\infty}^{\alpha^*_{I_e}} e^{-\frac{1}{2}\frac{(\alpha_i - \widehat{\mu})^2}{\widehat{\sigma}^2}} d\alpha_i$ and $\alpha^*_{I_e} = \frac{\Delta V_i}{1+r}(I_e \frac{1-\gamma}{\gamma} + 1)$.

Which gives:

$$\frac{\partial G(\alpha_i < \alpha^*_{I_e}|s)}{\partial s} = \frac{\partial}{\partial s} \frac{1}{\sqrt{2\pi\widehat{\sigma}^2}} \int_{-\infty}^{\alpha^*_{I_e}} e^{-\frac{1}{2}\frac{(\alpha_i - \widehat{\mu})^2}{\widehat{\sigma}^2}} d\alpha_i$$

with

$$\widehat{\mu} \equiv \mathbb{E}[\alpha_i|s] = \frac{\tau_{\alpha_i}\mu_{\alpha_i} + \tau_\eta s}{\tau_{\alpha_i} + \tau_\eta}$$

For simplification lets denote

$$z(\alpha, s) = \frac{(\alpha_i - \widehat{\mu})^2}{\widehat{\sigma}^2}$$

Using the Leibniz rule we an re-write

$$\frac{\partial G(\alpha_i < \alpha^*_{I_e}|s)}{\partial s} = \frac{1}{\sqrt{2\pi\widehat{\sigma}^2}} \int_{-\infty}^{\alpha^*_{I_e}} -\frac{1}{2}\frac{\partial z(s)}{\partial s} e^{-\frac{1}{2}z(\alpha_i, s)} d\alpha \tag{7}$$

Note that we have :

$$\frac{\partial z(\alpha_i, s)}{\partial s} = \frac{\tau_\eta(\alpha_i - \tau_{\alpha_i}\mu_{\alpha_i} - s)}{\widehat{\sigma}^2(\tau_{\alpha_i} + \tau_\eta)}$$

$$\frac{\partial z(\alpha_i, s)}{\partial \alpha_i} = -\frac{(\alpha_i - \tau_{\alpha_i}\mu_{\alpha_i} - s)}{\widehat{\sigma}^2(\tau_{\alpha_i} + \tau_\eta)}$$

which implies that

$$\frac{\partial z(\alpha_i, s)}{\partial \alpha_i} = -\frac{1}{\tau_\eta}\frac{\partial z(\alpha_i, s)}{\partial \alpha_i} \tag{8}$$

Plugging equation 8 in equation 7, we can re-write

$$\frac{\partial G(\alpha_i < \alpha^*_{I_e}|s)}{\partial s} = \frac{1}{\sqrt{2\pi\widehat{\sigma}^2}} \int_{-\infty}^{\alpha^*_{I_e}} -\frac{1}{\tau_\eta}\frac{\partial z(s)}{\partial \alpha_i} e^{-\frac{1}{2}z(\alpha, s)} d\alpha_i$$

$$= -\frac{1}{\tau_\eta}\frac{1}{\sqrt{2\pi\widehat{\sigma}^2}}e^{-\frac{1}{2}z(\alpha^*_{I_e},s)}d\alpha_i = -\frac{g(\alpha^*_{I_e})}{\tau_\eta}$$

$$\frac{\partial G(\alpha_i < \alpha^*_{I_e}|s)}{\partial s} = -\frac{g(\alpha^*_{I_e})}{\tau_\eta} < 0 \qquad (9)$$

Result 9 proof that the probability of cutting decrease with the signal of the campaign.

B Appendix

Table B.0.1: Robustness: Log Transformation

	Log Transformation of Bride-Price				
	log(y + 1)	log(y + 0.1)	log(y + 0.01)	IHS	Level
	(1)	(2)	(3)	(4)	(5)
Post X Treat	-0.211**	-0.206**	-0.205**	-0.212**	-311.6*
	(0.101)	(0.103)	(0.103)	(0.103)	(181.0)
Observations	12,358	12,358	12,358	12,358	12,358
R-squared	0.605	0.853	0.907	0.646	0.233
Cohort FE	Y	Y	Y	Y	Y
Village FE	Y	Y	Y	Y	Y
Year of Marriage FE	Y	Y	Y	Y	Y
Individual Controls	N	N	N	N	N
Mean Dep. Var.	1.418	-0.840	-1.769	1.626	1057.710
Clusters	1020	1020	1020	1020	1020

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

B.1 Tables Placebo

B.2 Placebo on brideprice

Table B.2.1: placebo reform on bride-price

Dependent Variable	Log(Bride-Price)	
	(1)	(2)
Panel A - Experiment of Interest: Women age 0 to 5 Versus 15 to 24 in 1994		
Post X Intensity	-0.546*	-0.631**
	(0.298)	(0.286)
Observations	6,074	6,074
	(3)	(4)
Panel B - Control Experiment: Women age 15 to 25 versus 25 to 35		
Post X Intensity	-0.112	-0.0738
	(0.316)	(0.297)
Observations	2,888	2,888

specification 2 and 4 controls for Village-cohort trends)

Table B.2.2: placebo reform on FGC

Dependent Variable	FGC (Self Reported)	
	(1)	(2)
Panel A - Experiment of Interest: Women age 0 to 5 Versus 15 to 24 in 1994		
Post X Intensity	-0.214***	-0.211***
	(0.0291)	(0.0309)
Observations	21,272	21,272
	(3)	(4)
Panel B - Control Experiment: Women age 15 to 25 versus 25 to 35		
Post X Intensity	-0.0193	-0.0182
	(0.0119)	(0.0127)
Observations	41,504	41,504

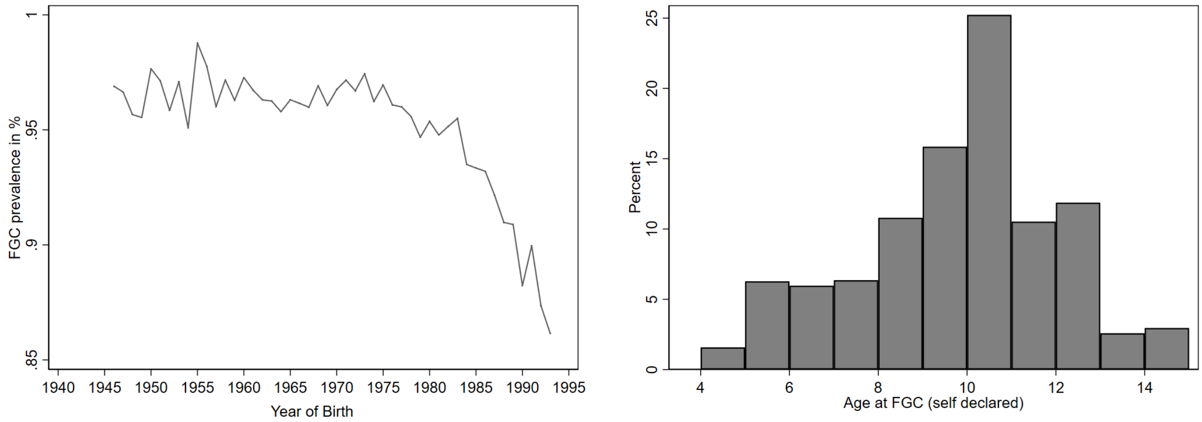

Figure B.2.1: FGC Prevalence and Age at FGC for women born between 1946 and 1995, Weighted, Egypt DHS (1992-2014), N= 62,305

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B.3 IV with first stage

B.3.1 Impact of the program and FGC on Virginity testing: DD and IV Analysis (with first stage)

Table B.3.1: Impact of the program and FGC on Virginity testing: DD and IV Analysis (with first stage)

Dependent Variable	Had a Virginity Exam		FGC	Had a Virginity Exam		FGC
	(1)	(2)	(3)	(4)	(5)	(6)
Post X Intensity	0.0468*		-0.267***	0.0513*		-0.266***
	(0.0279)		(0.0163)	(0.0292)		(0.0163)
FGC (Respondent is Cut)		-0.132**			-0.139**	
		(0.0607)			(0.0603)	
Observations	12,926	12,924	12,924	12,847	12,846	12,846
R-squared	0.481	0.474	0.141	0.495	0.487	0.140
Controls	✓	✓	✓	✓	✓	✓
Village FE	✓	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓	✓
Village-cohort trends	✓	✓	✓	✓	✓	✓
Year of Marriage FE	✓	✓	✓	✓	✓	✓
Model	OLS	2SLS	2SLS	OLS	2SLS	2SLS

B.3.2 Impact of the program and FGC on Virginity testing: DD and IV Analysis (with first stage)

Table B.3.2: Impact of the program and FGC on Education (Years) : DD and IV Analysis (with first stage)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	totalyearedu	diff_edu3	circum	totalyearedu_hsb	totalyearedu_hsb	circum	diff_edu3	diff_edu3	circum
1.REB_cohort#c.REB_radio	0.838***		-0.273***	0.822***		-0.254***	-0.0511*		-0.273***
	(0.300)		(0.0169)	(0.290)		(0.0135)	(0.0275)		(0.0169)
circum		1.911***			6.064***			1.911***	
		(0.496)			(1.027)			(0.496)	
Observations	19,163	12,514	12,514	19,129	19,122	19,122	12,518	12,514	12,514
R-squared	0.452	0.087	0.140	0.454	0.378	0.123	0.975	0.087	0.140
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Village FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Village-cohort trends	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year of Marriage FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Model	OLS	2SLS	OLS	OLS	2SLS	OLS	OLS	2SLS	OLS

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