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Abandoning female genital mutilation/cutting (FGMC) is an emerging but costly parental investment strategy in rural Ethiopia

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ABSTRACT

Female genital mutilation or cutting (FGMC) has profound consequences for an estimated 200 million women world-wide, yet affected communities often resist efforts to end the practice. Marriage market dynamics have been proposed as key to this resistance, because where FGMC is normative, parents are motivated to cut their daughters to improve their marriage prospects. Some economists have also argued that financial gain, through bride wealth payments, incentivises parents to cut daughter's at time of marriage. Bride wealth, however, does not necessarily equal net economic return, confounding efforts to test this assumption. Here we use detailed data on the financial value of *all* exchanges at marriage from Ethiopian Arsi Oromo agropastoralists to assess their association with FGMC. We also explore the idea that parents must replace FGMC with other forms of investment (e.g., education) when cutting practices are rejected. Multivariate multilevel Bayesian models were run using data from the first marriages of 358 women to assess the association between FGMC status and education and marriage-related outcomes: bride wealth payments, dowry costs, and age at marriage. Being cut is associated with lower dowry costs and earlier age at marriage but does not predict bride wealth paid by the groom's family. School attendance is associated with higher bride wealth, particularly for women with four or more years of education, and with later age at marriage. These findings indicate that bride wealth payments do not maintain FGMC among the Arsi Oromo. While we find a relative economic loss for parents from FGMC abandonment through higher value dowry gifts, this may be traded-off against the health benefits to uncut daughters. These findings point to the emergence of new norms, whereby Arsi Oromo parents reject cutting for their daughters and prefer their daughters-in-law to be educated.

1. Introduction

Female genital mutilation/cutting (FGMC) refers to procedures which alter female genital organs for non-medical reasons (World Health Organization et al., 1997). The negative health consequences of FGMC, particularly the most severe forms of FGMC are well documented, and include physical, psychological, and sexual harm for cut women (Berg and Denison, 2012; Reisel and Creighton, 2015), which additionally represent an economic burden for the wider community (Tordrup et al., 2022). Despite multi-million-pound campaigns led by the United Nations (UN), national governments, and non-governmental organisations (NGOs) to end the practice by 2030 (Sustainable Development Goal target 5.3), over 200 million girls alive today are estimated to have been cut. In Ethiopia, one of the countries where the practice is most concentrated, around 60% of women have experienced FGMC (UNICEF, 2020). Understanding why FGMC persists is a central priority for global policymakers, reflected in recent calls for more research on the social norms and cultural institutions thought to hold the practice in place (Matanda and Lwanga-Walgwe, 2022). In this article we explore the largely untested assumption that customary wealth exchanges at marriage, specifically bride wealth payments, are a key factor in the perpetuation of FGMC (Avalos et al., 2015; Garcia-Hombrados and Salgado, 2019; Khalifa, in preparation; Wagner, 2015), focusing on a rural Arsi Oromo community in South-Central Ethiopia where FGMC rates are high but declining (Gibson et al., 2018). We investigate the relationship between a woman's cutting status and both the economic transfers that occur at her marriage and her age at marriage, to assess whether there are financial and social benefits associated with FGMC. We also explore the idea that FGMC can be replaced by formal education, acting as an alternative form of pre-marital parental investment, by

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improving a daughter's marriage prospects (Garcia-Hombrados and Salgado, 2019).

1.1. Economic drivers of FGMC maintenance

There is a growing body of both economic and anthropological literature arguing that parents may be strongly motivated to cut their daughters to improve their marriage prospects (Boyden, 2012; Chesnokova and Vaithianathan, 2010; Jinnah and Lowe, 2015). Scholars in the field of FGMC widely acknowledge that in communities where this practice is prevalent, it is considered a prerequisite for marriage. FGMC is thus represented as a form of pre-marital parental investment which ensures that daughters gain access to essential social and economic resources through marriage (Garcia-Hombrados and Salgado, 2019; Wagner, 2015), for example, by securing wealthier husbands or becoming a high-ranking wife in a polygynous union (Chesnokova and Vaithianathan, 2010). This is most evident in contexts where there are few labour-market opportunities for women, and marriage represents the main mechanism for ensuring a daughter's socio-economic welfare (Boyden et al., 2013; Howard and Gibson, 2017; Reason, 2004). However, there are also numerous socio-cultural reasons beyond access to marriage markets which may maintain cutting, to which we will return in our discussion.

Economists have interpreted the requirement of FGMC as a precondition for marriage as a form of commodification of sexual access. In this perspective, marriage is viewed as a transaction where a groom seeks to acquire a virgin and sexually exclusive wife, and FGMC is seen as a means to guarantee this desired outcome. Ethnographic data supports this interpretation in certain communities (Abathun et al., 2016; Johansen, 2017; Mackie, 2000; Posner, 1994). However, in other societies, the value placed on virginity and sexual exclusivity may not be as high, and the role of female (and male) genital mutilation or cutting is more focused on regulating appropriate sexual interactions rather than preventing women (and men) from engaging in them (Hodgson, 2011; Talle, 2007). These latter ethnographic observations are supported by quantitative research by Howard and Gibson (2019) who found that FGMC does not always restrict women's sexual behaviour using large-scale DHS data from five West African countries.

Economists have also proposed that bride wealth payments, i.e., customary transfers of money and other assets from the groom's family to the bride's at marriage, may create strong additional economic incentives for cutting (Avalos et al., 2015), because cut brides are assumed to command higher bride wealth payments (Khalifa, in preparation). Bride wealth can be used to increase the budget available to other family, typically brothers to fund their own marriage payments, giving them a "stake" in the market return of female relatives (Bergstrom, 1996). Although compelling, the hypothesis that FGMC leads to higher value bride wealth payments from in-laws at the individual level has yet to be tested with empirical evidence.

1.2. Alternatives to FGMC

If parents cut their daughters to improve their resource acquisition, social status, or reproductive opportunities, this leads to the prediction that it may be possible to replace FGMC with alternative, less harmful forms of pre-marital investment which achieve the same goals. Garcia-Hombrados and Salgado (2019) propose a theoretical model whereby education and FGMC act as substitutes in the marriage market, based on the notion that both lead to improvements in marriage outcomes. Support for this idea can be found in studies showing how formal education may replace FGMC as a source of status, respect, and marker of adulthood (Van Bavel, 2022), and may provide women with new economic opportunities through skills-based employment within and outside marriage (Reason, 2004). Further, it has been found in Indonesia and Zambia that school construction programmes increased female educational attainment among ethnic groups practicing bride wealth, but not groups who do not (Ashraf et al., 2020). The reason for this finding is attributed to the expectation that educated daughters would receive higher bride wealth, which motivated parents to prioritise their daughters' education. However, the hypothesis that education can be directly substituted for FGMC in the marriage market has not been empirically tested (Garcia-Hombrados and Salgado, 2019).

1.3. Wealth transfers at marriage: bride wealth and dowry

Historically and cross-culturally, many societies as part of marriage negotiations and ceremonies practice exchange wealth between the two families involved, namely the aforementioned bride wealth and dowry. Dowry is the giving of gifts and transfer of assets from parents directly to their daughter or jointly to the married couple. The size or value of dowry gift often contributes to a bride's status within her marital home and among her new affinal kin, and so can be considered a form of parental investment in daughters (Bossen, 1988; Mace, 1996), or a strategy to attract wealthy bridegrooms (Gaulin and Boster (1990). As noted, it has been suggested that bride wealth is a motivating factor for practicing FGMC on daughters, whereby parents accrue higher financial rewards when their daughters are cut. However, a narrow focus on bride wealth may miss the true immediate net financial returns to parents on their daughter's marriage (setting aside longer-term returns and non-financial benefits). While much of the literature on marriage transactions assumes bride wealth payments occur in societies without dowry gifts, and vice versa, this overlooks 'indirect dowry' whereby bride wealth payments from the groom's family fund the dowry given to a daughter (Schlegel and Eloul, 1987). Further, some anthropologists have critiqued the notion that all transfers of wealth at marriage fall neatly into the bride wealth-dowry typology (Helliwell, 2000), and less formalised gift giving may go undocumented.

Hence, the financial reward (net economic return) for parents on a daughter's marriage can only be calculated by considering the full range of transfers occurring in each cultural context. Further, even if the assumption that FGMC attracts higher bride wealth holds, the presence of gift giving in the opposite direction (whether as formalised dowry or not) may have varied impacts on net economic return. For example, higher bride wealth may be associated with lower dowry where parents are assured of their daughter's prospects, maximising net returns. Conversely, higher bride wealth payments for cut women may lead to higher dowry gifts too, *curtailing* any net financial returns for parents. Parents may also choose to bestow additional higher value dowry gifts to uncut daughters who attract lower bride wealth, to ensure they maintain status and bargaining power in marriage. While likely to vary by cultural context, the relationships between FGMC and bride wealth, dowry, and net economic returns have yet to be empirically tested anywhere due to lack of suitable data on the economic arrangements that surround marriage.

1.4. Aims and objectives

Here we use marriage and economic data from a rural Arsi Oromo community in South-Central Ethiopia where FGMC prevalence is high, but declining (Gibson et al., 2018). By exploring variation within a single population, we limit the confounding effects of cultural, economic change or outside intervention that may influence parental behaviour and marriage transactions. In this Arsi Oromo community marriage represents the main point of transfer of wealth and status from parents to offspring, and the main source of socio-economic security for women. People practice both culturally recognised bride wealth [*gabbara/'bride cost'*] *and* dowry [*gigawo/'gift for a journey'*], facilitating the clear discernment of wealth transfers contributing to parental net economic returns at marriage. In addition, our sample includes the first generation of women in the community not to have been cut. This situation offers insights into the processes underpinning FGMC decision-making; why some parents cut their daughters, while others defy the prevailing social

norms and choose not to. We explore the relationships between FGMC and wealth transfers at marriage, through both bride wealth payments and dowry costs. We also assess the relationship between FGMC and a woman's entry into marriage, through her age at first marriage.

Finally, we explore the 'education for FGMC' substitution hypothesis (Garcia-Hombrados and Salgado, 2019). Education in Ethiopia consists of primary/elementary school (split into two cycles of four years), followed by two years of 'secondary first cycle' schooling and the either two years of 'secondary preparatory', leading to higher education entrance examinations, or five grades of vocational training. Arsi Oromo participation is relatively low, yet becoming more common (Uggla et al., 2018). While education itself is free, it comes at the cost of a child's household labour (Gibson and Lawson, 2011; Hedges et al., 2018) and a lack of local secondary schools causes attendance to typically incur additional transport and accommodation costs, meaning education necessitates parental investment. In the early 2000's, Arsi Oromo parents favoured educating sons, with wealthier families preferentially investing in early-born sons (Gibson and Sear, 2010). Here we identify the extent to which investment in a daughter's education and interactions between education and FGMC predict marriage outcomes.

For the purposes of hypothesis testing we make the following (necessarily simplified) predictions, based on "optimal outcomes" for the daughters' parents:

Bride wealth: due to presumed associations between FGMC and desirable female characteristics, we predict payments to be higher when daughters are cut. Parents being willing to invest in the education of daughters indicates it is considered a valuable asset, thus education will also be associated with higher payments.

Dowry: if both FGMC and education are desired by prospective grooms and in-laws, parents will be required to make less investment in other ways and so dowry costs will be lower when daughters are cut and/or educated.

Economic returns (bride wealth – dowry): given the above predictions, returns will be higher when daughters are cut and/or educated.

Age at marriage: while we note that higher levels of education are often observed to delay marriage, we make the following prediction for the sake of consistency: earlier age at marriage increases the length of a woman's reproductive career, and so her family size, incentivising parental strategies to reduce time to marriage. If being cut and educated are desirable traits, they will reduce time to attract an approving groom and in-laws. Thus, age at marriage will be lower when daughters are cut and/or educated.

2. Materials and methods

2.1. Study population

The Oromo are the largest ethnic group in Ethiopia, of whom Arsi Oromo are one of the largest subgroups. The Arsi Oromo are predominantly-Muslim agro-pastoralists who combine maize and wheat cultivation with cattle-herding in the Arsi region in Southern Central Ethiopia. Inheritance patterns are patrilineal, and a third of men are polygynous with 2 or 3 wives (Gibson and Mace, 2007). Post-marital residence is predominantly patrilocal, so that daughters move from their natal village to join their husband's household in another village at marriage. Almost all Arsi Oromo marriages are arranged by the parents and extended family of the wedding couple. Marriage is of critical importance in Oromo society, as it strengthens social and economic alliances between families, lineages, and villages. Marriage also involves the largest intergenerational transfers of wealth from parents to offspring, through marriage payments and costs (Beyene and Tolera, 2006; Telila, 2020). Prior to marriage, the families of the wedding couple agree upon bride wealth payments [*gabbara, which translates as "bride cost"*]. The bride wealth is typically paid in cash which is endowed to the daughter's family from the son's family. The payment of bride wealth by the groom's family is viewed as compensation for the loss of the girl's contribution to her kin after marriage (Badhaasoo, 2000). Parents also bestow their daughters with dowry gifts [*gigawo, which translates as "gift for a journey"*], which are comprised of household items they take with them to their marriage, e.g., blankets, cooking equipment, and/or small livestock (Gibson and Gurmu, 2011). The dowry is paid to honour the bride, and is viewed as providing her with economic and negotiation power in her new household with her in-laws. With few off-farm income generating activities, Arsi Oromo parents may take years to accumulate the wealth required to cover these marriage payments; however, parents benefit from such investment, as higher marriage payments are linked to securing higher status marriage partners, and in turn to more surviving offspring (Gibson and Mace, 2007; Uggla et al., 2018).

2.2. Female genital cutting

The FGMC practiced among Arsi Oromo involves Type 1 female genital cutting, i.e., clitoridectomy (World Health Organization et al., 1997). It is referred to in Oromiffa as "*huuba irrafuudhuu*," which can be translated as "*removing the garbage/unwanted*" (Gemechu and Mekuria, 2021). An Arsi Oromo woman is expected to be cut before marriage, typically this occurs one month before the marriage ceremony (for women at around 17 or 18 years of age). The cutting ceremony takes place in front of the door of the bride's parents house in the presence of her mother and other female relatives, from her own and the groom's family. The cutting is undertaken by an experienced local woman, with the skill passing down the female line from mother to daughter. The cost for performing the cutting is less than a day's wage for a rural farmer (<1 USD) and is paid for by the bride's parents. A local herbal beer "*gesho*" is administered as a laxative and to anesthetize the woman's pain. After the ceremony, a section of the back of the bride's head is shaved, and traditional cosmetics are applied to her hands and feet to publicly signal that she is ready for marriage. The bridegroom's parents supply food and drinks for this ritual.

Focus group discussions we undertook in 2010 (unpublished) reveal some of the community beliefs around FGMC. The reasons given for cutting a daughter fall into four main categories which all emphasise her suitability for marriage. Firstly, it is a sign of her transition from girlhood to womanhood. Secondly, that it reduces her sexual drive to guarantee her faithfulness to her husband within marriage. Thirdly, that it makes her more obedient to her husband, and more careful with household items and chores. And finally, the cutting ceremony can prove her virginity, which honours her family. The discussions also revealed that young people increasingly oppose the practice due to the harmful side effects that cutting causes women in childbirth, due to the influence of health extension workers arriving in the area in the early 2000s.

Data from our repeated surveys in this community have indicated that the practice of cutting women may be in decline. In 2010, nearly all married women (90%) reported having been genitally cut; however, by 2015 the prevalence of reported cutting had dropped to around a fifth of all married women. Previously we reported how this apparent dramatic recent decline may partly be explained by heightened secrecy around the practice, rather than reduced support for and practice of it, as some women who reported being cut in 2010, stated they were not cut five years later (Gibson et al., 2018). This change in attitudes toward cutting may have arisen due to government public health raising awareness campaigns which have increased local knowledge of federal laws which make it an offence to perform or procure FGMC (Ethiopia, 2005). For the analyses presented here we use the earlier 2010 dataset when cutting reporting was likely to be less influenced by social desirability bias (as indicated by nearly all women self-reporting being cut).

2.3. Data

Demographic, socio-economic, and marriage data used in this study

were collected from all the adult residents of five neighbouring villages in 2009 [see map in Gibson and Gurmu (2012)]. A household survey was administered to all married adults. This included detailed questions to married women regarding each of their daughters' first marriages, such as their age at first marriage, type of marriage, number of husband's existing wives (wife order), as well as a breakdown of all marriage income (bride wealth) and costs (dowry), with respondents asked about the financial value of bride wealth and dowry exchanged in cash and in other assets. Responses regarding financial values were cross-checked against the responses of their husband's and any discrepancies were resolved in the field. Women were also asked whether each of their daughters was cut before marriage. Daughters' education was measured both as years of state education received and whether any Qur'anic education was received. Daughters' current ages were recorded in years. Women were also asked their and their husband's total land holdings in hectares as a proxy for family wealth, this was also cross checked with their husbands. For the analyses presented here, the sample was restricted to responses regarding the married daughters (n = 363) who had the most common type of Oromo marriage, a betrothal marriage (Beyene and Tolera, 2006); married daughters who had atypical forms of marriage (abduction, sister exchange and levirate) were removed from the analyses (n = 7). Complete data on all variables used in the analysis was available for 358 daughters born to 212 women.

Ethical and research permissions for the study were obtained by local and national authorities in Ethiopia and from the University of Bristol in the UK. Informed consent was obtained from all participants.

2.4. Statistical analyses

Multivariate, multilevel Bayesian models were run with the package *brms* (Bürkner, 2017) in R to explore the relationship between FGMC, education, and marriage outcomes (bride wealth, dowry, and age at marriage), clustered by mother. Multivariate models allow the concurrent analysis of multiple related outcomes within a single model while accounting for any residual correlations between them not captured by our exposures. This makes models more accurate and conservative because parameter estimates are pooled across outcomes and extreme estimates are reduced towards the mean (McElreath, 2020). Further conservatism on parameter estimates was imposed by weakly informative priors. Due to the skewed distribution and zero being the modal response in the data we modelled the bride wealth and dowry outcomes using hurdle-gamma distributions. Hurdle models produce two distributions per parameter, one estimated using a logistic regression for the outcome being either 0 or not and the other estimated using a gamma model for outcomes above 0. Due to the skewed distribution of the data, we also modelled the age at marriage outcome as a skew-normal distribution. We allowed for a nonlinear effect using splines for daughter's age when age at marriage was the outcome. The control variables daughter age and land size were centred and standardised. We explored the relationship between FGMC, education, and economic returns by subtracting the estimated conditional value of dowry payments from those for bride wealth payments resulting from our models. The code for replicating the analysis can be found in the Supplementary Information (SI) (see Appendix A) and the data is available on the Open Science Framework at https://doi.org/10.17605/osf.io/bprcs.

To facilitate causal inference, we used a directed acyclic graph (DAG), constructed using dagitty (Ankan et al., 2021), for model selection (Fig. S1). We assumed all potential control variables share the same inferred directly causal relationships with our outcome measures (bride wealth, dowry, and age at first marriage); the rationale for the causal relationships mapped in our DAG can be found in Table S1. Setting our exposure variables to FGMC status and educational attainment, we selected between the following potential control variables: daughter's age, parent's wealth (proxied by size of total land holdings in hectares) and daughter's wife order. We used the smallest minimally sufficient adjustment set produced to adjust for in our models (McElreath, 2020), resulting in models controlling for daughter's age and parent's wealth.

We ran three models: Model 1 assessed the fixed effects of FGMC status and any educational attainment on marriage outcomes. Model 2 assessed the fixed effects of FGMC status and years of state education on marriage outcomes, to explore if there is a dose-dependent effect of education. Model 3 assessed the moderating effect of any educational attainment on the relationship between FGMC status and marriage outcomes. Our predictions can be seen in Table 1 and are based on optimal outcomes for the daughters' parents.

In all models, the reference category for FGMC status was 'uncut' and for educational attainment it was 'uneducated.' For each of these exposure variables, we plotted the posterior distribution and quantified the degree of support for a given prediction by reporting the proportion of the posterior that supports it, denoted as $P > 0$ for predicted positive associations and $P < 0$ for predicted negative associations (or for logistic estimates $P > 1$ or $P < 1$). A Bayesian approach does not assign thresholds for 'statistical significance'; we indicate our interpretation of the strength of evidence based on the resulting P's, but note readers are entitled to be more or less convinced. To help contextualise findings, we also reported the predicted value or age estimated by our models with associated 95% certainty intervals (CI), conditional on other variables in the model being held at either the median or reference category.

2.5. Sample characteristics

The main characteristics of our full sample of 363 married daughters who had betrothal marriages can be seen in Table 2. Three-quarters (72.5%) had been cut; for a breakdown of the proportions by daughter rank and the FGMC status of elder sisters see Table S2. The majority received no education (no Qur'anic or state 55.4%; no state 57%); of those who ever attended state school, the median attained 3 years (range 1–12). The distribution of cutting by years of educational attainment can be seen in Fig. 1; the younger daughters were, the more likely they were to both have i) received education and ii) remained uncut if receiving education (Fig. S2). The median age at first marriage was 17 years (range 12–32). The majority of marriages were associated with some form of payment: bride wealth payments occurred in 93.7% and dowry in 81.3%. Net economic gains occurred with 81.8% of marriages, losses with 12.7%, and 5.5% broke even. Median values in Ethiopian Birr (ETB) for marriage payments can be seen in Table 2; based on 2011 exchange rates (16 ET B = 1USD) the average value of bride wealth payments was 87.5 USD (range 0–699.9), the average of dowry assets was 25 USD (range 0–750), and economic return to parents (bride wealth$_i$ – dowry$_i$ = economic return$_i$) was 59.4 USD (range -375 – 574.9). For respective values split by FGMC status and education see Table S3.

Table 1
Predictions broken down by model.

Model	Exposure	Prediction
Model 1	FGMC status (ref = uncut)	Being cut will be associated with higher bride wealth, lower dowry, higher economic return, and lower age at marriage
	Any education (ref = none)	Having education will be associated with higher bride wealth, lower dowry, higher economic return, and lower age at marriage
Model 2	FGMC status (ref = uncut)	Being cut will be associated with higher bride wealth, lower dowry, higher economic return, and lower age at marriage
	Years of education (ref = none)	As years of education increase bride wealth will increase, dowry will decrease, economic return will increase, and age at marriage will decrease
Model 3	Uncut and uneducated (ref)	Lowest bride wealth, highest dowry, lowest economic return, highest age at marriage
	Cut and uneducated or uncut and educated	Higher bride wealth, lower dowry, higher economic return, lower age at marriage
	Cut and educated	Highest bride wealth, lowest dowry, highest economic return, lowest age at marriage

Table 2
Sample characteristics. Abbreviations: Interquartile range (IQR), standard deviation (SD), Ethiopian Birr (ETB). *This includes 6 individuals categorised as receiving 'Any education' who only received Qur'anic schooling. Sample size deviations due to missing data: [a]n = 362, [b]n = 96, [c]n = 359, [d]n = 262.

		Full sample (N = 363)		Cut (n = 266)		Uncut (n = 97)	
		Median (IQR)	Range	Median (IQR)	Range	Median (IQR)	Range
Bride wealth (ETB)		1400 (2100)	0, 11,199	1300 (1700)	0, 9400	2400 (2760)	0, 11,199
Dowry (ETB)		400 (900)	0, 12,000	300 (587.5)	0, 12,000	800 (2000)	0, 9500
Economic returns (ETB)		950 (1575)	−6000, 9199	950 (1400)	−6000, 7900	900 (2000)	−4040, 9199
Age at first marriage (years)		17 (5)	12, 32	17 (4)	12, 27	20 (4)	12, 32
		Mean (SD)	**Range**	**Mean (SD)**	**Range**	**Mean (SD)**	**Range**
Age (years)		30.9 (8.46)[a]	14, 63[a]	32.58 (8.55)	14, 63	26.23 (6.19)[b]	16, 44[b]
Landholdings (hectares)		1.86 (0.87)[c]	0.5, 5.5[c]	1.89 (0.83)[d]	0.5, 5.5[d]	1.8 (0.97)	0.5, 5.5
		N	**Percentage**	**N**	**Percentage**	**N**	**Percentage**
Wife order	**1**st	336	92.6	249	93.6	87	89.7
	2nd	24	6.6	16	6	8	8.2
	3rd	2	0.6	2	0.4	1	1
	4th	1	0.3	0	0	1	1
Any education	**Yes**	162	44.63	92	34.59	70	72.16
	No	201	55.37	174	65.41	27	27.84
State education (years)	**0***	207	57.02	176	66.17	31	31.96
	1	29	7.99	22	8.27	7	7.22
	2	29	7.99	19	7.14	10	10.31
	3	27	7.44	19	7.14	8	8.25
	4	24	6.61	12	4.51	12	12.37
	5	22	6.06	14	5.26	8	8.25
	6	13	3.58	3	1.13	10	10.31
	7	9	2.48	1	0.38	11	8.25
	8	1	0.28	0	0	1	1.03
	9	1	0.28	0	0	1	1.03
	10	0	0	0	0	0	0
	11	0	0	0	0	0	0
	12	1	0.28	0	0	1	1.03

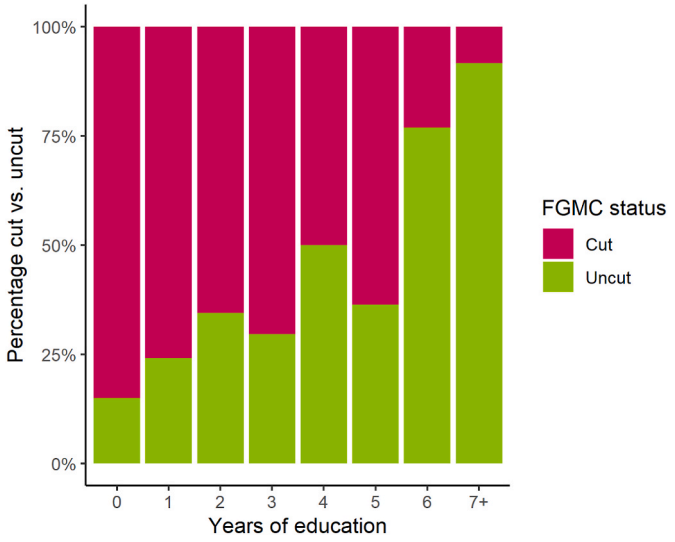

Fig. 1. Percentage of daughters cut vs. uncut by their years of completed state education (n = 363). Abbreviations: FGMC – female genital mutilation/cutting.

3. Results

3.1. Bride wealth

In Model's 1–2 (Figs. 2A–3A) we found little compelling support for the prediction that parents receive higher bride wealth for daughters who are cut compared to those who are uncut. While at 58% there was slightly more support than not for the prediction they would be more likely to receive *any* bride wealth in Model 1, when receiving *some* bride wealth, support for the prediction only reached 30% (Model 2). While the certainty intervals for conditional predicted bride wealth payments for cut vs. uncut daughters (when daughters were uneducated and of median age and parental wealth) respectively were heavily overlapping, the point estimates were in the opposite direction to that predicted: Model 1) 1699 ETB (95% CI 1465–1967) vs. 1892 ETB (95% CI 1519–2361); Model 2) 1712 ETB (95% CI 1479–1979) vs. 1813 ETB (95% CI 1468–2262).

We did, however, find reasonable support for the prediction that parents receive higher bride wealth for educated daughters; Model 1 found parents were both be more likely to receive *any* bride wealth and if receiving *some*, they received more (Fig. 2A). The conditional predicted bride wealth payments for uneducated vs. educated daughters (when daughters were uncut and of median age and parental wealth) respectively were: Model 1) 1892 ETB (95% CI 1519–2361) vs. 2087 ETB (95% CI 1689–2560).

There was also reasonable support for a dose dependent response with a shift after a few years of education, with those having four or more years of education having been associated with higher bride wealth than having no years (Fig. 3A) (see Fig. S4 for fully plotted conditional effects). The conditional predicted bride wealth for a daughter with no years of education (who was uncut and of median age and parental wealth) was 1813 ETB (95%CI 1468–2262) and for four years and above was: 4 years – 2372 ETB (95% CI 1659–3363), 5 years – 2342 ETB (95% CI 1628–3390), 6 years – 2070 ETB (95% CI 1356–3205), and 7 Years+ – 2597 ETB (1638–4223).

The predicted pattern of bride wealth payments (i.e. 'cut and educated' > 'cut and uneducated' and 'uncut and educated' > 'uncut and uneducated') did not receive compelling support when interacting FGMC and educational status in Model 3 (Fig. 4A, Fig. S3A). There was only marginal support for the prediction that 'educated and uncut' (*any* bride wealth $P > 0 = 0.78$, *some* bride wealth $P > 0 = 0.36$) and 'educated and cut' (*any* bride wealth $P > 0 = 0.53$, *some* bride wealth $P > 0 = 0.48$) daughters are associated with higher payments than those 'uneducated and uncut', and limited support that those 'uneducated and cut' (*any* bride wealth $P > 0 = 0.63$, *some* bride wealth $P > 0 = 0.06$) are. The lowest bride wealth payments were associated with 'uneducated and cut' daughters at a predicted 1646 ETB (95% CI 1413–1914) compared to 2118 ETB (95% CI 1575–2871) for 'uneducated and uncut' (holding age and parental wealth at the median).

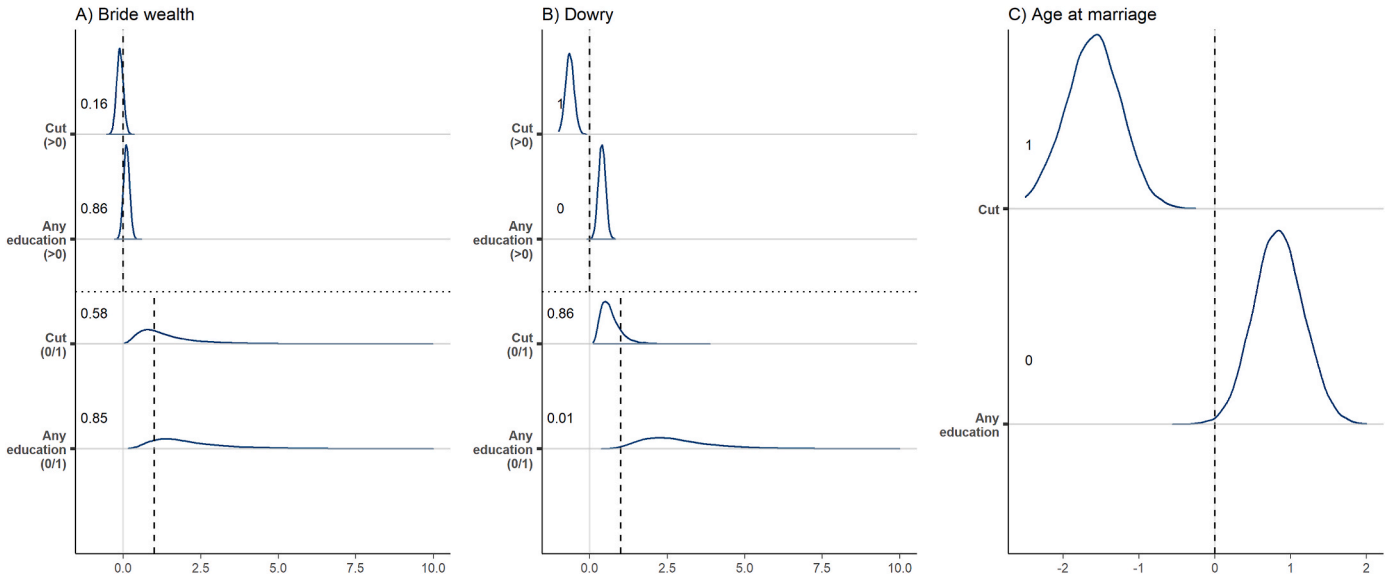

Fig. 2. Results from Model 1 assessing the relationship between both FGMC and educational status and marriage outcomes. Plotted are the posterior distributions with 90% credible intervals for Model 1, and numbers give the proportion of the posterior that supports the prediction (i.e. the proportion >0 for positive associations and <0 for negative associations, or for logistic estimates >1 or <1). In A and B, the top half of the plots reflect the gamma models predicting non-zero payments and the bottom half the logistic models (expressed as odds ratios) predicting zero vs. non-zero payments.

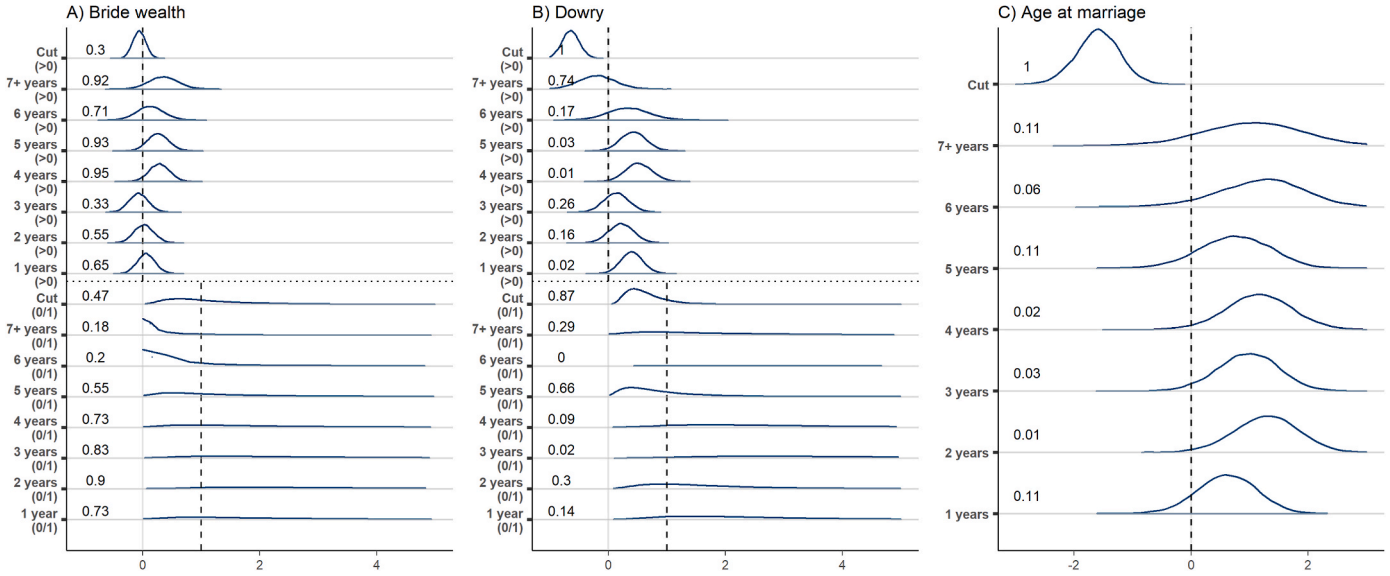

Fig. 3. Results from Model 2 assessing the relationship between both FGMC and years of education and marriage outcomes. Plotted are the posterior distributions with 90% credible intervals for Model 2, and numbers give the proportion of the posterior that supports the prediction (i.e. the proportion >0 for positive associations and <0 for negative associations, or for logistic estimates >1 or <1). In A and B, the top half of the plots reflect the gamma models predicting non-zero payments and the bottom half the logistic models (expressed as odds ratios) predicting zero vs. non-zero payments.

The Bayesian R2's for Model's 1–3 respectively when predicting bride wealth were 0.545, 0.57, and 0.556. The full conditional predicted bride wealth dependent on a daughter's FGMC and educational status across models can be seen in Table S4.

3.2. Dowry

In Model's 1–2 (Figs. 2B–3B) we found compelling support for the prediction that parents pay lower dowry costs for daughters who are cut compared to those who are uncut: they were both predicted to be less likely to have paid *any* dowry costs and when paying *some* dowry costs, they were predicted to have been lower. The conditional predicted dowry costs for cut vs. uncut daughters respectively were: Model 1) 458 ETB (95% CI 376–555) vs. 838 ETB (95% CI 608–1133); Model 2) 476 ETB (95% CI 390–577) vs. 872 ETB (95% CI 630–1196).

We found negligible support for the prediction that parents pay lower dowry costs for daughters who have any degree of education: Model 1 found parents were more likely to have paid *any* dowry costs and when paying *some* dowry costs, they were predicted to have been higher in association with a daughter having received any education (Fig. 2B). The conditional predicted dowry costs for uneducated vs. educated daughters respectively were: Model 1) 838 ETB (95% CI 608–1133) vs. 1088 ETB (95% CI 757–1516). We also found only limited support for a dose response of education, though there may be a drop in dowry for the most educated daughters (Fig. 3B); the predicted dowry costs for those with no education were 872 ETB (95% CI

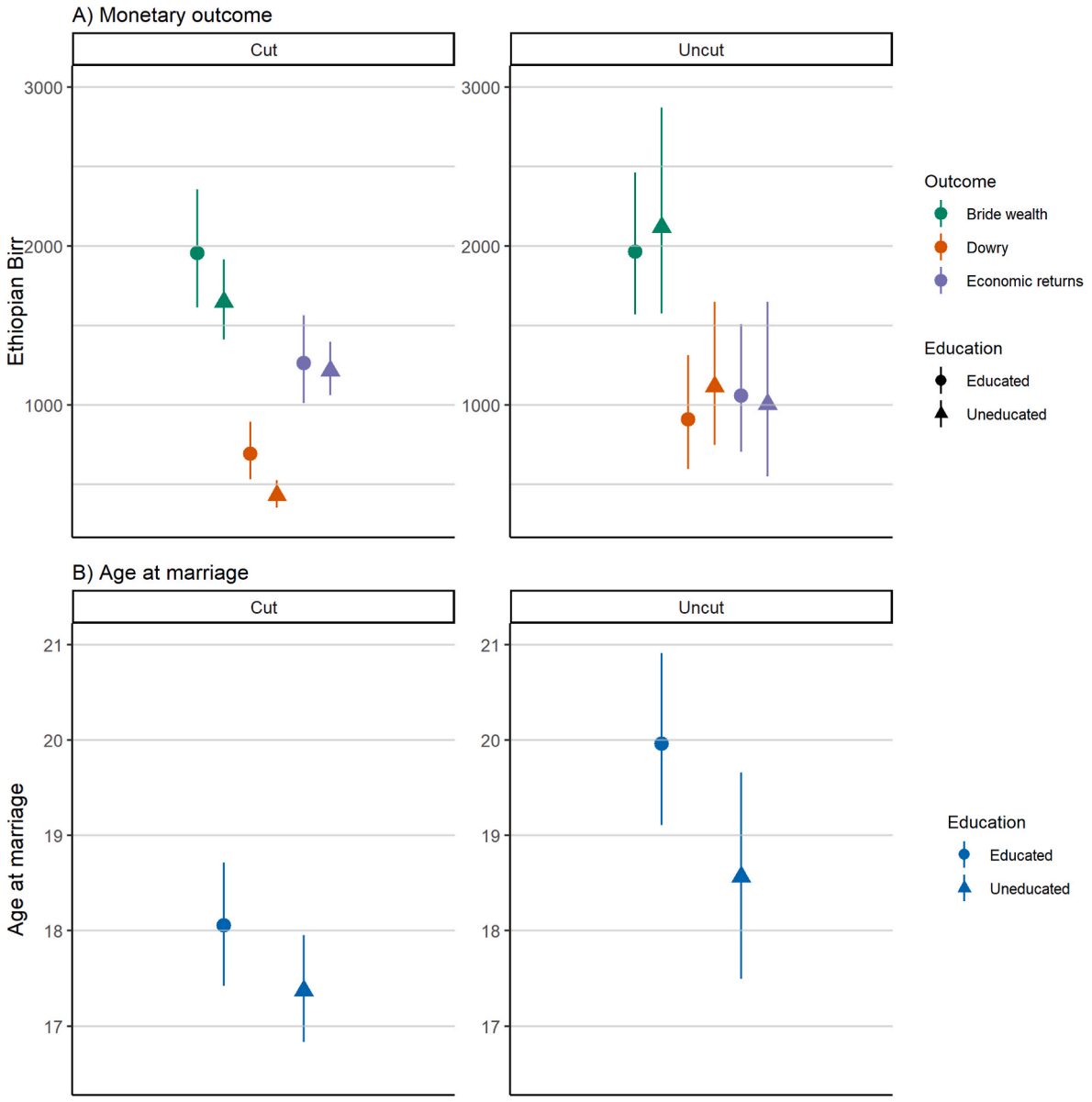

Fig. 4. Results from Model 3 assessing the moderating effect of educational status on the relationship between FGMC and marriage outcomes. Plotted are the predicted values resulting from the interaction effect of FGMC status and educational status, conditional on median child age and parental landholdings. In A, values for economic returns are calculated by subtracting the predicted values for dowry from those for bride wealth.

630–1196) vs. 650 ETB (95% CI 287–1286) for those seven years of more education.

We found evidence of an interaction effect between FGMC and educational status, though not as predicted (i.e. 'uncut and uneducated' > 'cut and uneducated' and 'uncut and educated' > 'cut and educated') (Fig. 4A, Fig. S3B). There was compelling support for the prediction that 'uneducated and cut' (*any* dowry $P < 0 = 0.47$, *some* dowry $P < 0 = 1$) and 'educated and cut' (*any* dowry $P < 0 = 0.93$, *some* dowry $P < 0 = 0.99$) daughters receive lower payments than 'uneducated and uncut' daughters, but support for the prediction that those 'educated and uncut' (*any* dowry $P < 0 = 0.02$, *some* dowry $P < 0 = 0.52$) was weak. However, the lowest dowry payments were associated with 'uneducated and cut' daughters at a predicted 431 ETB (95% CI 353–526) compared to 1114 ETB (95% CI 749–1650) for 'uneducated and uncut' (Fig. 4A).

The Bayesian R^2's for Model's 1–3 respectively when predicting dowry costs were 0.653, 0.664, and 0.650. The full conditional predicted dowry costs dependent on a daughter's FGMC and educational status across models can be seen in Table S5.

3.3. Economic returns (bride wealth – dowry)

The estimates of the conditional predicted economic returns to parents predicted by Model 3 suggest returns were higher for cut than uncut daughters, irrespective of education, though the CIs indicate uncertainty is attached to any conclusions drawn from these numbers (Fig. 4A). The point estimates did follow the predicted pattern (i.e. 'cut and educated' > 'cut and uneducated' and 'uncut and educated' > 'uncut and uneducated'), being highest for 'cut and educated' daughters (1263 ETB 95% CI 1010–1564), followed by 'cut and uneducated' (1216 ETB 95% CI 1060–1397), 'uncut and educated' (1056 ETB 95% CI 704–1507), then 'uncut and uneducated' (1003 ETB 95% CI 549–1648). The full estimated conditional predicted economic returns dependent on a daughter's FGMC and educational status across models can be seen in Table S6.

3.4. Age at marriage

In Model's 1–2 (Figs. 2C–3C) we found compelling support for the

prediction that age at marriage is lower among daughters who are cut compared to those who are uncut. The conditional predicted age at marriage for cut and uncut daughters respectively were: Model 1) 17.29 years (95% CI 16.77–17.82) vs. 18.89 years (95% CI 18.12–19.74); Model 2) 17.23 years (95% CI 16.74–17.79) vs. 18.82 years (95% CI 18.06–19.67).

However, we found negligible support for the prediction that age at marriage is lower among educated daughters (Fig. 2C). The conditional predicted age at marriage estimated from Model 1 was 18.89 years (95% CI 18.12–19.74) for uneducated daughters and 19.74 years (95% CI 19.00–20.56) for educated daughters. Further there was no clear indication of a dose dependent effect (Fig. 3C).

We found evidence for an interaction effect though only partially as predicted (i.e. 'uncut and uneducated' > 'cut and uneducated' and 'uncut and educated' > 'cut and educated') (Fig. 4B, Fig. S3C). We found compelling support for the prediction that 'educated and cut' ($P < 0 = 1$) and 'uneducated and cut' ($P < 0 = 0.98$) daughters are associated with lower age at marriage than those 'uneducated and uncut', but negligible support for the prediction that those 'educated and uncut' ($P < 0 = 0.01$) are. 'Uneducated and cut' daughters, however, were associated with the earliest age at marriage at 17.37 years (95% CI 16.83–17.95), rather than 'educated and cut' as predicted, while 'educated and uncut' were associated with latest age at 19.96 years (95% CI 19.11–20.91) (Fig. 4B).

The Bayesian R2's for Model's 1–3 respectively were 0.268, 0.259, and 0.278. The full conditional predicted age at marriage dependent on a daughter's FGMC and educational status across models can be seen in Table S7.

4. Discussion

Our results paint a nuanced picture of a community in which cultural norms surrounding women and marriage are undergoing transition. Arsi Oromo respondents reported in focus group discussions that FGMC improves a daughter's marriage opportunities and brings honour to her family. Our quantitative findings attest to the former, with cutting associated with earlier age at first marriage by a predicted 1.6 years. Earlier age at marriage affords a longer reproductive lifespan, potentially leading to more children which strengthen a woman's position within the marital household and her husband's lineage. We also identify that parents in this community incur a relative economic loss at the marriage of uncut compared to cut daughters. These findings indicate that there are social, reproductive, and economic costs to abandonment, which appear to be traded off against the benefits to women's health.

Counter to a standard narrative in the literature (Avalos et al., 2015; Khalifa, in preparation; Šaffa et al., 2022), we find that bride wealth payments (the cash and gifts received by a bride's parents from the groom's family) are not higher for brides who have undergone FGMC. In our sample, estimates for the size of bride wealth transactions are *lower* by a predicted 6.3–12.1 USDs (Model 2–1) for cut women compared with those who remain uncut, though certainty intervals are wide. This result indicates that customary bride wealth payments do not act as a financial incentive for daughters to be cut in this community and, if viewed in isolation, this could be taken as indicating there is no financial gain associated with cutting at the time of marriage.

We do, however, find that parents incur higher marriage costs when a daughter is uncut, as they endow them with higher value dowry gifts at their marriage. Our models predict an uncut bride receives the equivalent of 23.8–24.8 USDs (Model 1 and 2) on average more from her parents than a cut bride. This is indicative of an 'alternative' investment strategy by parents, protecting a daughter's health via FGMC abandonment and enhancing her status within her marital household. Arsi Oromo dowries are comprised of domestic items such as blankets and cooking utensils, which remain within the bride's hands rather than those of her husband (unlike cash assets); these larger dowry gifts may act as a form of insurance (Bossen, 1988, Zhang and Chan, 1999). From an evolutionary perspective, parental reproductive fitness is 'inclusive' of both their own surviving children and those of subsequent generations (Hamilton, 1964). Thus this 'alternative' parental investment strategy may also offset the costs to parents' inclusive fitness of uncut daughters being older at marriage and reflect a classic "quality vs. quantity" life history trade-off in evolutionary biology, i.e., fewer grandchildren for healthier grandchildren (Lawson et al., 2012).

When bride wealth and dowry costs are considered together, our results reveal that the average economic return to parents is higher for cut daughters than uncut daughters by 11.7–18.4 USDs (Model 1–2). At the time of data collection, this amount was equivalent to one month's income for the average Arsi Oromo household; representing a significant economic bonus in a community where agricultural land sizes are limited and controlled by the government, and there is little off-farm employment (Gibson and Gurmu, 2012). While caution is required when interpreting these results, as the certainty intervals are overlapping, the apparent financial penalty for not cutting is being driven by higher dowry costs for uncut daughters and *not* higher bride wealth payments for cut girls as typically assumed. This finding highlights both the limitations of a narrow focus on bride wealth, as prevails in areas of the FGMC literature, and the importance of understanding local cultural norms surrounding marriage when considering intervention targets. In terms of FGMC maintenance among the Arsi Oromo, these findings do not suggest that parents cut their daughters in the pursuit of financial gain. Rather that only when parents can financially "afford" it will they abandon cutting, paying higher dowry and forgoing higher economic returns in exchange for health benefits to their daughters.

Turning to our exploration of the 'FGMC for education' substitution hypothesis (Garcia-Hombrados and Salgado, 2019), we find female school attendance to be low: only 43% of daughters in our sample had ever attended school. This is likely explained by the fact that sending Arsi Oromo children to school can divert time away from productive activities linked to subsistence and household needs (Gibson and Lawson, 2011; Hedges et al., 2018). In our results we find that daughters who attend school marry at a later age, by a predicted 0.8 years on average, and their parents pay higher dowry at marriage (by a predicted 15.6 USDs); the latter may be motivated by the same high investment strategy that led a daughter's parents to invest in her education (and to reject cutting). However, given the interaction results provide only weak evidence that dowries are distinct based on education when daughters are uncut, dowries may be more convincingly interpreted as a cost paid by parents to secure the status of daughters whose health they have prioritised. Bride wealth payments are also higher for educated daughters by a predicted 12.2 USDs and, looking at the breakdown of payments by years of education (Fig. S3A), this is driven by higher bride wealth payments when daughters had completed the first cycle of primary education (i.e. had at least 4 years of education). This could indicate that more highly educated brides are in greater demand as marriage partners (Ashraf et al., 2020), and/or they are marrying into wealthier families who are better able to afford larger bride wealth payments (Gibson and Mace, 2007). Daughters completing the first cycle of primary school are also among the least likely to have been cut prior to marriage. In our sample, only 42% of women educated to grade 4 or above are cut, compared with 80% of women with lower or no education (Fig. 1), supporting the suggestion that education can act as a substitute for FGMC within the marriage market.

While substitution is plausible, receiving education and undergoing cutting are not mutually exclusive in our sample; indeed, more daughters were both cut and had received some education (25.3%) than were uncut and educated (19.3%). Further, we find that the proportion of educated daughters is higher in the under 25s compared to those older (68.2% vs. 37.2%), with a similar pattern at lower levels for FGMC abandonment (45.9% vs. 20.2%). This suggests an earlier and/or faster spread of education norms, with substitution becoming more likely over time. Alternatively, parents may actively choose both cutting and education as a 'dual investment' strategy, without appearing to incur penalties in terms of economic returns at marriage (Fig. 4A) or through later

age at marriage (Fig. 4B). Parents may also invest in their daughter's education in the hope of improving her prospects, marriage or otherwise, only to find that cutting is requested by would-be in-laws during later marriage negotiations. Combined these results indicate that while education opens an alternative route to marriage, education alone is not enough to tip the costs versus benefits of FGMC in favour of abandonment for all Arsi Oromo. The creation of new off-farm employment opportunities for women, which increase their economic contributions to the household and female autonomy, may also be required to accelerate the spread of anti-FGMC norms for this community.

These results also support arguments that customary marriage payments (bride wealth and dowry) should not be viewed as practices which inherently underpin women's subordination, constraining female autonomy (Akurugu et al., 2022; Horne et al., 2013); or in the case of bride wealth, serve only the interests of other male kin. Rather, these transactions can be a means by which parents can improve their daughter's welfare within and beyond marriage (Fafchamps and Quisumbing, 2005), providing women and their children with socio-economic security where income-generating opportunities are absent (Akurugu et al., 2021). Here we identify that Arsi Oromo parents who reject cutting for their daughters, appear to act strategically to supplement uncut daughters with extra dowry assets, in the form of material household items that she solely owns, which may elevate her position and bargaining power within marriage. We also find evidence that educated girls receive higher bride wealth payments at marriage, which could support the idea that bride wealth generates additional incentives for parents to educate their daughters, as found in Iran and Zambia by Ashraf et al. (2020).

We set out to test two existing economically informed hypotheses within the FGMC literature, one predicated on FGMC ensuring virginity and sexual exclusivity in marriage, and so far have interpreted our findings largely through an economic lens. However, such a narrow perspective can be critiqued both in terms of its premiss and the idea that parents are solely driven by financial gain. Importantly, the ethnographic literature on FGMC reveals a range of socio-cultural reasons why parents cut their daughters; these reasons include initiating individuals into adulthood and elevating their social status (Coyne and Coyne, 2014; Shell-Duncan et al., 2011, 2018), maintaining cleanliness and hygiene (Gruenbaum, 2001), imprinting gendered and ethnic identities onto the body (Boddy, 1982; Van Bavel et al., 2017; Van Der Kwaak, 1992; Winterbottom et al., 2009), and displaying respect for authority and/or community culture (Van Bavel, 2020).

FGMC's meanings and motivations are dynamic within and across cultures, influenced by various factors, including politics. In some cases, attempts to eradicate FGMC have ironically reinforced its significance as an ethnic identity marker and symbol of resistance against (neo)colonial interference (Van Bavel, 2020; Winterbottom et al., 2009). This was evident in colonial Kenya, where the ban on female circumcision triggered significant resistance (Anderson, 2018; Njambi, 2007; Thomas, 2003). Present-day postcolonial activists and researchers criticise these colonial legacies within the global campaign against FGMC (Fusaschi, 2023; Nnaemeka, 2005), shedding light on unintended consequences of interventions within historically marginalised communities (Van Bavel, 2020; Winterbottom et al., 2009). Taken in conjunction with our findings, such insights indicate that not only must FGMC interventions be based on an understanding of the wider cultural system in which cutting exists within a given society, but also the wider historical context in which the society itself exists, and they should be developed and implemented with societal consent.

4.1. Limitations

FGMC is a sensitive topic which participants may have been reluctant to admit to, meaning its prevalence in the population may be underestimated in our sample (Gibson et al., 2018); however, given 72% of married daughters were reported as being cut, we do not consider this to be of significant concern. Our sample size, when combined with low levels of both abandonment and education, constrains our statistical power to detect differences between subgroups; while our Bayesian methodology goes some way to attenuating this, wide certainty intervals still limit the strength of some of our conclusions.

With our data we unfortunately cannot tell who has the power to decide to cut among this Arsi Oromo community. In the preceding discussion we have framed parents as the primary decision makers; while young women undoubtably have their own opinions on the acceptability of FGMC, decisions regarding their lives are controlled by parents and other members of their patriline. This may be slowly changing; in focus group discussions in the community, respondents shared that a high school educated woman should have more autonomy over her marriage decisions, including choosing her own partner and rejecting FGMC.

5. Conclusion

Our findings challenge the hypothesis that parents cut their daughters for financial gain at the time of marriage. Rather, we find that parents appear to forgo financial reward in order to abandon FGMC if they can afford it. While we find costs to FGMC abandonment in terms of net economic returns to parents through higher dowry payments and later age at marriage, these costs appear to be traded-off against the health benefits to daughters.

Furthermore, our results indicate the emergence of two parallel norms, whereby by Arsi Oromo are inclined to reject cutting for their daughters and prefer their daughters-in-law to be educated. As parents seek to improve their daughter's marriage prospects, this means that they will also be motivated to educate their daughters. Although bride wealth payments are not an incentive for FGMC in this population, they do seem to encourage female education, complicating the idea that bride wealth is an inherently harmful cultural practice. That we find that FGMC and education are not mutually exclusive for the daughters in our sample, lends support to the idea that improving both income-generating opportunities for women, as well as education, may be needed to drive the abandonment of cutting.

Our results highlight the need for a more nuanced consideration of the social and economic implications of FGMC when designing effective interventions to eradicate the practice. More research is needed to understand how FGMC interlinks with marriage market dynamics beyond financial gain at the time of marriage. Recognising that FGMC is not a stand-alone phenomenon but entwined with social norms relating to marriage, household economics, and wider issues linked to female autonomy is important for understanding the conditions under which FGMC abandonment might occur.

Data availability

The data is available at https://doi.org/10.17605/osf.io/bprcs. The code is available in the Supplementary Information at https://doi.org/10.1016/j.socscimed.2023.116170.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.

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