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Bride Price and Fertility Decisions: Evidence from Rural Senegal

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ABSTRACT *This paper provides evidence about the relationship between bride price payments and fertility decisions in Senegal. Higher bride price payments reduce the fertility pressure for women with results being robust to confounding socio-economic and contextual factors. The fertility-reducing impact is greater for women who are economically dependent on their husbands. In polygamous households and for arranged marriages, a lower bride price increases fertility pressure while in monogamous households and for non-arranged marriages, the bride price does not affect fertility. As bride price payments have less power over (economically) independent women, empowerment will give leeway to girls in traditional societies.*

1. Introduction

In many sub-Saharan African countries, particularly in Senegal, the bride price payment is a key element of the marriage contract. Contrary to a dowry payment, where the bride and her family give the marriage payment to the groom and his family, a bride price payment is defined as the money or wealth transfer given by or on behalf of the groom to the bride and her family upon the marriage of the couple. Such a bride price system raises several concerns related to the economics of the marriage market, gender empowerment and intra-household bargaining power. The anthropological literature has shown that bride price payments strengthen normative constraints on women's autonomy in the reproductive domain (Horne, Dodoo, & Dodua Dodoo, 2013). We consider a woman's role in marriage as represented by the fertility decisions of the couple. Previous research for the case of Indonesia has shown that women who perceive more household assets as being their own have a greater say in fertility decisions (Beegle, Frankenberg, & Thomas, 2001). Thus, fertility choices, as measured by the number of children at a given age, can be taken as an indicator of female bargaining power and a woman's relative position within the household.

This paper is an important contribution to the existing literature as most of the studies about marriage payments have been carried out in South Asia. The African context, in which a bride price is paid, is substantially different and the dynamics that apply in many parts of Asia cannot be extrapolated to the African continent. To the best of our knowledge, our study is the first large-scale analysis of bride *price* dynamics in Africa and the first study that is interested in the relationship between bride price payments and fertility decisions in general and in rural Africa in particular.

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For the purpose of this study, we employ a unique dataset of married couples from rural Senegal consisting of 2241 observations. The data were collected in two survey rounds in 2009 and 2011 as part of a gender and female empowerment module of a larger survey on rural infrastructure development in Senegal. The dataset is representative for rural Senegal in seven out of 14 regions and allows us to quantify the effect of the bride price on the number of children a woman gives birth to. Employing Ordinary Least Squares (OLS) and Poisson regressions controlling for region and marriage cohort effects, we find a negative relationship between bride price payments and the number of children indicating that women who receive a higher bride price have fewer children. At the mean bride price, a woman reduces her number of children by 0.55. The main dynamic stems from the difference in birth outcomes of those women receiving only a symbolic bride price and those representing the top 5 per cent of the bride price distribution. Their difference in realised fertility is about 0.2 children. This is a small but robust difference indicating that bride price payments have a lasting implication on the life of women. We also address potential endogeneity bias stemming from omitted variables by controlling for income and wealth dynamics. Simultaneity bias is accounted for by including measures of bargaining power of both husband and wife at the time of the marriage. Measurement error in the recall of the bride price is controlled for by including the mean bride price between 2009 and 2011, instead of the actually reported values in every year. We demonstrate that our findings are not driven by these sources of bias. Furthermore, we carry out a detailed heterogeneity analysis by exploring various variables through which the marriage payments influence the fertility decisions such as the age of the bride at marriage, the age difference between husband and wife, income generating activities of the wife, the type of union (polygamy) and distance to the couple's parents.

The remainder of the paper is structured as follows: Section 2 reviews the existing literature. A simple theoretical framework of the link between bride price payments and fertility outcomes is presented in Section 3. In Section 4 we present the study context and the data. Section 5 introduces the empirical strategy and the main results. Sources of endogeneity and corresponding robustness checks are discussed in Section 6. Heterogeneous effects are presented in Section 7. Section 8 concludes and presents the implications of our results.

2. Background on Marriage Payments and Fertility Decisions

Family and marriage dynamics have first been extensively studied in economics by Becker (1981). Becker's model of marriage rests upon the equilibrium of a matching exercise, which fits men and women together as couples. This assortative mating model can explain the existence of dowries and bride price payments. The latter arises particularly in polygynous societies where women are relatively scarce. These payments allow, for example, to differentiate between single and divorced women with the former being more highly valued on the marriage market (Goldschmidt, 1974; Papps, 1980). Thus, Becker views the bride price payment as an investment. According to his analysis, bride price payments are forfeited if husbands divorce their wives without cause. This explains why husbands have an incentive to maintain the social contract they have engaged in. Wives, in turn, have to repay their ex-husbands if they leave them for no reason (Kaye, Mirembe, Bantebya, Ekstrom, & Johansson, 2005).

Marriage payments are a known concept in almost all societies. Although they are hardly ever practiced in the West, they are still prominent in many developing countries (Anderson, 2007). To date, most of the studies about marriage payments have been carried out in South Asia. In this region, marriage payments are mostly found in the form of dowries meaning that the bride's parents give the marriage payment to the groom. Several studies in the literature analyse the relationship between dowry payments and various other factors such as the surplus of women in the marriage market (Rao, 1993), the caste system (Anderson, 2003), domestic violence (Srinivasan & Bedi, 2007), female human capital endowment (Sharma & Frijters, 2009) and family planning (Peters, 2011).

Most African countries base the marriage contract upon bride price payments instead of dowries.[1] A plethora of reasons for this difference in marriage systems has been discussed (Botticini & Siow,

2003): first, Africa is characterised by collective rights that prevent a dowry system from evolving since possibilities for parents to transfer individual wealth to their children are limited. Second, Africa has a non-plough agricultural system where female labour is more important than in the plough agricultural system that exists in Asia (Boserup, 1970). Such a system of agricultural production limits the possibilities to introduce dowries and bequests. Third, dowries are found in monogamous societies whereas African societies have a polygynous structure (Bergstrom, 1994; Tertilt, 2005).

In recent years, the economics of bride price systems have received increasing attention. For instance, it has been shown that higher bride price payments do not influence the behaviour of husbands towards their wives whereas higher dowries do (Zhang & Chan, 1999). Kaye et al. (2005) similarly argue that bride price payments in Uganda enhance the social status of women, but due to the economic dependence of women on their husbands they cannot expect less domestic violence. In a different study using Ugandan data, Bishai and Grossbard (2010) interpret the bride price as the women's sexual fidelity to men because this marriage payment is associated with a lower rate of extra-marital sexual relationships for women, yet not so for men. In the specific case of Senegal, Gaspart and Platteau (2010), Platteau and Gaspart (2007) show that the value of the bride price is determined not only by a woman's socio-economic characteristics but also by strategic behaviour by herself and her parents. The bride and her altruistic parents can prefer a (relatively) low bride price in the case of a love marriage or to reduce the risk of ill-treatment and failure of the marriage. Yet, the persistence of the bride price system even under changing socio-economic conditions has been documented for the case of Indonesia and Zambia where females with a higher level of education upon marriage results in higher bride prices (Ashraf, Bau, Nunn, & Voena, 2015).

The ancient practice of bride price payments is performed in many sub-Saharan African countries.[2] In the specific case of Senegal, the value of the bride price is determined in negotiations between the two families. The bargaining process preceding a marriage may only involve the couple or may even take into consideration the advice given by the extended family. Before the actual marriage celebration, several consultative visits and mutual invitations take place between the future spouses and/or close family members. To conclude this period of negotiations, the bride's parents have to choose a date for the marriage ceremony and announce the desired value of the bride price. This bride price can be composed of cash and material goods such as furniture and jewels. Moreover, most Senegalese are Muslims and according to Islamic law, a minimum amount is necessary to validate the marriage. However, this amount is low enough to be only of symbolic value (less than 23 Euros). It is common practice that people pay a higher bride price than that which is required by their religion. The bride price is given to the bride and her family. In this context it is impossible to disentangle which share of the marriage payment goes to the bride herself and which share her family keeps (Horne et al., 2013).[3] Moreover, in sub-Saharan African countries bride price payments result from tribal traditions and are practiced regardless of religious affiliations; Muslims as well as Christians adhere to these traditions. As the bride price that exceeds the amount set by Islamic law is not fixed, its precise amount depends on the appreciation of the bride by her family and in-laws, the bride's socio-economic conditions, her relative bargaining power, the prestige of both families as well as customary law. In the extreme case, the bride price payment asked for by the girl's family might be prohibitively high to prevent the union with an unpopular man. In a different context, the girl's family might abstain from any claim for altruistic reasons. As the actual negotiation is a dynamic process that depends upon the socio-economic conditions of the two families, the value of the realised bride price payment varies considerably across couples.

Next to the literature on marriage dynamics in developing countries this paper also draws upon the literature on the fertility transition and factors that shape fertility preferences and decisions. Over recent decades we see a global decline in fertility (United Nations, 2015). Female education has been identified as an important driver for the fertility transition (Baird, Chirwa, McIntosh, & Özler, 2010; Baird, McIntosh, & Özler, 2011; Drèze & Murthi, 2001; Fafchamps & Shilpi, 2014; Osili & Long, 2008). It is suggested that the fertility reducing effect of education works through delayed marriage and birth of the first child (Marchetta & Sahn, 2016) as well as increased female labour market participation (Bbaale, 2011). For Senegal, existing evidence points to delayed marriage and

motherhood but findings about labour market participation are mixed. A study by Beguy (2009) suggests that women's participation in the labour market is not associated with a decline in fertility in the city of Dakar. In turn, in rural, northern Senegal an increase in female off-farm labour due to a boom in horticulture exports led to a lower fertility rate (Van den Broeck & Maertens, 2015).

Next to education, there is widespread agreement that social norms regulate fertility across societies and changes of these norms due to shocks, social programmes and over time can lead to fertility transitions. One such change in social norms, such as the introduction of contraceptives, has been studied by Munshi and Myaux (2006). The open question that the study at hand addresses is related to the social norm of bride price payments, which is deeply embedded in Senegalese culture. We assess whether the amount of the bride price influences the fertility pressure on women and along which channels. To answer this question, we start with a simple theoretical model of a husband's demand for a wife and children.

3. Theoretical Framework

We set up a basic, static model depicting the relationship between bride price payments and realised fertility. In line with anthropological evidence we argue that with the full payment of the bride price a woman loses her reproductive autonomy and subordinates her fertility preferences to the husband (Horne et al., 2013). Then, every man in a traditional society maximises the following utility function:

$$U = U(W, N(W), C) \tag{1}$$

where W denotes the direct utility from being married. This contains the services a wife provides for her husband, such as taking care of the household, and her level of education but also less tangible traits such as her beauty and her reputation within the local community. This builds on existing evidence that the amount of the bride price reflects a woman's socio-economic characteristics (Gaspart and Platteau, 2010; Horne et al., 2013; Platteau and Gaspart, 2007). The second component entering male utility is his number of children, which is a function of a woman's traits W. Building on existing anthropological evidence we argue that men in traditional societies aim for large families as it increases their standing within the community (Caldwell & Caldwell, 1990). A priori, we remain agnostic about the relationship between a woman's traits W and the number of children.[4] Lastly, men derive utility from a composite consumption good. We impose the standard assumption that utility is increasing in all its factors at a decreasing rate, that is $U_i > 0$ and $U_{ii} < 0$ for $i = W, N, C$.

A man wants to maximise utility subject to his budget constraint:

$$I = p_W W + p_N N(W) + pC,$$

where I is the combined income from all sources. The income is used to come up with the marriage payment with the bride price being captured by p_W, the costs of raising a child as denoted by p_N and the costs of consumption p. The costs of raising a child contain expenditures for nutrition, health care, and the time devoted to the child.[5] The price associated with the composite consumption good is set to 1.

From the maximisation we obtain the following expression for the relationship between a woman's traits and her number of children:

$$\frac{dN}{dW} = \frac{U_W - p_W U_C}{p_N U_C - U_N} < 0 \tag{2}$$

This expression together with the budget constraint allow us to draw two conclusions about the impact of the bride price on the number of children: first, for a given level of income $\bar{I}$ a man has to reduce the

number of children in response to a marriage with an 'expensive' bride, for whom he pays $\bar{p}_w$. This is the income effect. Second, from Equation (2) we obtain that an increase in the bride price increases the probability that $\frac{dN}{dW} < 0$ suggesting that women with more 'expensive' traits want a smaller number of children. Based on the literature about the fertility transition and the impact of education on fertility we refer to this latter effect as the education effect, which has already been observed by Ashraf et al. (2015).

In this admittedly simple model we have only considered the role of women as perceived by men. However, by making the number of children dependent on a woman's traits we implicitly model a woman's bargaining power, which is low for women whose traits are not valued by the husband. Concomitantly, an increase in female bargaining power will result in a decreasing fertility pressure as the woman is more valued for who she is as captured by *W*. Thus, whenever the groom pays a high bride price, he demonstrates his willingness to treat his wife well and to avoid the risk of divorce, which would correspond to a financial failure of his investment. In consequence, a husband who has paid a higher bride price gives more independence to his wife by reducing the pressure on her to produce offspring. Put differently, a lower bride price reduces a woman's bargaining power in the household, which in turn increases the fertility pressure on her.[6]

Our model is a simple formalisation of the evidence provided by Beegle et al. (2001) showing for the case of Indonesia that the more assets a woman owns, the bigger her say on fertility decisions. In what follows we will empirically disentangle if, controlling for income, higher bride prices imply a reduction in realised fertility.

4. Survey Context and Data

4.1. The Survey

Data are provided by a household survey carried out in rural areas of seven regions of Senegal.[7] The survey was part of the programme evaluation of a rural electrification initiative by the United Nations Development Programme (UNDP) known as multifunctional platform. The dataset includes two waves: the baseline survey was carried out between May and July 2009 and the second survey between April and June 2011. Villages were randomly selected based on the criterion of not having access to the national grid, which is not a severely restricting criterion as the overall rural electrification rate was only roughly above 20 per cent in 2008 including off-grid solutions (Mawhood & Gross, 2014). Within the villages, households were also selected at random from the list of resident households supplied by the head of the village. The sample can therefore be considered representative for rural Senegal in seven out of 14 regions, in which subsistence agriculture is the most prevalent form of income generation.

For the purpose of our analysis, we restrict the sample to married individuals at the time of the survey, who responded to the gender questionnaire. Consequently, we establish an unbalanced panel of married couples, which allows us to compare the dynamics of marriage payments across regions. While at the household level we have a balanced panel, at the level of the individual couple it is unbalanced. This is because within a household the same couple was not necessarily interviewed during both survey rounds. We employ a dataset that consists of 2241 responses by married couples, with repeated observations for 58.19 per cent of the sample. Put differently, 1304 of the observations in our sample represent 652 couples that were interviewed twice. The remaining 937 couples were interviewed once either in 2009 or in 2011. The subsample of repeated observations at the couple level shows that the amount of the bride price recalled by the same woman can differ from one survey round to the next. We exploit the variation in women's declaration about their bride price to address recall bias, which is a novel aspect of this study that has not yet been addressed in the literature.

4.2. Descriptive Statistics

We present summary statistics in Table 1. The ethnic and socio-economic composition of the sample underlines the representativeness of the dataset. An important majority of households declare their ethnic group as being Wolof (43%), Pular (24%) or Serere (18%). Moreover, almost one fifth of the households are casted[8] and 42 per cent of the couples report living in a polygamous union.

Household ownership of farmland, durable goods and livestock is reported by 86 per cent, 89 per cent and 93 per cent of households, respectively. On average, households own 2.51 plots of arable land indicating that they are in agriculture and derive their living from farming. In order to capture the economic conditions at the time of the marriage, we build five cohorts derived from the difference

Table 1. Summary statistics

	Mean	Std. Dev.	Min	Max
Number of children	5.20	3.10	0	16
Bride price	240,917.5	340,149.2	0	1,000,000
Mean bride price (years 2009 and 2011)	263,343.3	276,150.9	0	1,000,000
Characteristics of the wife				
Age of the wife	37.00	12.18	16	90
Age of the wife at marriage	17.85	4.63	10	55
Literacy of the wife	0.16	0.37	0	1
Income generating activity (IGA) of the wife	0.47	0.5	0	1
Wife occupation before marriage	0.07	0.25	0	1
Wife owns livestock at marriage	0.14	0.34	0	1
Wife owns durable goods at marriage	0.16	0.37	0	1
Characteristics of the husband				
Age of the husband	51.03	14.33	15	94
Age difference between husband and wife	14.89	10.61	0	68
Literacy of the husband	0.44	0.50	0	1
IGA of the husband	0.91	0.29	0	1
Husband occupation before marriage	0.45	0.5	0	1
Household characteristics				
Polygamy household	0.42	0.49	0	1
Distance to wife's parents	20.00	62.12	0	908
Distance to husband's parents	2.55	29.17	0	900
Household owns farmland	0.86	0.34	0	1
Number of plots	2.51	1.73	0	10
Household owns durable goods	0.89	0.31	0	1
Household owns livestock	0.93	0.25	0	1
Ethnicity				
Pular	0.24	0.43	0	1
Serere	0.18	0.38	0	1
Manding	0.06	0.23	0	1
Soninké	0.04	0.21	0	1
Diakhanke	0.02	0.15	0	1
Other ethnicity	0.03	0.17	0	1
Caste	0.18	0.39	0	1
Year of marriage cohort				
Year of marriage cohort [0, 5[	0.13	0.34	0	1
Year of marriage cohort [5, 10[	0.16	0.37	0	1
Year of marriage cohort [10, 15[	0.15	0.35	0	1
Year of marriage cohort [15, 20[	0.14	0.35	0	1
Year of marriage cohort [20, 25[	0.14	0.35	0	1

Notes: Pooled summary statistics for the survey years 2009 and 2011. The total number of observations is 2241. The reference group for the ethnicity is Wolof. The reference group for the year of marriage cohort is the cohort [25, .].

between the year of the survey and the year of marriage. For instance, the year of marriage cohort [0, 5[is an indicator variable equal to one if the marriage was celebrated less than five years before the survey. The year of marriage cohort [5, 10[codes for women who were married between five and 10 years before the survey. We further construct the year of marriage cohorts [10, 15[, [15, 20[and [25,.] by following the same logic; 13 per cent of the marriages were celebrated between 0 and 5 years before the survey.

At the level of the individual couple we derive most information from the woman's questionnaire. Women have on average 5.20 children. This number includes children who are alive and those who have died. The average woman is almost 37 years old. Considering the span of reproductive age is 15–49 years old, which is applied by the Demographic and Health Surveys, the average woman has already completed almost two-thirds of her reproductive life. Thus, we have a considerable share of women in the sample with (almost) completed fertility profiles. Nevertheless, in the empirical analysis we will control for current age and age at marriage. Moreover, the sampled women are on average14 years younger than their husbands. This gender age gap is not surprising in rural Senegal and gives an indication of the timing of marriages and the underlying marriage market processes: men first need to acquire the necessary assets to set up a family. The bride price paid at the wedding constitutes a non-negligible part of these assets. From our survey we have detailed self-reported bride price information reflecting the complete amount of the bride price that was paid. While the average bride price in the sample is FCFA 240,917 (367 Euros), there is considerable variation and the mean is driven by some large amounts as the median of FCFA 75,000 (114 Euros) shows.[9] All bride prices are denoted in nominal terms. Our analysis shares this feature with a similar study by Gaspart and Platteau (2010) who also had to rely on nominal values.

Women marry young as the average age at first marriage indicates; they are below 18 years of age on average. Similarly to the anthropological literature discussed above, we find that women's position is weak: only 16 per cent of women know how to read and write, whereas 44 per cent of their husbands are alphabetised. Yet, almost 47 per cent of the women in the sample are economically active beyond household chores and family farm work and 91 per cent of men pursue additional economic activities. At the time of their marriage, some 14 and 16 per cent of women own livestock and durable goods, respectively. A relatively low share of women (7%) have had an occupation before getting married while this proportion is as high as 45 per cent for men. Women's subordinate position is also demonstrated with respect to their living arrangements. Women live close to their in-laws since on average the couples live only 2.55 kilometres away from the husband's parents. This distance is estimated at 20 kilometres for the woman's parents. This last pair of descriptive statistics represents virilocality in the rural communities where wives have to take care of their parents-in-law and the domestic activities in the in-laws' home. Last, but not least, these descriptive statistics also show that the majority of couples come from the same region as indicated by the relatively short distances to the parents in general.

Overall, summary statistics leave no doubt that the sample at hand represents rural villages in Senegal, in which women are in a considerably weaker position in terms of education and (economic) empowerment compared to men.

5. Econometric Framework and Main Results

5.1. Empirical Strategy

We set up a linear model for the theoretically derived link between bride price payments and fertility decisions to empirically analyse whether realised fertility is indeed a function of the bride price along with other female and overall socio-economic characteristics. We specify the model in terms of its conditional mean:

$$E(y_{ihrt}|Condition_{ihrt}) = \beta_0 + \beta_1 log(BP)_{ihrt} + \beta_2 W_{ihrt} + \beta_3 H_{ihrt} + \beta_4 HH_{hrt} + \mu_t + \lambda_r, \quad (4)$$

where the subscript i denotes wife, h household, t year and r region. The dependent variable $y_{ihrt}$is the number of children a woman has given birth to at the moment of the survey. It is conditioned on all right-hand side variables, which are collected in $Condition_{ihrt}$. The variable of interest is the logarithm of the bride price $log(BP)_{ihrt}$. More specifically, we use $log(1 + BP)_{ihrt}$ to take into account amounts of bride price equal to zero. We also control for the socio-demographic characteristics of the women W_{ihrt} such as contemporaneous age and its square, the age of the women at her current marriage and its square, and a binary variable equal to one if the women is literate. The variable literacy is used to proxy for the education level. Similarly, we control for the husband's characteristics H_{ihrt} such as his age and its square, and a binary variable equal to one if he is literate. In addition, we take into account household characteristics HH_{hr} by controlling for ethnicity and caste as well as the type of marriage practiced.[10] The marriage form is captured by an indicator variable coding for polygamous unions. We further control for household wealth by including the number of plots owned by the household.

In addition, we include μ_t in our basic regression model to capture year of marriage cohort fixed effects. Economic conditions at the time of the marriage are considered as underlying factors that can influence both the amount of the bride price and the ensuing number of children. In order to deal with this source of omitted variable bias, we include year of marriage cohort fixed effects. Controlling for the marriage cohorts allows us to take into account positive or negative shocks such as weather events that prevailed around the wedding period and economic variables such as the level of prices. Furthermore, we need to control for marriage cohort fixed effects as all bride prices are denoted in nominal terms. Alternatively, we could have included information about the inflation history of Senegal but since this information is at the national level and does not change within marriage cohort, we opted for cohort-fixed effects. Gaspart and Platteau (2010) in their analysis of bride price dynamics face the same problem and present a detailed discussion of the evolution of bride prices over time. Moreover, our data highlight that the recalled bride price information is susceptible to recall bias and reported relative to current conditions. Therefore, controlling for inflation at the time of marriage would not necessarily do justice to the data.

We employ five-year windows for the cohorts to rule out any impact of the economic context at the beginning of the marriage on both the bride price negotiations and the initial fertility decisions. Finally, regional heterogeneity is controlled for by including region fixed effects λ_r in Equation (4). Standard errors are clustered at the regional level to account for intra-cluster correlations.

While the linear fixed effects model is our benchmark model, we also employ a fixed effects Poisson model as robustness test. The Poisson model better encompasses our outcome variable, number of children, which is a count variable that is censored at zero and skewed to the right. The conditional mean of the Poisson model is defined as follows:

$$E(y_{ihrt}|Condition_{ihrt}) = exp(\delta_0 + \delta_1 log(BP)_{ihrt} + \delta_2 W_{ihrt} + \delta_3 H_{ihrt} + \delta_4 HH_{hrt} + \mu_t + \lambda_r), \quad (5)$$

where the variables are the same as described above. Since coefficient estimates from the linear model and the Poisson model differ by construction, we assess the robustness of the OLS coefficient estimates relative to the comparable *marginal effects* from the Poisson model.

Moreover, endogeneity is a key concern in our analysis. First, it is important to disentangle between the income or wealth effect and the bride price effect on the number of children while at the same time income and wealth are considered endogenous themselves. However, even if these variables tend to be endogenous, by not controlling for them we may introduce omitted variable bias. Therefore, we compare our results with and without income variables. At the very least, it allows us to see whether our findings are robust to their inclusion. As we do not have detailed information on income, we have to use proxy variables. A primary candidate to proxy for income is the number of plots owned by the household. We believe that this variable is a good proxy for permanent income and can be considered exogenous due to the lack of active land markets in rural Senegal. In addition, land is considered as a suitable wealth indicator because inheritance is patrilineal in rural Senegal. However, a concern is whether the number of plots is a good predictor of wealth that controls for income adequately.

Therefore, we use alternative measures of income such as ownership of durable goods and livestock to challenge the robustness of our results to the introduction of these variables.

Second, the year of marriage cohort fixed effects help us to address another source of endogeneity introduced by measurement error in the amount of bride price due to the recall nature of the data. As with all analyses that employ recall data we face the challenge that human memories are adaptive. It is likely that the precise amount of the bride price is not correctly expressed by the interviewed women. These variations in the amount can be due to the duration between the year of the survey and the year of the marriage. Although we address the potential measurement error in the recalled amount of the bride price by including year of marriage cohort dummies, we further use an alternative specification, which considers the mean bride price between 2009 and 2011.

Third, by including region fixed effects, we can rule out sources of bias stemming from regional characteristics that are common across couples residing in a particular area.

A fourth source of endogeneity is simultaneity bias arising from the fact that both bride price payments and the number of children are driven by the bargaining power of the bride. We control for the bargaining power of both husband and wife at the time of the marriage by including a proxy of the husband's income and the assets of the bride *at the time of marriage*.

Lastly, to gain a more precise picture of the differential impact of bride price payments we carry out a heterogeneity analysis with respect to five variables: (i) the age of the bride at the time of the marriage, (ii) the age difference between husband and wife, (iii) the income generating activities (IGA) of the wife, (iv) the type of union (polygamy) and (v) the distance to the couple's parents. We allow the coefficient associated with bride price to vary with these different sets of variables and split the sample between these categories. We replace $log(BP)_{ihrt}$ with $log(BP)_{ihrt} \times \left(Dummy_{ihrtj} = 1\right)$ and $log(BP)_{ihrt} \times \left(Dummy_{ihrtj} = 0\right)$with j being equal to any of the five variables, for which we assess heterogeneous effects. Consequently, we report the interaction term of bride price with these different categories of variables and directly interpret the differences in coefficient estimates by means of the F-test. Since we interact both categories ($Dummy_{ihrtj} = 1$ and $Dummy_{ihrtj} = 0$) with bride price, the bride price itself is no longer directly included in the regressions as this would result in perfect multicollinearity.

5.2. Main Results

The main results are presented in Table 2 and clearly show that the bride price is negatively related to the number of children.

We start the analysis by assessing a simple correlation between bride price and the number of children. In Column 1 of Table 2, the OLS framework yields a significant (α = 5%) and negative coefficient associated with the log bride price payment, namely −0.164. Column 2 of Table 2 shows the results with regional and year of marriage cohort fixed effects. The coefficient associated with bride price remains significant and negative. Yet, the magnitude and the size of the coefficient is lower as compared to Column 2 indicating that the overall economic conditions around the wedding play a role in ensuing fertility decisions. In addition to these fixed effects, we control for wife and husband characteristics, polygamy, ethnicity and caste and confirm the significant (α = 5%) and negative relationship between bride price and the number of children (Column 3 of Table 2). The coefficient is −0.044 indicating that at the mean bride price of FCFA 240,917 a woman gives birth to 0.55 children less. At the median bride price, a woman has 0.49 children less on average. Put differently, every other woman who receives a bride price between the median and the mean value of our sample compared to a woman who does not receive a marriage payment, gives birth to one child less. While the effects seem to be large at first glance, they need to be qualified relative to the model we employ. The main dynamic stems from the difference in birth outcomes of those women receiving only a symbolic bride price of up to FCFA 10,000 or less, which make up for the bottom 5 per cent, and the top 5 per cent, which receive a bride price of FCFA 650,000 and above. Their difference in realised fertility is about 0.2 children. This is a small but robust difference that is found across all specifications and consistent with the theoretical model. Given that the bride price is paid at the beginning of the marriage and is a

Table 2. Bride price and fertility: main results

	Dependent variable: number of children							
	OLS	OLS	OLS	OLS	Poisson	Poisson	Poisson	Poisson
					Marginal effects			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bride price (log)	−0.164**	−0.054*	−0.044**	−0.043**	−0.151***	−0.055**	−0.044***	−0.043**
	(0.06)	(0.02)	(0.02)	(0.02)	(0.05)	(0.02)	(0.02)	(0.02)
Age of the wife			0.442***	0.444***			0.558***	0.557***
			(0.07)	(0.07)			(0.08)	(0.08)
Age^2 of the wife			−0.004***	−0.004***			−0.005***	−0.005***
			(0.00)	(0.00)			(0.00)	(0.00)
Age of the wife at marriage			−0.255**	−0.258**			−0.277***	−0.281***
			(0.08)	(0.08)			(0.09)	(0.08)
Age^2 of the wife at marriage			0.004**	0.004**			0.004***	0.004***
			(0.00)	(0.00)			(0.00)	(0.00)
Literacy of the wife			−0.275	−0.281			−0.310	−0.315
			(0.18)	(0.18)			(0.21)	(0.21)
Age of the husband			0.041	0.045			0.055*	0.060*
			(0.03)	(0.02)			(0.03)	(0.03)
Age^2 of the husband			−0.000	−0.000			−0.000	−0.000*
			(0.00)	(0.00)			(0.00)	(0.00)
Literacy of the husband			0.152	0.161			0.152	0.161
			(0.26)	(0.25)			(0.26)	(0.26)
Polygamous household			−0.165	−0.185			−0.131	−0.153
			(0.15)	(0.16)			(0.14)	(0.15)
Number of plots				0.085**				0.077***
				(0.02)				(0.03)
Ethnicity and caste	No	No	Yes	Yes	No	No	Yes	Yes
Region dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year of marriage cohort dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Observations	2,241	2,241	2,241	2,241	2,241	2,241	2,241	2,241
R^2	0.01	0.31	0.36	0.37				

Notes: The reference group for the ethnicity is Wolof. The reference group for the year of marriage cohort is the cohort [25, .]. All OLS regressions include a constant. Robust standard errors clustered at the region level are in parentheses. ***, **, * indicate significance at the 1, 5, 10 per cent level, respectively.

sunk cost at the time of child bearing, this early marriage decision has a considerable long-term impact.

We have not yet accounted for wealth in the analysis although assets and wealth clearly influence both bride price payments and fertility decisions. Therefore, we include the number of plots owned in Column 4 of Table 2. This does not affect the coefficient associated with bride price (compare Column 3 of Table 2). At the same time, the wealth effect is non-negligible and is represented by the positive impact that the number of plots has on realised fertility. The coefficient is twice as big as the one associated with the bride price indicating the importance of contemporaneous income streams for raising children. Moreover, this positive effect associated with land also has to be understood as a demand for labour, as households owning more farmland need more hands to work on it (Jacoby, 1995).

As the analysis is an ex post analysis of realised fertility at the time of the survey and we rely on contemporaneously observed fertility outcomes, we control for the age of the husband and wife as well as their age at marriage. Unsurprisingly, older women have given birth to more children but this relationship is non-linear. The turning point is at the age of 55, which roughly corresponds to the average age of natural menopause according to medical research (McKinlay, 1996). At the same time,

we observe that the younger a bride was at her marriage, the more children she has given birth to at the date of the survey. However, the relationship between the age at marriage and the fertility decisions is U-shaped with 32 years marking the threshold. Since the average woman in our survey is 37 years old, our analysis seems to be a valid representation of the fertility-age dynamics. Similarly, literacy has the expected negative sign showing that more educated women tend to have fewer children. Yet, the coefficient associated with literacy is not significant.

While we do not find any significant differences in fertility patterns across castes, the ethnic group of the Serere tends to have one more child on average. This result has also been found in the Demographic and Health Surveys and confirms the representativeness of our dataset for rural Senegal (see the Appendix for the full set of results of Table 2). As motivated above, the Poisson model might be more suited for the analysis as our dependent variable is a count variable. We employ the Poisson model akin to the linear model. Marginal effects are presented in Column 5–8 of Table 2 and show identical results. Therefore, in the remainder of the paper we only present the OLS results.

Turning to the impact of the covariates on fertility decisions, the contextual dimension of both marriage arrangements and ensuing family planning is emphasised. The analysis demonstrates that the individual characteristics of husband and wife and the timing of their marriage jointly shape fertility decisions. In what follows, we test the robustness of our results by considering various sources of endogeneity. We also look at the extent to which the characteristics of the couple are linked to bride price payments. By carrying out a differential analysis we improve our understanding of the institutional settings of the marriage market in rural Senegal.

6. Endogeneity Bias and Robustness Checks

In our econometric approach we use the detailed information provided by the household survey and control for the characteristics of the couple and the household. We rule out sources of biases that possibly come from time-invariant regional characteristics and trends in bride price through the region and the marriage-year cohort fixed effects. Although we pay attention to all these elements, we may still face endogeneity problems due to the omission of relevant variables such as income.

6.1. Omitted Variable Bias

One concern related to the use of the number of plots as a measure for wealth is that a household with one large plot can be richer than a household with many small plots. To address this, we replace the variable number of plots with a dummy taking the value 1 if the household owns any land (Column 1 of Table 3). The coefficient associated with bride price remains significant and negative and of identical magnitude as before. The ownership of land is insignificant.

We further disentangle the income from the bride price effect by including income generating activities (IGA) undertaken by the wife and the husband in our empirical specification jointly with the number of plots and two additional dummy variables equal to 1 if the household owns durable goods or livestock, respectively. By including IGAs, we control for the labour market participation of women and men. We construct two indicator variables, the first variable is binary and equal to one if the wife is economically active, the second one is similarly constructed for economically active husbands. The coefficient associated with the bride price remains negative and significant, although at the 10 per cent level (Column 2 of Table 3). The magnitude of the coefficient is smaller probably due to the demanding specification. We observe that income-generating activities by the wife increase her number of children while such activities by the husband have no impact on fertility decisions. This result demonstrates that women provide most of the resources for

Table 3. Bride price and fertility: robustness checks

	Dependent variable: number of children					
	OLS	OLS	OLS	OLS	OLS	Wildboot-strap
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Bride price (log)	−0.044**	−0.038*	−0.045*		−0.043*	−0.043**
	(0.02)	(0.02)	(0.02)		(0.02)	(0.02)
Mean bride price				−0.059**		
				(0.02)		
Ownership of farmland	−0.107					
	(0.15)					
Number of plots		0.086***	0.078***	0.085**	0.085**	0.085***
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
IGA of the wife		0.305***				
		(0.07)				
IGA of the husband		0.038				
		(0.13)				
Household owns durable goods		−0.118				
		(0.11)				
Household owns livestock		−0.012				
		(0.29)				
Husband had an occupation before marriage			−0.340**			
			(0.12)			
Wife had an occupation before marriage			0.010			
			(0.31)			
Wife owns livestock at marriage			0.033			
			(0.11)			
Wife owns durable goods at marriage			−0.633***			
			(0.12)			
Repeated observations dummy					−0.057	
					(0.09)	
Observations	2,241	2,241	2,241	2,241	2,241	2,241
R-squared	0.36	0.37	0.37	0.37	0.37	0.37

Notes: All regressions include a constant and control for age of the wife and its square, age of the wife at marriage and its square, literacy of the wife, age of the husband and its square, polygamy in the household, ethnicity and caste, region and year of marriage cohort dummies. Robust standard errors clustered at the region level are in parentheses. ***, **, * indicate significance at the 1, 5, 10 per cent level, respectively.

raising their children themselves and paternal contributions are limited (Desai, 1992). The ownership of durables or livestock is not significantly different from 0.

6.2. Simultaneity Bias

A second concern is simultaneity bias since it is female bargaining power that drives both bride price and fertility decisions. Therefore, we checked the robustness of our results to the inclusion of variables that proxy for the bargaining power between husband and wife at the time of the marriage. In Column 3 of Table 3, we control for labour market participation of the husband before getting married and the economic activity of the woman before getting married. To further capture the bargaining power of women, we add dummy variables for her ownership of livestock and durable goods at the time of marriage. The results are robust to the inclusion of these variables. Moreover, a husband with an

occupation before getting married and a wife with durable goods at the time of marriage reduce their number of children.

6.3. Bias from Measurement Error

Although we control for the economic conditions at the time of the marriage, we want to make sure that the measurement error resulting from the recall of the bride price does not invalidate our results. We note that the average bride price in 2009 is different from the one in 2011. Consequently, we implement an alternative specification that uses the log of the mean bride price between 2009 and 2011 instead of the actually reported values in every year. In Column 4 of Table 3, the relationship between the mean bride price and the number of children is shown to be similarly negative and significant. The magnitude of the coefficient is higher in absolute terms when we use the mean bride price rather than the values reported for every period. However, we prefer being conservative in assessing the magnitudes and focus on the results in Table 2, which are lower in absolute terms.

6.4. Other Robustness Checks

For about half of the couples, we have two observations. In order to make sure that it does not affect our results, we include a dummy for the repeated observations and the results do not change (Column 5 of Table 3).

All our estimates are clustered at the region level. However, given the small number of regions, a simple clustering of standard errors can underestimate them. Following Cameron, Gelbach, and Miller (2011), we present in Column 6 of Table 3 the main result controlling for multi-way clustered standard errors. The latter option allows us to account for the small number of clusters by implementing Wild boostrapping. The results remain statistically significant at the 5 per cent level.

7. Heterogeneous Effects

To gain a more precise picture of the differential impact of bride price payments we consider heterogeneous effects. We report the interaction term of bride price with five different categories of variables. We allow the coefficient associated with bride price to vary with these different sets of variables and split the sample between these categories. The coefficient estimates are directly interpreted by means of the F-test. Since we interact both categories with bride price the latter is no longer directly included in the regressions as this would result in perfect multicollinearity.

7.1. Age at Marriage and Age Difference Between Husband and Wife

First of all, we consider the woman's age at the time of the marriage. We split the sample into brides below and above 20 years of age at the time of their marriage (Column 1 of Table 4). At first glance, results suggest that there is a difference between older and younger women in the relationship between bride price payments and pressure for offspring. However, the F -test of 20.34 per cent reveals that the dynamics and expectations linked to the bride price are similar for women who get married very young (below the age of 20) and at a slightly older age (above the age of 20). We also tried other thresholds for the age of marriage subsamples. The results did not change.

Bride price dynamics can be further nuanced by analysing the nature of the marriage, namely an arranged versus a love marriage. While we cannot directly control for these two types of marriage, we have information on the age difference between husband and wife. By controlling for the age difference of the couple, we build on anthropological evidence that in rural Senegal arranged marriages between young girls and older men are not uncommon (Foley & Drame, 2013). In Column 2 of Table 4, we present the results controlling for age difference and its interaction with

Table 4. Bride price and fertility: heterogeneity analysis

	Dependent variable: number of Children				
	OLS	OLS	OLS	OLS	OLS
Variables	(1)	(2)	(3)	(4)	(5)
Age of the wife at marriage	−0.203**				
	(0.07)				
Age^2 of the wife at marriage	0.003**				
	(0.00)				
BP*Married below 20	−0.035*				
	(0.02)				
BP*married above 20	−0.063**				
	(0.02)				
Age difference		0.046*			
		(0.02)			
Age difference^2		−0.001**			
		(0.00)			
BP*high age difference		−0.047**			
		(0.02)			
BP*Low age difference		−0.029			
		(0.02)			
IGA			−0.599		
			(0.39)		
BP*IGA			0.001		
			(0.02)		
BP*No IGA			−0.078**		
			(0.03)		
Polygamous household				1.020**	
				(0.37)	
BP*Polygamous household				−0.259**	
				(0.09)	
BP*Monogamous household				−0.013	
				(0.01)	
Distance to wife's parents					0.000
					(0.00)
BP*Distance to wife's parents					−0.019
					(0.03)
BP*No distance to wife's parents					−0.001
					(0.00)
Distance to husband's parents					0.003**
					(0.00)
BP*distance to husband's parents					−0.454**
					(0.17)
BP*No distance to husband's parents					−0.040**
					(0.01)
Observations	2,241	2,241	2,241	2,241	2,241
R-squared	0.37	0.37	0.37	0.37	0.37
F-test (p-value)	0.203	0.047	0.050	0.025	0.576
					0.038

Notes: All regressions include a constant and control for age of the wife and its square, age of the wife at marriage and its square, literacy of the wife, age of the husband and its square, polygamy in the household, ethnicity and caste, region and year of marriage cohort dummies. Robust standard errors clustered at the region level are in parentheses. ***, **, * indicate significance at the 1, 5, 10 per cent level, respectively. At the bottom of column 5, the values 0.576 and 0.038 represent the *p*-value from the F-test of the bride price interacted distance to the wife's and the husband's parents, respectively.

the bride price payment. We find a direct effect of age difference: the bigger the difference is, the more pressure the woman has to give birth. Yet, there is a threshold at which a higher age difference decreases the number of children. When the age gap exceeds 23 years, fertility is decreasing again. In addition to including the age difference, we interact the bride price payments with a dummy variable equal to one if the age difference is higher than 10 years. The interaction term further reinforces the finding that higher bride prices reduce the number of children a woman has to give birth to in arranged marriages. The coefficient is similar in size and significance to the one found in the main model (Column 2 of Table 2). The interaction between bride price payments and (almost) no age difference is not statistically significant. This term, which represents a marriage between individuals of similar age, is considered to code for marriages out of mutual affection. In love marriages, bride price payments are not needed to regulate fertility decisions taken by the couple. Yet, for arranged marriages, in which a considerably older husband has chosen a young girl, the bride price is decisive for the woman's pressure for offspring (p-value of the F -test 4.65%). In this type of marriage, if the bride and her family can negotiate a substantial payment for her, she will face less pressure for reproductive success.

7.2. Income Generating Activities of the Wife

Results in Column 3 of Table 4 show that women who are economically dependent on their husbands while having received a low bride price tend to have more children, indicating that the concerned women are less valued and have to gain respect through reproductive success (p-value of the F-test 5.4%). This finding highlights that economically inactive, poor women are at a considerable risk of not being honoured with a bride price and face pressure to gain respect through offspring. Poor women have little bargaining power to ask for high bride price payments. This limits them in their choice of a husband and might result in less affectionate but rather affordable marriage arrangements. Being in such a marriage of convenience puts a high reproductive pressure on them.

7.3. Polygamous Versus Monogamous Households

Being in a polygamous household increases the number of children a woman gives birth to (Column 4 of Table 4). This result comes from the competition between wives particularly with respect to inheritance. The higher the number of children of any individual wife, the higher will be the share she and her children inherit upon the death of the husband. For women living in a polygamous household, a lower bride price payment increases fertility pressure while in a monogamous household the bride price payment has no effect on the couple's decisions concerning fertility (p-value of the F-test 2.46%). Indirectly, this finding also supports the results about age difference: whenever a couple is close due to affection, marriage payments have no significance and thus do not influence fertility decisions. In turn, if a woman is just an addition, her value and appreciation is defined by the bride price she receives.

7.4. Distance to Parents

We also examined the geographical distance between the married couple and their parents. While the first variable has no effect on the fertility decisions of the couple, we find an inverse relationship between the number of children and the distance to her in-laws. Put differently, women who live near their in-laws encounter higher reproductive pressure. However, the magnitude of the coefficient is close to 0 and despite being precisely estimated the coefficient has no economic significance (Column 5 of Table 4).

In addition, we split the sample between women living more than 20 kilometres from their parents and those who live within a radius of 20 kilometres from their parents. We find no differential effects with respect to the impact of bride price payments on fertility decisions (p-value of the F-test 57.55%). However, when we compare women living far from their parents-in-law, which means that their residence is at least located 20 kilometres from them, to those who live closer, bride price dynamics with respect to distance appear. In response to high bride price payments, women close to their

parents-in-law reduce the number of children considerably less as compared to women who live far away from their in-laws (*p*-value of the F -test 3.78%). In other words, the fertility pressure is stronger for women who receive a low bride price and live close to their in-laws compared to those who live far from their parents-in-law. When women live close to their in-laws, they are pressured by the family and judged according to the number of children they give birth to. Living further away from the in-laws implies a higher level of (economic) independence and concomitantly less fertility pressure.

8. Conclusion

The bride price system has a long tradition in many sub-Saharan African countries and to this day is deeply embedded in local cultures. This system of marriage payments has considerable implications for the bargaining power and status of women. This paper contributes to the existing anthropological literature suggesting that upon receipt of the full bride price payment a woman loses her reproductive autonomy (Horne et al., 2013). The literature to date mainly assesses the role of bride price payments *per se* but not whether differences in the amount of the bride price paid have differential effects on fertility. We complement this literature with an assessment of the relationship between the size of the bride price payment and related fertility decisions. Our econometric results suggest that a woman's say in her marriage, as captured by her realised fertility, is crucially influenced by the payment from the groom's family to the bride and her family upon the marriage. As outlined by the anthropological literature, a marriage represents a social contract between a man and a woman and their respective families. Whenever the groom is disposed to pay a high bride price, he demonstrates his willingness to treat his wife well and to avoid the risk of divorce, which would correspond to a financial failure of the investment. The woman, in turn, can judge from the bride price payment she received how much she is appreciated and whether she needs to gain reputation within the groom's family by giving birth to many children.

Bride price payments are not only an African phenomenon. In recent years they have gained increasing importance in China and marriage migration for high bride prices is not uncommon (Davin, 2005). Thus, bride prices are an important marriage market institution that remains in existence even as countries and regions develop.

This type of marriage contract seems odd to Western observers. Yet, in poor rural societies this mutual insurance is prominent, covering not only the spouses but also their families. Therefore, efforts to eradicate the tradition of bride price payments and formalise marriages according to national legal standards might make the concerned women particularly worse off.

Already to date, bride price payments have less power over women who are economically independent. A direct change of the bride price system might be too challenging a task. But economic empowerment will give leeway to girls even in traditional societies. The established marriage contract can be broken indirectly by giving women more possibilities for economic independence. Another possible entry point to counteract the continuance of this tradition are family planning programmes. On the one hand, our findings suggest that these programmes may be inefficient if they do not take into account norms and values, which define women's behaviour with regard to fertility decisions in traditional societies. At the same time, these programmes can be used to educate women. Moreover, family planning programmes, which are integrated in broader support structures, can offer women opportunities to increase their (economic) independence such that the social contract that stipulates the marriage arrangements is a tool of empowerment for young couples and also fosters marriages of mutual affection.

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Disclosure statement

No potential conflict of interest was reported by the authors.

Notes

1. Bride price payments are also practiced in some Asian countries such as Thailand (Cherlin & Chamratrithirong, 1988) or rural China where it is possible to find the two systems of marriage payments to coexist (Anderson, 2007; Brown, 2009).
2. The following sub-Saharan African countries practice bride price payments: Ghana, Kenya, Nigeria, Rwanda, Senegal, South Africa, Tanzania, and Uganda. The list is non-exclusive. The mentioned countries participated in an international conference about the system of bride price payments in Uganda in 2004.
3. It is important to keep in mind that in African societies, particularly in traditional societies, the group is more important and valued than the individual taken on her own. Consequently, the specific share received by the bride is of minor importance since she is initially considered as part of her family of origin. What is of importance is the transaction from one family to another. Whenever the family of the bride receives a transfer, the bride will be considered as the one who received the payment and was valued by her in-laws regardless of the share of the transfer that she has direct control over.
4. In contrast, Bergstrom (1994) *assumes* in his model of polygamy that fertility increases in the bride price.
5. We abstain from directly modelling child health since we are only interested in child 'quantity' and not in 'quality'.
6. An historical overview of marriage laws in early African societies reveals that marriage payments have not always been perceived as 'bride price'. According to Kanji and Camara (2000), the term 'prenuptial gift' is more appropriate than bride price. Historically, marriage payments were not viewed as a price or compensation. Such transfers were of symbolic nature and represented the engagement of the groom towards his bride and her family. Yet, these nuptial transfers were interpreted as bride price as time evolved and the concept bride price was further shaped by tribal, religious and political influences.
7. The regions are Diourbel, Fatick, Kaolack, Kolda, Louga, Tambacounda, and Thies. The newly established region Kedougou is also part of the survey but is here considered as part of the region of Tambacounda.
8. Senegal has a caste system, which is historically based on labour division. The dummy caste equals 1 if households belong to the Ñeeño, who work in handcraft jobs and music; being a member of the Geer caste is coded with 0. The latter are not bounded by job categories (Mbow, 2000).
9. Very few bride prices are higher than FCFA 1,000,000. To avoid deleting these outliers and losing some observations, we associate them to an amount of FCFA 1,000,000.
10. We cannot systematically disentangle lineage in the analysis since Senegalese society shifted from a matrilineal to a patrilineal one, although matrilineal traditions still exist. Therefore, we proxy for different tribal and regional occurrences by including ethnicity and regional fixed effects in the analysis. Yet, even based on these indicators we are not in a position to disentangle lineage effects since a variety of matrilineal and patrilineal traditions are found across Senegalese society, which cannot be clearly attributed to one tribe or another inhibiting us from assessing lineage per se. In line with Horne et al. (2013) we argue that in both contexts, matrilineal and patrilineal societies, the marriage payment from the groom to his wife affects the woman's reproductive autonomy while bride price payments tend to be lower in matrilineal societies.

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Appendix

Table A1. Full set of results presented in Table 2. Bride price and fertility: main results

	Dependent variable: number of children							
	OLS	OLS	OLS	OLS	Poisson	Poisson	Poisson	Poisson
							Marginal effects	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bride price (log)	–0.164**	–0.054*	–0.044**	–0.043**	–0.151***	–0.055**	–0.044***	–0.043**
	(0.06)	(0.02)	(0.02)	(0.02)	(0.05)	(0.02)	(0.02)	(0.02)
Age of the wife			0.442***	0.444***			0.558***	0.557***
			(0.07)	(0.07)			(0.08)	(0.08)
Age^2 of the wife			–0.004***	–0.004***			–0.005***	–0.005***
			(0.00)	(0.00)			(0.00)	(0.00)
Age of the wife at marriage			–0.255**	–0.258**			–0.277***	–0.281***
			(0.08)	(0.08)			(0.09)	(0.08)
Age^2 of the wife at marriage			0.004**	0.004**			0.004***	0.004***
			(0.00)	(0.00)			(0.00)	(0.00)
Literacy of the wife			–0.275	–0.281			–0.310	–0.315
			(0.18)	(0.18)			(0.21)	(0.21)
Age of the husband			0.041	0.045			0.055*	0.060*
			(0.03)	(0.02)			(0.03)	(0.03)
Age^2 of the husband			–0.000	–0.000			–0.000	–0.000*
			(0.00)	(0.00)			(0.00)	(0.00)
Literacy of the husband			0.152	0.161			0.152	0.161
			(0.26)	(0.25)			(0.26)	(0.26)
Polygamous household			–0.165	–0.185			–0.131	–0.153
			(0.15)	(0.16)			(0.14)	(0.15)
Number of plots				0.085**				0.077***
				(0.02)				(0.03)
Ethnicity								
Pular			–0.408	–0.382			–0.433	–0.411
			(0.33)	(0.32)			(0.36)	(0.35)
Serere			0.822**	0.805**			0.776***	0.763***
			(0.23)	(0.24)			(0.20)	(0.20)
Manding			0.237	0.230			0.259	0.246
			(0.39)	(0.38)			(0.37)	(0.36)
Soninke			–0.602	–0.556			–0.652*	–0.608*
			(0.34)	(0.32)			(0.35)	(0.33)

(*continued*)

Table A1. (*Continued*)

	Dependent variable: number of children							
	OLS	OLS	OLS	OLS	Poisson	Poisson	Poisson	Poisson
							Marginal effects	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Diakhanke			–0.597	–0.557			–0.648*	–0.611*
			(0.35)	(0.33)			(0.36)	(0.34)
Other ethnic groups			–0.186	–0.169			–0.206	–0.192
			(0.36)	(0.35)			(0.33)	(0.33)
Caste			0.041	0.036			0.025	0.021
			(0.18)	(0.18)			(0.18)	(0.18)
Year of marriage cohort								
Year of marriage cohort [0, 5]		–4.829***	–0.766	–0.702		–6.070***	–1031	–0.990
		(0.29)	(1.02)	(1.01)		(0.35)	(1.09)	(1.09)
Year of marriage cohort [5,10]		–3.306***	–0.326	–0.269		–3.354***	0.434	0.473
		(0.19)	(0.86)	(0.85)		(0.16)	(0.95)	(0.94)
Year of marriage cohort [10, 15]		–2.299***	–0.298	–0.252		–2.094***	0.474	0.505
		(0.29)	(0.75)	(0.74)		(0.29)	(0.79)	(0.78)
Year of marriage cohort [15,20]		–1.267***	–0.104	–0.074		–1.055***	0.474	0.495
		(0.21)	(0.47)	(0.46)		(0.18)	(0.46)	(0.46)
Year of marriage cohort [20,25]		–0.444	0.102	0.133		–0.340	0.407	0.436
		(0.31)	(0.47)	(0.46)		(0.24)	(0.40)	(0.39)
Region dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Observations	2,241	2,241	2,241	2,241	2,241	2,241	2,241	2,241
R-squared	0.01	0.31	0.36	0.37				

Notes: The reference group for the ethnicity is Wolof. The reference group for the year of marriage cohort is the cohort [25,.]. All OLS regressions include a constant. Robust standard errors clustered at the region level are in parentheses. ***, **, * indicate significance level at the 1, 5, 10 per cent level, respectively.