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What's Your Child Worth? An Analysis of Expected Dowry Payments in Rural India

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Abstract

This paper introduces a new primary dataset on dowry payments in rural India. A novel feature of the data is that in addition to eliciting actual dowry payments, we also asked rural Indian households how much dowry they expected to pay/receive for each of their currently unmarried children. These expectations are presumably the basis of household decision making (as opposed to actual dowries paid and received) with respect to decisions such as human capital investments, saving and consumption, etc. We find that the distribution of dowry forecasts appears to be consistent with the distribution of actual dowry payments, suggesting that dowry perceptions may be quite accurate. Our analysis of dowry forecasts further indicates that (i) Individual-specific attributes are significantly more important than household income and wealth in terms of explaining the magnitude of dowry payments, and (ii) bride quality is also a significant determinant of dowry, which provides a corrective to the emphasis on groom quality in the literature.

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1 Introduction

The practice of dowry, generally defined as the transfer of assets and goods from the bride's to the groom's family at the time of marriage, is a pervasive phenomenon in India despite having been declared illegal in 1961. Dowry practices have even been adopted in communities that did not previously practice dowry (a phenomenon memorably labeled "Sanskritization" by Srinivas (1952)), and have also replaced bride-price in some communities (Billig 1989).¹ Anderson (2007A) reports that dowry is being practiced in about 93% percent of Indian marriages, and that dowry payments are several multiples of a household's annual income. There is also some indication that dowry payments in India are on the increase (see, Epstein 1973, Rajaram 1983, Caldwell et al. 1992, Rao 1993, Deolalikar and Rao 1998, Sautmann 2014, Anderson 2003 and 2007B).² Understanding these phenomena is imperative, given the growing concerns about the socioeconomic consequences of the dowry, including its impacts on household consumption and saving (Browning and Subramaniam 1995, Anukriti, Kwon and Prakash 2017), fertility (Alfano 2017), and sex selection (Bhalotra, Chakravarty and Gulesci 2018).

Research into the causes and consequences of the institution of dowry has however remained limited because of the paucity of reliable and up-to-date data on the practice. The seminal empirical contributions on dowry in India (Rao 1993, Deolalikar and Rao 1998) were based on a (by now) dated ICRISAT sample of six Indian villages from 1983.³ In this paper, we introduce a novel, primary dataset on dowry practices in three of the ICRISAT villages. Our data differ from existing sources in that we elicited prospective dowry payments, in addition to the usual questions about retrospective dowry payments. Specifically, we asked parents to forecast the maximum dowry amount that they would be willing to pay at time of marriage for each of their unmarried daughters, and the minimum dowry amount they would be willing to accept for each of their unmarried sons.

To our knowledge, our study represents the first effort to elicit expectations of dowry payments. The importance of measuring *perceived*, as opposed to *actual*, costs and benefits has been emphasized in studies of decisions such as migration (e.g. McKenzie et al 2013), education and

¹For an introduction to marriage in developing countries, see Anukriti and Dasgupta (2017).

²We should note that the phenomenon of dowry inflation has been contested by some authors (Edlund 2006, Arunachalam and Logan 2016, Anukriti, Kwon and Prakash 2017).

³The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) selected six villages in Maharashtra state and Andhra Pradesh state in India as part of their Village Level Studies (VLS) program to represent (albeit not statistically) the semi-arid tropics in India. The ICRISAT-VLS collected data from these villages during 1975-1985; and again after 2000.

marriage (e.g. Jensen 2010, Rosenzweig 2010, Delavande et al. 2011, Attanasio and Haufmann 2017), and agriculture (e.g. Berazneva et al. 2018, Maredia et al. 2019).

In the context of dowry, households' consumption and investment decisions are determined by their expectations of dowry payments, rather than actual (or realized) dowry payments. The distinction is potentially important given that the studies cited above find that expected returns to investments such as migration, schooling and technology adoption deviate systematically from objectively measured returns. A second advantage of prospective data is that, to the extent that analyses of dowry make use of recall data on dowry payments, recall error (which may be systematic) is an important concern, whereas this issue does not arise in the context of prospective data.

Our paper is primarily descriptive, and makes two contributions to our understanding of the practice of dowry. First, we examine how the elicited prospective payments (or dowry forecasts, as we refer to them hereafter) compare with the distribution of actual dowry payments. We find that the distribution of expected dowry payments appears consistent with actual dowries paid and received. It appears therefore that parents (on average) have a reasonably accurate perception about the value of marriage market transfers. On the one hand, this may seem unsurprising, given that information diffusion in small villages is likely to be highly efficient. On the other hand, having accurate perceptions of average marriage market payments is not necessarily inconsistent with having biased perceptions of the marriage market worth of one's own child - for instance, an "optimism bias" phenomenon is commonly observed in a variety of contexts (see Griffin and Tversky 1992, and DellaVigna 2009 for a framework and evidence, respectively), including assessments of health risks (e.g. Weinstein 1987) and returns to education (e.g. Jensen 2010).

A second contribution of our study is to shed light on how individual characteristics factor into dowry payments. This question is important because it bears on the motives underlying the practice of dowry. The early literature on dowry in India equated it with the traditional custom of *stridhanam*, which could be thought of as a pre-mortem bequest to the girl from her parents (e.g. Tambiah 1973). Later studies argued that *stridhanam* had transformed into something more akin to a "groomprice" (see, for example, Caldwell et al 1983 and Billig 1992 for explanations of this phenomenon; and Arunachalam and Logan 2016 for an attempt to measure the relative prevalence of the bequest and groomprice motives). As noted by Chowdhury (2010), the relationship (if any) between dowry payments and the characteristics of the bride and the groom may help to distinguish between the two hypothesized functions of dowry.

Relatedly, as Deolalikar and Rao (1998), among others, have noted, marriage in India appears to be "largely an alliance between two families" - an obvious question therefore is whether dowry is the "price" paid for the productive ability of a particular groom, or for the status/wealth associated with his family. Distinguishing between the marriage market returns to household versus individual characteristics may also be key to understanding phenomena such as dowry inflation and the spread of the practice of dowry.

The existing evidence has however not provided a consistent picture of the relation between dowry payments and individual characteristics: Whereas household wealth is a consistent predictor of dowry payments, the importance of individual attributes varies between studies. Both Rao (1993) and Deolalikar and Rao (1998) find that groom attributes play little role in determining dowry, whereas Anderson (2003) and Dalmia and Lawrence (2005) report that dowry payments do vary with the individual attributes of both bride and groom (we should however note that the two studies are not necessarily comparable, since they correspond to different regions and time periods).⁴

A challenge common to these studies is that an individual's marriage-relevant qualities may be difficult to measure, and this shortcoming may be particularly severe when assessing the importance of bridal characteristics: Anthropological and sociological evidence emphasize the role of women as homemakers and childbearers (e.g. Srinivas 1984 and Jeffery and Jeffery 1996), especially among the higher social classes in North India (e.g. Tambiah 1989), as opposed to men who are valued for their education and urban occupations (e.g. Caldwell et al. 1983). For instance, according to our survey respondents, a girl's physical appearance and "homely nature" are characteristics which are highly valued on the marriage market; yet these are unlikely to be represented in measures of education or ability, whereas in contrast, earning ability (which can be proxied by education and wages) is thought to be the most relevant groom characteristic.

We argue in this paper that even directly productive characteristics (or "ability", broadly interpreted) are likely to be mismeasured in the case of girls, because social norms surrounding education and marriage may curtail the level of educational attainment of women (see, for example, Field and Ambrus 2008, and Chari, Heath and Maertens 2017), so that the latter may not fully reflect the productive ability of women. We shed light on this issue by making use of novel

⁴Ambrus et al. (2008), using recall data of about 1,300 marriages from Bangladesh, find that a more educated groom receives a higher dowry (in contrast to the education of a bride, which appears to have no effect on the dowry). Arunachalam and Logan (2008) find, in a similar context, that both bride and groom's education relate in a positive manner to dowry.

measures of ability and educational aspirations that we collected in our survey. More specifically, we asked parents to indicate the rank of each child in his or her class in school, and to indicate the level of education that they desire for each child. Our analysis indicates that dowry payments are strongly associated with our measure of child ability, even after controlling for household socioeconomic characteristics, including wealth. In the case of boys, however, the effect of ability disappears once we control for educational aspirations (or planned education), whereas in the case of girls the effect of ability persists (indeed, is unaffected) after controlling for education. These results are consistent with the findings reported in Chari and Maertens (2014), who show that perceptions of child ability influence parents' educational aspirations for the child differently for male versus female children. From the perspective of understanding dowry, our conclusion is that measures of educational attainment are likely to be poor proxies for a girl's productive ability.

A limitation of this analysis is that our measure of child ability is only available for a subsample of children who are currently in school or who have been to school. We therefore propose and implement a novel, alternative approach to estimate the importance of child ability. The strategy is based on the hypothesis that there is a latent component of child ability that is revealed gradually over time (to the parents), causing parents to revise their dowry forecasts as the child grows older. We construct a simple model of Bayesian learning to illustrate the intuition that learning about child ability implies that dowry forecasts for a cohort of very young children (whose abilities have not yet been fully revealed) are likely to be much more similar to one another (i.e. exhibit much less dispersion) than dowry forecasts for a cohort of older children. The concavity of learning also implies that the within-cohort dispersion in dowry forecasts will tend to increase with child age in a concave fashion, a prediction that is indeed borne out in the data. We then show that this observation provides a simple strategy for estimating the value of child ability.

Our estimates of the parameters of the learning model suggest that individual ability is highly valued in terms of dowry, for boys as well as for girls. A one standard deviation increase in male ability would increase dowry payments by 64%, while a one standard deviation increase in female ability increases dowry payments by 46%. These effects are three to four times greater than the effect of household income and wealth.

By establishing the importance of individual quality as a determinant of dowry, our paper contributes to the debate surrounding the sources of dowry inflation in India.⁵ A number of hypothe-

⁵Similar debates take place in other South Asian nations, such as, Bangladesh (see, for instance, Ambrus, Field and Torero 2010 and Arunachalam and Naidu 2010).

ses have been proposed in the literature, including the "marriage-squeeze" hypothesis which attributes dowry increases to population-growth induced changes in the sex-ratio (Rao 1993, Dalmia and Lawrence 2005, Sautmann 2014), and a theory of dowry inflation as being a result of increasing wealth dispersion in conjunction with hypergamy (Anderson 2003). Our results instead provide support for a hypothesis that emphasizes changes in the distribution of bride/groom quality (Chiplunkar and Weaver 2017, in a concurrent working paper, arrive at a similar conclusion). A surprising element of our findings is that, contrary to popular perception, it is not only groom quality that matters but also bride quality, even though the latter is not well-reflected in levels of educational attainment. Indeed, the contribution of our approach is its ability to estimate the value of bride quality even when the latter is not "capitalized" into observable forms of human capital.

The remainder of this article is structured as follows. The next section describes the data collection process, presents descriptive statistics and results on the correlates of dowry. Section three outlines a simple Bayesian learning model which is then estimated and Section four concludes.

2 Data and descriptive statistics

2.1 Survey sample

We surveyed households in three villages in South and West India in 2008: Dokur in the Telangana region in Andhra Pradesh, and Kalman and Shirapur in the Solapur district in Maharashtra. These three villages are part of a set of six villages, selected in 1975 by the International Crop Research Institute of the Semi-Arid Tropics (ICRISAT) as part of their Village Level Studies (VLS) program to represent (albeit not statistically) the semi-arid tropics in India.⁶ In addition to the usual questions on household demographics, subcaste and caste category,⁷ wealth and income⁸, our survey included questions about households' planned educational investments and

⁶For an overview of the ICRISAT-VLS program see Bantilan et al. (2006), Rao and Charyulu (2007), and Walker and Ryan (1990).

⁷While the sub-caste, or *jati*, is the basis of social life in rural India, we classify households into the following caste categories: Forward Castes (FC or Other), Other Backward Classes (OBC), and Scheduled Castes (SC) as these are the official basis of affirmative action policies in India (we do not have any Scheduled Tribes in the sample). Forward Castes are not eligible for official affirmative action schemes or benefits; Scheduled Castes are the former "untouchables" castes, which were at the bottom of the caste hierarchy. The OBC are also considered socially and economically disadvantaged compared to the FC.

⁸The wealth module includes questions on durable assets, agricultural stocks, livestock and land ownership, equipment, savings, lendings and borrowings. The income module asks the respondent to provide an estimate of the net-income from various sources, such as, agricultural income, (other) business income, remittances, pensions, wages and salaries for the kharif (main, rainy) season.

decisions/expectations regarding marriage and dowry.

In addition to these household survey data, we also collected qualitative data. We interviewed 10 households per village using semi-structured interviews in which we covered (gender-dependent) practices and social norms regarding marriage, education, and occupation. In these interviews, we interviewed different members of the household, including the children, in an individual and in a group setting. In addition, we pre-tested the quantitative data instruments extensively among non-sample households in the same villages prior to the survey. As a general matter, working with households who have been part of a sample for almost 40 years has the advantage that a bond of trust has been established between researchers and respondents, something which is conceivably of great importance when collecting data on activities such as giving and receiving dowry which are illegal in India. Indeed, the respondents freely discussed the dowry payments that they had made and received, as well as those they planned to make and receive in the future.

Table 1A introduces the sample villages and households. The sample selected in each village is representative for each village in terms of landholding size. With a total number of households of 1,720 and a sample size of 339 households, the sampling rate is almost 20%. The average size of a household is 5.6 members, the average *kharif* (rainy season)⁹ income is 51,176 Rupees (about \$1,280 at the time of the survey) and the average education level of the respondent is 4.8 years.¹⁰

The main analysis in this paper is based on individual-specific data on marriage and dowry. To obtain information about marriage and dowry, we interviewed the individual in the household with the most say on the marriage and education of those under the age of 25 in the household. In most cases, this was the father of the children, but in some cases it was the mother, grandfather or uncle. In the remainder of this article we will refer to this respondent as the "parent" and to the individuals up to the age of 25 years as the "children". The sample includes a total of 838 children, of whom 719 are unmarried. The unmarried sample contains 429 boys and 290 girls, the gender imbalance reflecting the fact that girls typically get married earlier than boys. Correspondingly, we find that 85 out of the 119 married children are girls. By the same token, the unmarried sample has more boys than girls. To minimize sample selection issues, the analysis restricts the unmarried

⁹The rainy season is the main agricultural season in the semi-arid tropics of India.

¹⁰The average education level of respondents in the sample is low, but matches well with the all-India average of 4.69 years of education for individuals in the 40-44 age-group in 2005 according to the Barro-Lee data on education (note that the average respondent in our sample is 41 years old). The all-India average in the broader age group 25-64 is also low, about 5.18 years of education in 2005. There is also some variation in education levels within our sample, corresponding to the differences in socio-economic conditions across villages: Dokur, which is the poorest village has an average of 2.7 years of education, compared to Kalman and Shirapur, where the average respondent has 4.6 and 5.6 years of education respectively.

sample to children under the age of 19. This leaves a sample of 270 unmarried boys and 255 unmarried girls.

2.1.1 Marriage and dowry payments: Married children

Qualitative interviews indicated that once it has been decided that a child is "ready" for marriage, the parents start inquiries among their social network to find a spouse. Once a match is selected (and the dowry agreed upon), the marriage often takes place a few months later. In many cases the bride and groom will only have seen each other at most a few times by this date. This process is often referred to as an "arranged marriage", and most commonly takes place within one's subcaste and in some groups within one's extended family (see also Caplan 1984, Srinivas1984, Kapadia 1993, Do et al. 2013). This is opposed to what is known as a "love marriage" in which bride and groom select each other, after having gotten to know each other. While the distinction between these two might have been blurred in urban India, in these three villages, respondents in our sample had a clear idea of the type of marriage they envisioned for their child.

For the married children, we elicited retrospective information on the kind of marriage ("love marriage" versus "arranged marriage"), the spousal selection process, income, wealth and education of both families at the time of wedding, the various transfers made at the time of wedding, and the cost of the ceremony and remaining debts with regard to the wedding.

All but three of the 119 children who were married at the time of the survey had arranged marriages. The median household reports having seen two potential candidates, and reports having been willing to proceed with marriage with just one candidate (indicating the search stops from the moment an acceptable candidate has been found). Qualitative interviews revealed the complexity of the various transfers that take place at the time of marriage. The bride's family offers gifts, assets, goods and cash to the groom's family and vice versa; both families also transfer gifts, assets, goods and cash to the bride and groom; and both families contribute to the expenses of the wedding ceremony. These transfers can take many forms. Parents of the bride report giving kitchen utensils and appliances, jewelry and clothing to the bride, and often transfer productive assets to the groom or groom's family, such as a bicycle or three-wheeler, and in some cases even land. Smaller, more symbolic gifts, including clothing and certain home-produced goods are often transferred from the groom's side to the bride and her family.¹¹

To capture these various flows, we asked the parent about the total value of the dowry and

¹¹This narrative is also confirmed by Sautmann (2009).

gifts transferred to the child, the total value of transfers to the in-laws, the total value which was transferred by the in-laws to the child, and the total value which was transferred from the family-in-law to the child. Table 1B reports the means and standard deviations of the value of these respective transfers. Focusing on the girls only (as the sample of married boys is very small, only 34), the average value of the amount transferred from the bride's family to the bride is approximately 30,000 Rupees while the average value of the amount transferred from the bride's family to the groom's family is approximately 28,000 Rupees. The comparability of these magnitudes is notable: Historically, dowry consisted of two components, the *stridhan*, which served as a pre-mortem bequest to the daughter, and hence defined as a transfer from the bride's natal family to the bride at the time of wedding¹², and the *dakshina*, defined as the transfers given directly to the family-in-law, as a way of compensating the groom's family for the economic support they had to provide their new family member (Srinivas 1996). Using this terminology, it would appear that the *stridhan* is a large component of the total amount spent by the parents of the bride.¹³ Qualitative interviews however indicate that these gifts to the bride, especially the household appliances and even the jewelry, are often used by the entire family-in-law. This phenomenon, where the line between the *stridhan* and the price component of the dowry is blurred, has also been documented by anthropologists (see for instance, Miller 1981, Den Uyl 2005). Compared to the bride's family, the groom's family gives considerably less. In our data, the average value given from the groom's family to the bride's family is 5,865 Rupees, which is only about 8% of the total transfers.

2.1.2 Marriage and dowry payments: Unmarried children

For unmarried children, we asked the parent what type of marriage they anticipate, their estimated expenditure for the marriage ceremony (and their share of this cost), and their dowry forecasts. It is important to emphasize that these forecasts are child-specific, i.e. they were elicited separately for each child in the household. During pre-testing of the survey instrument, it appeared that the respondents were unable to answer the question: "How much do you expect to pay in terms of dowry", and responded in terms of how much they are willing to set aside in the case of girls, and for how much they were willing to "let their son go" in the case of boys. We therefore rephrased the question to elicit the maximum amount of dowry the parent would be

¹²The bequest interpretation is also common in the European context (see, for instance, Botticini and Siow 2003).

¹³This is in contrast with what Ambrus, Field and Torero (2010) find in the Bangladeshi context where the dowry given from parents to the bride (which they call "bequest dowry") is small compared to the dowry given to the groom's household (which they call "gift dowry"). Roy (2015) who notes a positive impact on dowry of gender-progressive reforms also suggest a bequest interpretation.

willing to pay (in the case of daughters) and the minimum amount of dowry the parent would be willing to accept (in the case of sons). We refer to these amounts as the Willingness-to pay (WTP) and Willingness-to-accept (WTA) respectively. These dowry forecasts should be interpreted as the total value of the various goods and assets transferred, including gifts and cash. We do not distinguish the *stridhan* component of the dowry (given directly to the bride) from the component directly given to the in-laws. Given our previous discussion, we believe that treating the *stridhan* component separately from payments to the groom's family may not be justified. Our measure of forecasted dowry also does not deduct the gifts transferred from the groom's family to the bride's family. We are therefore measuring what Edlund (2006, 2009) refers to as "gross dowry", rather than "net dowry".¹⁴

In our analysis we exclude children for whom the parent could not answer the dowry question - among the unmarried children, there are 45 boys and 12 girls for whom the respondent reported "don't know", or "it will depend" when asked about their dowry expectations. These children are excluded from the analysis. In terms of observable characteristics, there are few significant differences between this group of children and the rest of the sample. We also exclude cases in which the respondent mentioned that they will not accept or give any dowry. As we have noted earlier, the illegality of dowry did not come up even once during the qualitative discussions preceding the data collection, so we are inclined to take these responses at face-value. Several of the respondents who told us that they would not accept dowry mentioned in the same breath that they were a "modern family" who would opt for a "registered marriage"¹⁵. When asked about the type of marriage he or she envisions, 94% of parents indicated "arranged marriage within one's caste".

Figure 1 overlays the kernel density estimates of the forecasted dowry for boys and girls. The two distributions are remarkably similar - a Kolmogorov-Smirnov test cannot reject equality between the two distributions, with a p-value of 0.74. The figure suggests a market-clearing allocation that matches individuals such that each party pays/accepts their reservation value. Qualitative interviews lend some support to this interpretation: Parents often noted that when starting the search for a marriage partner, they inform their social network about their dowry expectations, and typically, only candidates with similar values in mind approach them.

¹⁴Anthropologists and sociologists also traditionally focus on gross dowry (see Srinivas 1984 and Tambiah 1989).

¹⁵In India, marriages can be registered either under the Hindu Marriage Act, 1955 or under the Special Marriage Act, 1954. When the respondent speaks about a "registered marriage" it is implied that no wedding ceremony or wedding celebration will take place, but only the documents will be signed.

A natural question is how dowry forecasts compare to actual dowry payments. Figure 2 compares the kernel density of gross dowries that were actually paid by households of married girls, with the kernel density of the dowry forecasts for unmarried girls between the ages of 13 and 16 (the latter is a sample of individuals who have either just entered, or are on the threshold of entering, the marriage market).¹⁶ The distribution of actual dowry payments matches remarkably well with the distribution of dowry forecasts, and a Kolmogorov-Smirnov test cannot reject the equality of the distributions, with a p-value of 0.58. Similarly, a t-test of difference in means also fails to reject the null hypothesis of equal means, with a p-value of 0.41. In Table 1C, we further examine the match between actual and forecast dowry by disaggregating the data by village and by caste group. With the caveat that sample sizes are small, we do not find any statistically significant differences between actual and forecast dowry for any of the groups, although dowry forecasts appear to be considerably larger on average than actual dowries in Dokur and for forward castes. These results suggest that parents on average have a reasonably accurate perception about marriage market values (although we cannot rule out that some parents might be overestimating dowry while others are underestimating it).¹⁷

2.1.3 Child ability and education

Qualitative interviews pointed towards the importance of earning ability as the most relevant groom characteristic, which can be captured by family's assets, or, more commonly mentioned, a good education and secure urban job. In contrast, according to our survey respondents, a girl's physical appearance and "homely nature" are characteristics which are highly valued on the marriage market. We measure earning ability by school performance and educational aspirations, and return to the unobservability of bride's characteristics in two sections.

¹⁶The dowries received by boys' households are not directly comparable with the projected dowry data for boys because the former do not contain the *stridhan* component. In addition, the fact that the married sample is truncated at age 25 implies that the married boys sample is unlikely to be representative of dowries actually received for boys. For these reasons, we do not attempt to compare the distributions of actual and forecast dowry for boys, but only do so for girls.

¹⁷To the extent that households form dowry forecasts on the basis of dowries that have been paid in received in the past, there is a scope for biased forecasts if the actual dowries paid or received are not representative of the dowries that will be paid or received in the future.

This bias, if any, is difficult to assess in the data, but we consider two possible issues: The first is recall error, and we have attempted to minimize this by only asking households to recall the dowries paid for children who were recently married (and who are currently under the age of 25). A second issue is that there may be an increase in dowry payments over time, i.e. dowry inflation. Our sense from the interviews is that households are not factoring inflation into their forecasts, which may result in their expectations being incorrect. While this does not affect our conclusion that expected dowries agree with actual dowries paid in the past, it does imply that expected dowries may deviate significantly from the dowries that these households will actually end up paying in the future.

We elicited the parent's perception of each child's ability by asking the parent "At the end of this school year, how did your child compare to the other children in his/her class?" We formulated the question in this manner, as many parents did either not receive or keep records of their children's performance in school (e.g. the first few standards often do not involve any graded tests). Nevertheless, as all schools were local to the village, and as a result class mates well known and teachers approachable, and most parents had an idea of the quartile rank of their child.¹⁸ This question refers to the latest school year the child was enrolled in school, and is, as such, only available for children who have ever been to school (for children who are not currently in school, the question refers to the last year in which the child was in school).

To elicit the parent's planned educational investment or educational aspirations for each child (including the ones who are too young for school but excluding the ones who have dropped out of school), we distinguish between the minimum amount of education the parent wants the child to complete and the maximum amount of education the child would be allowed to complete.¹⁹ During the qualitative interviews, parents noted that the actual level of education which will be obtained is a complex function of many factors, not all of which are foreseeable. The minimum and maximum amount of education then correspond to the bounds of what the parent perceives plausible at the time of the interview. For instance, if the child appears to be very bright, highly motivated, and the family does not face any financial difficulties, the actual education level will be close to the maximum mentioned. Conversely, with financial difficulties, or poor ability the actual education level will be close to the minimum mentioned. Hence, we elicited the aspirations with the following questions: "What is the minimum amount of education you want this particular child to obtain?" and "What is the maximum amount of education you would allow this particular child to complete?"

Figure 3 graphs the frequency distribution of responses to these questions, distinguishing between boys and girls. The gender differential in aspirations is evident: 40% of the girls in the sample will not be allowed to pursue education beyond the 10th standard, and only 16% of them

¹⁸We coded the answers from the parent as: 1=much above average, 2=somewhat above average, 3=somewhat below average and 4=much below average.

¹⁹The education system in India comprises school education from 1st to 12th standard, and higher education, beyond 12th standard, also referred to as 12+. A child typically enrolls in school at the age of six. Up to the age of 14 (which typically corresponds to elementary school—1st to 8th standard), school education is compulsory. The recently passed Right to Education Act made elementary education a right of every child. The last two years of school education are referred to as higher secondary education, while 10th and 11th are referred to as lower secondary education. Before entering 11th standard the child has to pass a national or state level administered exam and from the 11th standard onward, the student chooses three to four subjects in which he/she specializes. The student completes his school education by taking another national or state level administered exam after 12th standard.

will be allowed to complete a university degree, whereas the corresponding figures for boys are 21% and 31%. This is not to say, however, that female education is not valued: In fact, nearly all parents (approximately 98%) want their daughter to obtain at least 10 years of schooling.

2.2 What determines dowry?

We now descriptively examine the individual and household correlates of dowry forecasts using simple linear regressions. Before doing so, we emphasize that the respondents in our survey likely took into account equilibrium conditions in the marriage market when formulating their forecasts. For convenience, however, we will frequently use the term "prices" to describe the regression coefficients, with the understanding that, as in the hedonic pricing model, these "prices" may be a complex function of supply and demand parameters.

We start with a specification in which (the logarithm²⁰ of) dowry forecasts are regressed on (i) a vector of household characteristics, including income and wealth, education of the decision-maker, caste and village dummies, and household composition (specifically, the number of unmarried boys and girls in the household), and (ii) child ability, as measured by his/her quartile rank in class.

Columns (1) and (5) of Table 2 report the results from this specification, for boys (WTA) and girls (WTP) respectively. The pattern of coefficients on household variables is in line with expectations: Both WTA and WTP are increasing in income and wealth, and are significantly lower in backward and scheduled caste groups. The number of unmarried children is also an important factor: Not surprisingly, WTP declines with the number of unmarried girls in the household (but is not strongly affected by the number of unmarried boys); interestingly, WTA declines with the number of unmarried boys in the household (while not being significantly related to the number of unmarried girls), consistent with the notion that dowry transfers are partially captured by the groom's larger household.

In terms of child-specific attributes, child ability (as proxied by quartile rank) matters for both boys as well as girls, but what is perhaps surprising is that higher levels of ability (as reflected in a lower value of quartile rank) are associated with a higher WTP for girls. To test whether this finding reflects the confounding effects of omitted variables that are correlated with household perceptions of child ability, we re-estimate the regressions but this time with the inclusion of household fixed effects, i.e. we are now looking at the effect of between-sibling variation in

²⁰Because the dowry distribution appears to be log-normal, we have taken the logarithm of dowry.

ability - the results are reported in Columns (2) and (6). The effective sample size in the household fixed effects regressions is much smaller, given that these utilize within-household variation only. With that caveat, the coefficients on child ability retain their sign and significance (and are in fact slightly larger in magnitude). A reasonable explanation of these results is that parents of higher-ability girls are willing to pay more in order to secure them better matches. Thus dowry prices appear to play a screening role in the marriage market.

We can also test whether child ability matters by itself, or only to the extent that it is reflected in observable human capital. To test this hypothesis, we add controls for the educational aspirations, namely the minimum and maximum education that the parents desire for the child. Columns (3) and (7) report the results without household fixed effects; while Columns (4) and (8) include household fixed effects. The results reveal an interesting dichotomy: The inclusion of educational aspirations absorbs the effect of child quality in the case of boys, as evidenced by the fact that the coefficient on quartile rank shrinks and becomes statistically insignificant, whereas in the case of girls the coefficient on quartile rank remains virtually unchanged. This dichotomy reflects social norms in rural India regarding marriage and female labor force participation, as a result of which girls tend to marry at an early age (at which point their educational attainment is curtailed) and thereafter largely specialize in domestic production - thus, there may be limited scope and incentive for high ability to be converted into higher levels of education. In Appendix Table 1, we show that these results are robust to restricting the sample to children who are currently in school (as the quartile rank variable is a more current measure of child ability in this sample).

Our main takeaway from Table 2 is that dowry payments are indeed a function of individual characteristics, some of which are not (at least in the case of girls) likely to be reflected in observable characteristics at time of marriage, such as education. While the quartile rank measure of child ability is a useful starting point, one may be concerned that it is too coarse a measure to capture the extent to which variation in child ability drives variation in dowries. In addition, this variable is only measured for children who have ever attended school. We therefore outline below an alternative approach to estimating the importance of child ability.

3 An alternative approach to estimating the price of child quality

We consider the hypothesis that there is a latent component of child ability that is revealed gradually over time (to the parents), causing parents to revise their dowry forecasts as the child grows

older (see Chari and Maertens 2014 for evidence that parents learn about child ability as the child grows older). This would tend to imply that dowry forecasts for a cohort of very young children (whose abilities have not yet been fully revealed) are likely to be much more similar to one another (i.e. exhibit much less dispersion) than dowry forecasts for a cohort of older children.²¹ The concavity of learning also implies that the within-cohort dispersion in dowry forecasts will tend to increase with child age in a concave fashion. This relationship between within-cohort dowry dispersion and cohort age can be used to infer something about the value of (unobserved) ability.

There is some evidence consistent with such a phenomenon in our data: Figure 4 compares the kernel density of dowry forecasts across three age-groups: Children aged 0-5 years, 6-12 years and 12-18 years, corresponding approximately to pre-school, primary school and secondary school ages. In the remainder of this section, to focus on the child quality component and abstract away from socioeconomic differences between households, Figure 4 uses the residuals from a regression of the logarithm of dowry forecasts on the household variables reported in Table 2. There is clear evidence of a widening in the distribution of dowry forecasts in Figure 4 as one progresses from younger to older cohorts, and this widening is apparent for boys as well as for girls.

Before outlining the model and results, we briefly consider two alternative mechanisms that may result in a change in the distribution of dowry forecasts as children grow older. First, one may wonder about the role of uncertainty regarding the dowry price of quality: perhaps households only begin to find out about prices once their children start nearing marriageable age. However, this implies that (absent any innovations in child quality) the dispersion in price forecasts would be lower, rather than higher, for older children. Second, if households are adjusting their forecasts for inflation in the price of quality (i.e. the nominal price is lower for children who are close to marriageable age), this would also tend to reduce rather than increase dowry dispersion for older children.²² Neither of these conjectures, therefore, can explain the pattern of increasing variance observed in the data.²³

In Appendix A, we present a simple model of learning about child ability, that can be taken to the data to obtain an estimate of the dowry value or "price" of child quality. We define child

²¹Unless signals about ability are negatively correlated with the household's current perception of the child's ability.

²²Our sense from the interviews, however, is that households are not factoring inflation into their forecasts.

²³A third alternative hypothesis is that households are not really learning anything new, but that differences in child-specific investments cumulate over time to create a deterministic divergence in children's quality. It is worth emphasizing at this point that what is being elicited is the household's forecast of the child's future (i.e. at time of marriage) dowry value. Presumably, this forecast takes into account future investments planned by the household. Thus, the evaluation of current quality may diverge in the cross-section in a deterministic way, but this by itself would not affect the distribution of forecasts of future quality.

quality as a composite index that is affected by both latent ability as well as by human capital investments. The model predicts the following relationship between the age of a cohort, t , and the within-cohort variance in dowry forecasts:

$$\text{Var}[E_t(d^i)|t] = \frac{p_q^2 ct}{1 + ct} \quad (1)$$

where $E_t(d^i)$ denotes the parents' dowry forecast given their current belief about child i 's quality, and the t index captures the assumption that beliefs about child quality (and hence dowry forecasts) evolve over time as new information about the child's quality is gradually revealed; the parameter p_q denotes the price of a standardized unit of quality (i.e. it is the percentage change in dowry that would result from a one standard deviation increase in child quality); c represents the precision of the signals about quality relative to the precision of the parents' initial belief about the child's quality.

Equation (1) predicts that within-cohort dispersion in dowry forecasts should increase with cohort age, but at a decreasing rate. In Figure 5, we graph the within-cohort variance in quality against the age of the cohort, as theorized in Equation (1), for selected values of p_q^2 and c . For comparison, Figure 6 graphs the corresponding *empirical* relationship between within-cohort variance and child age, separately for boys and girls. Our estimation strategy is to match the theoretical relationship to the empirical relationship to estimate the model parameters. Figure 5 shows that p_q^2 and c are separately identifiable: p_q^2 is the value that $\text{Var}[E_t(d^i)|t]$ asymptotes to, while c and p_q^2 together control the curvature.

We now turn to the estimation of the parameters in Equation (1), namely c and p_q^2 . We emphasize here that our data are at a single point in time, and the empirical strategy is therefore to compare the dispersion in dowry forecasts for younger cohorts to the dispersion for older cohorts (i.e. we cannot actually follow a given cohort over time).

Given that Equation (1) is non-linear in the parameters, we can either estimate a linearized version using simple linear regression, or employ non-linear regression methods. We first consider the linear regression approach. As suggested by Figure 5, the relation between dowry variance and age can be approximated by a quadratic function of child age. In fact, we can derive the following approximation to Equation (1):

$$\text{Var}[E_t(d^i)|t] \approx p_q^2 ct - p_q^2 c^2 t^2 \equiv \alpha t + \beta t^2 \quad (2)$$

We can estimate Equation (2) by OLS: In this regression, there is one observation for each age cohort, with the dependent variable being the within-cohort variance in dowry. To account for the fact that the variance in each age-cohort is constructed from a different number of observations, we implement a weighted version of this regression.²⁴ We then obtain the structural parameters as functions of the regression coefficients, i.e. $c = -\beta/\alpha$ and $p_q = \sqrt{\frac{\alpha}{c}}$.

While the OLS approach is simple, it does not take full advantage of the functional form implied by theory. If we were to instead directly estimate Equation (1) by non-linear least squares (NLS), we could also allow the dowry forecast to contain unobserved elements other than child quality, and control for their effects on the within-cohort variance by means of polynomial terms, relying on the functional form for identification of the model parameters. Thus, we could estimate the following equation by non-linear least squares:

$$Var[E_t(d^i)|t] = f(t) + \frac{p_q^2 ct}{1 + ct} \quad (3)$$

where $f(t)$ is a polynomial in child age. However, because the theoretical variance in Equation (1) is well-approximated by a quadratic polynomial in child age, we limit the polynomial control $f(t)$ to be linear in age, in order to reduce collinearity with the learning function.

Table 3 presents the estimated model parameters from the OLS and non-linear least squares (NLS) regressions, separately for the sample of boys and girls. Appendix Table 2 reports the underlying coefficient estimates from the OLS regressions. The coefficient estimates of p_q are larger under the OLS approach, with the associated price of child quality being consistently larger for boys than for girls. A one standard deviation in quality would increase dowry WTA by 64%-100% for boys and dowry WTP by 46-79% for girls. Comparing these estimates to the regression estimates reported in Table 2, the price coefficients represent very large effects, substantially greater than the effect of caste, as well as the effect of household income and wealth (a one standard deviation increase in log income would increase dowry WTA and WTP by 11% and 28% respectively, while a one standard deviation increase in log wealth would increase WTA and WTP by 16% and 11% respectively). The estimates are also considerably larger than the estimated effects of the quartile rank measure of child ability: A one standard deviation increase in the latter is predicted to increase WTA and WTP by 11% and 13% respectively, suggesting that the quartile rank measure only accounts for a small part of the variation in child quality.

²⁴In practice, there turns out to be virtually no difference between the estimates from the weighted and unweighted regressions.

One particular aspect of quality that we have ignored, but that has been emphasized in other studies is physical attractiveness, which is believed to matter significantly for girls. In the Indian context, this aspect of quality is thought to largely be a function of skin complexion, although we do not rule out that other elements of physical beauty may also matter. Whereas the former is largely revealed at birth, the latter may only be known after the child attains puberty. To abstract away from this aspect of quality, we re-estimate the model parameters but this time restricting the sample to girls under the age of 12. The results are reported in Appendix Table 3. The price of child quality for girls is now more precisely estimated than before and in addition, is much more closely aligned with the estimated price of quality for boys, which is intuitively consistent with assortative matching in the marriage market.

4 Conclusion

The institution of dowry remains pervasive in India, despite having been prohibited by law in 1961. The function of dowry appears to have evolved over time, as has the magnitude of dowry payments which have (by some accounts) increased dramatically. Understanding how dowry relates to household and individual characteristics is central to understanding its function as well as related phenomena such as dowry inflation.

In this paper, we introduce a new primary dataset on dowry payments in rural India. We interviewed households in three villages, and elicited retrospective information on dowry transfers, as well as forecasted dowry transfers for the each of the currently unmarried children. Because the latter refer to households perceptions/expectations, they are more likely to be the basis for forward-looking investments such as education and saving.

We find first that the distribution of dowry forecasts matches well with the distribution of actual dowry payments from the retrospective data. This finding is on the one hand unsurprising since the households are living in small, relatively homogeneous communities and have had ample opportunity to learn about local marriage markets. On the other hand, there is by now considerable evidence of perceptual biases in other contexts, where individuals tend to incorrectly perceive their own risks and returns relative to the average. At least at the aggregate level, however, this does not appear to be the case in the context of dowry.

Our second contribution is to shed light on the relation between dowry and the ability of the bride and groom. To do so, we first take advantage of novel information that we elicited on the

perceived ability of children - the perceived quartile rank in school. In an alternative procedure, we treat ability as an unobservable, and infer its price by estimating the parameters of a Bayesian model in which parents gradually learn about the ability of their child. This model carries the implication that dowry forecasts for a young cohort of children will tend to be much less dispersed than the forecasts for an older group of children. This implication can be matched to the data to estimate the "price" of child ability.

The results indicate that quality plays a major role in determining dowry payments, on both sides of the marriage market. Higher ability girls are willing to pay more dowry, and higher ability boys demand more dowry. The positive effect of ability on dowry for girls may appear surprising, but is consistent with the findings of a number of studies that have found a positive correlation between female education and dowry. An important nuance of our findings is that the effect of ability is completely accounted for by educational attainment in the case of boys, whereas in the case of girls ability continues to exert a significant influence on dowry even after controlling for education. We interpret this finding as indicative of the constraints arising from social norms that curtail the educational attainment of women. At the same time, we should note that our results do not imply that girls' educational attainment is not valued on the marriage market. Over 90% of the children under the age of 15 years in our study are enrolled in school, with little difference between the sexes. As Behrman et al (1999) note, literate women, in their data, are more effective home teachers and command a premium in the marriage market. In the same way, it is plausible that today, girls who received 10 years of education are considered more effective home makers, and this is therefore a valuable attribute on the marriage market. As Caldwell et al. (1983) put it, "...schooling [for women] is explained as the minimum qualification for securing an educated husband and as a necessity for helping children with their schooling, being an efficient wife and housekeeper, and looking after the whole family's health".

Our estimation of the learning model indicates that the effect of child ability is significantly larger than that of household characteristics such as wealth and household income. These results are striking; in contrast, Deolalikar and Rao (1998) and Rao (1993 A/B), using retrospective dowry data collected in 1983 from 120 households in the same set of villages as we consider in this study, find that none of the individual traits of the bride and groom (such as schooling or height) seems to matter for dowry. The discrepancy between these sets of findings could reflect the differences in the type of dowry data (prospective versus retrospective) as well as differences in methodology, but it is also possible that our findings are reflective of a larger trend in which individual attributes

are assuming greater importance than inherited status, perhaps driven by the growing returns to education in India.

We conclude by noting some limitations of our study, as well as some directions for future research. One limitation of our study is that we only elicited expectations at a single point in time; with data following individuals over time, one could directly look at how households change their expectations in the light of new circumstances or information. Second, we have focused on describing dowry expectations, but the underlying motivation for studying these expectations is that households may be making a number of consumption and investment decisions on the basis of their expected dowry payments or receipts. For instance, Anukriti, Kwon and Prakash (2018) look at how dowry expectations influence savings decisions - understanding these interactions is of considerable interest given the significant amounts of dowry that are given and received.

References

- [1] Alfano, M. (2017). Daughters, Dowries, Deliveries: The Effect of Marital Payments on Fertility Choices in India. *Journal of Development Economics*, 125(C), 89–104
- [2] Ambrus, A., E. Field & M. Torero. (2010). Muslim Family Law, Prenuptial Agreements, and the Emergence of Dowry in Bangladesh. *Quarterly Journal of Economics* 125(3), 1349-1397.
- [3] Anderson, S. (2003). Why Dowry Payments Declined with Modernization in Europe but Are Rising in India. *Journal of Political Economy*, 111(2), 269-310.
- [4] Anderson, S. (2007A). The Economics of Dowry and Brideprice. *Journal of Economic Perspectives*, 21(4), 151-174.
- [5] Anderson, S. (2007B). Why the Marriage Squeeze Cannot Cause Dowry Inflation. *Journal of Economic Theory*, 137(1), 140-152
- [6] Anukriti, Kwon, S. & Prakash, N. (2016). Dowry: Household Responses to Expected Marriage Payments. Working Paper.
- [7] Anukriti, S., Kwon, S. & Prakash, N. (2018). Household Savings and Marriage Payments: Evidence from Dowry in India. IZA Discussion Paper No. 11464.
- [8] Anukriti, S., & Dasgupta, S. (2017). Marriage Markets in Developing Countries. In *The Oxford Handbook of Women and the Economy*, 97–120.
- [9] Arunachalam, R. & Naidu, S. (2010). The Price of Fertility: Marriage Markets and Family Planning in Bangladesh. Working Paper.
- [10] Arunachalam, R. & T.D. Logan. (2016). On the Heterogeneity of Dowry Motives. *Journal of Population Economics*, 29(1), 135–166.
- [11] Attanasio, O. & K. Haufmann. (2017). Education Choices and Returns to Labor and Marriage Markets: Evidence on Subjective Expectations. *Journal of Economic Behavior and Organisation*, 140, 35-55.
- [12] Bhalotra, S., Chakravarty, A., & S. Gulesci. (2018). The Price of Gold: Dowry and Death in India. CEPR Discussion Paper No. DP12712

- [13] Bantilan, M.C.S., P. Anand Babu, G.V. Anupama, H. Deepthi, & R. Padmaja. (2006). Dry-land Agriculture: Dynamic Challenges and Priorities. Research Bulletin No. 20, GT-IMPI, ICRISAT.
- [14] Becker, G.S. (1991). *A Treatise on the Family*. Harvard University Press, Cambridge, MA.
- [15] Behrman, J. R., A.D. Foster, M. R. Rosenzweig, & P. Vashishtha. (1999). Women's Schooling, Home Teaching, and Economic Growth. *Journal of Political Economy*, 107(4), 682–714.
- [16] Berazneva, J., McBride, L., Sheahan, M., & Güereña, D. (2018). Empirical Assessment of Subjective and Objective Soil Fertility Metrics in East Africa: Implications for Researchers and Policy Makers. *World Development*, 105, 367–382.
- [17] Billig, M.S. (1992). The Marriage Squeeze and the Rise of Groomprice in India's Kerala State. *Journal of Comparative Family Studies* 23(2), 197-216.
- [18] Botticini, M. & A. Siow. (2003). Why Dowries? *American Economic Review*, 93(4), 1385-1398.
- [19] Browning, M. & R. Subramaniam. (1995). Gender-Bias in India: Parental Preferences or Marriage Costs. Working Paper Yale University.
- [20] Caldwell, J.C., P.H. Reddy & P. Caldwell. (1983). Causes of Marriage Change in South India. *Population Studies*, 37(3), 343-361
- [21] Caplan, L. (1984). Bridegroom Price in Urban India: Class, Caste and 'Dowry Evil' Among Christians in Madras. *Man*, 19(2), 216-233.
- [22] Chamley, C. (2003). *Rational Herds*. Cambridge University Press, Cambridge, UK.
- [23] Chari, A.V. & Maertens, A. (2014). Gender, Productive Ability and the Perceived Returns to Education: Evidence from Rural India. *Economics Letters*, 122(2), 253-257.
- [24] Chiplunkar, G. & J. Weaver. (2017). Marriage Markets and the Rise of Dowry in India. Working paper.
- [25] Chowdhury, A.R. (2010). Money and Marriage : The Practice of Dowry and Brideprice in Rural India. Working paper.
- [26] Dalmia, S.& P.G. Lawrence. (2005). The Institution of Dowry in India: Why it Continues to Prevail. *The Journal of Developing Areas*, 38(2), 71-93.

- [27] Delavande, A., Giné, X., & McKenzie, D. (2011). Measuring Subjective Expectations in Developing Countries: A Critical Review and New Evidence. *Journal of Development Economics*, 94(2), 151–163.
- [28] DellaVigna, S. (2009). Psychology and Economics: Evidence from the Field. *Journal of Economic Literature*, 47(2), 315–372.
- [29] Den Uyl, M.. (2005). Dowry in India: Respected Tradition and Modern Monstrosity. In *The Gender Question in Globalization: Changing Perspectives and Practices*, T. Davids & F. Van Driel (eds.), Ashgate Publishing, 143-158.
- [30] Deolalikar, A. & V. Rao. (1998). The Demand for Dowries and Bride Characteristics in Marriage: Empirical Estimates for Rural South-Central India. In *Gender, Population and Development*, M. Krishnaraj, R. Sudarshan, & A. Shariff (eds), Oxford University Press.
- [31] Do, Q., Iyer, S. & Joshi, S. (2013). The Economics of Consanguineous Marriages. *Review of Economics and Statistics*, 95(3), 904-918
- [32] Edlund, L.. (2000). The Marriage Squeeze Interpretation of Dowry Inflation: A Comment. *Journal of Political Economy*, 108(6), 1327-1333.
- [33] Edlund, L.. (2006). The Price of Marriage: Net Versus Gross Flows and the South Asian Dowry Debate. *Journal of the European Economic Association Papers and Proceedings*, 4(2-3), 542-551.
- [34] Epstein, T. S. (1973). *South India: Yesterday, Today and Tomorrow*. Macmillan, London.
- [35] Griffin, D. & Tversky, A. (1992). The Weighing of Evidence and the Determinants of Confidence. *Cognitive Psychology*, 24, 411-435.
- [36] Field, E. & A. Ambrus. (2008). Early Marriage, Age of Menarche, and Female Schooling Attainment in Bangladesh. *Journal of Political Economy*, 116(5), 881-929.
- [37] Jensen, R. (2010). The Perceived Returns to Education and the Demand for Schooling. *Quarterly Journal of Economics*, 125(2), 515-548.
- [38] Patricia Jeffery & Roger Jeffery. (1996). *Don't Marry Me To A Ploughman! Women's Everyday Lives in Rural North India*. Boulder and Oxford: Westview Press.

- [39] Kapadia, K. (1993). Marrying Money: Changing Preference and Practice in Tamil Marriage. *Contributions to Indian Sociology*, 27(1), 25-51.
- [40] Maertens, Annemie. (2013). Social Norms and Aspirations: Age of Marriage and Education in Rural India. *World Development*, 47, 1-15
- [41] Maredia, M. K., Shupp, R., Opoku, E., Mishili, F., Reyes, B., Kusolwa, P., & Kudra, A. (2019). Farmer Perception and Valuation of Seed Quality: Evidence from Bean and Cowpea Seed Auctions in Tanzania and Ghana. *Agricultural Economics*, 50(4), 495-507
- [42] McKenzie, D., J. Gibson & S. Stillman. (2013). A Land of Milk and Honey with Streets Paved with Gold: Do Emigrants Have Over-optimistic Expectations about Incomes Abroad? *Journal of Development Economics*, 102, 116-127
- [43] Miller, B. (1981). *The Endangered Sex: Neglect of Female Children in Rural North India*. Cornell University Press, Ithaca, NY.
- [44] Rajaram, I. (1983). Economics of Bride Price and Dowry. *Economic and Political Weekly*, Feb 19, 275-278.
- [45] Rao, K.P.C. & Kumara D. Charyulu. (2007). Changes in Agriculture and Village Economies. Research Bulletin no 21, GT-IMPI, ICRISAT.
- [46] Rao, V. (1993). The Rising Price of Husbands: A Hedonic Analysis of Dowry Increases in Rural India. *Journal of Political Economy*, 101(4), 666-677.
- [47] Rosenzweig, M. R. (2010). Microeconomic Approaches to Development: Schooling, Learning, and Growth. *Journal of Economic Perspectives*, 24(3), 81-96.
- [48] Roy, S. (2015). Empowering Women? Inheritance Rights, Female Education and Dowry Payments in India. *Journal of Development Economics*, 114, 233-251.
- [49] Sautmann, A.. (2014). Partner Search and Demographics: The Marriage Squeeze in India. Working Paper.
- [50] Srinivas, M. N. (1952). *Religion and Society Among the Coorgs of South India*. Oxford University Press
- [51] Srinivas, M.N. (1984). *Some Reflections on Dowry*. Oxford University Press.

- [52] Srinivas, M.N. (1996). *Village, Caste, Gender and Method: Essays in Indian Social Anthropology*. Oxford University Press.
- [53] Tambiah, S. J. (1973). Dowry and Bridewealth and the Property Rights of Women in South Asia. In J. Goody and S.J. Tambiah (eds.), *Bridewealth and Dowry*. Cambridge University Press.
- [54] Tambiah, S.J. (1989). Bridewealth and Dowry Revisited – the Position of Women in Sub-Saharan Africa and North India. *Current Anthropology*, 30(4), 413-435.
- [55] Walker, T.S. & J.G. Ryan. (1990). *Village and Household Economies in India's Semi-Arid Tropics*. John Hopkins University Press, Baltimore and London.
- [56] Weinstein, N. D. (1987). Unrealistic Optimism about Susceptibility to Health Problems: Conclusions from a Community-wide Sample. *Journal of Behavioral Medicine* 10, 481–500.

Appendix A: A model of learning about child quality

The model below abstracts away from household characteristics and assumes that dowry is a function of child quality alone - when estimating the model, we accordingly work with the residuals from a regression of dowry forecasts on household variables. Our starting point is a simple relation between child quality and dowry:

$$d^i = p\theta^i \quad (4)$$

where d denotes the dowry (either WTP in the case of girls, or WTA in the case of boys) for child i , p refers to the dowry price of child quality, and θ^i denotes child i 's "true" quality at time of marriage. We assume that when the child is born, however, the parent does not know θ^i but has a prior belief about it, which is then revised as the child's innate ability is revealed over time. Thus, we consider θ^i to be the object of learning.

This formulation requires some explanation. First, we are clearly abstracting from the multidimensionality of child attributes by assuming that quality can be measured by a single composite index. Second, we are implicitly conceiving of "child quality" more broadly than as merely representing a genetic endowment; rather, it is a summary measure of child "value" at the time of marriage, and may therefore encompass observable aspects of human capital such as educational attainment. As a concrete example, one may imagine child quality as being produced according to a production function $\theta = \phi + K$ where ϕ denotes (fixed) genetic ability and K denotes human capital investments, such as, education. If K is chosen as a response to perceived child ability, learning about ϕ is equivalent to learning about θ ,²⁵ i.e. as the child's innate ability is gradually revealed, the household accordingly revises its belief about the child's value at time of marriage while taking into account the household's new educational investment plans.

At any point in time, t , the parent's belief about θ^i is assumed to be described by a normal distribution with mean q_t^i and standard deviation σ_t^i . Thus, q_t^i denotes expected child quality at time t , which we take to be the parent's forecast of child quality at time t . In each year, t , of the child's life, the parent receives an unbiased signal, s_t^i , about the child's quality. These signals are

²⁵ K will also depend on household income and resources, but because we have partialled out the effects of these household variables from the dowry forecasts, we assume that the residual part of human capital investment is a function of child quality alone.

drawn from a normal distribution with mean θ^i and variance σ_ϵ^2 :

$$s_t^i = \theta^i + \epsilon_t^i, \quad \epsilon_t^i \sim N(0, \sigma_\epsilon^2) \quad (5)$$

The signal errors ϵ_t^i are assumed uncorrelated over time and across individuals. The parent uses the signal to update his belief about the child's quality. This setup corresponds to a standard Bayesian learning model with normal priors and signals (see e.g. Chamley 2003).

Denote by ρ_t the precision of this belief after the t -th signal has been received - this is the inverse of the variance of the belief distribution. Similarly we denote by ρ_ϵ the precision of the signal (i.e., the inverse of the variance of the signal, σ_ϵ^2). Bayesian updating implies:

$$q_{t+1}^i = (1 - \alpha_{t+1})q_t^i + \alpha_{t+1}s_{t+1}^i \quad (6)$$

where s_{t+1}^i denotes the signal of child i 's ability at age $t + 1$ and $\alpha_{t+1} = \frac{\rho_\epsilon}{\rho_t + \rho_\epsilon}$. Equation (6) indicates that the expected ability of child i at age $t + 1$ is a linear function of the expected ability at time t and the signal received at time $t + 1$, with their respective importance dependent on the precision of each piece of information.

A standard result in Bayesian learning models is that with normal priors and signals, the precision of the belief increases deterministically in a linear way, i.e. $\rho_{t+1} = \rho_t + \rho_\epsilon$. Using the recursivity of (6), we can then show that:

$$q_t^i = \frac{\rho_0}{\rho_t} q_0^i + \frac{\rho_\epsilon}{\rho_t} \sum_{\tau=1}^t s_\tau^i \quad (7)$$

$$= \frac{\rho_0}{\rho_t} q_0^i + \frac{\rho_\epsilon}{\rho_t} (t\theta^i + \sum_{\tau=1}^t \epsilon_\tau^i) \quad (8)$$

where, recall, q_0^i denotes the expected quality at birth. Also note that q_0^i equals θ because when the child is born, its expected ability is θ . We can now write:

$$q_t^i = \frac{\rho_0}{\rho_t} \theta + (1 - \frac{\rho_0}{\rho_t}) \theta^i + (1 - \frac{\rho_0}{\rho_t}) \frac{1}{t} \sum_{\tau=1}^t \epsilon_\tau^i \quad (9)$$

As t increases, the precision of the belief, ρ_t , increases unboundedly. Because the signal errors are mean-zero, it follows that the expected ability, q_t^i , converges to true ability θ^i in the probability limit. Thus the parents' belief about their child's ability collapses to true ability in the limit. In-

tuitively, parents start off with little idea about the ability of a child, and their belief distribution has high dispersion, reflecting their uncertainty; over time, as they observe signals of their child's ability, their belief distribution narrows down and becomes more precise.

In contrast, the *cross-sectional* dispersion in expected abilities increases over time. To see this, we start by writing the cross-sectional variance of q_t^i using (8):

$$\text{Var}(q_t^i|t) = \left(\frac{\rho_\epsilon}{\rho_t}\right)^2 [t^2 \sigma_\theta^2 + t \sigma_\epsilon^2] \quad (10)$$

where we have used (5) and the assumption that parents have common priors before the child is born. This can be rewritten as:

$$\text{Var}(q_t^i|t) = \frac{\sigma_\theta^2 c t}{1 + c t} \quad (11)$$

where $c = \frac{\rho_\epsilon}{\rho_0}$. A more revealing form of this expression is given by:

$$\text{Var}(q_t^i|t) = \sigma_\theta^2 - \sigma_t^2 \quad (12)$$

where σ_t^2 is the variance of the individual belief distribution at t . Recalling that $\sigma_0^2 = \sigma_\theta^2$ and that σ_t^2 falls with t , the expression above reveals that the cross-sectional dispersion in quality increases from 0 and asymptotes to σ_θ^2 , the rate of convergence being governed by the parameter c . It can be verified from (11) that $\text{Var}(q_t^i|t)$ increases at a diminishing rate, i.e. $\text{Var}(q_t^i|t)$ is a concave function of age t .

The variance of quality forecasts in turn implies the following variance of dowry forecasts:

$$\text{Var}[E_t(d^i)|t] = \frac{p^2 \sigma_\theta^2 c t}{1 + c t} \quad (13)$$

where $p\sigma_\theta \equiv p_q$ denotes the price of a standardized unit of quality.

Table 1A. Selected household-level descriptive statistics

Number of households in village	1,720
Number of households in sample	339
Number of married children ¹	119
Number of unmarried children ¹	719
Average age of married children	21
Average age of unmarried children	11
Average number of household members	5.55
Average <i>Kharif</i> income (Rs) ²	51,176
Average education level of respondent (in years) ³	4.77

Notes: ¹A child is defined as an individual up to the age of 25 and includes migrants (individuals who have left the household). Note that the adults also include the daughters-in-law under 25; ²The Kharif season is the rainy season; ³The respondent is the main decision-maker with regard to the education of the children under 25 years in the household.

Table 1B: Marriage market transfers (actual)

Value of transfers given to the bride by bride's parents (Rs) ¹	30,294.12 (30,159.33)
Value of transfers given to the bride by family-in-law (Rs) ¹	8,138.55 (7781.04)
Value of transfers given to the family-in-law by bride parents (Rs) ¹	28,349.40 (27,333.61)
Value of transfers given to bride's parents by family-in-law (Rs) ¹	5,865.67 (8989.92)

Notes: The table reports means and standard deviations. The sample includes only transfers reported by the parents of married girls; values reported are nominal values.

Table 1C. Comparing actual and forecast dowries

	Actual	Forecast	Difference
Overall	50,687.50	57,907.41	7219.91
<i>By village</i>			
Shirapur	40,785.71	45,761.90	4976.19
Kalman	44,172.41	43,388.89	-785.52
Dokur	68,727.27	92,833.33	23,606.06
<i>By caste</i>			
Forward caste	47250.00	65,193.55	17943.55
Scheduled Caste (SC)	29,333.33	27,857.14	-1,476.19
Other backward caste (OBC)	58,297.30	56,937.50	-1,359.80

Notes: The table shows means of actual and forecast dowry. The sample for forecast dowry is restricted to girls between the ages of 13 and 16. Castes are categorized according to the official basis of affirmative action policies in India. Forward Castes are not eligible for official affirmative action schemes or benefits; Scheduled Castes are the former "untouchables" castes, which were at the bottom of the caste hierarchy. The OBC are also considered socially and economically disadvantaged compared to the FC.

Table 2. Individual and household correlates of dowry forecasts

	Boys (Willingness-to-accept dowry)				Girls (Willingness-to-pay dowry)			
	OLS (1)	FE (2)	OLS (3)	FE (4)	OLS (5)	FE (6)	OLS (7)	FE (8)
<i>Child ability</i>								
Quartile rank in class	-0.133*** (0.034)	-0.153*** (0.053)	-0.052 (0.047)	0.058 (0.092)	-0.145*** (0.051)	-0.170*** (0.057)	-0.159** (0.069)	-0.174* (0.084)
<i>Educational aspirations</i>								
Minimum education desired			0.037 (0.031)	0.131** (0.048)			-0.001 (0.039)	-0.137 (0.093)
Maximum education desired			0.044 (0.030)	0.121 (0.103)			0.027 (0.027)	0.032 (0.042)
<i>Household characteristics</i>								
Number of unmarried girls	-0.003 (0.033)		-0.011 (0.036)		-0.180*** (0.045)		-0.151*** (0.046)	
Number of unmarried boys	-0.124*** (0.034)		-0.098*** (0.035)		-0.066 (0.041)		-0.076 (0.046)	
Log of household income	0.130** (0.058)		0.183** (0.076)		0.321*** (0.063)		0.328*** (0.071)	
Log of household wealth	0.148*** (0.039)		0.068 (0.051)		0.101** (0.044)		0.087* (0.049)	
Education of parent	0.048*** (0.007)		0.033*** (0.009)		0.025*** (0.008)		0.020** (0.009)	
Other Backward Caste	-0.189** (0.088)		-0.129 (0.102)		-0.478*** (0.100)		-0.442*** (0.122)	
Scheduled Caste/Tribe	-0.383*** (0.097)		-0.517*** (0.109)		-0.554*** (0.125)		-0.377** (0.162)	
Household fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	175	84	140	58	163	80	132	51

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. The dependent variable in columns (1)-(4) is the logarithm of the minimum dowry that the boy's family is willing to accept, and the dependent variable in column (5)-(8) is the logarithm of the maximum dowry that the girl's family is willing to pay. Quartile rank in class is the parent's perception of the child's ability relative to others in his/her class in school, with lower values of rank indicating higher ability. For children who are no longer in school, rank refers to the most recent year in which they were enrolled in school. Household wealth is the total value of durables, land, animals, stock, equipment, savings and net-lendings. All regressions include village dummies (coefficients not reported).

Table 3. Estimation of model parameters

	Boys			Girls		
	OLS	NLS		OLS	NLS	
	(1)	(2)	(3)	(4)	(5)	(6)
p_q (Price)	1.004*** (0.153)	0.647*** (0.084)	0.644 (0.550)	0.794** (0.315)	0.588*** (0.106)	0.457* (0.223)
c (learning parameter)	0.028*** (0.010)	0.190 (0.158)	0.192 (0.480)	0.034* (0.020)	0.321 (0.390)	1.144 (3.176)
Estimation method	OLS	NLS	NLS Linear	OLS	NLS	NLS Linear
Polynomial control	None	None	trend	None	None	trend
Observations	18	18	18	18	18	18

Notes: Robust standard errors are reported in parentheses. The dependent variable is the within-cohort variance in the (the logarithm of) dowry forecasts. The estimates are obtained from estimating the structural equation of the learning model using OLS (Columns 1 and 4) and non-linear least squares (Columns 2, 3, 5 and 6). The regressions in Columns 3 and 6 control for a linear term in child age. All regressions are weighted to account for the fact that the variance in each age-cohort is constructed from a different number of observations.

Figure 1: The figure shows the kernel density of forecasted dowry separately for (unmarried) boys and girls under the age of 19.

Figure 2: The figure shows the kernel densities of forecasted dowries for (unmarried) girls between the ages of 13 and 16, as well as the kernel density of actual dowries from the retrospective data.

Figure 3: The figures plot the frequency distribution of the minimum years of desired education (left panel) and the maximum years of desired education (right panel).

Figure 4: The panels above graph the kernel density of dowry forecasts for each of the three indicated age categories, after partialling out the effects of a set of household variables. The left panel reports the kernel density for boys and the right panel the kernel density for girls.

Figure 5: The figure plots the theoretical cross-sectional variance in ability as a function of age for various parameter values of the price of child quality and the learning parameter, c .

Figure 6. The panels above plot the within-cohort variance of dowry forecasts (after partialling out the effects of household variables), separately for boys (left panel) and girls (right panel).

Appendix Table 1. Individual and household correlates of dowry forecasts (currently enrolled children only)

	Boys (Willingness-to-accept)				Girls (Willingness-to-pay)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Child ability</i>								
Quartile rank in class	-0.109*** (0.040)	-0.173 (0.128)	-0.056 (0.048)	0.144 (0.136)	-0.170** (0.066)	-0.177** (0.075)	-0.167** (0.069)	-0.174* (0.084)
<i>Educational aspirations</i>								
Minimum education desired			0.037 (0.031)	0.127** (0.055)			-0.016 (0.042)	-0.137 (0.093)
Maximum education desired			0.042 (0.030)	0.142 (0.110)			0.033 (0.028)	0.032 (0.042)
<i>Household characteristics</i>								
Number of unmarried girls	0.002 (0.039)		-0.011 (0.036)		-0.163*** (0.046)		-0.153*** (0.046)	
Number of unmarried boys	-0.121*** (0.038)		-0.099*** (0.035)		-0.076* (0.045)		-0.073 (0.047)	
Log of household income	0.167** (0.078)		0.183** (0.076)		0.327*** (0.068)		0.321*** (0.071)	
Log of household wealth	0.122** (0.050)		0.069 (0.051)		0.097** (0.048)		0.093* (0.048)	
Education of parent	0.043*** (0.008)		0.034*** (0.009)		0.023** (0.009)		0.022** (0.009)	
Other Backward Caste	-0.198* (0.107)		-0.131 (0.104)		-0.431*** (0.123)		-0.419*** (0.127)	
Scheduled Caste/Tribe	-0.495*** (0.107)		-0.515*** (0.110)		-0.402** (0.154)		-0.349** (0.164)	
Household fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	142	57	138	53	134	53	131	51

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses. The regression samples are restricted to children who are currently enrolled in school. The dependent variable in columns (1)-(4) is the logarithm of the minimum dowry that the boy's family is willing to accept, and the dependent variable in column (5)-(8) is the logarithm of the maximum dowry that the girl's family is willing to pay. Quartile rank in class is the parent's perception of the child's ability relative to others in his/her class in school, with lower values of rank indicating higher ability. For children who are no longer in school, rank refers to the most recent year in which they were enrolled in school. Household wealth is the total value of durables, land, animals, stock, equipment, savings and net-lendings. All regressions include village dummies (coefficients not reported).

Appendix Table 2. Model estimation: OLS regression estimates

	(1) Boys	(2) Girls
Age	0.029* (0.016)	0.022 (0.025)
Age-squared	-0.001 (0.001)	-0.001 (0.001)
Constant	0.067 (0.075)	0.132 (0.084)
Observations	18	18

Notes: Robust standard errors are reported in parentheses. The dependent variable is the within-cohort variance in the (logarithm of) dowry forecasts. The estimates are obtained from the OLS regression of within-cohort dowry variance on cohort age and its square.

Appendix Table 3. Estimation of model parameters for girls under 12

	(1)	(2)
p_q (Price)	0.940*** (0.341)	0.551*** (0.110)
c (learning parameter)	0.062** (0.026)	0.674 (0.963)
Estimation method	OLS	NLS
Polynomial control	None	None
Observations	12	12

Notes: Robust standard errors are reported in parentheses. The dependent variable is the within-cohort variance in the (the logarithm of) dowry forecasts for girls. The estimates are obtained from estimating the structural equation of the learning model using OLS (Column 1) and non-linear least squares (Column 2). The samples are restricted to girls under the age of 12.