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ABSTRACT

Marriage Markets and the Rise of Dowry in India*

Dowry payments are common in many marriage markets. This paper uses data on over 74,000 marriages in rural India over the last century to explain why the institution of dowry emerges and how it evolves over time. We find that the proportion of Indian marriages including dowry payments doubled between 1930 and 1975, and the average real value of payments tripled. We empirically test whether four prominent theories of dowry can explain this rise, and find support for only one: increased differentiation in groom quality as a result of modernization. We also find a decline in the average real value of dowry payments after 1975 and demonstrate that this could be rationalized within a search model of marriage markets.

JEL Classification: J12, N35, O15

Keywords: dowry, marriage markets, India

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1 Introduction

One of the most significant economic transactions for households across the world occurs at the time of marriage. Dowry, a transfer of wealth from the household of a bride to that of her groom, has historically been a part of marriages across much of Europe and Asia. It is now most commonly practiced in South Asia, where over 80 percent of marriages in Bangladesh, India, and Pakistan include dowry payments (Anderson, 2007a). Dowry payments are typically quite large, with the value of a single dowry typically in excess of a year of earnings. In India alone, we estimate that the total value of dowry payments between 1950 and 1999 was nearly a quarter of a trillion dollars.

Policymakers have frequently attempted to eliminate dowry through legislative measures, but most of these measures proven ineffective. These attempts are in line with previous research documenting numerous negative consequences of dowry, such as encouraging sex-selection (Alfano, 2017; Borker et al., 2017; Bhalotra et al., 2020) and violence against women (Bloch and Rao, 2002; Sekhri and Storeygard, 2014), although some recent research has pointed out that anti-dowry policies could actually make the situation worse (Calvi and Keskar, 2021a,b). Regardless of the intent, any policy-making around dowry is made more difficult by the fact that there is still significant disagreement over why dowry exists and what factors can shift dowry practices: the economics and sociology literature contain numerous plausible and conflicting theories, with little empirical evidence on their validity. In order to design appropriate and effective policy responses to combat dowry, it is critical to understand the underlying determinants of dowry.

In this paper, we use data on over 74,000 marriages in rural India over the twentieth century to explain why dowry emerges and what factors influence its evolution over time. The Indian context is particularly well suited to study the emergence of dowry, both due to the large population affected, and the relatively recent emergence of dowry as a dominant institution in the country. In our data, we observe that dowry was only paid in around 38 percent of observed marriages in the 1920s. By 1975, this figure had increased to 88 percent and has remained at that level since. Between 1945 and 1975, the average size of dowry payments more than tripled, a phenomenon termed as "dowry inflation" (Caldwell et al., 1983; Rao, 1993). We observe that dowry payments were initially driven by an increasing proportion of high value dowry payments, followed by a rightward shift of the distribution of dowry payments itself. The conventional wisdom remains that the magnitude of dowry payments has continued to increase through the present day (Deolalikar and Rao, 1995; Anderson, 2003, 2007a; Bhaskar, 2016), but this is

not what our data show. Instead, there appears to have been a decline in large payments between 1975 and 1999, with little movement in other parts of the distribution, meaning that the mean dowry value falls.

A natural question to ask is what factors cause the emergence and evolution of dowry? While there is a rich theoretical literature on dowry, empirical work has been constrained by the limited availability of data on dowry outside of small or geographically limited samples (Anderson, 2007a). In this paper, we leverage a large and geographically comprehensive data set to examine four prominent theoretical models of dowry and test which, if any, can explain the rise of dowry in India. Each theory has either been cited extensively in the dowry literature (Srinivas, 1956, 1984) and/or published in a "top-five" general interest journal in economics (Rao, 1993; Botticini and Siow, 2003; Anderson, 2003; Anderson and Bidner, 2015).

First, one well-known explanation for increases in the prevalence of dowry in India is the 'Sanskritization' hypothesis (Srinivas, 1984). This theory proposes that dowry was traditionally practiced among upper caste households and spread as lower castes emulated upper caste practices in an attempt to increase their social status (or *'Sanskritize'*). We show that this theory cannot explain the wide-scale adoption of dowry since adoption began at around the same time among both low and high caste groups.

Second, a number of papers link changes in dowry prevalence and size to how population growth affects marriage market sex ratios (e.g. Caldwell et al. 1983; Rao 1993; Billig 1991, 1992; Dalmia and Lawrence 2005; Sautmann 2011). Since men marry at older ages than women, population growth will generate a surplus of women on the marriage market. In the resulting "marriage squeeze", competition over scarce grooms could cause increases in dowry prevalence and payments. Rao (1993) observes a relationship between sex ratios and increased dowry size, but with data from fewer than 200 marriages across 6 villages. We find that changes in marriage market sex ratio do not explain the large changes in the prevalence or size of dowry over the study period. Instead, "marriage squeeze" pressures appear to be relieved by decreasing age gaps between men and women at the time of marriage, as predicted theoretically in Anderson (2007b).

Third, Anderson (2003) proposes a matching model in which dowry inflation results from the process of modernization in a caste-based society. In this model, dowry is an equilibrium payment to match with a groom of a particular value on the marriage market. Brides prefer to marry wealthier and higher caste men, while men only care about dowry. As modernization leads to increased dispersion in wealth, there is a corresponding widening in the distribution of dowry payments. The pressure placed on dowry payments within a particular caste grouping by brides competing from lower

castes leads to dowry inflation. We empirically test the key model predictions, but do not find supporting evidence; this is likely due to strong preferences against marrying across caste boundaries (Banerjee, Duflo, Ghatak and Lafortune, 2013).

Finally, we provide evidence that changes in groom characteristics are a major driver of the rise of dowry prevalence and size (Caldwell et al., 1983); this is similar to the mechanism in Anderson (2003), but without cross-caste competition. If dowry is modeled as an equilibrium price to match with a higher quality groom, higher earning grooms will command higher dowries. During the 1930s and 1940s, there was an expansion in educational and economic opportunities for Indian men, which increased the number of high quality grooms. Aggregate dowry payments will then rise as the number of such men on the market increases, consistent with the theoretical frameworks in Anderson (2004) and Anderson and Bidner (2015).[1]

Our data contain information on multiple marriages within the interviewed households. We use this variation to test this specific theory and the broader framework of dowry as groom price under very demanding regression specifications. Specifically, we take advantage of the variation in dowry payments between immediate family members of the same household on the marriage market within the same (five-year) time period, to show that higher quality grooms, as measured by their educational attainment, receive substantially larger dowry payments. Taking advantage of the caste-based segmentation in Indian marriage markets, we demonstrate that this is not due to a groom's "rank" relative to other grooms on the marriage market, but their absolute level of quality . This implies that dowry inflation will occur as the pool of high quality grooms expands, supporting this explanation. To benchmark the extent to which this theory can explain the observed changes in dowry, we estimate the returns to groom education with regards to dowry amount in five year intervals from 1930 to 1980. Multiplying those returns by the changes in average groom educational attainment over each of those periods, we find that changes in the groom educational distribution can explain over two-thirds of the observed rise in dowry amounts.

One remaining puzzle is trying to understand the decline in high value dowry payments after 1975. We consider how the presence of search frictions can produce such a trend as compared to standard matching models. In such a search model, potential

[1]We do not formally test one other theory, from Botticini and Siow (2003), which argues dowry is a bequest to daughters from parents. This is because it is hard for bequest motives to rationalize the rapid and massive increase in the size of dowry in India: such an increase would have to come either from increases in family wealth, which are small over that period, or the desire to provide daughters with a greater share of the inheritance, which is inconsistent with other family investment decisions. See Section E.6 in the online appendix for further discussion of why this theory is unlikely to explain the observed patterns here (Chiplunkar and Weaver, 2023).

grooms and brides are randomly matched and bargain over dowry. Grooms are differentiated on quality, and marriages between a bride and a high quality groom produce a greater marital surplus. If a matched potential bride and groom agree on a dowry, they marry, and if not, they are randomly re-matched to other unmatched individuals. A bride is willing to pay a higher dowry to marry a high quality groom rather than re-match with a potentially lower quality groom and so high quality grooms receive larger dowries. However, as the proportion of higher quality grooms on the marriage market increases, there is a higher probability of a bride meeting a high quality groom if she rematches, and the dowries commanded by higher quality grooms decrease. We find this exact pattern in the data: as the pool of educated grooms in a marriage market increases, there is a decrease in the dowry premium that more educated grooms receive. We investigate other potential explanations for the pattern, such as the growth of female educational attainment over this period, but our estimates suggest that this does not drive the results. While other factors may also be responsible, and female educational attainment is likely increasingly important in more recent years, the search mechanism appear to be at least one factor in the evolution of dowry payments between 1975 and 1999.

Our paper makes a number of contributions to the literature. First, we provide novel facts on how dowry in India has evolved throughout the twentieth century. These complement, but also often contrast with the small empirical literature on historical dowry in India, which has been based on data sets that are either relatively small, do not span all of India, or do not cover the period of dowry inflation. To the best of our knowledge, this is the first paper to quantitatively document the adoption of dowry (as opposed to changes in the size of dowry among those paying dowry) and how the distribution of dowry payments has changed over time.[2] Dowry has been shown to affect a wide range of economic activities and behaviors (Bloch and Rao, 2002; Sekhri and Storeygard, 2014; Borker et al., 2017; Bhalotra et al., 2020; Anukriti et al., 2022), and so a better understanding of the evolution of dowry in India can help explain historical shifts in practices such as sex selection. It also may inform understanding of other economic phenomena for

[2]Rao (1993) and Edlund (2000) use a data set of less than 200 observations from six villages to examine average dowry size. Sautmann (2011) uses data on 375 marriages from one state, while Arunachalam and Logan (2014) uses the same data set as Rao (1993) and Edlund (2000), as well as data from two other states that focus on the period after the rise of dowry. Dalmia (2004) uses data from two states, with data from mostly after the period of dowry inflation. Anukriti et al. (2022) use the 2008 round of the REDS data to document trends in the average size of dowry payments across India between 1986 and 2007, after the period of dowry inflation. Other papers have used the 1999 REDS data to study aspects of dowry other than historical trends, such as how it is affected by related legislation (e.g. Roy (2015); Alfano (2017); Calvi and Keskar (2021a)) and trade liberalization (Chakraborty, 2015).

which there has been less work on the direct role of dowry, such as relative investments in female and male children.

Second, due to the paucity of data on dowry payments and marriage patterns, much of the economics literature on the causes of dowry has been theoretical, particularly in the case of India (Anderson, 2003, 2007b; Anderson and Bidner, 2015; Bhaskar, 2016). Our paper helps explain the emergence of dowry in India, similar to how Ambrus et al. (2010) demonstrate that legal changes in marriage contracts explain the emergence of dowry in Bangladesh.[3] We show that the mechanism underlying the matching model of Anderson and Bidner (2015) can explain the rise of dowry, and augmenting the model with search dynamics provides additional insights on explaining the evolution of dowry post 1975. More generally however, understanding the theoretical underpinnings of dowry matters for the design of anti-dowry policies: for example, if we had found that dowry emerged for social signaling reasons (Sanskritization), then a policy recommendation for anti-dowry campaigns would be to focus on changing norms among higher status individuals. Instead, the economic logic of dowry as groom price suggests that the many existing campaigns to change norms around dowry may be less effective. It is also informative as to why policies to ban dowry may have negative unintended consequences (Calvi and Keskar, 2021a,b).[4]

The remainder of the paper is organized as follows. Section 2 discusses the data, while Section 3 uses the data to document stylized facts on the evolution of marriage markets in rural India since 1930. Section 4 provides tests of existing theories of dowry, as well as testing a new competitive search model of Indian marriage markets. Section 5 offers a short conclusion.

[3] Ambrus et al. (2010) show that the emergence of dowry in Bangladesh is the result of legal changes around the *mehr*, which governs transfers at the time of divorce in Muslim marriages. This legal shift did not occur in India, and most Indians are Hindu, so other factors must explain the rise of dowry in India.

[4] We omit discussion of a few theories in the paper for brevity, but discuss them in Section E.6 of the online appendix (Chiplunkar and Weaver, 2023). For example, dowry may spread if it is adopted as a cultural norm from which deviation is socially costly. We show that within-household patterns in dowry payment are inconsistent with such a norm. Dowry payments may also track the price of commodities typically given as part of dowry, such as gold. However, gold prices were almost completely stable between 1945 and 1967, so could not have influenced the rise of dowry in the 1950s and 1960s (World Gold Council, 2019).

2 Data

2.1 Data on Dowries

Our analysis is primarily based on data from the Rural Economic and Demographic Survey (REDS), a detailed panel survey of rural households conducted by the National Council of Applied Economic Research (NCAER) across the 17 most populous states in India.[5] The 1999 round of the survey collected detailed retrospective information on the marriages of the household head, their parents, brothers and sisters, and their sons and daughters, which we combine to generate a data set of over 74,000 marriages.[6]

The REDS data reports the nominal value of gifts and cash transfers from the household of the bride to that of the groom at the time of marriage, as well as from the household of the groom to that of the bride.[7] As is standard in the literature (e.g. Rao 1993; Edlund 2006), we define the value of dowry as the *net value* of gifts/payments, i.e. the value of transfers made to the household of the groom minus the value of transfers made to the household of the bride.[8] We use the wholesale price index to convert these into *real* values and therefore, study the evolution of the ***net real value*** of dowry over time.[9] The REDS data also contain information on marriages for deceased family members, avoiding mortality-related attrition. Lastly, while the 2008 round of the REDS

[5]Data was collected in 1969-1971, 1982, 1999 and 2008. The original sample of villages was drawn in the first round and was meant to be representative of the rural population in India in those states. All households (including splits) were followed over time and information was collected on all their deceased members. The 17 surveyed states contain roughly 96% of the population of India. Since this is a rural sample, our results may not extend to urban areas. However, over 85% of the observed marriages are from a period before the Indian urbanization rate was at even a quarter, so this describes most of the population.

[6]Table B1 provides a detailed breakdown of all marriages by decade and state.

[7]Dowry typically includes cash payments and physical items. The 1994 Survey of Women and Fertility (SWAF) asked couples about whether particular items were given as dowry in their marriage. Nearly all had given jewelry (91%), kitchen utensils (94.5%), and clothing (95%), while other relatively common items include furniture (49%), radios (33%), and bicycles (32%). Land is almost never part of dowry (1.2%).

[8]This is as opposed to the *gross value* of the transfers from the bride's household to that of the groom, which does not subtract the value of transfers made by the groom's household to the bride. Using either gross or net dowry has little effect on the results since the value of transfers from the bride's household to the groom are much larger than those from the groom to the bride. In Apppendix Section C.5, we show that the temporal patterns between gross and net dowry are virtually identical, and all of our results are robust to using gross dowry.

[9]We prefer the wholesale price index since it incorporates many relevant goods and has a long, consistently measured time series. Some other papers have used price indices based on gold (Rao, 1993) and rice (Arunachalam and Logan, 2014). There is a large spike in the price of gold in 1980, so it is hard to compare before and after 1980 with a gold-based price index. For 1900-1950, we use wholesale price index data from pg 685 of Singh (1965). For the period 1939-1950, we cross-check this with data from other sources and find it to be consistent. For 1950 to 1970, we use data from from the Office of the Economic Advisor, and for 1970-2013, from the Reserve Bank of India.

survey collected similar data on dowry, this paper will primarily use data from the 1999 wave for reasons described in Appendix C.[10]

The REDS data have substantial advantages relative to data sources used in earlier empirical work on dowry in India. Most empirical articles on dowry in India have been based on data collected in 1983 by the International Crops Research Institute for Semi-arid Tropics or ICRISAT (e.g. Behrman et al. 1999a; Deolalikar and Rao 1995; Edlund 2000, 2006; Rao 1993; Rosenzweig and Stark 1989). These data contain fewer than 200 observations of dowry between 1923 and 1978 from six villages in South India (see Edlund (2006) for descriptive statistics). These may not be representative of larger trends across the country given India's cultural and regional heterogeneity. Another source of data was collected from two Indian states by the NCAER in 1995 (Anderson, 2007a; Dalmia, 2004; Dalmia and Lawrence, 2005; Sautmann, 2011). We also do not use this data given its limited geographic and temporal coverage before 1970, when most of the changes in dowry practices occur. Appendix Section C.1 provides detailed information on these data as well as others that we do not consider given the scope of this paper.

Despite significant advantages, there are some limitations of using the REDS that we discuss below. First, there were inconsistencies in how the 1999 REDS surveyors administered questions related to dowry in five states (Andhra Pradesh, Gujarat, Maharashtra, Orissa and Tamil Nadu; see Appendix C.2 for details). In those states, we can observe *whether* dowry was paid, but do not consistently observe the *amount* of the payment. In the main tables of the paper, we use data from these five states when examining whether dowry was paid in a marriage, but drop them in any analysis on the size of dowry payments. For the remaining states (which account for almost 70 percent of India's population), we consistently observe both whether dowry was given and the amount. Appendix C.3 replicates all of our main results with two alternative approaches: first, we re-run our analysis using data on dowry from the 2008 round of the REDS survey to replace the 1999 data for those five states. Second, we drop these five states from all of the analysis. Neither approach significantly changes our findings, indicating that this should not be a major concern for our analysis.[11]

[10]The 2008 wave is sometimes referred to as the 2006 round of the REDS survey, but 84% of responses are from 2008, so we refer to it as the 2008 round in this paper.

[11]Trends in whether dowry was paid are also similar for the five states and the rest of India (Figure A1), suggesting that the descriptive statistics on trends in dowry amount should generalize well to all of India.

2.2 Recall Bias in Dowry Data

Given the lack of extant historical data on dowry, the data on dowry payments in the REDS is retrospective. One concern is that respondents may not accurately recall dowry transactions. There are numerous reasons to think that recall bias should be modest. First, the importance of marriage makes events around this time particularly salient to households. The rate of missing data on dowry payments is quite low (5% of marriages), consistent with recall being good. Second, the substantial size of dowry payments makes it likely that respondents recall them, similar to asking a homeowner what they had paid for their house; for example, the median dowry payment is around 1-2 times the average annual rural male earnings.

We also conduct two tests to examine the extent of recall bias. The first test takes advantage of the panel nature of the REDS survey to test for a systematic recall bias that increases over time. Since respondents were interviewed in 1999 and 2008 and asked similar questions about dowry payments, a systematic recall bias would lead to differences in responses between the 1999 and 2008 waves of the survey. Ideally, we would compare the recall for a particular marriage across the 1999 and 2008 waves, but it is not possible to match marriages across waves of the REDS. We instead take the full distribution of nominal dowry size for each state within five year bands for each wave of the survey (e.g. the distribution of dowry payments in Bihar between 1960-64 in both the 1999 and 2008 waves). We calculate five percentiles of that distribution (20^{th}, 35^{th}, 50^{th}, 65^{th}, 80^{th}) for each state in each five year period and regress the 1999 wave percentiles of the distribution on the 2008 percentiles (e.g. 20^{th} percentile of the dowry distribution in Bihar in 1960-1964 in the 1999 data as compared to the 20^{th} percentile of the dowry distribution in Bihar in 1960-1964 in the 2008 data). This is a relatively stringent test since we not only focus on the central moments, but also other parts of the distribution. We cannot reject the null hypothesis that the values of the percentiles of the dowry distribution are on average the same between the two waves, i.e. that the coefficient is equal to one (Column 1 of Table B2).[12] This does not preclude that classical measurement error may be increasing over time, but suggests that recall is not systematically biasing our estimates of dowry payments upwards or downwards. In Column (2), we add an interaction term to test for recall bias as a function of the number of years since the marriage. There is no systematic bias that is increasing in the number of years since the marriage either.

We also use an alternative data source, the Survey of Women and Fertility (SWAF), for a second test of the measurement error in recall of dowry payments over time. This

[12]The coefficient indicates that dowry payments are slightly larger in the 1999 wave, but the difference is not significantly different from 1.

data was collected between 1993-1994 in the states of Tamil Nadu (1551 households) and Uttar Pradesh (895 households) and contains retrospective data on marriages. In particular, it separately interviews husbands and wives and asks them identical questions about whether particular items (land, jewelry, cash, vehicles, household assets, furniture, utensils, livestock and clothing) were part of dowry in their marriage. If there is significant measurement error in recall of dowry, we would expect that the answers of the two would be poorly aligned: in the extreme case where individuals have no recall of dowry gifts and were randomly selecting yes or no for each response, they would only match half of the time. Instead, their responses match in 87.8 percent of cases. There is also nearly no decline in match rates between couples with the earliest marriages in the data (between 1970-1975) and those whose marriages were within a year of the survey (Figure A2). This increases our confidence that while recall might be poor for less significant economic transactions, it appears to be excellent for a transaction as important as dowry.

Another possible concern is that even if the REDS sample is representative at the time of sampling in 1971, it will not be a representative sample of marriages in other years – for example, a parent married in 1940 who has many surviving offspring will be more likely to observed than one who has fewer children. To assess the extent of this concern, we reconstruct the main descriptive figures in the paper with a sample reweighted by family size (Appendix Figure A8). We find that they are virtually identical to the unweighted versions, indicating that the correlation between family size and dowry is not so large that this would significantly bias our analysis of dowry trends.[13]

2.3 Population and Descriptive Data

We combine the REDS data with two other data sources that measure demographic factors relevant to marriage markets. The first of these is the Census of India, a survey of all Indian households conducted every 10 years by the Government of India. For example, in our analysis on how sex ratios affect dowry (Section 4.2), we construct sex ratios using the district-level population counts of men and women in different age groups from the four Census rounds between 1961-1991.

The second data set is the National Sample Survey (NSS), a large, nationally representative, repeated cross-sectional survey administered by the Government of India. We

[13]A related concern is the possibility of attrition due to mortality. Fortunately, the REDS data contains information on marriages for deceased family members, and so avoids attrition due to mortality, but it is possible that recall of dowry for those marriages is worse. Appendix Section C.4 shows that if we restrict to only marriages of those still alive at the time of the REDS survey in 1999, aggregate trends in dowry amounts are similar, and all of of main results remain the same.

use NSS data to estimate the distribution of educational attainment of men and women on the "marriage market" in a given year. We pool five NSS rounds (Rounds 38 [1983], 43 [1987], 50 [1993], 55 [1999], and 62 [2005]) that collect information on every member of a surveyed household, including state of residence, broad caste grouping, religion, gender, education and birth year. This generates a data set of 2.4 million observations, which we re-weight to produce representative figures for the entire population. For our analysis using these data, we define the marriage market as being within a particular year, state, religion, and caste group. The pool of men and women defined to be "on the marriage market" in a given year is women between the ages of 13–20, and men between the ages of 18–25.[14] On average, data from 1368 men and 1422 women are used to estimate the distribution of educational attainment in a particular state-religion-caste-year.[15]

3 Marriage Markets in India: 1930-Present

3.1 Marriage Practices

Marriages in India are nearly all monogamous with fewer than 1 percent ending in divorce (National Family Health Survey, 2006). Parents play an important role in marriage decisions– in over 90 percent of marriages between 1960 and 2005, parents chose the spouse (Indian Human Development Survey, 2005). Over 90 percent of couples live with the husband's family after marriage, and over 85 percent of women marry someone from outside their own village (Ibid). While brides move outside of their village, they don't move far– 78.3 percent of marriages are within same district (REDS, 1999), with an average travel time of 3 hours from the household of the bride to that of the groom (Indian Human Development Survey, 2005).[16] One of the most significant features of the Indian marriage market is caste. Indian society has traditionally divided individuals in different sub-castes (*jatis*), based on the traditional occupation of an individual's ancestors within a village economy (e.g. leather workers, blacksmiths). Individuals have a

[14]Note that we can use these finer age ranges because exact age is available in this data, whereas in the census data, it is only available in five-year age bins. In cases where the NSS data contains fewer than 100 men or 100 women in a particular state-religion-caste-marriage year, we do not estimate the distribution of educational attainment due to concerns about accuracy. In practice, results are nearly identical if we include these cases since the restriction affects less than 1500 cases.

[15]The NSS data is not representative at the district level, but is at the state level. We thus only use the NSS for state-level estimates rather than using the district identifiers.

[16]Despite advances in communications technology, there has been no change in the average distance between bride and groom households over time (see Section E.8 in the online appendix (Chiplunkar and Weaver, 2023).). This is consistent with earlier literature on the role of social connections in screening partners (Rosenzweig and Stark, 1989).

strong preference for marrying within their own *jati*, or sub-caste group (Dugar et al., 2012; Banerjee et al., 2013). In fact, Banerjee et al. (2013) find that the preference is so strong that a woman would be indifferent between a husband from the same *jati* with no education and a husband from a different *jati* with a master's degree. The prevalence of marriages across caste boundaries is incredibly low in rural areas, with only 6 percent of marriages occurring between individuals from different sub-castes. There is no change in inter-caste marriage in rural areas between 1930 and 2011, with only a slight increase of 2 percentage points in urban areas (Figure A3).

3.2 Dowry Prevalence and Size

Since the seminal work of sociologist M.N. Srinivas, the conventional wisdom has been that dowry payments became larger and more prevalent in India over the twentieth century (Srinivas, 1976, 1984; Rajaraman, 1983; Billig, 1992). To the best of our knowledge, there has not been any quantitative documentation of an extensive margin shift towards dowry, and work on changes in average dowry size have been based on small and non-geographically representative samples. Using the 1999 wave of the REDS data, we document three stylized facts on the evolution of dowry payments in India:[17]

Fact #1: On the extensive margin, there was a rapid increase in the prevalence of dowry payments between 1935 and 1975. After 1975, dowry payments were nearly universal.

Fact #2: On the intensive margin, dowry payments increased across all parts of the distribution between 1945 and 1975. This was initially driven by an increase in mass in the upper tail of the distribution (i.e. larger dowry payments), followed by a shift in the bottom half of the distribution. Post-1975, there was a decline in larger dowry payments, but the rest of the distribution remained unchanged.

Fact #3: Median dowry payments were around twice the average annual rural male earnings in the 1960s. Payments (as a fraction of income) have declined over time and were around 1.2 times the average annual rural male earnings in 1990.

Figure 1(a) shows the prevalence of dowry over time (Fact #1). Before 1930, only

[17] A limitation of this analysis is that the REDS data is only from rural areas and so may not represent what is happening in urban areas. A large majority of the Indian population lived in rural areas over our study period (from 82.7% in 1951 to 80.1% in 1971 to 74.5% in 1991), so this still represents the experience of most Indians. However, Section E.2 in the online appendix uses data from the IHDS and the Census of India 2011 to delve into the evolution and integration of urban and rural marriage markets (Chiplunkar and Weaver, 2023). We find that patterns in urban and rural marriage markets appear to be similar, so it may be that trends in rural areas also reflect what is happening in urban areas.

38 percent of households engaged in the payment of dowry (defined as a positive net dowry payment), which increased to 88.2 percent by 1970, and has remained relatively steady since then.[18] The timing of adoption is consistent with ethnographic evidence, such as Srinivas (1976) noting the adoption of dowry in Karnataka in the 1940s.[19]

One concern is that the pattern could be produced by poor recall, where individuals have systematically worse recall in earlier periods and hence state they did not pay dowry. However, the data separates non-payment and non-recall of dowry, and the rate of non-recall is quite low. Moreover, it is not skewed towards older/earlier marriages either (Appendix Figure C1).[20]

Turning now to the size of dowries, the existing literature has focused on the change in the *average* dowry payments, with the common wisdom that it has increased over time (Billig 1991, 1992; Epstein 1973; Rajaraman 1983; Bhaskar 2016; see Anderson (2007a) for a review). Quantitative evidence from Rao (1993) using the ICRISAT data concurs with this as well. Instead, we consider the evolution in the size of dowry payments between 1930 and 1999 using the 1999 wave of the REDS data, which has two key advantages over existing research. First, the coverage is broader and more representative, as discussed previously. Second, we can examine how the *distribution* of dowry payments has changed, as opposed just the average payments, which could shed light on interesting patterns in the data that are masked by the central moments.

Figure 1(b) plots the median real dowry payment in thousands of rupees as a three year moving average (normalized to real value in 2010).[21] Median dowry size steadily rose in the post-1945 period, from Rs. 4,324 in 1944 (real value in 2010 rupees, equivalent to roughly US$96) to Rs. 18,088 in 1975 (real value in 2010 rupees, equivalent to roughly US$401). However, it has not consistently grown in real value since around 1975. This is in stark contrast to popular accounts, which suggest steady increases in dowry payments over time. This discrepancy may be attributable to thinking in nominal rather than real terms (Shafir et al., 1997), as there have been large increases in nominal dowry payments over time. However, as we will show later, the value of dowry payments as a fraction of

[18] Appendix Figure A1 shows the geographical heterogeneity in adoption of dowry.

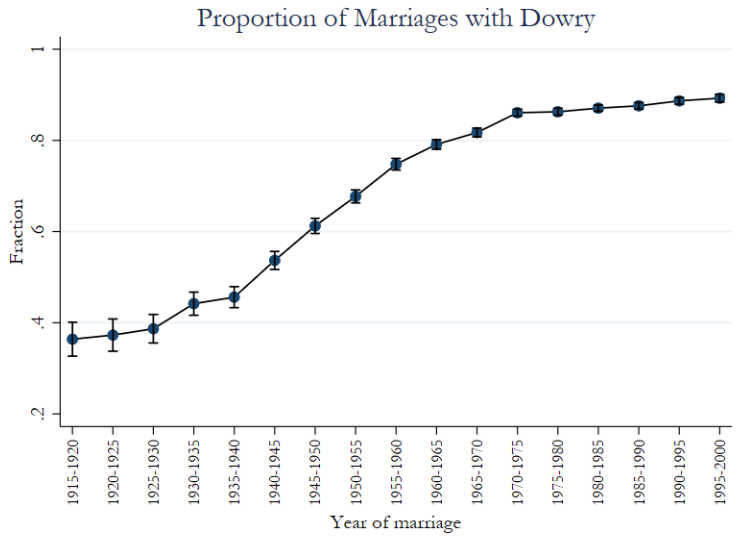
[19] Approximately 3 percent of marriages in the data set involved a negative net dowry payment (bride-price). These are typically much smaller in absolute value than dowry payments. For the analysis on dowry payment, we code these as non-payment of dowry since our paper is broadly interested in the shift to dowry practices from either non-payment of dowry or bride price.

[20] Another concern is the survival of households over decades, where marriages who produced more surviving offspring will be over-represented. Our results are virtually identical when we re-weight households by family size to account for the over-representation of larger households with more surviving offsprings (Figure A8), so this cannot explain the observed aggregate trends.

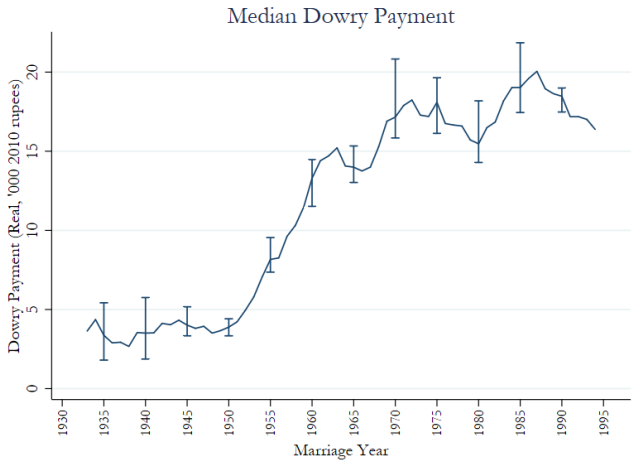
[21] Non-payment of dowry, i.e. a dowry payment of zero, is included in this median as well as when calculating all of the other summary statistics used in the paper related to dowry size.

Figure 1: Evolution of Dowry from 1930-1995

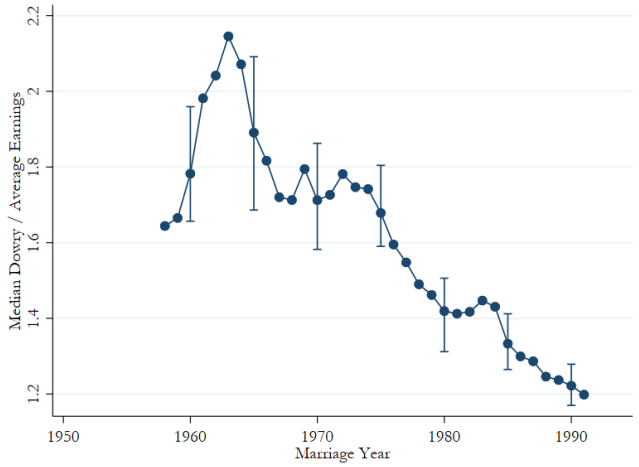
(a) Prevalence of Dowry



(b) Dowry Payment By Year of Marriage



(c) Dowry Payments and Annual Household Earnings



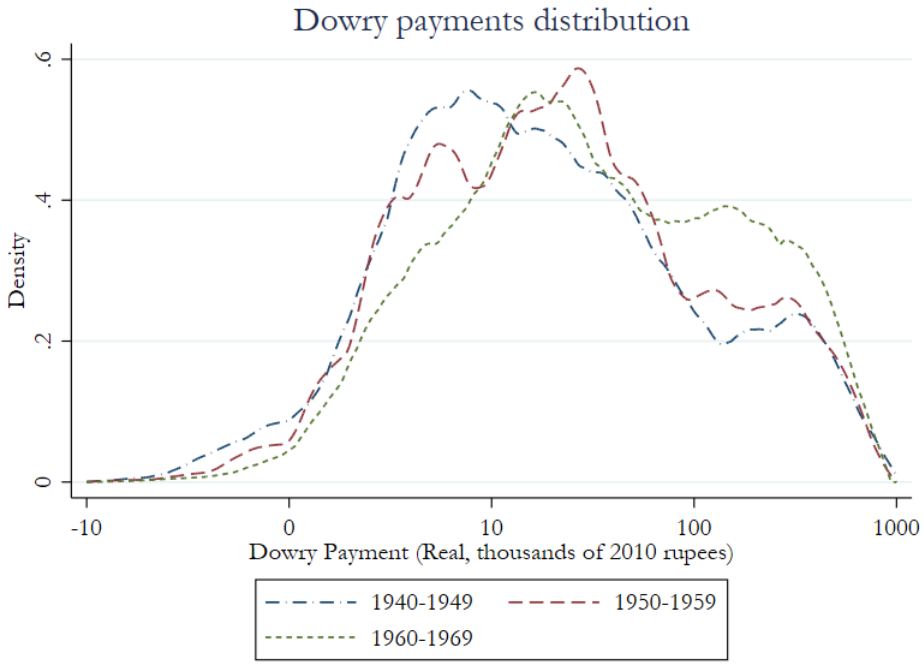
Notes: Figure (a) plots the proportion of marriages in which dowry was paid over a given five year period. Figure (b) plots a three-year moving average of median real dowry payments in each year between 1930 to 1999. Figure (c) plots a three year moving average of median dowry as a proportion of average household earnings from 1960 to 1991. The average household earnings are calculated using the average daily rural agricultural wage at the state level from the relevant NSS round. The bars in all figures correspond to bootstrapped 95% confidence intervals around the estimates at 5 year intervals.

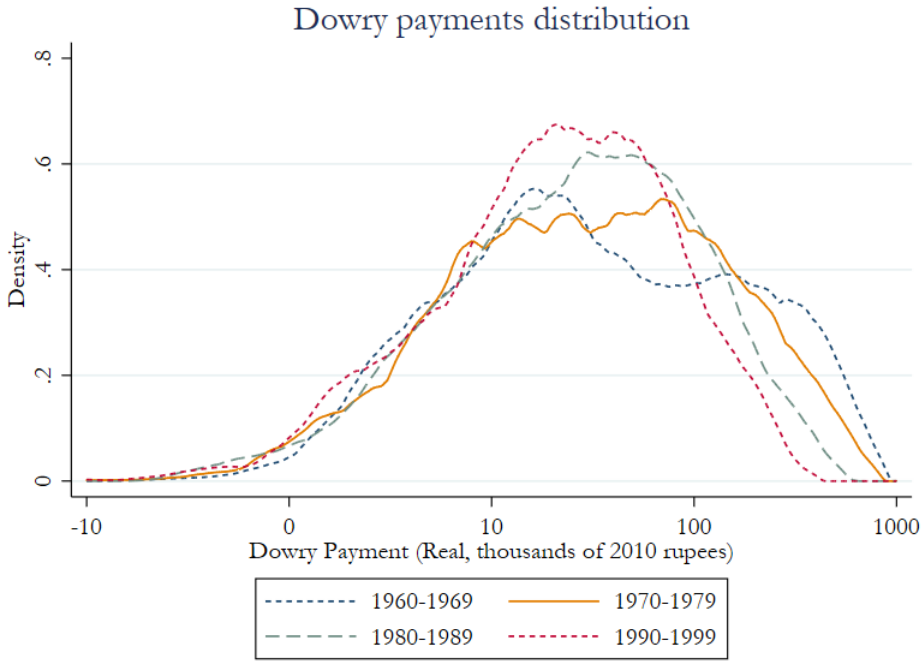
average earnings has indeed declined post 1975.

Figure 2 plots the full probability density function of dowry payments by decade between 1940 and 1999. In the 1940s and 1950s, the median of the distribution shifted upwards, along with some increase in the upper tail as well. Between the 1950s and 1960s, the entire distribution of dowry payments shifted outwards, with the largest increase in the upper tail of the distribution. Starting in the 1970s, there an inwards shift

Figure 2: Distribution of Dowry Payments

(a) Dowry payments 1940-1979





(b) Dowry payments 1970-2000

Note: This figure plots the entire distribution of log real dowry payments for each decade between 1940 to 1969 in Figure (a) and 1960 onward in Figure (b). Broadly, the dowry payments distribution is shifting to the right in Panel (a), while in Panel (b), there is an inwards shift of the upper tail of the distribution.

of the upper tail of the distribution, an outwards shift around the 60^{th}-70^{th} percentile of the payment distribution, and stagnation elsewhere. After the 1970s however, there is a clear decline in dowry in the upper tail of the distribution, with no major changes in the lower tail. As a result, the mean dowry has declined over that period, which we will discuss in greater detail in Section 4.4. In all cases, we can easily reject equality of the distribution of dowry payments across each decade and the decade preceding it (Kolmogorov-Smirnov p-value< 0.001 in all cases).

Next, we document trends in dowry payment as a fraction of average annual earnings. These earnings are calculated as the average daily rural agricultural wage by state, using the National Sample Surveys between 1960 and 1995. We use rural wages since the REDS data is entirely rural in its coverage. Since wages in the NSS and dowry in REDS are both in nominal terms, we divide the reported dowry payment by the average daily rural agricultural wage multiplied by 300 (approximate working days per year). Using a three-year moving average, Figure 1(c) shows that dowry payments have declined as a fraction of average annual earnings. Nonetheless, median dowry payments are still substantial–around one to two times the annual average income of rural males.

Finally, we combine the data on dowry size with demographic information from the Census of India to estimate the approximate size of the dowry market between 1950 and 1999. Based on the REDS data, 27% of women married before the age of 15 over this time period, 56% of women married between the ages of 15-19, and 14% of women married between the ages of 20-24. To get a rough estimate of the number of marriages in each five year period, we multiply these figures by the Census of India count of the total number of women in each of those age ranges over the relevant period. We then multiply the estimated number of marriages in a given period by the proportion of marriages with dowry and the average size of dowry payments in that period. Summing across all the periods, we estimate that the total real value of dowry payments between 1950 and 1999 was $247 billion US dollars, or nearly five billion dollars annually.

4 Empirical Examination of Theories of Dowry

As discussed before, there is a rich theoretical literature on the evolution and prevalence of dowry practices, especially in India. Most theories model dowry as a price in a two-sided marriage market, where brides pay higher prices to match with better quality grooms (Becker, 1973).[22] However, due to the lack of comprehensive data on dowries,

[22]Depending on the relative values of brides and grooms, payments might instead go from the groom's family to the bride's family (bride price); the direction of payments has implications for investment be-

there has been a limited empirical examination of these theories. The spirit of the discussion in this section is using the REDS data to empirically examine the insights of these theoretical models and thereby better understand why dowry exists.[23]

4.1 Sanskritization

One of the most widely cited theories in Indian sociology is that of Sanskritization, first proposed by Srinivas (1956) during his field research in rural villages of Karnataka in the late 1940s and 1950s. The theory states that Brahmins, the priestly caste, traditionally carried out a number of practices that reinforced their elevated caste status, such as payment of dowry, vegetarianism and particular forms of dress. Lower castes then began emulating these practices, including dowry, in order to increase their ranking in the caste hierarchy. Other authors have disputed this explanation for dowry on theoretical grounds,[24] but to the best of our knowledge, no study has quantitatively tested it.

Sanskritization has two main testable predictions with regards to dowry. First, if Sanskritization is to explain the wide scale adoption of dowry, i.e. the observed increase of over 50 percentage points, dowry payments historically must have been relatively rare in lower caste marriages and common in upper caste marriages. Figure 3 reports the proportion of marriages with dowry payments (defined as a net positive payment to the household of the groom) over time across four caste groupings in the REDS data. Even in the early time period, upper caste marriages had only modestly higher rates of dowry payments. Table B4 formally tests this by regressing an indicator for whether a marriage included dowry payments on an indicator for caste grouping, as well as district and year fixed effects. Panel A compares Brahmin to non-Brahmin marriages, while Panel B divides into general caste (including Brahmins) and lower caste. The difference between Brahmin and non-Brahmin marriages is not statistically significant prior to the 1930s, although this may be due to a lack of statistical power. Upper caste marriages were indeed slightly more likely to involve dowry in the pre-1930 period (Panel B of Table B4), but the small difference (5.2 percentage points) is inconsistent with dowry

havior (Ashraf et al., 2019; Corno et al., 2020; Vogl, 2013).

[23]One theory that we do not formally test is the bequest theory of Botticini and Siow (2003). Even without formal tests, it is clear that theories of bequest cannot rationalize the rapid and massive increase in the size of dowry in India: such an increase would have to come either from increases in family wealth, which are small over this time period, or the desire to provide daughters with a greater share of the inheritance, which is inconsistent with other family investment decisions. See Section E.6 in the online appendix for a discussion of this theory (Chiplunkar and Weaver, 2023).

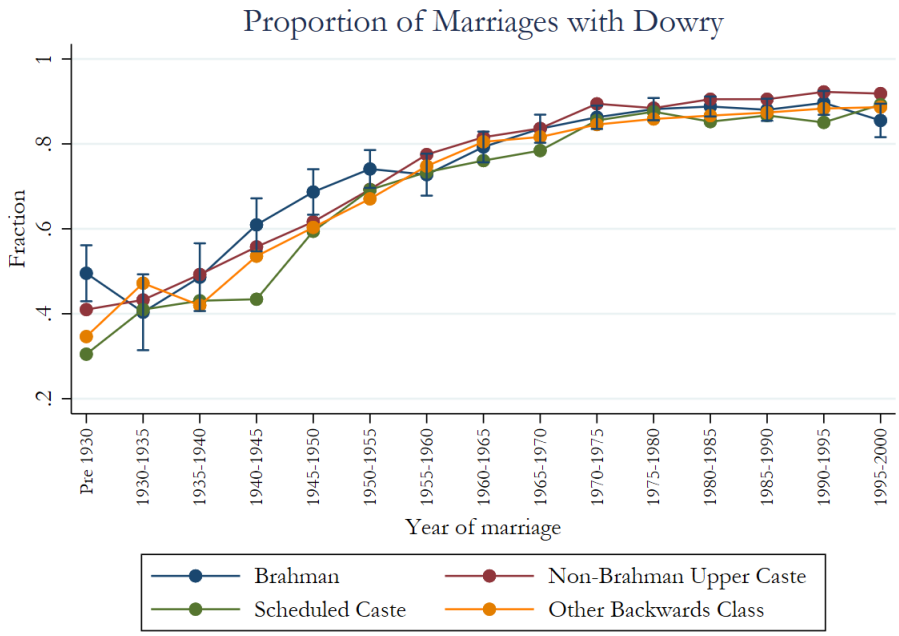
[24]For example, Rao (1993) argues that the increase in status conferred by dowry could not justify the payments of this size. Caldwell et al. (1983) points out that demands for dowry are typically viewed in a negative light and thus are unlikely to confer higher status.

historically being an exclusively upper caste institution.

A second testable prediction of Sanskritization is that the wide scale adoption of dowry comes from increased adoption among lower caste marriages. Figure 3 shows that all caste groups adopt dowry at similar rates until peaking at near universal adoption of dowry around 1975. Based on Table B4, we cannot reject that the difference in dowry prevalence across lower and upper caste marriages, or Brahmin and non-Brahmin marriages was the same in the 1930s-1940s (2 and 1.6 p.p. respectively) as it was in the 1970s-1990s (1.5 and 0.9 p.p.), which is inconsistent with the overall rise of dowry coming from low caste emulation of upper caste practices.

Put together, we conclude that it may be that lower caste individuals began to emulate upper caste practices other than dowry, but Sanskritization cannot explain the broad adoption of dowry practices over the past century.

Figure 3: Prevalence of dowry by decade across caste groups



Notes: This figure plots the proportion of marriages in which dowry was paid over a given five year period for different caste groups. For Brahmins, we include 95% confidence intervals around the estimates to provide a visual representation on whether we can reject equivalence of dowry among Brahmins and non-Brahmins in a given year.

4.2 Marriage Squeeze Hypothesis

A prominent strand of the dowry literature attributes the shifts in Indian dowry practices to a *'marriage squeeze'*. This theory, initially proposed by Caldwell et al. (1983), notes that in India, as in many other developing countries, women typically marry at younger ages

than men. As a result, if the population of a country is growing, the cohort of men on the marriage market is smaller than the cohort of women. This could lead to increased competition over limited men, thus increasing dowry payments.

Using the decadal Census of India data between 1961-1991, Figure A4 in the Appendix plots: (i) the approximate marriage market sex ratio i.e., the number of women aged 10-25 divided by the number of men aged 15-30; (ii) the aggregate population sex ratio i.e., the number of women of all ages divided by the number of men of all ages; (iii) the population sex ratio for ages 0-5 and 5-10 years i.e., the number of girls in the age groups 0-5 (or 5-10) divided by the number of men in the same age bin. We find that though the population sex ratios (defined in (ii)-(iv) above) are relatively steady over time, the marriage market sex ratio increased prior to 1970 and then decreased, consistent with the timing of changes in dowry discussed in Section 3.2.

On the other hand, there are reasons why dowry practices may not respond to population growth and sex ratio imbalances. Imbalances can be relieved through changes in the age of marriage, where women may marry later or men may marry earlier to equilibrate the market (Bergstrom and Lam, 1991). Foster and Khan (2000) show that even small changes in age of marriage can equilibrate large cohort size differences, as well as demonstrate that the nature of shift in ages will differ across static and dynamic models. The static model of Anderson (2007b) expands upon these models to explicitly incorporate dowry and argues that the marriage squeeze will not cause dowry inflation, but only shift the age at which individuals marry. Bhaskar (2016) further extends this model in a dynamic setting to incorporate the impact of persistent and transient population growth on the equilibrium age gap and size of dowry. He shows that persistent population growth will not affect the age gap, but there will be an increase (decrease) in dowry paid with positive (negative) growth of cohort size. Furthermore, a transitory shock to cohort size could affect both age gaps and dowry sizes of the nearby cohorts, and the dynamic adjustment will depend on how sensitive cohorts are to age considerations. It is unclear which type of shock is empirically relevant in this context since prospective brides and grooms are unlikely to observe aggregate changes in population growth outside of their local areas and/or know whether those are transitory or permanent.

Rao (1993) provided the first empirical support for the marriage squeeze hypothesis, showing a positive relationship between the marriage market sex ratio and dowry size in the ICRISAT data. Edlund (2000) reanalyzed the same data and found no relationship between sex ratio and dowry size, although Rao (2000) demonstrated a relationship when a quadratic term is added to the specification. Regardless, both Edlund (2000) and Rao (2000) note that their limited sample size makes it difficult to draw definitive

conclusions, and that analysis with a larger data set is needed.[25]

With the REDS data, we analyze the relationship between marriage market sex ratios and dowry using a two-way fixed effects approach. Marriage market sex ratios are estimated at the district level since around 80 percent of marriages are within the same district, and most marriages outside the district are still geographically proximate (REDS, 1999). We use four rounds of data from the Census of India (1961-1991), which provides the total number of men and women in a district within 5 year age bands (0-4,5-9,10-14, etc.), and calculate the marriage sex ratio within five year bins (1950-1954, 1955-1959, etc.). For each five year bin, we estimate the fraction of men and women who married at each age using REDS data from the prior five year period. For each district, we then multiply these fractions by the number of men and women in each age band in the district to get the estimated number of men and women on the marriage market in that district.[26] The marriage market sex ratio is the ratio of marriage age women divided by marriage age men. We estimate the following regression specification for a marriage m in a district d in year t:

$$y_{mdt} = \alpha_d + \alpha_t + X_{mdt}\beta + \gamma \text{ Sex Ratio}_{dt} + \varepsilon_{mdt} \tag{1}$$

where: y_{mdt} is an outcome variable of interest (dowry payments, age gap, etc.), X_{mdt} is a vector of controls (education levels of the bride and groom, caste fixed effects, etc.) to account for compositional differences in the types of individuals getting married in a particular year. District (α_d) and year (α_t) fixed effects account for unobserved heterogeneity over time and space.[27]

While all the empirical papers on the marriage squeeze have examined the relationship between sex ratio and dowry size, the same mechanism can affect both size and prevalence; indeed, the original paper on the marriage squeeze was focused as much on the emergence of dowry as on the size of dowry payments (Caldwell et al., 1983). We thus look at the relationship between sex ratio and both whether dowry is paid in the marriage (Column 1 of Panel A of Table 1) and the net dowry amount (Column 2).[28] In

[25] Dalmia and Lawrence (2005) also find no relationship between sex ratio and dowry in a different data set, but have very little variation in sex ratios since they only have data from ten districts across two states.

[26] By using ages of marriage from the prior 5 year period, we avoid the endogeneity in the sex ratio-marriage age relationship, but allow the age of marriage to vary with historical changes in age of marriage in Indian marriages; below we show that results are similar if using a fixed set of marriage ages.

[27] Given the recent advances in the two-way fixed effects literature, especially when the treatment variable is continuous (as in our case), in Section E.7 of the online appendix, we follow suggestions by Callaway et al. (2021) and Cook et al. (2023) to show that it is not a potential concern in our case.

[28] In this and all of the following analysis, the value of net dowry is negative if the transfer to the bride's side exceeds the value of the transfer to the groom's side.

both cases, we do not observe a statistically significant relationship.[29] Although we do not observe a relationship between sex ratio and dowry payments, it is possible that the magnitude of the relationship is sufficiently small that we are underpowered to detect it. However, this would still imply that the response of dowry to changes in sex ratio is not sufficiently large to generate the rise in dowry between 1940-1975, the pattern that this paper seeks to explain.[30]

However, as discussed earlier, sex ratio pressures may be relieved through changes in the age of marriage rather than necessarily dowry size. In the REDS data, the age at marriage is only recorded for the household head and their spouse, so this reduces the sample size to approximately five thousand marriages. Columns (3)-(5) of Table 1 use the same specification, but with the outcomes as the marriage age gap (defined as the age of the groom minus the age of the bride) and age at marriage for grooms and bridges. Results are consistent with Anderson (2007b): an increase in the number of marriage age women relative to men reduces the gap in bride and groom ages. Interestingly, the smaller gap comes from an increase in female age of marriage, suggesting sex ratios are at least partially responsible for the rise in female age of marriage in India over time.[31]

We now discuss two important caveats for the above analysis. First, the true marriage market sex ratio experienced by an individual would ideally be the ratio of marriage age women to marriage age men from the same *jati* and 'marriage market' as the individual. Since there are no data of such granularity, we have used district-level marriage age sex ratios as an approximation. For robustness, we also test alternate approaches to estimating the relevant sex ratio. Our first alternative approach uses the *Age Tables* from the 1991 round of the Indian Census, which gives the full age distribution of individuals by gender at the district level (e.g. as of 1991, there were 37,120 men and 36,260 women born

[29]Note that the number of observations is only 59,120 in the first column since we lack reliable census data prior to 1961, and so cannot run this regression for early years. There is a smaller number of observations in Column (2) than Column (1) because there are five states for which we observe whether dowry was paid, but not the dowry amount. In Appendix Section C.3, we implement two robustness checks: the first drops those five states for all of the outcomes in the table, and the second uses data on dowry amounts from the 2008 REDS in those five states. Results are very similar.

[30]For example, the next paragraph shows that women marry at older ages in response to sex ratio shifts, which could increase average dowry due to the positive relationship between female age of marriage and size of dowry. As a back of the envelope calculation on how much the shift in age of marriage would affect average dowry, we multiply the the aggregate change in sex ratio over this period with the estimated relationship between sex ratio and female age of marriage as well as with the estimated relationship between bride age and dowry in the data. The resulting implied effect on dowry due to marriage age adjustments is less than 5% of the overall inflation in dowry value between 1940 and 1975.

[31]Outside of India, other papers have found that imbalanced sex ratios change ages of marriage, including Bergstrom and Lam (1994) in Sweden, Brandt et al. (2016) in China, and Edlund (1999) in cross-country regressions. However, these papers do not estimate the effect on dowry and are primarily from non-dowry paying societies.

Table 1: Sex Ratio and Dowry

	Dowry (=1)	Dowry Value	Age Gap	Age of Marriage (Male)	Age of Marriage (Female)
	(1)	(2)	(3)	(4)	(5)
			Panel A: Sex Ratio (Census)		
Sex Ratio	0.087	-6.946	-3.043*	0.705	4.104**
	(0.123)	(37.335)	(1.692)	(2.062)	(2.041)
Oster's δ			-5.38		1.98
Observations	59120	40467	5477	5567	5480
			Panel B: Sex Ratio (All Sources)		
Sex Ratio	0.037	4.201	-1.575***	-0.226	1.355**
	(0.031)	(5.748)	(0.570)	(0.617)	(0.610)
Oster's δ			0.24		1.09
Observations	63080	43149	5851	5949	5854
			Panel C: Sex Ratio (Census, Static)		
Sex Ratio	-0.043	37.010	-1.061	1.214	2.327**
	(0.066)	(28.900)	(0.969)	(1.204)	(1.127)
Oster's δ			-10.23		-1.21
Observations	56095	38061	5273	5344	5275

Notes: This table reports the relationship between marriage market sex ratios and marriage outcomes. All specifications include controls for bride and groom education as well as district, time, and caste fixed effects. In column (1), the dependent variable is a dummy variable for if dowry was paid in a given marriage. In column (2), the dependent variable is the real value of the dowry payment, which is equal to zero if no payment was made. Age gap in column (3) is the difference in groom and bride ages. There is a smaller number of observations in column (2) than column (1) because there are five states for which we observe whether dowry was paid, but not the dowry amount. The REDS data contains data on marriage age only for the marriage of the head of the household, so there are fewer observations in columns (3) to (5). Panel A uses data from the census to define the district-level marriage market sex ratio. The census counts the total number of men and women within five year age ranges (0-4, 5-9, etc.) in each district. For each marriage, we use the REDS data to calculate the fraction of men/women within each age range who were on the marriage market over the preceding five year period. For each district, we multiply this by the number of men/women in that age range to calculate the sex ratio. Panel B uses the average of the marriage market sex ratio calculated in three different data sets: the census data (panel A), the Age Tables from the 1991 census, and pooled data from the National Sample Survey Survey (see Table B6 for details on calculating the sex ratio in those data sets). Standard errors are clustered at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

in 1975 in the West Godavari district of Andhra Pradesh). Another approach combines multiple rounds of the National Sample Survey (Rounds 38, 43, 50, 55, and 62) to construct sex ratios within broad caste groups at the state (rather than district) level. Both of these alternative approaches have strengths and weaknesses (see Section E.1 in the online appendix for a detailed discussion (Chiplunkar and Weaver, 2023)). For example, both of these allow us to construct marriage market sex ratios in each year rather than over five year periods, but are subject to mortality-related concerns since the data were collected after the marriages of interest. For each marriage, we estimate the sex ratio using all three methods of estimating sex ratio. Panel B of Table 1 takes the average across these three estimates and re-estimates Equation (1), while Panels A and B of Table B6 re-estimates the regression with the two alternative definitions of sex ratio separately. In each case, we find no relationship between sex ratios and dowry as well as a consistent relationship between marriage market sex ratios and marriage ages.[32]

Second, the identifying assumption behind our empirical strategy warrants careful examination, given that we do not have any plausible exogenous variation in the marriage market sex ratios. Given the district and year fixed effects, the identifying variation comes from the differential changes in marriage market sex ratios across districts over time.[33] This variation must either result from differential gender-specific pre-marital mortality across districts or differences in population growth rates, where faster population growth in some locations leads to more women on the marriage market with an approximately 15 year lag. Changes in gender-specific mortality rates can be directly observed and controlled for using the *contemporaneous* sex ratio at birth in a given period, which we define as the ratio of women between the ages of 0-4 to men between the ages of 0-4; if there were a decrease in this ratio, this would indicate that the survival rate for female children has decreased relative to the survival rate for male children. Results are similar after controlling for contemporaneous sex ratio (Panels C and D of Table B6), indicating that differential gender-specific pre-marital mortality does not explain the findings.[34] The identifying variation instead comes from lagged differential population growth rates across districts over time, i.e. whether changes in dowry amount between $t-5$ and t are greater for districts with a faster population growth approximately 15

[32] As a further robustness check, we re-estimate these regressions using fixed marriage age ranges when calculating the marriage market sex ratios, rather than allowing the age range to adjust over time. The results are similar though slightly weaker (Panels E and F of Table B6).

[33] To check whether there is sufficient variation after the inclusion of fixed effects, we regress the marriage market sex ratio on the district, time and caste fixed effects, and then plot the distribution of the residual in Figure A5(a). There is still substantial residual variation.

[34] Note that sex-selective abortions also only become prevalent in India after 1984 (Bhalotra and Cochrane, 2010), meaning that it should not affect the marriages in our sample (pre-1999).

years prior (i.e. change in the size of the cohort between $t-13$ and $t-20$ as compared to the cohort born from $t-18$ and $t-25$ relative to the preceding five year period).[35]

Given that the marriage squeeze hypothesis predicts a positive relationship between sex ratio and dowry while our estimate is indistinguishable from zero, the key concern is whether our estimates are downwards biased. There are two main empirical concerns with using lagged differential population growth rates. First, households may endogenously adjust their fertility in response to expectations of the value of dowry payments 15-20 years in the future. This could bias our estimates downwards if households lower total fertility in response to expected higher dowry payments. Other work on household response to dowry finds that although households do exhibit gender preference in fertility in response to changes to current dowry payments, this roughly balances out across male and female children (Bhalotra et al., 2020); thus we would not expect aggregate fertility to respond.[36] It is also likely to be difficult to accurately predict the trend in dowry over the next 20 years at the time of conception.

The bigger concern is that the determinants of population growth might independently affect dowry, such as wealth shocks increasing both population growth and dowry. However, a wealth shock should begin to affect dowry values immediately, rather than with a 15-20 year lag. This would also bias our estimates in a positive direction rather than towards zero, whereas we are concerned with factors that would bias our estimates in a negative direction.[37]

Lastly, we also examine the role of omitted variables more systematically by calculating Oster's δ statistic (Oster, 2019). This statistic indicates how important unobservables would need to be as compared to the observables for omitted variable bias to fully explain our results.[38] Of the statistically significant variables in both panels of Table 1 (age gap and age of marriage for women), the estimated δ is larger than one in 2 out of the 4 cases and negative in one other. Oster (2019) recommends a threshold of 1, while a negative value of δ indicates that the omitted variables would bias us in the opposite direction. This implies that omitted variable bias would have to be considerably large as

[35]Table B5, shows that the lagged population growth over the period t-20 to t-10 is strongly related to marriage market sex ratios using the Census data.

[36]In particular, Bhalotra et al. (2020) find that in response to shocks in the price of gold, prenatal mortality goes up for female children and down for male children at similar rates.

[37]Another concern is that pre-marital investments may respond to sex ratios (Lafortune, 2013). We do not observe a relationship between groom or bridal education and the marriage market sex ratios that they face (online appendix table OA9), likely because it takes time for rural households to recognize shifts in sex ratios and adjust pre-marital investments accordingly. Our empirical strategy relies on short-run fluctuations before there is time for pre-marital investment to respond.

[38]Similar to Oster (2019), we set $R^2_{max} = 1.2R^2$ i.e., we assume that inclusion of omitted variables in a hypothetical regression can lead to a maximum R^2 that is 1.2 times the estimated R^2 in our specification.

compared to the observables to explain away the results.

4.3 Modernization in Caste-Based Societies

Anderson (2003) develops a novel theoretical framework to explain why dowry disappears during modernization in some societies but increases in others. In this section, we provide a high-level overview of the theory, but mostly focus on two tests of its empirical predictions. In the portion of the model that pertains to India, individuals are divided into caste groups. Caste is an inherited and hierarchical characteristic, with a universally agreed upon ranking of caste groups. Potential brides are characterized by their caste and the wealth of their parents, while grooms are characterized by their caste and wealth. Matches form between brides and grooms, where dowry transfers are made from brides to the groom in order to secure matches. The model assumes that women prefer marrying men of higher caste status and wealth, where these characteristics are substitutable. Men are assumed to only care about the dowry they can receive, and so are indifferent to the caste status of their potential brides. In equilibrium, the size of dowry transfers are such that a bride married to a particular groom is indifferent between marrying him and the next best groom. Initially, marriages are between brides and grooms of the same caste group and positive assortative on wealth.

Modernization has two components in the model: increasing average wealth and increasing income dispersion within caste groups. The highest caste groups are the first to experience modernization/wealth dispersion, and over time, castes of progressively lower ranks also experience modernization. Broadly, an increase in within-caste wealth dispersion leads to an inflation in the size of dowry payments–because of how lower caste brides value upper caste grooms. For the lowest quality grooms within a given caste group of rank c, the wealth dispersion from modernization may cause their quality to be lower than that of the lowest quality groom of rank c in the previous period. However, as a result of the competition over them by brides from the caste group of rank $(c-1)$, the dowry they receive does not decline by as much as it otherwise would have.[39] Cross-caste competition causes further inflation as increased dispersion in the quality of lower caste grooms increases the dowries paid to higher caste grooms.

Fundamentally, the model revolves on the presence of cross-caste competition among brides over grooms. This is manifested in one of the model's key empirical predictions:

[39]This is the result of two assumptions: brides of lower castes are less sensitive to income differences among higher caste grooms than higher caste brides; and as part of a concavity assumption on the utility function of brides, the loss to a bride from marrying a groom one rank lower in the caste hierarchy is larger than the gain to "marrying up" one rank.

dowry payments for a caste of rank c will increase if there is an increased dispersion in groom quality/wealth among the castes ranked $\{1, ..., c-1\}$ below them in the caste hierarchy (*Proposition 4(b)* in Anderson, 2003). This occurs because increased dispersion leads to dowry inflation among the lower caste groups, and to maintain incentive compatibility and marriage within caste groups, dowry payments in caste c rise.

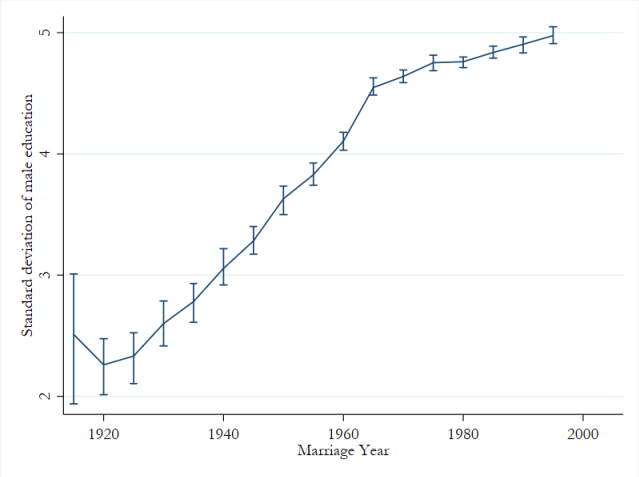
At an aggregate level, the time period of dowry inflation matches well with increasing dispersion in groom educational attainment in India. Figure 4 plots the standard deviation of the groom educational distribution among grooms married in a given five-year period among all grooms (Figure 4(a)) as well as within caste groupings (Figure 4(b)) in the REDS. There is a clear increase in dispersion in educational attainment that begins around 1940 and slows after 1965, lining up closely with the period of dowry inflation and the pattern of increasing dowry prevalence by caste, as seen in Figure 3.[40]

As a test of this model of cross-caste competition, we test the proposition that dowry payments for a caste of rank c are affected by increases in average groom quality or increased dispersion in groom quality among castes lower in the caste hierarchy. We focus on education as our measure of groom quality since there is a tight link between the level of educational attainment of a groom and the dowry they receive (see Section 4.4). First, we test how increases in educational attainment among Scheduled Castes (SC), the lowest group in the caste hierarchy, affect dowry payments among Other Backwards Classes (OBC), the next highest group in the caste hierarchy. Second, we test how increases in educational attainment among scheduled castes affect marriages among all individuals above them on the caste hierarchy. Finally, we look at how changes in the OBC educational attainment affect the dowry of general caste individuals, a broad category encompassing all those above OBCs. Note that the model predicts that changes among the lower castes will cascade through all of higher castes i.e., increases in educational attainment among one group affects the group immediately above them, and continue to cascade through higher caste marriages to preserve stable matches. This implies that the marriage market of the highest caste group can be affected by changes among even the lowest caste groups, even if lower caste households are too poor to directly compete for high caste grooms.

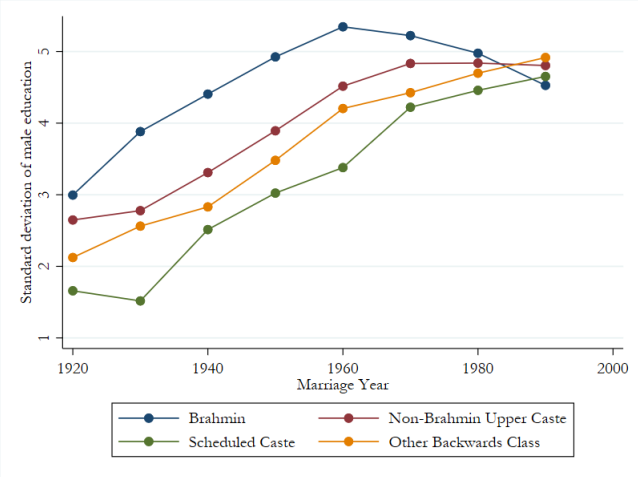
[40] Figure 4(c) shows that average education attainment is consistently increasing over the full sample period for both males and females.

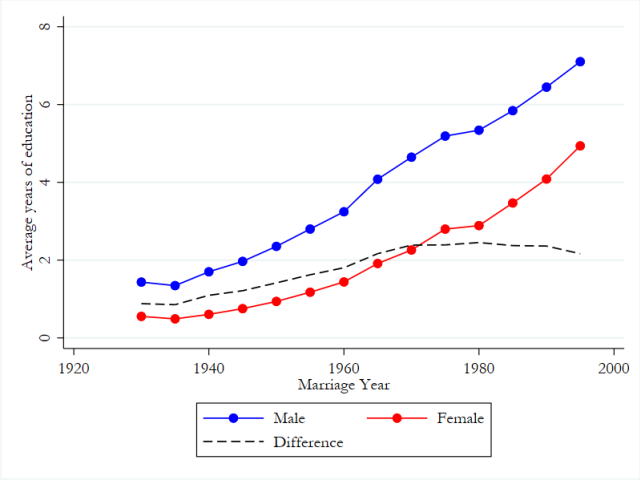
Figure 4: Educational attainment by year of marriage

(a) Dispersion of education (overall)



(b) Dispersion of education (by caste group)





(c) Average Educational Attainment by Gender

Note: This figure plots the standard deviation of the male educational attainment distribution for grooms married in the REDS data within a given five year period. Figure (a) plots the standard deviation across all grooms, while figure (b) plots it within larger caste groupings. Panel (c) plots the average years of education for brides and grooms in the REDS data over each 5 year period.

We use a two-way fixed effects specification so that identification comes from differential changes in lower caste groom quality across locations over time:

$$y_{mrsct} = \alpha_t + \alpha_{src} + \beta \text{ Lower Caste Quality}_{srt} + X_{mrsct}\gamma + \varepsilon_{mdt} \quad (2)$$

where: y_{mrsct} is the dowry payment in marriage m for an individual from state s, religious group r, and caste group c in year t. $LowerCasteQuality_{srt}$ is based on the NSS data and is either the average or standard deviation of educational attainment among the relevant group of lower caste men whose age would place them on the marriage market within a particular five year period (1950-1954, 1955-1959, 1960-1964, etc.), and who are from the same state and religious group as marriage m. The regression includes controls for the groom and bride quality in marriage m (years of education), and the average/standard deviation of education among grooms in the relevant state-religious group sample. Year (α_t) and religion-state-caste (α_{rsc}) fixed effects account for aggregate time trends and unobserved (time-invariant) heterogeneity over space. The theory only makes predictions on the magnitude of dowry payments rather than whether dowry is paid, so the net dowry payment is the sole outcome of interest.

Table 2: Dowry and shifts in the lower caste groom quality distribution

	OBC		OBC/general		General only	
	Dowry Value	Dowry Value	Dowry Value	Dowry Value	Dowry Value	Dowry Value
Lower Caste Groom Education Avg	6.383		22.75		10.01	
	(9.188)		(14.00)		(16.88)	
	[0.537]		[0.330]		[0.750]	
Lower Caste Groom Education SD		-4.058		1.726		-35.03
		(13.30)		(14.72)		(12.23)
		[0.818]		[0.921]		[0.211]
Observations	14206	14206	33709	33709	11019	11019
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table investigates how changes in educational attainment among lower caste groups affect the dowry payments of higher caste groups. Dowry value is reported in real terms (2010 rupees). In columns (1) and (2), we restrict to marriages in which the groom is OBC, while columns (3) and (4) also include general caste marriages. Columns (5) and (6) use data from two rounds of the NSS (55, 62) to look at the relationship between OBC educational and general caste marriages. p-values are wild clustered bootstrapped at the state-caste group level and included below the standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The first two columns of Table 2 restrict the sample of marriages in which the groom is OBC and check for a relationship with educational attainment among potential grooms in Scheduled Castes (SCs). Columns (3) and (4) relate SC educational attainment to dowry among the full set of general caste and OBC marriages, since this model predicts

that changes among the lowest caste groups will cascade to all higher caste groups, not just those directly above them in the caste hierarchy. Across all specifications, we do not observe a statistically significant relationship between changes in the educational distribution among low castes (either the average or standard deviations) and the size of dowry payments for higher caste individuals.

Although not directly in the model, one concern may be that SCs are so low in the caste hierarchy that they do not participate in cross-caste competition, but that there is such competition between OBC and General Caste grooms. Columns (5) and (6) thus test for a relationship between OBC educational attainment and dowry in General Caste marriages.[41] Again, we do not observe that increased educational attainment or dispersion in lower caste educational attainment increases higher caste dowry payments.

Another concern with this approach could be that the relevant demarcator of status is the *jati*, and OBC and General Castes are broad groupings that encompass many *jatis*. However, note that increases in average educational attainment among all SCs or OBCs imply that there must be increases for at least some *jatis* within that group. Since the model predicts cascading effects, increased education among even only some lower caste *jatis* should produce changes for marriages higher in the caste hierarchy. Although *jati*-level measures would allow for additional, more precise tests, the current data is sufficient to test the model predictions. Thus, the broad lack of response of upper caste marriages to changes in marriage market conditions among lower caste individuals suggests an absence of this type of cross-caste competition in marriage markets.

A last concern could be that education is an imperfect measure of groom quality, and other measures such as groom income would be better. In online appendix Section E.3, we use multiple rounds of the National Sample Survey to construct the average and standard deviation of groom earnings by state-identity group in a given time period (Chiplunkar and Weaver, 2023). We then rerun the analysis with income instead of education, but again find no evidence for cross-caste competition (see Table OA4).

As a second test of the theory, we examine whether the small number of cross-caste marriages in the data (1,810 cases) are consistent with a model in which there is cross-caste competition over grooms and a desire to "marry up". We create a variable that is equal to -1 if the wife is of a higher caste than the husband, 0 if they are of the same caste, and +1 if the husband is higher caste. Table B3 regresses whether dowry is paid and the

[41] Our sample size is reduced for this test because we use the NSS to measure the distribution of educational attainment, but some rounds of the NSS do not have data separately identifying OBC and general caste individuals. For this analysis, we use the rounds that do have this differentiation (Rounds 55 and 62), but since we require a minimum number of observations to estimate educational attainment, the sample size is smaller.

dowry amount on this variable, controlling for bride and groom education, and caste and birth order fixed effects. We also control for various (rather restrictive) temporal and spatial fixed effects, such as a household-five year fixed effect, where the variation comes from differences across marriages within the same household that occur over the same five year period.[42] Contrary to what the theory would suggest, we do not observe that brides pay more when "marrying up" as compared to "marrying down".[43]

While Anderson (2003) provides an elegant and internally consistent theory of how dowry practices might evolve over time, it does not appear to fit the Indian context. This is probably due to the assumption that brides prefer to marry higher caste men. Banerjee et al. (2013) estimate preferences over the caste of prospective partners using data on responses to matrimonial advertisements. Even among a relatively educated and urbanized sample, they find an extremely strong preference for marrying within caste; Hortaçsu et al. (2019) complement this by showing that even a large monetary incentive to marry across caste lines has only a small effect on inter-caste marriage. Therefore, such a high cost of marrying outside of caste can prevent cross-caste competition and dominate any vertical preferences that individuals might have over caste.

4.4 Changes in Labor Market Opportunities

Finally, we test whether changes in dowry result from changes in economic opportunities and educational attainment. Prior to the 1930s, the vast majority of rural India was uneducated and worked in agriculture. During the 1930s and following decades, there was an expansion in the availability of education, especially in response to the passage of compulsory primary schooling laws across a large number of states (Sharma and Sharma, 1996). Portions of the male labor force also began to shift out of agriculture into other types of jobs, such as those in urban areas and the public sector, which had the potential to earn higher and more stable wages. These often required some level of education, while technical change also led to positive returns to education in agriculture

[42] One might be concerned that there is insufficient variation to be statistically powered to detect a relationship. However, the standard errors allow us to rule out any economically meaningful positive relationship (low caste women pay more to marry high caste grooms). Even with the household-five year fixed effects, our 95% confidence intervals rule out positive effects of greater than 1.6pp on whether dowry was paid and on dowry amount of Rs 900.

[43] Another concern is that competition may occur within broader caste categories (e.g. OBC), but not outside of them. Appendix Figure A7 takes the set of inter-caste marriages and plot the percent of marriages by a groom within a particular caste group to a bride from each of the other caste categories. While grooms are more likely to marry someone within their category (57%), they do marry outside of their broad caste category 43% of the time; this points against "hard boundaries" at the level of caste group for inter-caste marriages. Banerjee et al. (2013) also estimates preferences over partners and finds evidence against this type of competition.

as well (Foster and Rosenzweig, 1995, 1996). Figure 4(a) shows the rapid increase in the dispersion of educational attainment among grooms between 1940 and 1965. This is followed by a slowdown in dispersion after 1965, which closely matches the period of dowry inflation, although mean educational attainment continued to rise in the post-1965 period (figure 4(c)). Caldwell et al. (1983) and Srinivas (1984) both hypothesized that competition over these scarce quality grooms was a reason for increases in both the prevalence and size of dowry payments.

More formally, an expansion in the number of more desirable grooms can potentially lead to dowry inflation in a two-sided matching market.[44] For simplicity, grooms can be thought of as either high quality or low quality types, while brides are not differentiated on quality. Dowry transfers can be made at the time of marriage in order to match with a particular groom– brides get a higher marital surplus from matching with a high quality type, so offer higher dowries to those grooms. The dowry payment to a low quality groom will depend on a potential bride's return to marrying them relative to remaining single; she will give no more than an amount that makes her indifferent to marrying a low quality man and remaining single. Dowry payments to the high quality grooms will similarly depend on the return to marrying them relative to low quality grooms. In the two-sided matching framework, an increase in the fraction of high quality grooms does not change bride's reservation utility from remaining single or marrying low quality grooms, so the dowry amount given to high quality groom would remain the same; we will later show that this is not true in a search model. As the fraction of high quality grooms increases, the average dowry payment increases, producing aggregate dowry inflation. Thus dowry inflation would initially come from payments to higher quality grooms, consistent with the initial shifts in the right tail of the dowry payment distribution observed in Figure 2. The key underlying mechanism is modernization, as in Anderson (2003), but here castes are operating in independent marriage markets.

We test this hypothesis by examining the returns to groom quality on the marriage market. A number of other papers have previously tested for associations between dowry size and groom education in India (Rao, 1993; Deolalikar and Rao, 1995; Dalmia, 2004), Bangladesh (Ambrus, Field and Torero, 2010), and Pakistan (Anderson, 2004) by regressing dowry payments on groom education. However, it is hard to know whether to attribute such an association to qualities of the groom or to other characteristics of the household related to groom qualities (e.g. overall wealth of the household, caste group,

[44]See Anderson (2004) for a theoretical model corresponding to the intuition laid out here. Anderson and Bidner (2015) builds on that earlier paper, but endogenizes decisions on pre-marital investments.

unobserved tastes for paying dowry).[45]

An advantage of the REDS data is that we observe multiple marriages within each household and so can account for time invariant confounders with household fixed effects. However, some of the most obvious confounds, such as household wealth and tastes, are not time invariant: a household may be relatively poor and have poorly educated grooms in the 1940s, but grow wealthier and educate its grooms in the 1960s. We thus include more stringent time-varying "household-five year" fixed effects, i.e. one fixed effect for marriages in that household between 1940-1944, another for marriages between 1945-1949, etc. Under this set of fixed effects, the identifying variation comes from whether differences in dowry between siblings married within the same five-year window are related to differences in their education.[46] While such stringent fixed effects implicitly drop only children or cases where all have the same level of education, there remains substantial residual variation in education to identify the coefficients, as seen in Figure A5.[47] For a marriage m in household h in district d in year t within the five-year band f, we estimate the following specification:

$$y_{mhdt} = \alpha_{hf} + \alpha_t + \beta e_{mhdt} + X_{mhdt}\gamma + \varepsilon_{mhdt} \tag{3}$$

where: y_{mhdt} is either a binary variable for whether dowry is paid or the real value of the dowry payment. X_{mhdt} contains a control for the bride's education and birth order fixed effects, e_{mhdt} is the years of education of the groom, and α_t and α_{hf} are marriage year and household-five year fixed effects respectively. Marriage year fixed effects account for changes in aggregate dowry payments over time, while birth order fixed effects account for cultural norms around birth order. β is not a causal estimate of the effect of education, since there may be omitted qualities of a groom related to education that allow them to command a higher dowry. However, since those omitted characteristics related to education are still measures of quality, we still observe what we

[45] Calvi, Fulford and Beauchamp (2022) also estimate preferences over spousal characteristics and dowry in India, but within a structural general equilibrium model. Their identifying assumption differs from these other papers, where their model moments are estimated from cross-sectional differences in marriage market conditions across districts rather than across individuals. However, it is difficult to directly compare to our estimates as a result of our approach being reduced form, as well as the differences in the data sets used (see Section 2 and Appendix Section C for more discussion on the data).

[46] The key identifying assumption is that there are not other within-household changes over that five year span that are simultaneously related to dowry and the quality of the groom. That is plausible given that education is completed prior to marriage for 97.4 percent of males in our sample.

[47] In Figure A5, we plot the distribution of the residual from a regression of years of education e_{mhdt} on a household-five year fixed effect (α_{hf}) and find substantial residual variation in the education levels after controlling for α_{hf} (around 25% of the underlying variation in education in the sample).

seek to measure, i.e. dowry responses to groom quality.[48]

Table 3: Dowry and education

	(1) Dowry (=1)	(2) Dowry Value	(3) Dowry (=1)	(4) Dowry Value	(5) Dowry (=1)	(6) Dowry Value
Groom Education (Years)	0.00291***	1.014***			0.00225*	0.610*
	(0.000810)	(0.249)			(0.00118)	(0.309)
Groom Education Percentile			0.0332**	15.24***	0.000335	6.399
			(0.0143)	(4.462)	(0.0182)	(4.977)
Observations	44298	30658	39435	26997	39435	26997
Oster's δ	9.068	8.553	6.800	15.65		0.604
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the relationship between groom education and marriage outcomes. In columns (1), (3) and (5), the dependent variable is a dummy variable for if dowry was paid. In columns (2), (4), and (6), the dependent variable is the real value of the dowry payment in 2010 rupees, which is equal to zero if no payment was made. There is a smaller number of observations in columns (2), (4) and (6) than columns (1), (3) and (5) because there are five states for which we observe only whether dowry was paid. We calculate the percentile rank in educational attainment using individual-level data from the National Sample Survey on men from the same state, religion, and caste group who are aged 18 to 25 in the year of marriage. The number of observations also drops in regressions with groom education percentile as an independent variable since we use the NSS data to calculate these percentiles, and there are insufficient observations in some cases. Standard errors are clustered at the district level. The table notes report the value of delta from Oster (2019). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Columns (1) and (2) of Table 3 indicate substantial returns to groom quality on the marriage market.[49] Educated grooms are substantially more likely to receive dowry ($p < 0.001$), and each additional year of a groom's education is associated with an increase in the real value of dowry of over Rs. 1000 (approximately 4 percent of the median dowry payment; $p < 0.001$).[50]

[48]It is not possible to use household-five year fixed effects in previous tests as sex ratio and distribution of education for lower caste grooms do not significantly vary within the household-five year fixed effect.

[49]Note that the number of observations is only 44,299 in the first column since we are restricting to households that experience multiple marriages within a five year period. The number of observations also drops when groom education percentile is included since there are insufficient observations in the NSS data to calculate percentiles in some cases. There is a smaller number of observations in the even columns (amount of dowry) than odd columns (whether dowry was paid) because there are five states for which we observe whether dowry was paid, but not the dowry amount. In Appendix Section C.3, we implement two robustness checks: the first drops those five states for all of the outcomes in the table, and the second uses data on dowry amounts from the 2008 REDS in those five states. Results are very similar.

[50]The relationship between whether dowry is paid and groom quality is attenuated by the nearly universal adoption of dowry by 1970. If we split the sample before and after 1970 and re-estimate Equation (3) for that outcome, the estimated coefficient $\hat{\beta}$ is 0.0058 ($p < .001$) in the pre-1970 period and 0.0020

While this is suggestive, it does not necessarily mean that an increasing number of higher quality grooms will result in dowry inflation. That will depend on the nature of bridal preferences over groom quality, and in particular, whether bridal utility is over the *absolute* level of groom quality or the groom's *rank* in the distribution of potential grooms. On the one hand, a bride seeking economic security should care about the absolute level of education (proxying for life-time income). On the other hand, if marrying a more educated groom is a "status" good, then brides should care about the rank of the groom in the relevant marriage market i.e., utility from marrying a groom with 10 years of education will be higher if this groom is the most educated groom in the local marriage market, as compared to if he is the median. Moreover, if preferences are over rank, changes in the distribution of groom earnings/education should not affect the average dowry size– a man at the 80^{th} percentile of groom quality would still receive the same dowry regardless of whether he has completed 5 or 10 years of education. However, if brides care about the absolute level of groom quality, then an increasing number of high quality grooms, who receive large dowries, will cause aggregate inflation in dowry.

We take advantage of the segmented nature of Indian marriage markets to identify whether bride preferences are over the absolute quality or rank of grooms. We define $\widetilde{e}_{mhdt}$ as the groom's percentile rank in the distribution of educational attainment for men in his marriage market.[51] Columns (3) and (4) of Table 3 estimate Equation (3) but with $\widetilde{e}_{mhdt}$ as the outcome variable instead of e_{mhdt} and suggest that individuals' relative rank within the marriage market is a strong predictor of receipt of dowry ($p = 0.022$) and dowry size ($p = 0.003$).

$$y_{mhdt} = \alpha_{hf} + \alpha_t + \beta_1 e_{mhdt} + \beta_2 \widetilde{e}_{mhdt} + X_{mhdt}\gamma + \varepsilon_{mhdt} \tag{4}$$

Equation (4) then runs a horse race between e_{mhdt} and $\widetilde{e}_{mhdt}$ to see which set of preferences determine dowry payments. We are able to separately identify β_1 and β_2 due to the segmentation of marriage markets in India. For example, suppose there were two sets of brothers on the marriage market from state s in a five year period f, but one set of brothers is from caste group A and the second is from caste group B. In both sets, the

($p = 0.025$) in the post-1970 period.

[51] We calculate the distribution of education attainment by combining individual-level data from multiple rounds of the National Sample Survey. We calculate the groom's relative position among men from the same state, religion, and broad caste grouping (SC, ST, and general+OBC) who are aged 18 to 25 in the year of marriage. For example, for a Scheduled Caste Hindu groom who was married in 1984 in Rajasthan, we calculate the number of Scheduled Caste Hindu males in Rajasthan aged 18-25 in 1984 who had lower educational attainment than this groom. We divide that by the total number of Scheduled Caste Hindu males in Rajasthan aged 18-25 in 1984 to get their percentile ranking.

first brother has 8 years of education and the second has 10 years of education, but the brothers from caste A are in the 30^{th} and 50^{th} percentile of the distribution of education in their market, while those from caste B are in the 70^{th} and 80^{th} percentile of their market. Intuitively, β_1 and β_2 are derived from taking the difference in dowry between the brothers and seeing if that is related to either the difference in their years of education (2 years) or their relative ranking in the educational distribution (20 p.p. and 10 p.p.).

As reported in Column (6) of Table 3, only years of education is a statistically significant predictor of dowry payments ($p = 0.008$) after both variables are included.[52,53] Moreover, the estimated coefficient on the groom's percentile $\hat{\beta}_2$ drops sharply (Columns 4 and 6). This implies that bridal preferences over the absolute level of groom education are a stronger predictor of dowry payments, as opposed to the relative standing of the groom in the distribution. Therefore, the increase in average level of groom education (and hence potential earnings) before 1970 discussed above could rationalize the dowry inflation observed during this period.

As a back of the envelope calculation, we estimate the extent to which the rise of dowry can be explained by this mechanism. Since the returns to groom education on the marriage market may change over time, we use the same household-fixed effects strategy to estimate separate returns to groom education for each 5 year interval between 1930 and 1980 (i.e. estimate Equation (3) for each five year interval to separately determine the returns to education for 1945-1949, 1950-1954, etc.). We then multiply the estimated returns to education by the change in the groom educational distribution between five year intervals to determine how much we expect dowry to increase over that period, and sum up across all of the intervals. Summed over all of the intervals, changes in groom education explains around 70 percent of the increase in dowry amounts between 1930-1980 (71.8 percent of change in median dowry, 68.9 percent of change in mean dowry). Given that education is not a perfect proxy for the change in the groom earnings distribution, the explanatory power may be even higher if we were able to observe that. While other factors may also play a role, changes in the groom quality distribution appear to be a significant factor in the observed changes in dowry payments.[54]

[52]In Column (5), neither coefficient is statistically significant, likely due to the high degree of collinearity between e_{mhdt} and $\widetilde{e}_{mhdt}$. However, the coefficient on education percentile has shrunk to a third of its value in Column (4), while the attenuation of $\hat{\beta}_1$ is much smaller; the coefficient $\hat{\beta}_1$ would still be statistically significant at the 5% level if the standard errors were the same as in Column (1).

[53]Similar to Section 4.2, we also report the values of Oster's δ statistic in the table (Oster, 2019). Given the estimated values of δ , it is unlikely that these patterns are driven by omitted variables.

[54]Figure A6 plots the percent of marriages with dowry by the education level of the groom and shows that the prevalence of dowry is higher among the more educated grooms. Moreover, the change in the distribution of dowry amounts by education group (Figure A9) shows that the distribution is relatively static, with a slight shift outwards between 1940 and 1970 for each of the educational groups.This is

In Section E.4 of the online appendix, we provide additional corroborative evidence by taking advantage of a policy reform that led to the expansion of primary education due to the District Primary Education Program (DPEP) (Chiplunkar and Weaver, 2023).[55] Under this program, districts that were below the national average of female literacy rate in 1991 received additional primary schooling resources, which translated into higher levels of education attainment–but only for boys and not girls (Khanna, 2023). This creates an exogenous (policy-induced) increase in the education level of grooms on the marriage market later on, which we find results in higher average dowry payments in those districts.

One question raised by these results is why modernization did not lead similar dowry inflation in other societies.[56] There are many unique features of the Indian context that could explain this, where cultural aspects of India (aside from caste) may interact with economic factors to produce a different path for dowry. For one, India is unique in having female labor force participation decline with modernization. As a result, improved economic opportunities from modernization may disproportionately favor men on the marriage market relative to countries in which modernization is accompanied by higher female labor force participation. Another possible explanation is that in India, individuals typically marry partners from outside their local areas. As a result, households may match more strongly based on economic characteristics rather than non-economic factors that are only observable when matching to partners within a local geographical area (e.g. personality). In the end, the question is likely impossible to answer empirically given there is one observation (India) and a high-dimensional vector of plausible explanations. Our focus is on explaining changes in marriage practices in a single country, as in Ambrus, Field and Torero (2010), and so we see the question of why India is different from other countries as outside of the scope of the paper.

4.5 Changes in Labor Market Opportunities in a Search Model

One remaining question is why there is a decline in high value dowry payments in the post-1975 period, especially given the relative stability in lower value dowry payments

followed by an inwards shift of the distribution for all of the groups post-1970. Put together, it is plausible that most of the large increase in average dowry followed by its muted fall post 1975 can be explained by shifts in the prevalence of the more highly educated grooms.

[55] We thank an anonymous referee for this suggestion.

[56] An advantage of the model in Anderson (2003) is that it offers an explanation for why dowry declined in Europe after modernization. Within the model, modernization in non-caste based societies leads to declines in dowry. However, this is a particular matching model, and it is possible to write alternative models based on different assumptions in which modernization in non-caste based societies could produce dowry inflation.

(see Figure 2). We propose a refinement of the existing theories to characterize marriage markets with a search model rather than a matching model. This refinement produces a channel where competitive pressures lead to the decline in high value dowries.

In this model, there are two types of individuals of gender $g \in \{M, F\}$ on the marriage market: educated or high quality (H) and uneducated, low quality (L), where α^g is the fraction of H-type individuals. These potential brides and grooms are randomly matched, bargain over dowry, and marry if they are able to agree on a dowry payment. If not, they are rematched in the next period and repeat the process. The model predicts that *conditional* on the fraction of H-type brides, an increase in the fraction of educated grooms in the population (α^m) has two effects on how average dowry evolves. First, brides receive a higher marital surplus from marrying a more educated groom. Therefore, she would prefer to match with him even at a higher dowry, rather than randomly rematch with a different, potentially lower quality groom in the future. This would suggest an increase in average dowry as more grooms get educated. However there is also a second countervailing force: with an increase in α^m, a bride now also has a higher probability of meeting a high quality groom if she rematches in the future, and so he has to give up some of his surplus for her to match with him. Such a model is consistent with each of the patterns observed in the data: while the former channel dominates for low values of α^m, an inflection point is eventually reached, where the latter channel starts to dominate instead. To put it another way, with an increase in the dispersion in groom quality, there is initially an increase in the size of dowry (driven by high value dowries received by educated grooms). However, this is eventually followed by a decline dowries, as these higher quality men no longer command such large sums because there are more of their type.[57,58]

To test the predictions of the model, we want to see whether returns to groom education decline as the number of educated grooms on the marriage market increases. For each marriage in the REDS data, we use the NSS data to calculate the fraction of men in the same state-religion-caste marriage market with twelve or more years of education.[59]

[57] We present and solve the theoretical model in Section D of the online appendix (Chiplunkar and Weaver, 2023). The model also predicts a decrease in average dowry as more women get educated i.e., as α^f increases (Figure D1). Given the rapid increase in male as opposed to female education in India during this period, we focus on the former in this paper, and provide evidence later in this section that groom education is the more important channel.

[58] A more complicated model with more than two types can also match the increase in the prevalence, rather than just size, of dowry – for example, suppose there were three types, where the surplus from marrying the lowest quality type is equal to the value of remaining single. This man would receive a dowry of zero. As the proportion of this type in the the population shrinks, the proportion of marriages with dowry increases.

[59] We select 12 or more years of education because that is the highest level available in the NSS data.

Table 4: Dowry and education with marriage market competition

	(1) Dowry (=1)	(2) Dowry Value	(3) Dowry (=1)	(4) Dowry Value	(5) Dowry (=1)	(6) Dowry Value	(7) Dowry (=1)	(8) Dowry Value
Groom Education	0.00612***	2.085***			0.00579***	2.204***	0.00658***	1.814***
(Years)	(0.00187)	(0.637)			(0.00182)	(0.674)	(0.00193)	(0.588)
Groom Education X	-0.0156**	-5.088*			-0.00618	-8.274**	-0.00468	-11.27**
Highly Educated Frac	(0.00692)	(2.729)			(0.00993)	(4.092)	(0.0101)	(4.283)
Above Med. Education			0.0408***	15.57***				
			(0.0133)	(3.913)				
Above Med. Education			-0.0769	-39.73**				
X Highly Educated Frac. (Male)			(0.0545)	(15.19)				
Groom Education X					-0.0149	5.290		
Highly Educated Frac. (Women)					(0.0117)	(3.741)		
Groom Education X							-0.00176	1.083**
Avg Fem Education							(0.00114)	(0.449)
Observations	43002	29616	43002	29616	43002	29616	43002	29616
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the returns to education on the marriage market as a function of aggregate marriage market characteristics. In odd columns, the dependent variable is a dummy variable for if dowry was paid, and in even columns, the dependent variable is the real value of the dowry payment in 2010 rupees, which is equal to zero if no payment was made. Groom education is defined in years. Highly Educated Fraction is the fraction of men on the marriage market in the same state-caste-five year period with more than 12 years of education. Above Median Education takes the value 1 if the groom's education is above the median education level for men. All regressions include controls for the bride's education. There is a smaller number of observations in even columns because there are five states for which we observe whether dowry was paid, but not the dowry amount. Standard errors are clustered at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

We therefore modify Equation (3) to estimate the following relationship:

$$y_{mhdt} = \alpha_{hf} + \alpha_t + \beta_1 e_{mhsct} + \beta_2 e_{mhsct} \times \text{ Frac. Educated}_{scf} + X_{mhdt}\gamma + \varepsilon_{mhsct} \qquad (5)$$

where: y_{mhsct} is the (real) dowry payment, e_{mhsct} is the years of education of the groom, $Frac.Educated_{scf}$ is the fraction of prospective grooms within this state-religion-caste over this five year period that have attained twelve or more years of education, and (like before) α_t and α_{hf} are marriage year and household-five year fixed effects respectively. A non-interacted term $Frac.Educated_{scf}$ is excluded because it is absorbed by the household-five year fixed effects. We are interested in the sign of β_2, which can be interpreted as how the educational level of other grooms on the marriage market affects the returns to education in terms of dowry. A negative sign would imply that a higher fraction of educated grooms on the marriage market reduces the dowry premium for more educated grooms.

The results are reported in Table 4. From Columns (1) and (2), the returns to groom education–either in the probability of receiving dowry, or the value of dowry–decrease as the proportion of highly educated grooms increases (p-value=*0.027* and p-value=*0.067*

18% of grooms in the REDS sample have 12 or more years of education (mostly because there are more observations in later years), with that proportion quadrupling between the 1940s and 1990s. This aligns closely with other papers measuring educational attainment over this time period (Mukherjee, 2004).

respectively). This is also robust to an alternative definition of e_{mhsct} in columns (3) and (4), where we use a binary variable for whether the groom has more than the median level of education in the sample. There is the same pattern when looking at the size of dowry payment (Column (4), p-value=*0.011*), and the result on whether dowry is paid has a negative point estimate that is just below significance at conventional levels (Column (3); p-value=*0.16*).[60] Put together, these results provide support of a search model in which the returns to groom education decrease as the supply of educated grooms increases.

The principal concern with Equation (5) is that areas with an increasing fraction of educated grooms are changing in other ways that could affect the returns to education for grooms on the marriage market. Groom education is an endogenous choice, and high returns to education on the marriage market may cause investment in groom education. This reverse causality would bias the estimate of β_2 in a positive direction, and so cannot explain the consistently negative estimates of β_2. Moreover, areas with faster growth in groom education may also have faster economic growth, which could increase the size of dowries by increasing household wealth or raising the returns to education (Rosenzweig, 2010). Again, this would bias β_2 in the opposite direction of what we observe.[61]

Another possibility, as outlined in our theoretical model above, is that growth in male education is correlated with growth in female education (see Figure 4(c)), and improved female education could produce the decline in dowry payments. We conduct three checks to examine this hypothesis. First, we use the NSS data and similar to the males, calculate the educational attainment of potential brides in the same state-religion-caste group during the five-year period in which the marriage occurs. Columns (4)-(8) of Table 4 then add interactions between this variable and e_{mhsct} to the regression. In Columns (5) and (6), we look at the interaction with the fraction of women in the most highly educated category, exactly as we did with male education in Columns (1) and (2). Since few women are in the highest education category at this time, Columns (7) and (8) interact groom education with average female education instead. In all cases, the coefficient on the interaction of groom education with the fraction of highly educated grooms (β_2) is larger (more negative) in magnitude as compared to Column (2), implying that if anything, the estimates in columns 1 and 2 were conservative.[62]

[60] This could be because dowry payment is almost universal around midway through the study period, so we are underpowered to detect an effect on dowry prevalence.

[61] A final possibility is that the increase in the proportion of educated grooms depresses the economic returns to education on the job market, which lowers the marriage market value of education (Khanna, 2023). Given that this mechanism is similar to the one proposed, we do not seek to disentangle the two.

[62] An interesting point to note is that the coefficient of "Groom Education X Avg Fem Education" in Column (8) of Table 4 is positive. This could result from intra-household complementarities that cause an

As a second check, we examine the aggregate effects of changes in average male and female education on dowry payments. Similar to the previous analysis, we calculate average male and female educational attainment at the state-religion-caste-year using the NSS data. We then regress dowry value on average male and female education attainment, controlling for marriage characteristics, economic conditions, and state-religion-caste and marriage year fixed effects. The identifying variation therefore comes from the differential changes in educational attainment across state-religion-caste groups over time (similar to the other tables). As reported in Table B7, increases in average male educational attainment increase dowry, and increases in average female education decrease it.[63] However, the magnitude of these estimates imply that a one year increase in average male education has an effect 1.75-2 times larger than a one year increase in female education.[64] Figure 4(c)) shows that the increases in female education over our sample period are never more than 1.75-2 times larger than male education, meaning that this cannot explain aggregate declines in dowry; however, this may not be true in more recent years when growth in female education has accelerated.

Lastly, the above discussion shows that while an increase in female education is unlikely to explain the decline in dowry, it could nevertheless be an important driver of dowry dynamics. To assess its quantitative importance, we take the estimated coefficients from Column (6) of Table 4 and use the male and female education distribution (from the previous analysis), to predict the average dowry for each five-year period between 1930-95 (denoted by $\bar{D}_t^0$).[65] Next, in a counterfactual simulation, we fix the female education distribution to that in 1930, and predict average dowry for each five-year period again ($\bar{D}_t^1$). By construction, the ratio $\bar{D}_t^1 / \bar{D}_t^0$ therefore captures the change in av-

increase in the returns to groom education when there are more educated brides on the market; in this scenario, if shifts in the bride and groom educational distributions are positively correlated, then failure to account for the distribution of bride education in a regression would cause the (negative) coefficient on the interaction of groom education and the fraction of highly educated grooms (β_2) to be biased in a conservative (positive) direction. While better understanding of these potential complementarities between male and female education in the marriage market is certainly interesting and important, we view this as outside the scope of this paper.

[63]Columns (2) and (3) show robustness to inclusion of different types of fixed effects, including household fixed effects and household-generation fixed effects. We are unable to use household-five year fixed effects here because this removes nearly all identifying variation, which comes from variation in male/female education across state-religion-caste groups as opposed to the individual.

[64]The larger effect of male education is plausibly because low female labor force participation means returns to female education come from within-household channels such as educating children (Behrman et al., 1999b). Although valuable, these are likely less valued than wages accruing to more educated males in the labor market.

[65]See appendix E.5 for a more detailed discussion of this method. We take into account the precision of the estimate for each regression coefficient ($\hat{\beta}$) by simulating dowry payments using the underlying distribution of each $\hat{\beta}$, as measured by the point-estimate and its corresponding standard error, and averaging over these simulations.

erage dowry that can be explained solely by changes to the male education distribution. In the post 1975 period (when we observe a decline in dowry), this ratio is around 85% from 1975-85 and around 80% from 1985-95, meaning that changes in male education are substantially more important than changes in the female distribution.[66]

Put together, we interpret the above analysis as evidence that the increase in proportion of educated grooms (and hence the search channel) was an important channel driving the decline in dowry after 1975. However, by no means was it the only factor. For example, Calvi and Keskar (2021b) and Alfano (2017) find that the passage of the Dowry Prohibition Act amendment in 1985 significantly lowered dowry payments. Moreover, changes to the brides' side of the marriage market, and in particular, the continued increase in female education in recent years may play an important part in further lowering dowry payments. We leave it to future work to consider these other channels.

5 Conclusion

This paper provides evidence on what factors explain the institution of dowry in India. We document key facts and show that many prominent theories are not supported by the data. Instead, the emergence and evolution of dowry is best explained by shifts in the distribution of groom quality during the process of modernization. This has relevance for policy: if policymakers wish to eliminate dowry due to its many undesirable consequences, they need to understand what causes dowry. For example, if dowry emerges because payment of dowry increases social status (e.g. Sanskritization), anti-dowry strategy should focus on changing norms among high status individuals. On the other hand, if the relative earnings distributions of brides and grooms determine dowry, then encouraging female labor force participation is a promising strategy.

Our findings suggest that norms-based approaches to eliminating dowry may prove less effective because of the strong economic factors that perpetuate dowry. On the bride side, families who refuse to pay dowry for their daughters are left with lower quality grooms. Grooms have a strong economic incentive to accept dowry, particularly if their family has to pay dowry for its own female children or wants to recoup investments in the groom's education. Future campaigns to eliminate dowry must acknowledge these factors and address the economic factors that perpetuate dowry, such as low labor force participation of women.

[66]For robustness in Appendix E.5, we re-calculate the ratio by estimating Equation 5 with more flexible interactions between the male and female education distributions. The results are similar: changes in male education continue to explain over 65-75% of the predicted dowry changes post 1975.

While this paper addresses many empirical questions on dowry, others remain. We have focused on the male side of the marriage market, but it would be useful to understand how changes on the bridal side of the market affect dowry. Existing evidence points in different directions: Calvi et al. (2022) and Dalmia (2004) find that higher levels of education for women reduces their marriage market value, while Behrman et al. (1999a) and Maertens and Chari (2020) conclude the opposite. Our data is not well-suited to test for the female side of the market, but future research should consider collecting data on dowry and marriage market outcomes as part of experiments related to female education, empowerment, or labor force participation in order to better understand that side of the market. Our paper also does not address why modernization did not lead similar dowry inflation in other societies, the focus of the model in Anderson (2003). There are many unique features of the Indian context that could explain this, such as the low rates of female labor force participation and nature of marriage market matching, but this remains an interesting question for other future research.

References

Alfano, Marco, "Daughters, dowries, deliveries: The effect of marital payments on fertility choices in India," *Journal of Development Economics*, 2017, *125*, 89–104.

Ambrus, Attila, Erica Field, and Maximo Torero, "Muslim family law, prenuptial agreements, and the emergence of dowry in Bangladesh," *The Quarterly Journal of Economics*, 2010, *125* (3), 1349–1397.

Anderson, Siwan, "Why Dowry Payments Declined with Modernization in Europe but Are Rising in India," *Journal of Political Economy*, 2003, *111* (2), 269–310.

_ , "Dowry and Property Rights," Technical Report, Mimeo 2004.

_ , "The Economics of Dowry and Brideprice," *Journal of Economic Perspectives*, 2007, *21* (4), 151–174.

_ , "Why the marriage squeeze cannot cause dowry inflation," *Journal of Economic Theory*, 2007, *137* (1), 140–152.

_ **and Chris Bidner**, "Property Rights Over Marital Transfers," *The Quarterly Journal of Economics*, 2015, *130*, 1421–1484.

Anukriti, S, Sungoh Kwon, and Nishith Prakash, "Saving for dowry: Evidence from rural India," *Journal of Development Economics*, 2022, *154*, 102750.

Arunachalam, Raj and Trevon D. Logan, "Is There Dowry Inflation in South Asia?," *Historical Methods: A Journal of Quantitative and Interdisciplinary History*, 2014, *47* (2), 81–94.

Ashraf, Nava, Natalie Bau, Nathan Nunn, and Alessandra Voena, "Bride price and female education," *Journal of Political Economy*, 2019.

Banerjee, Abhijit, Esther Duflo, Maitreesh Ghatak, and Jeanne Lafortune, "Marry for what? Caste and mate selection in modern india," *American Economic Journal: Microeconomics*, 2013, *5* (2), 33–72.

Becker, Gary S, "A theory of Marriage: Part I," *Journal of Political Economy*, 1973, *81* (4), 813–846.

Behrman, Jere, Andrew Foster, Mark Rosenzweig, and Prem Vashishta, "Women's Schooling, Home Teaching, and Economic Growth," *Journal of Political Economy*, 1999, *107* (4), 682–714.

Behrman, Jere R, Andrew D Foster, Mark R Rosenweig, and Prem Vashishtha, "Women's schooling, home teaching, and economic growth," *Journal of political Economy*, 1999, *107* (4), 682–714.

Bergstrom, Theodore and David Lam, "The effects of cohort size on marriage markets in twentieth century Sweden," in "The Family, the Market, and the State in Ageing Societies," Oxford University Press, 1994, pp. 46–63.

Bergstrom, Theodore C and David Lam, "The two-sex problem and the marriage squeeze in an equilibrium model of marriage markets," 1991.

Bhalotra, Sonia, Abhishek Chakravarty, and Selim Gulesci, "The price of gold: Dowry and death in India," *Journal of Development Economics*, 2020, *143*, 102413.

Bhalotra, Sonia R and Tom Cochrane, "Where have all the young girls gone? Identification of sex selection in India," 2010.

Bhaskar, Venkataraman, "The Demographic Transition and the Position of Women: A Marriage Market Perspective," *Working Paper*, 2016.

Billig, Michael S, "The marriage squeeze on high-caste Rajasthani women," *The Journal of Asian Studies*, 1991, *50* (02), 341–360.

_ , "The marriage squeeze and the rise of groomprice in India's Kerala state," *Journal of Comparative Family Studies*, 1992, pp. 197–216.

Bloch, Francis and Vijayendra Rao, "Terror as a bargaining instrument: A case study of dowry violence in rural India," *American Economic Review*, 2002, *92* (4), 1029.

_ **,** _ **, and Sonalde Desai**, "Wedding celebrations as conspicuous consumption signaling social status in rural India," *Journal of Human Resources*, 2004, *39* (3), 675–695.

Borker, Girija, Jan Eeckhout, Nancy Luke, Shantidani Minz, Kaivan Munshi, and Soumya Swaminathan, "Wealth, Marriage, and Sex Selection," Technical Report, Working Paper, Cambridge University 2017.

Botticini, Maristella and Aloysius Siow, "Why Dowries?," *American Economic Review*, 2003, *93* (4), 1385–1398.

Brandt, Loren, Aloysius Siow, and Carl Vogel, "Large demographic shocks and small changes in the marriage market," *Journal of the European Economic Association*, 2016, *14* (6), 1437–1468.

Caldwell, John C, Palli Hanumantha Reddy, and Pat Caldwell, "The Causes of Marriage Change in South India," *Population Studies*, 1983, *37* (3), 343–361.

Callaway, Brantly, Andrew Goodman-Bacon, and Pedro HC Sant'Anna, "Difference-in-differences with a continuous treatment," *arXiv preprint arXiv:2107.02637*, 2021.

Calvi, Rossella and Ajinkya Keskar, "Dowries, resource allocation, and poverty," *Journal of Economic Behavior & Organization*, 2021, *192*, 268–303.

_ **and** _ , "'Til Dowry Do Us Part: Bargaining and Violence in Indian Families," *CEPR Working Paper*, 2021.

_ **, Scott Fulford, and Andrew Beauchamp**, "Terms of Engagement: Marriage and Migration in India," *Working Paper*, 2022.

Chakraborty, Tanika, "Trade liberalization in a traditional society: implications for relative female survival," *World Development*, 2015, *74*, 158–170.

Chiplunkar, Gaurav and Jeffrey Weaver, "Online Appendix for "Marriage Markets and the Rise of Dowry in India"," *SSRN Working Paper 4419201*, 2023.

Cook, Lisa D, Maggie EC Jones, Trevon D Logan, and David Rosé, "The Evolution of Access to Public Accommodations in the United States," *The Quarterly Journal of Economics*, 2023, *138* (1), 37–102.

Corno, Lucia, Nicole Hildebrandt, and Alessandra Voena, "Age of marriage, weather shocks, and the direction of marriage payments," *Econometrica*, 2020, *88* (3), 879–915.

Dalmia, Sonia, "A hedonic analysis of marriage transactions in India: Estimating determinants of dowries and demand for groom characteristics in marriage," *Research in*

Economics, 2004, *58* (3), 235–255.

_ **and Pareena G Lawrence**, "The Institution of Dowry in India: Why It Continues To Prevail," *The Journal of Developing Areas*, 2005, *38* (2), 71–93.

de Chaisemartin, Clément, Xavier d'Haultfoeuille, Félix Pasquier, and Gonzalo Vazquez-Bare, "Difference-in-Differences estimators for treatments continuously distributed at every period," *arXiv preprint arXiv:2201.06898*, 2022.

Deolalikar, Anil B and Vijayendra Rao, "The demand for dowries and bride characteristics in marriage: empirical estimates for rural south-central India.," 1995.

Dugar, Subhasish, Haimanti Bhattacharya, and David Reiley, "Can't Buy Me Love? A Field Experiment Exploring the Trade-off Between Income and Caste-Status in an Indian Matrimonial Market," *Economic Inquiry*, 2012, *50* (2), 534–550.

Edlund, Lena, "Son preference, sex ratios, and marriage patterns," *Journal of political Economy*, 1999, *107* (6), 1275–1304.

_ , "The Marriage Squeeze Interpretation of Dowry Inflation: A Comment," *Journal of Political Economy*, 2000, *108* (6), 1327–1333.

_ , "The Price of Marriage: Net vs. Gross Flows and the South Asian Dowry Debate," *Journal of the European Economic Association*, 2006, *4* (2/3), 542–551.

Epstein, T. Scarlett, *South India: Yesterday, Today and Tomorrow*, Macmillian, 1973.

Foster, Andrew and Nizam Khan, "Equilibrating the marriage market in a rapidly growing population: Evidence from rural Bangladesh," *Unpublished manuscript*, 2000.

Foster, Andrew D and Mark R Rosenzweig, "Learning by doing and learning from others: Human capital and technical change in agriculture," *Journal of political Economy*, 1995, *103* (6), 1176–1209.

_ **and** _ , "Technical change and human-capital returns and investments: evidence from the green revolution," *The American economic review*, 1996, pp. 931–953.

Godbout, Jacques T and Alain C Caille, *World of the Gift*, McGill-Queen's Press-MQUP, 1998.

Hortaçsu, Ali, Sam Il Myoung Hwang, and Divya Mathur, "Monetary incentives on inter-caste marriages in India: Theory and evidence," *Journal of Development Economics*, 2019, *141*, 102371.

Khanna, Gaurav, "Large-scale education reform in general equilibrium: Regression discontinuity evidence from india," *Journal of Political Economy*, 2023, *131* (2), 000–000.

Lafortune, Jeanne, "Making yourself attractive: Pre-marital investments and the returns to education in the marriage market," *American Economic Journal: Applied Economics*, 2013, *5* (2), 151–78.

Maertens, Annemie and AV Chari, "What's Your Child Worth? An Analysis of Expected Dowry Payments in Rural India," *World Development*, 2020, *130*, 104927.

Mauss, Marcel, *The gift: The form and reason for exchange in archaic societies*, routledge, 2002.

Mukherjee, Dipa, "Educational attainment in India: trends, patterns and policy issues," 2004.

Oster, Emily, "Unobservable selection and coefficient stability: Theory and evidence," *Journal of Business & Economic Statistics*, 2019, *37* (2), 187–204.

Rajaraman, Indira, "Economics of Bride-Price and Dowry," *Economic and Political Weekly*, 1983, *18* (8), 275–279.

Rao, Vijayendra, "The Rising Price of Husbands: A Hedonic Analysis of Dowry Increases in Rural India," *Journal of Political Economy*, 1993, *101* (4), 666–677.

_ , "The Marriage Squeeze Interpretation of Dowry Inflation: Response," *Journal of Political Economy*, 2000, *108* (6), 1334–1335.

Rosenzweig, Mark R, "Microeconomic approaches to development: Schooling, learning, and growth," *Journal of Economic Perspectives*, 2010, *24* (3), 81–96.

_ **and Oded Stark**, "Consumption Smoothing , Migration , and Marriage : Evidence from Rural India," *Journal of Political Economy*, 1989, *97* (4), 905–926.

Roulet, Marguerite, "Dowry and prestige in north India," *Contributions to Indian Sociology*, 1996, *30* (1), 89–107.

Roy, Sanchari, "Empowering women? Inheritance rights, female education and dowry payments in India," *Journal of Development Economics*, 2015, *114*, 233–251.

Sautmann, Anja, "Partner Search and Demographics: The Marriage Squeeze in India," *Working Papers*, 2011.

Sekhri, Sheetal and Adam Storeygard, "The Impact of Climate Variability on Crimes Against Women: Dowry Deaths in India," *Journal of Development Economics*, 2014, *111*, 212–223.

Shafir, Eldar, Peter Diamond, and Amos Tversky, "Money Illusion," *The Quarterly Journal of Economics*, 1997, *112* (2), 341–374.

Sharma, Ram Nath and Rajendra Kumar Sharma, *History of education in India*, Atlantic Publishers & Dist, 1996.

Singh, Vir Bahadur, *Economic History of India, 1857-1956*, Allied Publishers, 1965.

Smith, Herbert L., Sharon J. Ghuman, Helen J. Lee, and Karen Oppenheim Mason, "Status of Women and Fertility," 2000.

Srinivas, M.N., "A note on Sanskritization and Westernization," *The Journal of Asian Studies*, 1956, *15* (04), 481–496.

_ , *The Remembered Village*, University of California, Berkeley Press, 1976.

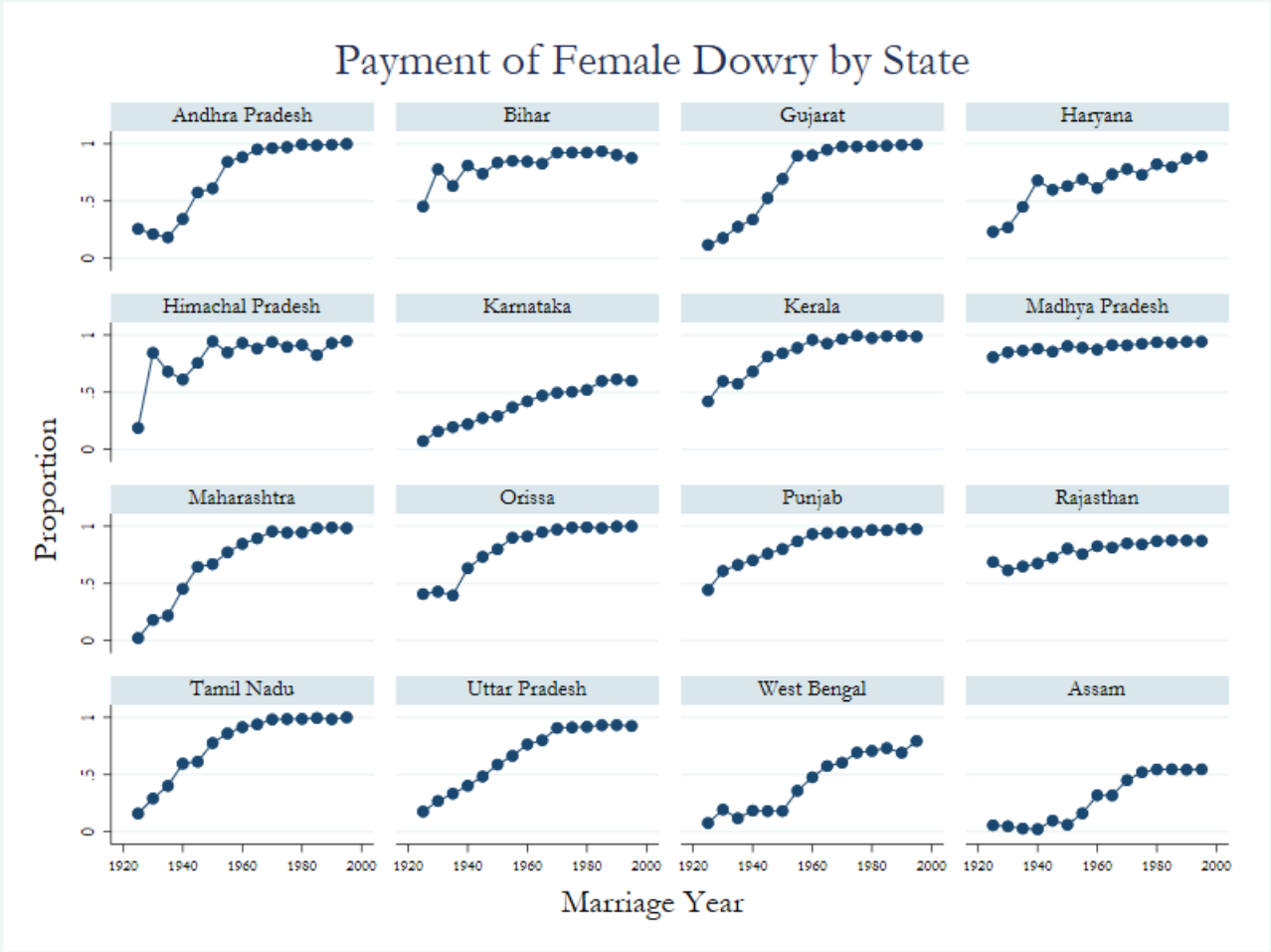
_ , *Some Reflections on Dowry*, OUP India, 1984.

Vogl, Tom S, "Marriage Institutions and Sibling Competition: Evidence from South Asia," *Quarterly Journal of Economics*, 2013, pp. 1017–1072.

World Gold Council, "Historical Gold Prices - 1833 to Present," Technical Report 2019.

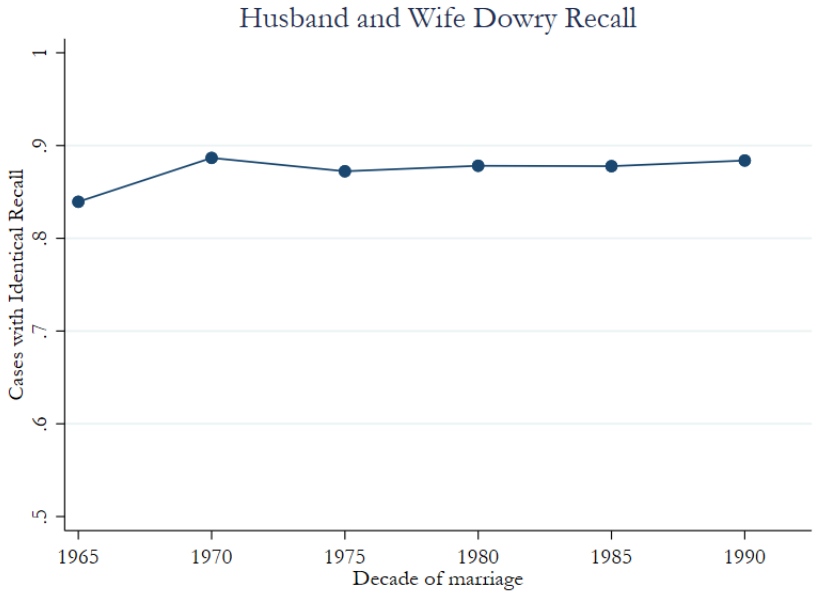
A Appendix Figures

Figure A1: Prevalence of Dowry Across States



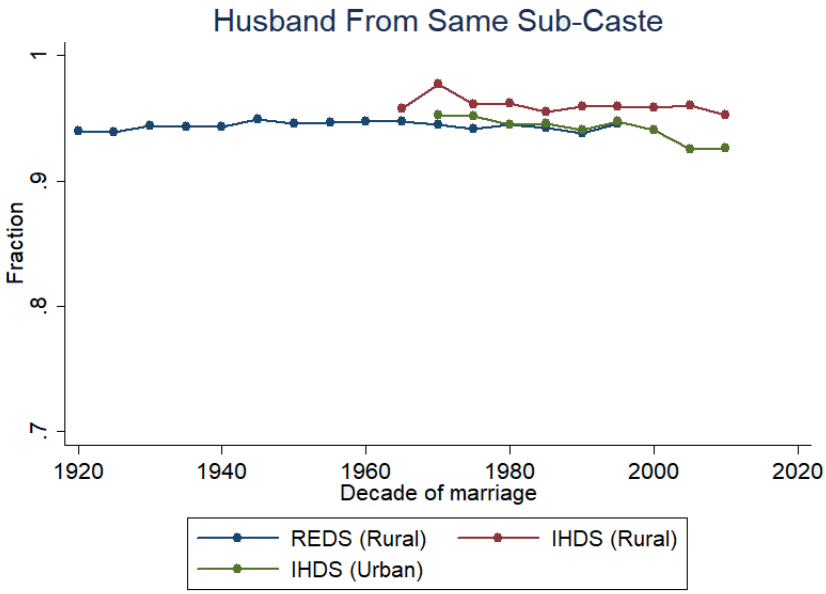
Notes: This figure plots the proportion of marriages in which dowry was paid over time, divided up by state. It uses data from the 1999 round of the Rural Economic Development Survey.

Figure A2: Dowry Recall in the Survey of Women and Fertility



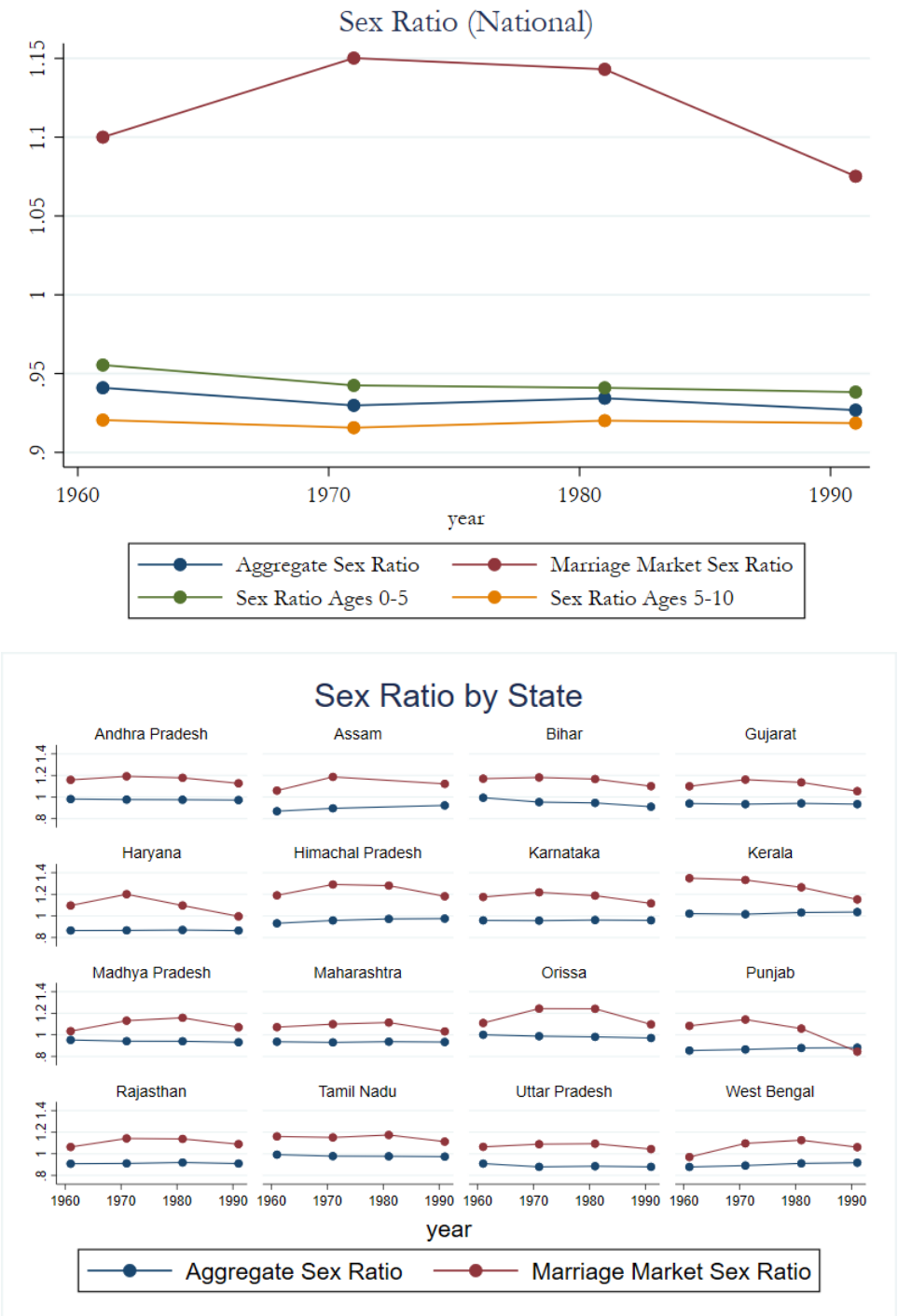
Notes: This figure uses data from the SWAF to plot the fraction of cases in which the husband and wife both have identical responses with respect to questions regarding dowry and gifts received in marriages.

Figure A3: Prevalence of Inter-jati Marriage from 1930-1999



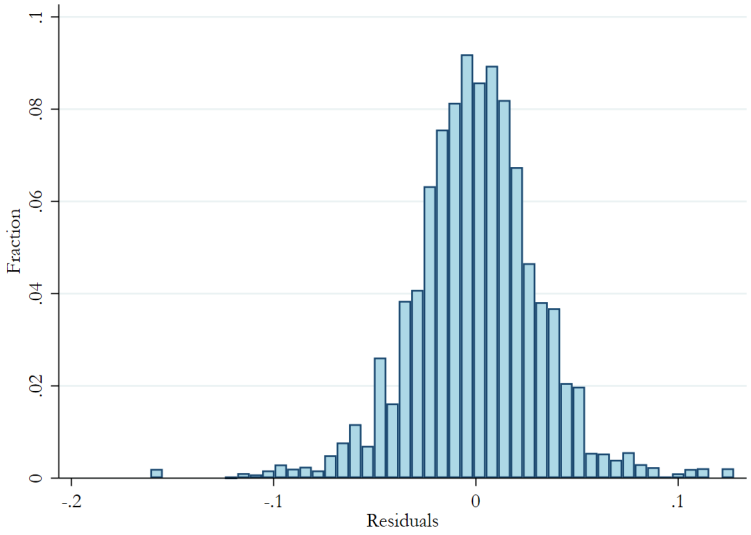
Notes: The figure plots the percentage of marriages that were between a bride and groom of the same sub-caste (*jati*) over time, using data from the Indian Human Development Survey (IHDS) and Rural Economic Development Survey (REDS).

Figure A4: Sex Ratio Over Time

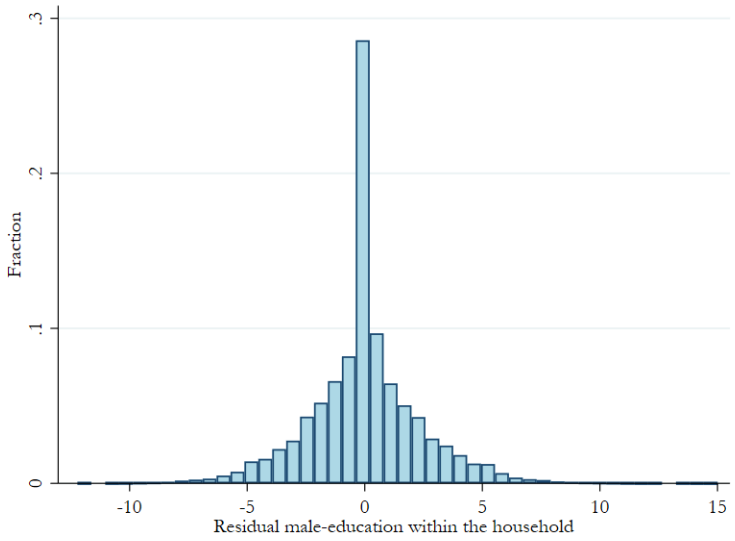


Notes: This figure plots the marriage market and aggregate sex ratios over time using data from the 1961, 1971, 1981 and 1991 Census of India. Marriage market sex ratio is equal to the number of women aged 10 to 25 divided by the number of men aged 15 to 30 in a given census. The aggregate sex ratio is the total number of women divided by the total number of men in the state. There was no census in 1981 in Assam due to an ongoing insurgency.

Figure A5: Residual variation



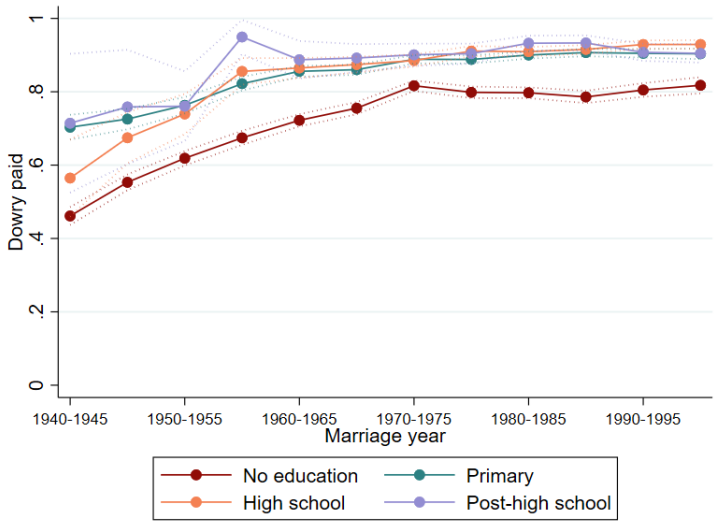
(a) Sex ratio within a district over time



(b) Male education within a household-five year bin

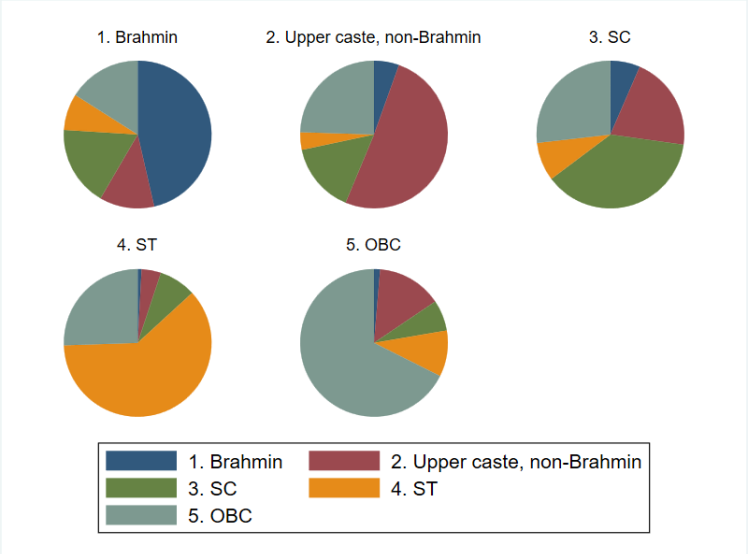
Notes: Figure (a) plots the residuals from a regression of sex ratio on district fixed effects, marriage five year fixed effects, and caste fixed effects; figure (b) plots the residual from a regression of the education level of a groom m in a household h in a five-year period t, on household-five year fixed effects, marriage year fixed effects, and birth order fixed effects.

Figure A6: Evolution of Dowry from 1940-1999 by educational group



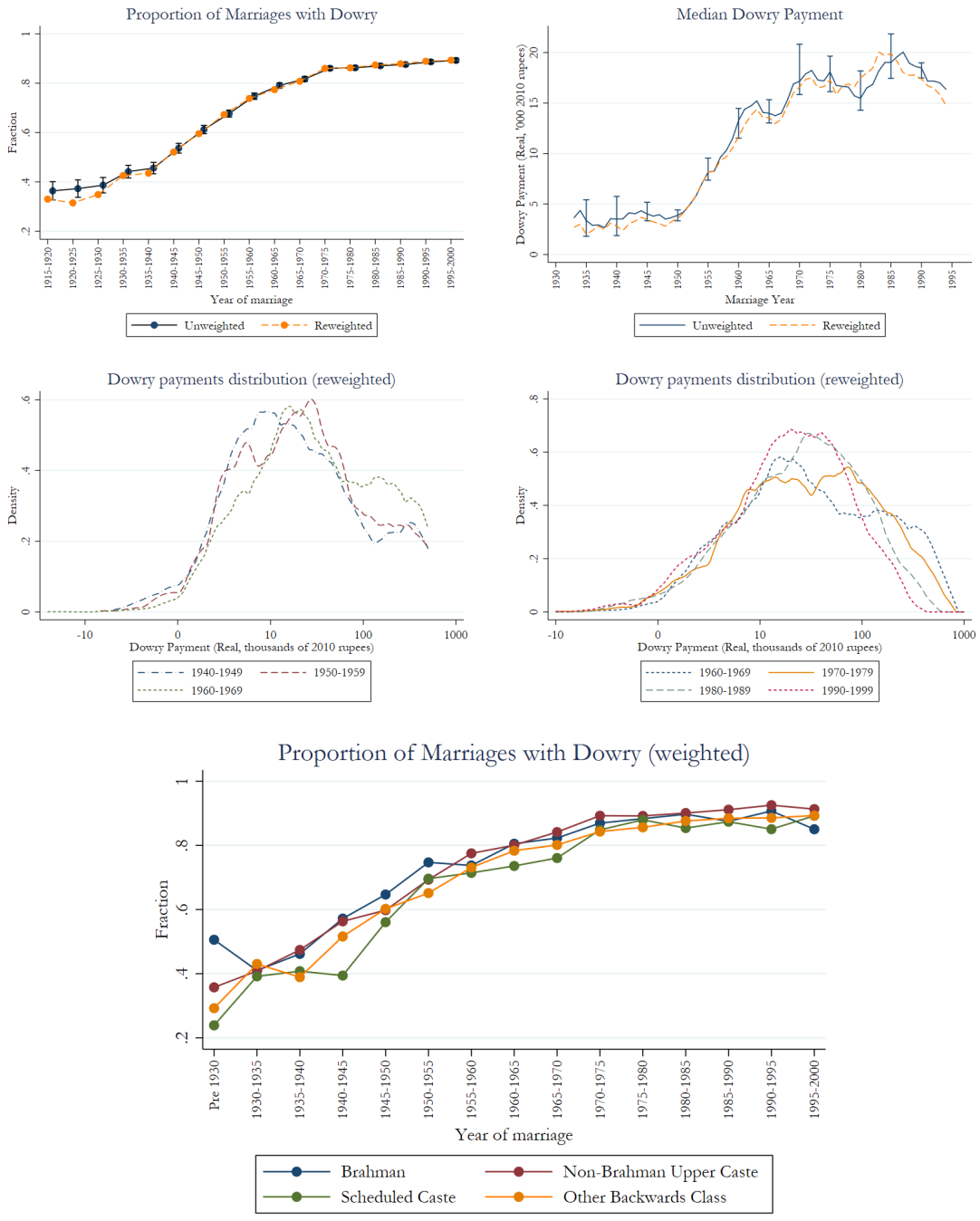
*Notes:*This figure shows the probability of paying dowry by four education groups. Each line is the fraction of individuals paying dowry in the relevant decade, as measured by the REDS data.

Figure A7: Caste of bride by caste of groom in intracaste marriages



Notes: This figure restricts the sample to inter-*jati* marriages in the REDS data and shows the caste of the bride across each caste category for the groom.

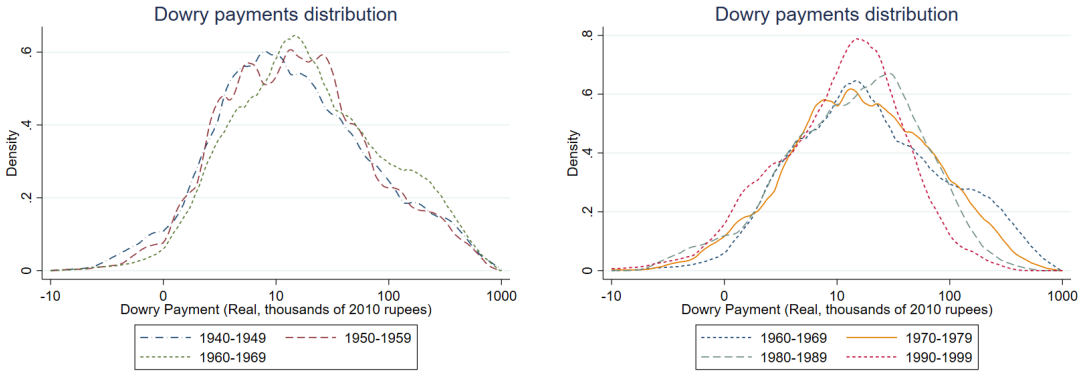
Figure A8: Main figures re-weighted by family size



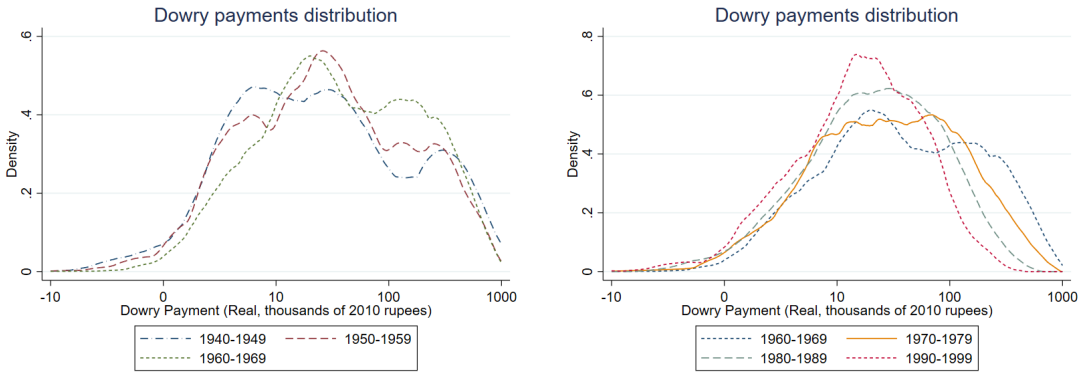
Notes: This figure remakes the main figures in the paper, reweighting the observations based on the number of children in the same generation as the household head to account for larger families have a higher probability of being sampled. The uppermost panel plots the unweighted and reweighted figures from figure 1. The middle two figures plot the reweighted kernel density plots from figure 2, while the bottom figure plots the reweighted version of figure 2. In all cases, the unweighted and weighted versions are extremely similar.

Figure A9: Evolution of Dowry from 1940-1999 by educational group

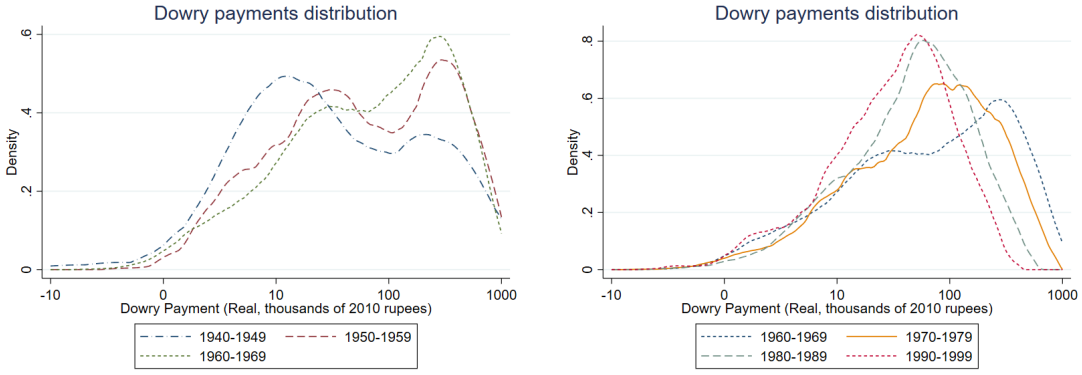
No education



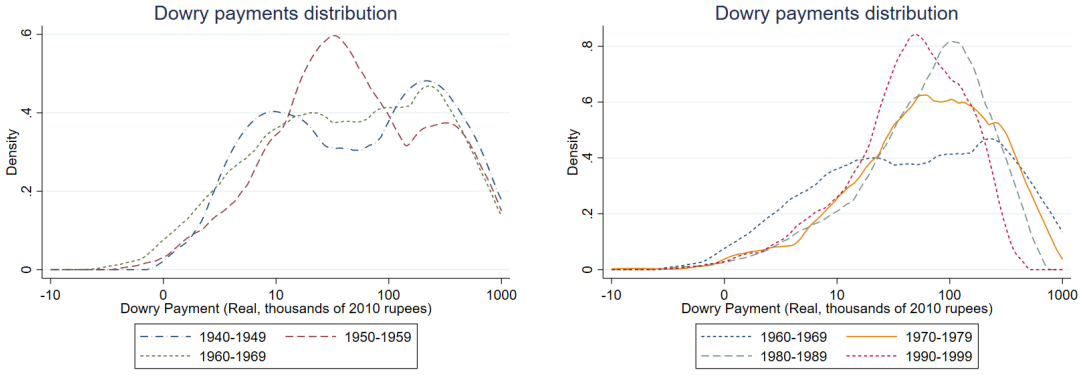
Primary school



High school



Post-high school



*Notes:*This figure shows a smoothed-kernel distribution of dowry payments by marriage decade as measured by the REDS data, for four categories of groom education: no formal education, some or completed primary or less, some or completed high school, and post-high school.

B Appendix Tables

Table B1: Number of Marriages in the 1999 REDS Data by Decade of Marriage

State	Pre-1930s	1930s	1940s	1950s	1960s	1970s	1980s	1990s	Total
Andhra Pradesh	39	82	167	246	424	667	749	678	3052
Bihar	31	65	119	174	256	391	520	494	2050
Gujarat	112	244	441	694	1055	1385	1560	932	6423
Haryana	13	55	142	354	616	891	1069	621	3761
Himachal Pradesh	16	57	77	113	164	232	201	131	991
Karnataka	110	175	364	550	876	1140	1685	1352	6252
Kerala	193	231	305	408	556	731	697	523	3644
Madhya Pradesh	321	411	737	1069	1316	1816	1732	1206	8608
Maharashtra	182	224	433	601	764	885	869	660	4618
Orissa	113	184	353	465	642	762	934	792	4245
Punjab	79	114	203	344	434	521	614	373	2682
Rajasthan	406	470	724	983	1388	1849	1865	1008	8693
Tamil Nadu	194	245	378	592	780	939	1161	918	5207
Uttar Pradesh	299	445	775	1151	1616	1836	1800	1026	8948
West Bengal	118	138	230	349	452	692	731	609	3319
Assam	35	56	126	232	298	494	696	329	2266
Total	**2261**	**3196**	**5574**	**8325**	**11637**	**15231**	**16883**	**11652**	**74759**

Notes: This table provides the number of marriages observed in the 1999 REDS data from each of these time periods.

Table B2: Dowry Payments by State-Year across the REDS rounds

	Dowry (1999)	Dowry (1999)
Dowry (2008)	1.049***	1.052***
	(0.0322)	(0.0496)
Dowry (2008) X Years Since Marriage		-0.000377
		(0.00382)
Observations	1050	1050
Test: equality with 1	.132	.292
State FE	Yes	Yes
Five Year FE	Yes	Yes

Notes: This table compares percentiles of the distribution of dowry payments over a given five year period in a state in the 1999 REDS data and the 2008 REDS data (e.g. 35th percentile in Rajasthan for marriages between 1960 and 1965, as reported in the 1999 REDS as compared to the 2008 REDS. The first column tests whether there is a systematic difference between the two waves by testing the null hypothesis of a coefficient of one. The second column tests whether deviations between the waves are increasing in the number of years since the marriage occurred. We test equality of the main effect coefficient with 1, i.e. no systematic deviation between the waves. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B3: Preference for caste in dowry payments

	Dowry (=1)	Dowry Value	Dowry (=1)	Dowry Value	Dowry (=1)	Dowry Value
Husband-Wife Caste Ranking	-0.0156	-1.114	-0.0138	-1.836	-0.0172	-4.289
	(0.0148)	(3.428)	(0.0139)	(1.864)	(0.0162)	(2.619)
Observations	72078	49410	72024	49368	43587	30129
District FE	Yes	Yes	No	No	No	No
Household FE	No	No	Yes	Yes	No	No
Household-5 year FE	No	No	No	No	Yes	Yes

Notes: Standard errors are clustered at the district level. All regressions include controls for bride and groom's education, as well as year, caste, and birth order fixed effects. Columns (1) and (2) include district fixed effects, columns (3) and (4) include household fixed effects, and columns (5) and (6) include fixed effects at the household-five year level, meaning that the identifying variation is between marriages within the same household that occur over the same five-year period. There is a smaller number of observations in even numbered columns because there are five states for which we observe whether dowry was paid, but not the dowry amount. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B4: Proportion of Marriages with Dowry (by Caste)

	Pre-1930s	1930s- 1940s	1950s- 1960s	1970s- 1990s
	(1)	(2)	(3)	(4)
Panel A: Dowry Prevalence in Brahmin and non-Brahmin Marriages				
Brahmin (=1)	0.043	0.016	0.026**	0.009
	(0.031)	(0.018)	(0.011)	(0.006)
Observations	2260	8770	19962	43766
Panel B: Dowry Prevalence in General Caste and Lower Caste Marriages				
Upper Caste (=1)	0.052***	0.020*	0.024***	0.015***
	(0.019)	(0.011)	(0.006)	(0.003)
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Dependent mean	.38	.53	.77	.87
Observations	2260	8770	19962	43766
Panel C: Detailed Breakdown of Dowry Prevalence				
Upper Caste (=1)	0.034	0.016	0.028***	0.018***
	(0.029)	(0.016)	(0.009)	(0.005)
SC (=1)	-0.058*	-0.021	-0.014	-0.013**
	(0.034)	(0.019)	(0.011)	(0.006)
OBC (=1)	-0.008	0.001	0.016*	0.013***
	(0.030)	(0.016)	(0.009)	(0.005)
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Dependent mean	.38	.53	.77	.87
Observations	2260	8770	19962	43766

This table examines the relationship between status in the caste hierarchy and probability of having dowry as part of a marriage. Panel A reports the difference in prevalence of dowry in Brahmin and non-Brahmin marriages. Panel B reports the difference in the prevalence of dowry in general caste and lower caste marriages, where general caste includes Brahmins and other general caste groups whereas lower castes include SC/ST/OBC caste groups. Panel C further breaks down the lower caste groups, where the left-out group is scheduled tribes and those who do not declare their caste status in the survey. Standard errors are clustered at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B5: Sex Ratio and Population Growth

	Sex ratio	Sex ratio	Sex ratio	Sex ratio
Population growth (t-20) to (t-10)	0.129***	0.126***		0.151***
	(0.0200)	(0.0208)		(0.0298)
Sex ratio at birth (t-10)		0.135**	0.176***	0.124*
		(0.0645)	(0.0642)	(0.0676)
Population growth (t-15) to (t-10)			0.145***	-0.0686
			(0.0388)	(0.0511)
Observations	592	592	592	592
District FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B6: Sex ratio and dowry (alternative specifications)

	Dowry (=1)	Dowry Value	Age Gap	Age of Marriage (Male)	Age of Marriage (Female)
	(1)	(2)	(3)	(4)	(5)
Panel A: Sex ratio defined using 1991 census age tables					
Sex Ratio	0.014	3.387	-0.610**	0.322	0.835***
	(0.011)	(4.252)	(0.261)	(0.332)	(0.280)
Observations	58539	38608	5393	5482	5396
Panel B: Sex ratio defined using National Sample Survey					
Sex Ratio	0.026	6.327	-0.864**	-0.992**	-0.053
	(0.023)	(5.379)	(0.374)	(0.496)	(0.444)
Observations	63035	43112	5848	5946	5851
Panel C: Include control for contemporaneous sex ratio (census)					
Sex Ratio	0.087	3.016	-2.569	1.127	4.109*
	(0.128)	(35.501)	(1.784)	(2.108)	(2.114)
Observations	59120	40467	5477	5567	5480
Panel D: Include control for contemporaneous sex ratio (all sources)					
Sex Ratio	0.038	4.490	-1.590***	-0.241	1.353**
	(0.031)	(5.660)	(0.562)	(0.619)	(0.611)
Observations	63080	43149	5851	5949	5854
Panel E: Static marriage ages (census)					
Sex Ratio	-0.043	37.010	-1.061	1.214	2.327**
	(0.066)	(28.900)	(0.969)	(1.204)	(1.127)
Observations	56095	38061	5273	5344	5275
Panel F: Static marriage ages (all sources)					
Sex Ratio	-0.009	11.476	-1.256*	-1.660**	-0.443
	(0.045)	(11.520)	(0.735)	(0.703)	(0.792)
Observations	63080	43149	5851	5949	5854

This table reports the relationship between marriage market sex ratios and marriage outcomes. All specifications include controls for bride and groom education as well as district, time, and caste fixed effects. Panel A uses the Age Tables from the 1991 census to define the district-level sex ratio. For each marriage, we take the average marriage age for men and women married in a preceding five year range in the REDS data and calculate the sex ratio as the total number of men and women within three years of that age in their district in the relevant marriage year. Panel B is the same as panel A, but uses the pooled National Sample Survey (rounds 38 [1983], 43 [1987-88], 50 [1993-4], 55 [1999-2000], and 62 [2005-6]). In this data set, we observe the state of residence, caste, gender, religion, education, and birth year of a given individual. We reweight according to the associated weight file to produce population-valid values. We generate estimates of sex ratio at the identity group-state level. Panels C and D modify the standard specification in the paper by including a control for the contemporaneous sex ratio at birth over the five year period. Panels E and F construct the sex ratio in a given year and district as the number of women aged 13-20 divided by the number of men aged 18-25 in that year, so this does not change over time. Standard errors are clustered at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B7: Dowry and average education of men and women

	Dowry Value	Dowry Value	Dowry Value
Education Avg (Male)	17.61*	17.68**	24.92***
	(8.823)	(7.657)	(6.935)
Education Avg (Female)	-10.36**	-6.266*	-9.514**
	(4.884)	(3.742)	(4.729)
Observations	29599	29492	26663
Household FE	No	Yes	No
Household-generation FE	No	No	Yes

Notes: Standard errors are clustered at the district level. All regressions include controls for marriage characteristics and economic conditions (average rural agricultural wage and poverty headcount ratio) as well as marriage year, state-identity group, caste, and birth order fixed effects. Column (2) includes household fixed effects and column (3) includes household-generation fixed effects, meaning that the identifying variation is between marriages within the same household that occur within the same generation. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

C Data Details and Robustness Checks

This appendix describes the administration of survey questions on dowry in the REDS data and how we have dealt with problems in a small number of states. In Section C.1, we discuss how the 1999 round of the REDS data that we use for our analysis compare with other data sources that have been used in the literature. In Section C.2, we then discuss how dowry payments are recorded in the REDS as well as how the implementation of these questions differed across Indian states. Section C.3 then re-runs our analysis to show that including or excluding these states does not matter for our analysis. Given the retrospective nature of the data, Section C.4 examines the robustness of the results to recall bias resulting from mortality. Lastly, Section C.5 examines the robustness of our results to using "gross" dowry as the outcome variable instead of "net" dowry.

C.1 Comparisons of the 1999 REDS to Other Data

There are a number of other data sets on dowry in India. Among others, Rao (1993), Edlund (2000), and Arunachalam and Logan (2014) use data from the ICRISAT sample and SWAF, which were described in the Section 2 of the main paper. Sautmann (2011) has NCAER data from Karnataka on 375 marriages, while Dalmia (2004) uses similar NCAER data. As discussed in the paper, it is difficult to use these data sets to get a more comprehensive sense of the evolution of dowry due to their small sample sizes. This is noted by both Rao (2000) and Edlund (2000), who both call for collection of larger data sets on dowry.

Two other data sets have information on dowry, but are not usable for this project. The Indian Human Development Survey (IHDS) is a multi-round, nationally representative survey conducted by researchers from the University of Maryland. It interviews a panel of approximately 41,000 households over two waves (2005 and 2011). While IHDS data have been used in other papers on dowry, it collects *perceptions* of the average dowry payments rather than actual payments and is about the value of dowry at the time of the survey (2005 and 2011).[67] Since this is modern rather than historical data, it cannot be used for this paper to analyze historical trends. However, it is well-suited for use in papers such as Calvi, Fulford and Beauchamp (2022), who apply it to estimate a general equilibrium model of contemporary Indian marriage markets.

The Survey of Women and Fertility (SWAF, Smith et al. (2000)) was collected between 1993 and 1994 in two districts in Tamil Nadu (1,551 households) and two districts in

[67]For example, asking questions like "Now, I would like to ask you some questions about marriage customs in your community (jati) for a family like yours...At the time of a boy's marriage, how much money is usually spent by the boy's (girl's) family?".

Uttar Pradesh (895 households). It contains retrospective information on marriages and whether particular items were given as part of dowry, but not the value of the dowry payments. Nearly all of the SWAF data is from marriages after 1975, so it is not useful for detecting historical patterns.

Lastly, Anukriti, Kwon and Prakash (2022) use the 2008 round of the REDS data to document trends in the average size of dowry payments across India between 1986 and 2007, as well as within specific state and caste groups. We instead elect to use the 1999 round since the 2008 round of the REDS data records a missing value in cases when the household states that no dowry is paid. As a result, it is not possible to distinguish between cases when respondents were unable to recall dowry payments and when they paid zero dowry. This does not create problems for Anukriti et al. (2022) since they focus on the period after which dowry payment is nearly universal, but is important in the earlier periods we study.

There are a few other reasons that the 1999 round is more appropriate for our study. First, the 2008 round of the REDS data does not collect information on the dowry payments of co-resident sons of the household head. Second, it records a missing value for the education of husbands/wives when the household states that the individual has zero years of education, which is over half the sample. This makes it hard to distinguish between non-response and zero education when analyzing the dowry-quality relationship. Finally, but most importantly, the earlier timing of the 1999 REDS survey means that it has better coverage of earlier time periods when major changes in dowry occurred.

Despite these limitations, we augment our primary sample from the 1999 round of the REDS with the 2008 round of the REDS i.e., we add the marriages between 1999-2008. We then redo our analysis with these expanded sample and report the results in Tables C1–C4. For ease of reference, Panel A in these tables report the specification in the paper (using the 1999 round only), while Panel B reports the results using the augmented sample as well. As is clear, the results are both quantitatively and qualitatively similar.

Table C1: Sex ratio and dowry (robustness checks)

	Dowry (=1)	Dowry Value	Age Gap	Age of Marriage (Male)	Age of Marriage (Female)
	(1)	(2)	(3)	(4)	(5)
Panel A: Sex ratio (main specification)					
Sex Ratio	-0.043	37.010	-1.061	1.214	2.327**
	(0.066)	(28.900)	(0.969)	(1.204)	(1.127)
Observations	56095	38061	5273	5344	5275
Panel B: Sex ratio (include 1999-2008 marriages from REDS2008)					
Sex Ratio	-0.043	36.437	-1.061	1.452	2.314**
	(0.066)	(28.612)	(0.969)	(1.206)	(1.125)
Observations	60110	42076	5273	6740	7888

Standard errors clustered at the district level. All regressions include controls for bride's education. Since the data on age of marriage is properly recorded in all of the 1999 REDS states, we do not use the hybrid data in panel B. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C2: Dowry and shifts in the lower caste groom quality distribution

	OBC only		OBC/general		General only	
	Dowry Value	Dowry Value	Dowry Value	Dowry Value		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Main specification						
Low Caste Groom Educ Avg	6.383		22.75		10.01	
	(9.188)		(14.00)		(16.88)	
	[0.537]		[0.330]		[0.750]	
Low Caste Groom Educ SD		-4.058		1.726		-35.03
		(13.30)		(14.72)		(12.23)
		[0.818]		[0.921]		[0.211]
Observations	14206	14206	33709	33709	11019	11019
Panel B: Include 1999-2008 marriages from REDS2008						
Low Caste Groom Educ Avg	7.122		18.95		10.10	
	(11.27)		(14.95)		(16.07)	
	[0.639]		[0.437]		[0.757]	
Low Caste Groom Educ SD		-5.621		0.0363		-34.99
		(13.01)		(13.81)		(11.74)
		[0.765]		[1]		
Observations	16013	16013	36474	36474	11710	11710

This table investigates how changes in educational attainment among lower caste groups affect dowry payments of higher caste groups. In columns (1) and (2), we restrict to marriages in which the groom is OBC, while columns (3) and (4) also include general caste marriages. Columns (5) and (6) use data from two rounds of the NSS (55, 62) to look at the relationship between OBC educational and general caste marriages. All specifications include controls for bride and groom educational attainment, and average education/SD of education among the dependent variable category in the state. p-values are wild clustered bootstrapped at the state-caste group level and included below the standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C3: Education and dowry (robustness checks)

	Dowry (=1)	Dowry Value	Dowry (=1)	Dowry Value	Dowry (=1)	Dowry Value
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Main table						
Groom Education (Years)	0.003***	1.014***			0.002	0.874***
	(0.001)	(0.249)			(0.001)	(0.317)
Groom Education Percentile			0.036**	12.743***	0.013	0.687
			(0.016)	(4.146)	(0.024)	(4.413)
Observations	44298	30658	39435	26997	39435	26997
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Include 1999-2008 marriages from REDS2008						
Groom Education (Years)	0.003***	0.961***			0.001	0.811***
	(0.001)	(0.237)			(0.001)	(0.302)
Groom Education Percentile			0.032**	12.237***	0.015	0.963
			(0.015)	(3.981)	(0.024)	(4.269)
Observations	45956	32316	40975	28537	40975	28537
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors clustered at the district level. All regressions include controls for bride's education. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C4: Education and dowry within a search model of marriage markets (robustness checks)

	Dowry (=1)	Dowry Value	Dowry (=1)	Dowry Value
	(1)	(2)	(3)	(4)
Panel A: Exclude all dowry data from five problematic states				
Groom Education (Years)	0.006***	2.085***		
	(0.002)	(0.637)		
Groom Education (Years) X Highly Educated Frac	-0.016**	-5.088*		
	(0.007)	(2.729)		
Above Median Education (=1)			0.041***	15.565***
			(0.013)	(3.913)
Above Median Education (=1) X Highly Educated Frac			-0.077	-39.728**
			(0.055)	(15.194)
Observations	43002	29616	43002	29616
Year FE	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes
Panel B: Include 1999-2008 marriages from REDS2008				
Groom Education (Years)	0.005***	1.967***		
	(0.002)	(0.598)		
Groom Education (Years) X Highly Educated Frac	-0.013*	-4.807*		
	(0.007)	(2.607)		
Above Median Education (=1)			0.036***	15.036***
			(0.013)	(3.754)
Above Median Education (=1) X Highly Educated Frac			-0.064	-38.491***
			(0.054)	(14.670)
Observations	44565	31179	44565	31179
Year FE	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes

This table reports the returns to education on the marriage market as a function of aggregate marriage market characteristics. In columns (1) and (3), the dependent variable is a dummy variable for if dowry was paid. In columns (2) and (4), the dependent variable is the real value of the dowry payment in 2010 rupees, which is equal to zero if no payment was made. Groom education is defined in years. Highly Educated Fraction is the fraction of men on the marriage market in the same state-caste-five year period with more than 12 years of education. Above Median Education takes the value 1 if the groom's education is above the median education level for men. All regressions include controls for the bride's education and cluster standard errors at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

C.2 Recording Dowry Payments in the REDS

For recorded marriage in the REDS, respondents were asked to give the value of transfers from the household of the bride to the household of the groom and vice versa. For our analysis, we take the net of these transfers as the value of dowry. However, all responses can be divided into three categories: the dowry transfer had a value of zero (i.e. dowry was not paid in this marriage), dowry had a non-zero value, or the dowry value is missing (which is meant to indicate that the respondent did not tell the surveyor the value of the dowry transfer). Figure C1 plots the proportion of marriages in each of these three categories by state over time. Based on this, we can divide states into 4 categories:

1. **Correctly administered:** In cases where the survey was fully orrectly administered, there should be a low and relatively constant proportion of missing data. That is the case in Bihar, Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Punjab, Rajasthan, Uttar Pradesh, West Bengal, and Assam, which jointly account for approximately 69% of the population of India (2011 Census of India). Only a small percentage of dowry payments in these states are recorded as missing values (Bihar: 2.94%, Haryana 3.34%, Himachal Pradesh 2.6%, Kerala: 19.8%, Madhya Pradesh: 4.0%, Punjab: 2.9%, Rajasthan: 3.4%, Uttar Pradesh: 4.3%, West Bengal: 7.1%, Assam: 6.5%), and this rate is quite consistent over time.

2. **Surveyors correctly recorded whether dowry was paid, but did not ask about the value of dowry in cases when dowry was paid:** This is only the case in Maharashtra. Surveyors correctly recorded if dowry was *not* paid (value of zero), but in nearly all cases where it was paid, they did not record the value. As a result, they recorded a missing value for the dowry payment field in that situation. This pattern is relatively clear in figure C1, as well as when we compare to the 2008 wave of the REDS survey, in which surveyors did record dowry payment amounts in Maharashtra.

3. **Significant time trends in missing data over time:** the last category contains three states with significant trends in missing data over time: Gujarat, Orissa and Tamil Nadu. In these states, the proportion of missing values is initially low, but then rises sharply over time. This is a less extreme version of what happened in Maharashtra, in which surveyors successfully found that respondents had paid dowry, but were unable to elicit the precise amount; however, there are some cases in which they did record the dowry amount (unlike in Maharashtra). That interpretation is again supported by comparisons with the 2008 wave of the data from those states.

4. **Surveyors recorded zero dowry payments as missing values:** This occurred in the state of Karnataka, where cases where the respondents did not pay dowry were recorded as missing values. This can easily be seen in the graph, where no respondents were ever recorded as not paying dowry.[68]

For analysis on whether dowry was paid, we code missing values in Maharashtra, Gujarat, Orissa, and Tamil Nadu as having paid dowry and missing values in Karnataka as having not paid dowry. Figure C2 plots the proportion of marriages with dowry over time with data from these five states either dropped or included in the manner described. Patterns of dowry adoption are virtually the same across both sets of estimates.

For the analysis on size of dowry, we drop data from Maharashtra, Gujarat, Orissa, and Tamil Nadu due to the inconsistent recording. We code missing values in Karnataka as a payment of zero. In section C.3, we re-run the main tables, but instead drop all of the dowry data from these five states. The results are nearly identical, indicating that these coding choices do not affect our main results. We also show robustness to including the data from the 2008 wave of the REDS survey for these states with problematic data in the 1999 wave.

[68]This error was made during the administration of the 2008 REDS survey data in all states.

Figure C1: Missing Dowry Information by State

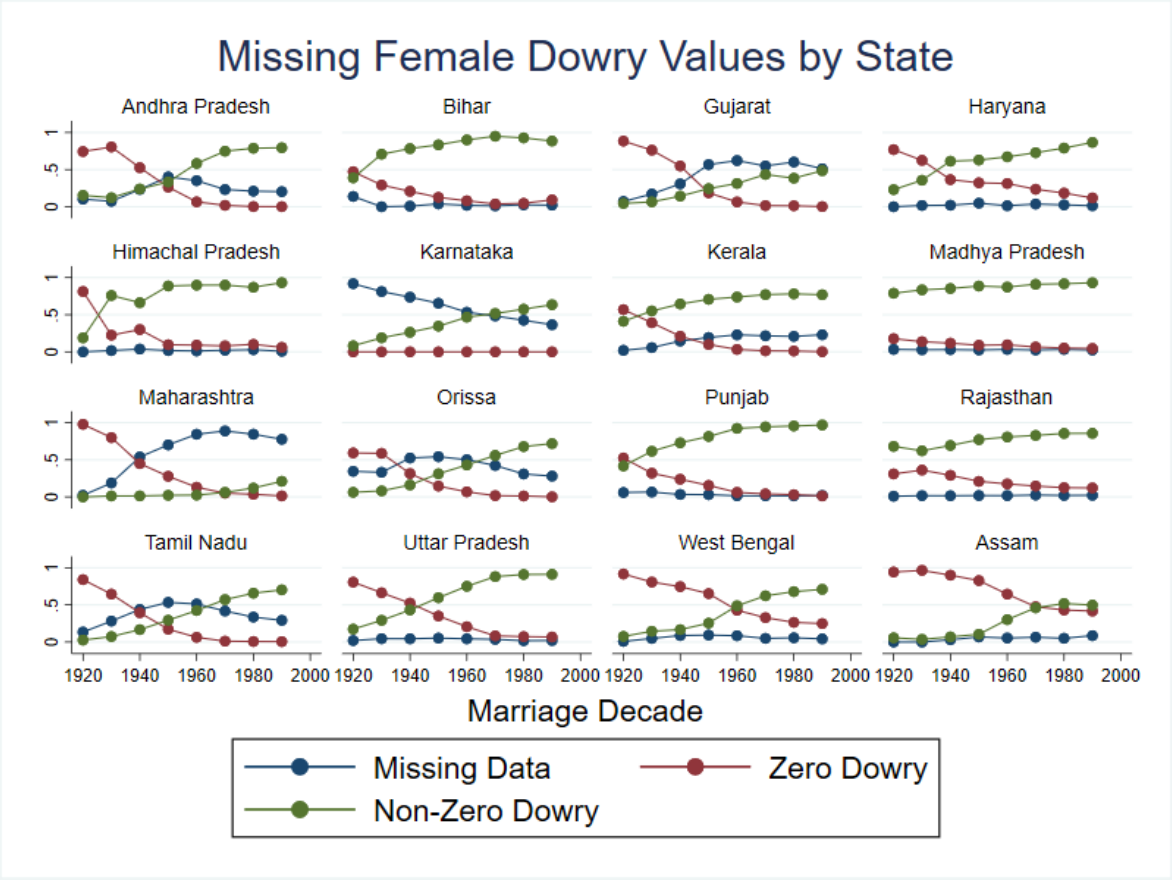
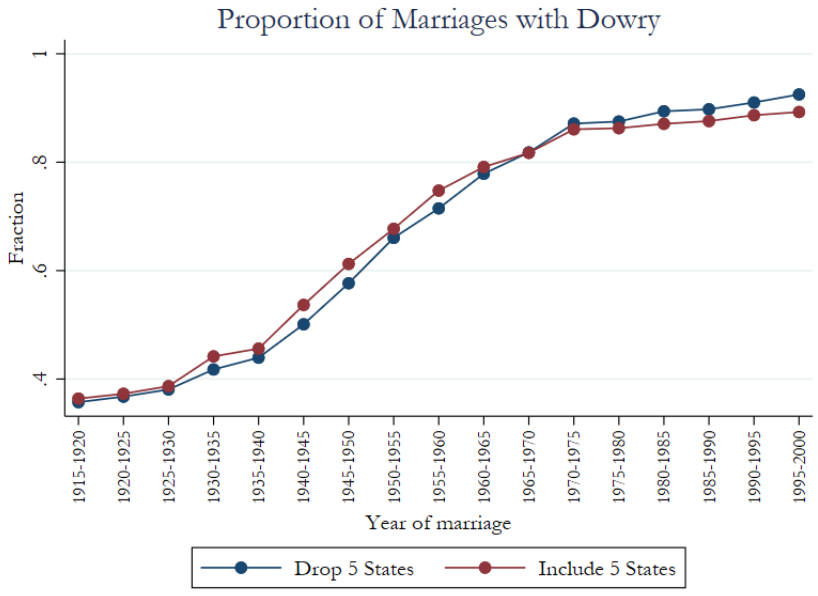


Figure C2: Comparison of Dowry Prevalence Estimates



C.3 Robustness Checks with Data from Andhra Pradesh, Gujarat, Maharashtra, Orissa and Tamil Nadu

Given the concerns about using the data from these five states, we check the robustness of our results to different decisions around including or excluding data from them. First, we show that even if there are concerns with dowry data in these five states, the remaining states are fairly representative of changes occurring across India. As discussed above, the data on the extensive margin of dowry payment from these states seems to be of a fairly good quality. Figure C2 shows our estimates of changes in the extensive margin of dowry over time when we include or exclude those states: the patterns are practically identical. Thus, even if we drop these states, we would expect that the remaining states are informative about all-India patterns.

Next, we re-run all of our main specifications under two alternative approaches to deal with data from these five states: (i) dropping all of the data from these states; and (ii) dropping the 1999 REDS data and using the 2008 REDS survey data for these states. Although we prefer the 1999 rounds of the REDS survey for the reasons listed in the previous section, it is helpful to know whether including these states affects the results.

Table C5 re-runs the dowry and sex ratio regressions, with Panel A dropping the five problematic states and Panel B using the 2008 REDS data on dowry in lieu of the 1999 REDS data in those states. The coefficient on sex ratio is marginally statistically significant in Panel B, but this could easily be due to chance given the large number of regressions run in the sex ratio analysis. The magnitude of the coefficients is also quite similar to Table 1 and even if we took it seriously, it could not rationalize the observed large rise in dowry. For age of marriage, the results are similar to the main table, with a consistent increase in the age of marriage for women in response to sex ratio pressures. While the coefficient for the age gap is no longer statistically significant in Panel A, this likely reflects the small sample size, as the coefficients are nearly identical to those in Table 1 (-3.16 and -3.04).

Table C6 re-runs the modernization in caste-based societies analysis, where Panel A drops the five problematic states (as in the paper), while Panel B uses the 2008 REDS data in lieu of the 1999 REDS data in those states. As in the main paper, there is no relationship between the lower caste educational distribution and higher caste dowries.

Table C7 re-runs the analysis on education and dowry. The patterns are exactly the same as in 3, where we again conclude that there are returns to absolute level of education. Table C8 re-runs the analysis on whether the patterns in dowry inflation are consistent with a search model. We again observe that returns to education decrease as the fraction of highly educated grooms on the marriage market increases, although as in the main analysis, the results on dowry value are more robust than the results on

whether dowry is paid. This may reflect the fact that most marriages paid dowry by the 1970s and so there is less possible variation for that variable.

Table C5: Sex ratio and dowry (robustness checks)

	Dowry (=1)	Dowry Value	Age Gap	Age of Marriage (Male)	Age of Marriage (Female)
	(1)	(2)	(3)	(4)	(5)
Panel A: Sex ratio (exclude all dowry data from five problematic states)					
Sex Ratio	0.202	-6.946	-3.158	1.961	5.554**
	(0.149)	(37.335)	(1.902)	(2.307)	(2.334)
Observations	40467	40467	3645	3732	3647
Panel B: Sex ratio (use 2008 REDS data for five problematic states)					
Sex Ratio	0.247*	-17.702	-3.043*	0.705	4.104**
	(0.138)	(33.677)	(1.692)	(2.062)	(2.041)
Observations	52153	52153	5477	5567	5480

Standard errors clustered at the district level. All regressions include controls for bride's education. Since the data on age of marriage is properly recorded in all of the 1999 REDS states, we do not use the hybrid data in panel B. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C6: Dowry and shifts in the lower caste groom quality distribution

	OBC only		OBC/general		General only	
	Dowry Value	Dowry Value	Dowry Value	Dowry Value		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Exclude dowry data from five problematic states						
Low Caste Groom Educ Avg	6.383		22.75		10.01	
	(9.188)		(14.00)		(16.88)	
	[0.537]		[0.330]		[0.750]	
Low Caste Groom Educ SD		-4.058		1.726		-35.03
		(13.30)		(14.72)		(12.23)
		[0.818]		[0.921]		[0.211]
Observations	14206	14206	33709	33709	11019	11019
Panel B: Use 2008 REDS data for five problematic states						
Low Caste Groom Educ Avg	12.72		16.94		2.405	
	(9.142)		(8.558)		(15.74)	
	[0.442]		[0.205]		[0.898]	
Low Caste Groom Educ SD		-4.840		-0.988		-12.25
		(12.12)		(9.794)		(18.49)
		[0.828]		[0.926]		
Observations	21721	21721	44925	44925	14348	14348

This table investigates how changes in educational attainment among lower caste groups affect dowry payments of higher caste groups. In columns (1) and (2), we restrict to marriages in which the groom is OBC, while columns (3) and (4) also include general caste marriages. Columns (5) and (6) use data from two rounds of the NSS (55, 62) to look at the relationship between OBC educational and general caste marriages. All specifications include controls for bride and groom educational attainment, and average education/SD of education among the dependent variable category in the state. p-values are wild clustered bootstrapped at the state-caste group level and included below the standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C7: Education and dowry (robustness checks)

	Dowry (=1)	Dowry Value	Dowry (=1)	Dowry Value	Dowry (=1)	Dowry Value
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Exclude all dowry data from five problematic states						
Groom Education (Years)	0.003***	1.014***			0.002	0.874***
	(0.001)	(0.249)			(0.002)	(0.317)
Groom Education Percentile			0.034*	12.743***	0.000	0.687
			(0.020)	(4.146)	(0.030)	(4.413)
Observations	30658	30658	26997	26997	26997	26997
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Use 2008 REDS data for five problematic states						
Groom Education (Years)	0.002**	0.956***			0.001	0.827***
	(0.001)	(0.230)			(0.002)	(0.289)
Groom Education Percentile			0.027	12.083***	0.009	0.611
			(0.019)	(3.834)	(0.028)	(4.038)
Observations	40773	40773	34259	34259	34259	34259
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors clustered at the district level. All regressions include controls for bride's education. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C8: Education and dowry within a search model of marriage markets (robustness checks)

	Dowry (=1)	Dowry Value	Dowry (=1)	Dowry Value
	(1)	(2)	(3)	(4)
Panel A: Exclude all dowry data from five problematic states				
Groom Education (Years)	0.005**	2.085***		
	(0.002)	(0.637)		
Groom Education (Years) X Highly Educated Frac	-0.012	-5.088*		
	(0.008)	(2.729)		
Above Median Education (=1)			0.037**	15.565***
			(0.017)	(3.913)
Above Median Education (=1) X Highly Educated Frac			-0.054	-39.728**
			(0.071)	(15.194)
Observations	29616	29616	29616	29616
Year FE	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes
Panel B: Use 2008 REDS data for five problematic states				
Groom Education (Years)	0.005**	2.015***		
	(0.002)	(0.586)		
Groom Education (Years) X Highly Educated Frac	-0.015*	-5.004**		
	(0.008)	(2.493)		
Above Median Education (=1)			0.038**	14.960***
			(0.016)	(3.518)
Above Median Education (=1) X Highly Educated Frac			-0.093	-39.728***
			(0.067)	(13.667)
Observations	39073	39073	39073	39073
Year FE	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes

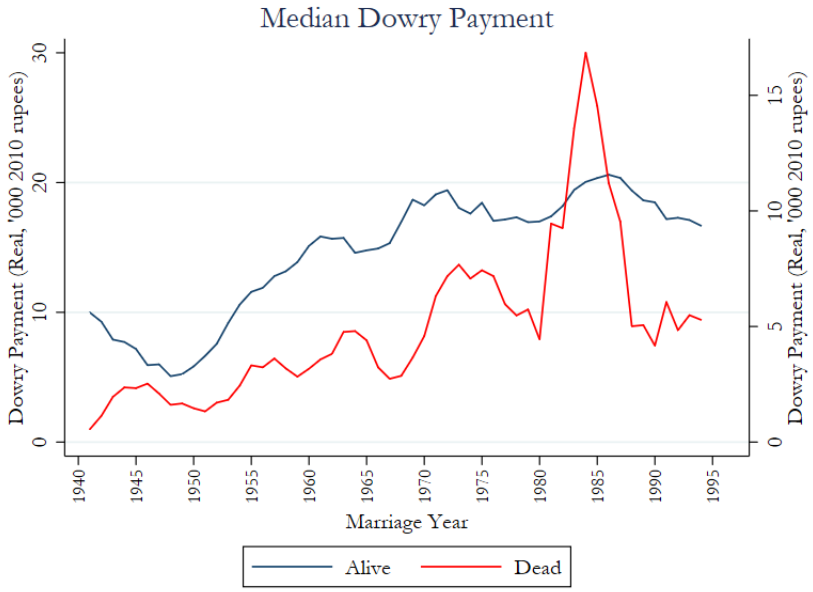
This table reports the returns to education on the marriage market as a function of aggregate marriage market characteristics. In columns (1) and (3), the dependent variable is a dummy variable for if dowry was paid. In columns (2) and (4), the dependent variable is the real value of the dowry payment in 2010 rupees, which is equal to zero if no payment was made. Groom education is defined in years. Highly Educated Fraction is the fraction of men on the marriage market in the same state-caste-five year period with more than 12 years of education. Above Median Education takes the value 1 if the groom's education is above the median education level for men. All regressions include controls for the bride's education and cluster standard errors at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

C.4 Robustness to Bias Induced by Mortality

This paper uses retrospective data on dowry, including from marriages that happened decades prior to the survey. One type of bias that could occur in such a setting would be from attrition from the sample due to mortality. Fortunately, the REDS survey collects information on the marriages of family members regardless of whether the family member is still alive, so there will not be attrition from the data due to mortality. However, recall of the marriages of the deceased may be worse, which could potentially produce recall bias.

To examine how this might bias our analysis of aggregate dowry trends, Figure C3 looks at how trends differ if we split marriages by whether the relevant individual is alive at the time of the 1999 REDS survey. Although the levels are lower among those who have died, the aggregate trends, which are the focus of the paper, are the same.[69] The lower levels are likely due to higher mortality rates among poor households, where the deceased tend to be from poorer households.

Figure C3: Evolution of dowry for alive and dead respondents



Notes: This figure shows the evolution of dowry payments for marriages where at least one of the respondents is still alive (blue line) and those for which both are dead (red line).

Next, we rerun the main analysis tables, but drop those marriages where the individual has died. Table C9 replicates the cross-caste competition table in the paper, where panel A is the specification with all marriages, and panel B drops those where the individual died. It finds no relationship between lower caste characteristics and higher caste

[69] There is a spike at 1985 among the deceased, but this is likely the result of the small number of deceased persons in the data who were married around that time period.

dowry amounts across multiple definitions of lower/higher caste. Table C10 tests the relationship between dowry and sex ratio using each of the seven definitions of sex ratio that we employ – in no case is the relationship statistically significant. Finally, Table C11 combines Tables 3 and 4 from the paper. While one of the coefficients that was statistically significant at the 10% level loses statistical significance – potentially due to reduced power in the smaller sample– the table otherwise looks the same. Given that these restrictions do not change the main take-aways of the paper, we conclude that recall bias in dowry amounts for the marriages of the deceased are unlikely to bias our findings.

Table C9: Dowry and shifts in the lower caste groom quality distribution

	OBC only		OBC/general		General only	
	Dowry Value (1)	Dowry Value (2)	Dowry Value (3)	Dowry Value (4)	(5)	(6)
	Panel A: Main specification					
Low Caste Groom Educ Avg	6.383		22.75		10.01	
	(9.188)		(14.00)		(16.88)	
	[0.537]		[0.330]		[0.750]	
Low Caste Groom Educ SD		-4.058		1.726		-35.03
		(13.30)		(14.72)		(12.23)
		[0.818]		[0.921]		[0.211]
Observations	14206	14206	33709	33709	11019	11019
	Panel B: Only include still living					
Low Caste Groom Educ Avg	8.824		22.62		16.71	
	(9.532)		(16.30)		(16.77)	
	[0.464]		[0.291]		[0.805]	
Low Caste Groom Educ SD		2.405		14.00		-24.74
		(22.65)		(20.33)		(15.45)
		[0.921]		[0.532]		[0.320]
Observations	12334	12334	29656	29656	9948	9948

Notes: This table investigates how changes in educational attainment among lower caste groups affect dowry payments of higher caste groups. In columns (1) and (2), we restrict to marriages in which the groom is OBC, while columns (3) and (4) also include general caste marriages. Columns (5) and (6) use data from two rounds of the NSS (55, 62) to look at the relationship between OBC educational and general caste marriages. All specifications include controls for bride and groom educational attainment, and average education/SD of education among the dependent variable category in the state. p-values are wild clustered bootstrapped at the state-caste group level and included below the standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C10: Sex ratio and dowry (robustness checks)

	Census	Average	NSS	1991 Census	Census (static)	Census (static)	Average
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Sex ratio (main specification)							
Sex Ratio	-6.946	4.201	6.327	3.387	37.010	3.016	4.490
	(37.335)	(5.748)	(5.379)	(4.252)	(28.900)	(35.501)	(5.660)
Observations	40467	43149	43112	38608	38061	40467	43149
Contemp. controls	No	No	No	No	No	Yes	Yes
Panel B: Sex ratio (only include still living)							
Sex Ratio	-23.593	2.867	4.686	4.868	49.478	-12.497	3.434
	(44.077)	(6.623)	(5.854)	(4.825)	(31.666)	(43.396)	(6.588)
Observations	37594	40034	39999	35920	36065	37594	40034
Contemp. controls	No	No	No	No	No	Yes	Yes

Standard errors clustered at the district level. All regressions include controls for bride and groom education. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C11: Education and dowry (robustness checks)

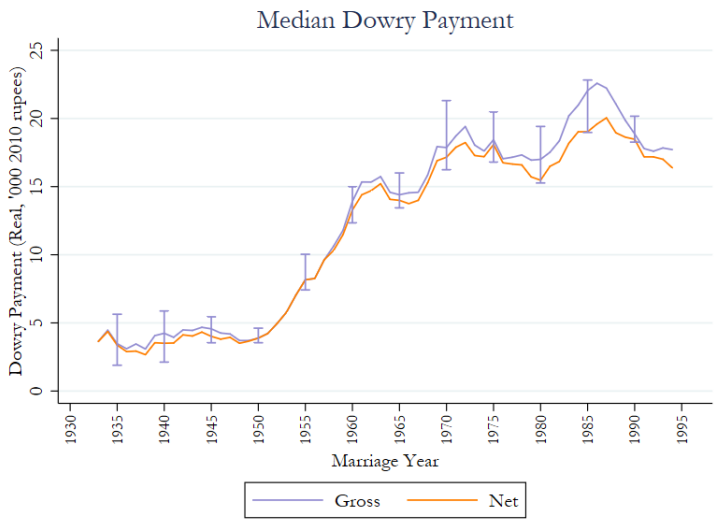
	Dowry Value	Dowry Value	Dowry Value	Dowry Value	Dowry Value
	(1)	(2)	(3)	(4)	(5)
	Panel A: Main specification				
Groom Education (Years)	1.014***		0.874***	2.085***	
	(0.249)		(0.317)	(0.637)	
Groom Education Percentile		12.743***	0.687		
		(4.146)	(4.413)		
Groom Education (Years) X Highly Educated Frac				-5.088*	
				(2.729)	
Above Median Education (=1)					15.565***
					(3.913)
Above Median Education (=1) X Highly Educated Frac					-39.728**
					(15.194)
Observations	30658	26997	26997	29616	29616
Year FE	Yes	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes	Yes
	Panel B: Only include still living				
Groom Education (Years)	0.881***		0.796**	1.635**	
	(0.248)		(0.324)	(0.675)	
Groom Education Percentile		12.256***	1.122		
		(4.191)	(4.570)		
Groom Education (Years) X Highly Educated Frac				-3.503	
				(3.091)	
Above Median Education (=1)					11.297***
					(3.635)
Above Median Education (=1) X Highly Educated Frac					-24.154*
					(14.328)
Observations	27088	25240	25240	26305	26305
Year FE	Yes	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes	Yes

This table reports the returns to education on the marriage market as a function of aggregate marriage market characteristics. In panel A, the dependent variable is the real value of the net dowry payment in 2010 rupees, which is equal to zero if no payment was made. In panel B, it is equal to the gross dowry payment from bride to groom. Highly Educated Fraction is the fraction of men on the marriage market in the same state-caste-five year period with more than 12 years of education. Above Median Education takes the value 1 if the groom's education is above the median education level for men. All regressions include controls for the bride's education and cluster standard errors at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

C.5 Gross and Net Dowry

A natural concern is whether it is better to the measure dowry using gross dowry payments from brides to grooms or net dowry, which subtracts out the transfers from grooms to brides. Fortunately, this turns out to not substantially effect our results. Figure C4 shows why: gross and net dowry closely track one another. The R^2 of a regression of net dowry on gross dowry is 0.95. This occurs because the value of transfers from groom households to bride households tend to be much smaller, so is dominated by the value of the gross transfer from bride to groom.

Figure C4: Evolution of gross and median dowry over time



For completeness, we redo all of our main tables using gross rather than net dowry. As one would expect given the similarity of gross and net dowry, results are basically identical. Table C13 finds no evidence of cross-caste competition, where changes in lower caste grooms are unrelated to gross dowries for higher castes. Table C12 shows that across many different ways of defining sex ratio (using contemporaneous census data; using NSS data; using the average of census, NSS, and 1991 census data; different assumptions on marriage age ranges), there is not a relationship between sex ratio and gross dowry. Table C14 combines the tables related to education and shows that results are if anything stronger when using gross dowry rather than net. As a result, this does not appear to present a big problem for our paper.

A related question is why we observe transfers in both directions if transfers are fungible. One possibility is that the transfers are not actually fungible. The 1994 Survey of Women and Fertility (SWAF) asked about whether particular items were given

Table C12: Sex ratio and dowry (robustness checks)

	Census	Average	NSS	1991 Census	Census (static)	Census (static)
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: Sex ratio (net dowry)			
Sex Ratio	-6.946	4.201	6.327	3.387	37.010	3.016
	(37.335)	(5.748)	(5.379)	(4.252)	(28.900)	(35.501)
Observations	40467	43149	43112	38608	38061	40467
Contemp. controls	No	No	No	No	No	Yes
			Panel B: Sex ratio (gross dowry)			
Sex Ratio	-10.300	2.668	8.378	0.893	38.970	3.307
	(37.744)	(6.302)	(6.130)	(4.752)	(28.447)	(35.832)
Observations	40467	43149	43112	38608	38061	40467
Contemp. controls	No	No	No	No	No	Yes

Standard errors clustered at the district level. All regressions include controls for bride and groom education. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

at the time of marriage for their marriage. Nearly all involved jewelry (91%), kitchen utensils (94.5%), and clothing (95%), while other relatively common items include furniture (49%), radios (33%), and bicycles (32%). The transfers from the groom's family are typically gifts other than cash, potentially mitigating the fungibility of the transfers.

Other possibilities are that gifts in both directions serve another purpose. There is an extensive work in anthropology and sociology on this, starting from the classic work of Mauss (2002) on gift-giving in ancient societies to more recent work on modern societies (e.g. Godbout and Caille (1998)). The important insight from this work is that visible gifts are a strong social signal to the other party, even if both parties gifted one another fundamentally similar objects (e.g., clothing). The gifts signal good intentions and have a bonding role. Furthermore, they may signal the wealth of the groom's household and that this is a desirable match for the bride's family. Note that since most marriages are not within the same village, the bride's family may not be able to easily observe characteristics of the groom's family and this is a credible signal. For example, Roulet (1996) describes how gifts may be given throughout the marriage negotiation process to demonstrate the commitment to the marriage as well as demonstration of the financial situation of the families. Furthermore, this receipt of gifts can allow the bride's family to signal to others in their social network that they have made a prestige-increasing match by matching their daughter to an economically successful family. The economics literature, Bloch et al. (2004) also argues that wedding celebrations in India are a form of conspicuous consumption, while Roulet (1996) in the sociology literature argues sim-

ilarly that they serve to provide honor and prestige to the family. Here the groom's family may get utility from their gifts by demonstrating their economic capabilities to the family of the bride as well as others who attend the wedding. This differs slightly from the second point, in which the signaling motivation was more instrumental, but has a similar flavor of gifts as signals.

Table C13: Dowry and shifts in the lower caste groom quality distribution

	OBC only		OBC/general		General only	
	Dowry Value (1)	Dowry Value (2)	Dowry Value (3)	Dowry Value (4)	(5)	(6)
			Panel A: Net dowry			
Low Caste Groom Educ Avg	6.383		22.75		10.01	
	(9.188)		(14.00)		(16.88)	
	[0.537]		[0.330]		[0.750]	
Low Caste Groom Educ SD		-4.058		1.726		-35.03
		(13.30)		(14.72)		(12.23)
		[0.818]		[0.921]		[0.211]
Observations	14206	14206	33709	33709	11019	11019
			Panel B: Gross dowry			
Low Caste Groom Educ Avg	8.199		22.90		12.66	
	(11.57)		(14.18)		(17.06)	
	[0.578]		[0.327]		[0.734]	
Low Caste Groom Educ SD		-9.370		-1.919		-32.52
		(15.95)		(16.15)		(12.46)
		[0.653]		[0.906]		[0.211]
Observations	14206	14206	33709	33709	11019	11019

This table investigates how changes in educational attainment among lower caste groups affect dowry payments of higher caste groups. In columns (1) and (2), we restrict to marriages in which the groom is OBC, while columns (3) and (4) also include general caste marriages. Columns (5) and (6) use data from two rounds of the NSS (55, 62) to look at the relationship between OBC educational and general caste marriages. All specifications include controls for bride and groom educational attainment, and average education/SD of education among the dependent variable category in the state. p-values are wild clustered bootstrapped at the state-caste group level and included below the standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C14: Education and dowry (robustness checks)

	Dowry Value	Dowry Value	Dowry Value	Dowry Value	Dowry Value
	(1)	(2)	(3)	(4)	(5)
Panel A: Net dowry					
Groom Education (Years)	1.014***		0.874***	2.085***	
	(0.249)		(0.317)	(0.637)	
Groom Education Percentile		12.743***	0.687		
		(4.146)	(4.413)		
Groom Education (Years) X Highly Educated Frac				-5.088*	
				(2.729)	
Above Median Education (=1)					15.565***
					(3.913)
Above Median Education (=1) X Highly Educated Frac					-39.728**
					(15.194)
Observations	30658	26997	26997	29616	29616
Year FE	Yes	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes	Yes
Panel B: Gross dowry					
Groom Education (Years)	1.163***		0.971***	2.300***	
	(0.231)		(0.302)	(0.633)	
Groom Education Percentile		15.183***	1.784		
		(3.826)	(4.491)		
Groom Education (Years) X Highly Educated Frac				-5.366**	
				(2.650)	
Above Median Education (=1)					17.025***
					(3.915)
Above Median Education (=1) X Highly Educated Frac					-41.014***
					(14.906)
Observations	30658	26997	26997	29616	29616
Year FE	Yes	Yes	Yes	Yes	Yes
Household-5 year FE	Yes	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes	Yes

This table reports the returns to education on the marriage market as a function of aggregate marriage market characteristics. In panel A, the dependent variable is the real value of the net dowry payment in 2010 rupees, which is equal to zero if no payment was made. In panel B, it is equal to the gross dowry payment from bride to groom. Groom education is defined in years. Highly Educated Fraction is the fraction of men on the marriage market in the same state-caste-five year period with more than 12 years of education. Above Median Education takes the value 1 if the groom's education is above the median education level for men. All regressions include controls for the bride's education and cluster standard errors at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

D Theoretical Model

This appendix lays out a simple two-period search model of marriage markets in India.[70]

Setup of the Model

There are two types of individuals of a gender $g \in \{M, F\}$ in the marriage market: high quality (H) and low quality (L), where the fraction of individuals of a gender g that are of type H is equal to α^g. In each period t, unmarried potential grooms and brides and costlessly search and are randomly matched to a potential partner. The groom and bride are denoted by their type i and j respectively, and the pair negotiates over a dowry payment d_{ijt}, where the value of d_{ijt} is determined in equilibrium. If the pair agrees on a dowry and decides to marry, they receive a (present-discounted) lifetime utility of $s_{ij} = y_i^m + y_j^f$ and do not participate in the marriage market in future periods. The bride receives a share λ of this marital surplus s_{ij}, while the groom received a share (1-λ).

The utility of a bride j who marries a groom of type i in period t is therefore given by:

$$U_{ijt} = (1-\lambda)s_{ij} + d_{ijt} \qquad \text{(Utility of Groom)} \tag{6}$$

$$V_{ijt} = \lambda s_{ij} - d_{ijt} \qquad \text{(Utility of Bride)} \tag{7}$$

We normalize the outside option of never marrying and remaining single to 0. There are no separations/divorce after marriage (consistent with the Indian context), and we assume a discount rate of 0 across periods for simplicity.

Dowry Payments in Equilibrium

We solve for the equilibrium dowry payments using backward induction.

Terminal period (T): In the last period, a pair ij will marry if the utility from marriage is greater than the utility from staying single i.e. $U_{ijT} \geq 0$ and $V_{ijT} \geq 0$. From Equations (6) and (7), this implies that the minimum dowry payment received by a groom of type i from a bride of type j should be at least $d_{ijT} \geq -(1-\lambda)s_{ij}$ and the maximum dowry that this bride would be willing to pay is given by $d_{ijt} \leq \lambda s_{ij}$. Any dowry value in this range can be sustained in equilibrium. We assume that the equilibrium dowry is determined through a Nash bargaining strategy where θ denotes the bride's bargaining power. This

[70] A two-period model is sufficient to provide the insights on how equilibrium dowry payments evolve as the 'types' of groom change. We later discuss the implications of including $T > 2$ periods.

implies that the equilibrium dowry solves:

$$\max_{d_{ijT}} U_{ijT}^{1-\theta} V_{ijT}^{\theta} \tag{8}$$

Substituting the values from Equations (6) and (7) and solving, we get:

$$\frac{1-\theta}{(1-\lambda)s_{ij} + d_{ijt}} = \frac{\theta}{\lambda s_{ij} - d_{ijt}}$$

Re-arranging the above expression, we get:

$$\begin{aligned} d_{ijT}^{*} &= (\lambda - \theta)s_{ij} && \text{(Equilibrium dowry)} \\ U_{ijT} &= (1-\theta)s_{ij} && \text{(Utility of the groom)} \\ V_{ijT} &= \theta s_{ij} && \text{(Utility of the bride)} \end{aligned} \tag{9}$$

The intuition for the above is straightforward from a model of two-sided matching with transferable utility. In such a model, the surplus generated by the match (s_{ij}) is divided among the two partners based on their bargaining weights (θ), while dowries are used to compensate for differences in their Pareto weights/preferences (λ). To put it another way, the equilibrium dowry paid by the bride will be the difference between her share of the marital surplus (λ) and her bargaining power over this surplus (θ). Given that we observe positive dowries in our empirical context, we assume $\lambda > \theta$.

Penultimate period: We now turn to the penultimate period $t = T - 1$. Let α_T^m and α_T^f (determined endogenously in equilibrium) be the fraction of H-type grooms and brides in period T respectively. Let EU_{iT} and EV_{jT} be the expected utility received by the groom and the bride respectively from rejecting this match in period $T-1$ and searching in period T. As discussed before, the equilibrium dowry will then be determined in Nash equilibrium by:

$$\max_{d_{ijt}} \Big[U_{ijt} - EU_{iT}\Big]^{1-\theta} \Big[V_{ijt} - EV_{jT}\Big]^{\theta} \tag{10}$$

Taking the first-order conditions and solving, we get that the equilibrium dowry payment, along with the utility for the bride and groom will be given by:

$$\begin{aligned} d_{ijt}^{*} &= (\lambda - \theta)s_{ij} + \theta EU_{iT} - (1-\theta)EV_{jT} && \text{(Equilibrium dowry)} \\ U_{ijt} &= (1-\theta)s_{ij} + \theta EU_{iT} - (1-\theta)EV_{jT} && \text{(Utility of the groom)} \\ V_{ijt} &= \theta s_{ij} - \theta EU_{iT} + (1-\theta)EV_{jT} && \text{(Utility of the bride)} \end{aligned} \tag{11}$$

Similar to the final period, note that the surplus generated in the marriage $U_{ijt} + V_{ijt} = s_{ij}$, and dowry is a way to divide this among the partners after adjusting (in additional to the channels discussed previously) for their outside options as well.

A bride of quality j and groom of quality i will decide to marry in period $T-1$ as long as:

$$\begin{aligned} \triangle_{ij} &\equiv s_{ij} - EU_{iT} - EV_{jT} \geq 0 \\ &= \theta(y_i^m - \overline{y^m}) + (1-\theta)(y_j^f - \overline{y^f}) \geq 0 \\ \text{where: } \overline{y^m}_i &= \alpha_T^m y_H^m + (1-\alpha_T^m) y_L^m \\ \overline{y^f}_j &= \alpha_T^f y_H^f + (1-\alpha_T^f) y_L^f \end{aligned} \tag{12}$$

Again, this has a very intuitive interpretation–the marriage surplus generated today (s_{ij}) has to exceed the expected surplus that the bride and groom will get from searching in the next period T ($EU_{iT} + EV_{jT}$).

Proof. Note that the expected utility for a groom of type i and a bride of type j in the last period T can be given by:

$$EU_{iT} = \alpha_T^f \times \underbrace{(1-\theta)s_{iH}}_{\text{Matched with H-type bride}} + (1-\alpha_T^f) \times \underbrace{(1-\theta)s_{iL}}_{\text{Matched with L-type bride}} \tag{13}$$

$$EV_{jT} = \alpha_T^m \times \underbrace{\theta s_{Hj}}_{\text{Matched with H-type groom}} + (1-\alpha_T^m) \times \underbrace{\theta s_{Lj}}_{\text{Matched with L-type groom}} \tag{14}$$

Since $s_{ij} = y_i^m + y_j^f$, we can simplify the above expressions as follows:

$$\begin{aligned} EU_{iT} &= \alpha_T^f \times (1-\theta)(y_i^m + y_H^f) + (1-\alpha_T^f) \times (1-\theta)(y_i^m + y_L^f) \\ &= (1-\theta)y_i^m + (1-\theta) \underbrace{\left[\alpha_T^f y_H^f + (1-\alpha_T^f) y_L^f\right]}_{=\overline{y^f}_T(\alpha_T^f)} \\ &= (1-\theta)\left[y_i^m + \overline{y^f}(\alpha_T^f)\right] \end{aligned}$$

Similarly:

$$EV_{jT} = \theta\left[y_i^f + \overline{y^m}(\alpha_T^m)\right]$$

A bride and groom will marry each other as long as: $U_{ijt} \geq EU_{iT}$ and $V_{ijt} \geq EV_{jT}$. Substituting from Equation (11) and re-arranging, a marriage will happen as long as $s_{ij} - EU_{iT} - EV_{jT} \geq 0$. Furthermore, substituting the values for EU_{iT} and EV_{jT} from

above, we get:

$$\begin{aligned}\triangle_{ij} &= y_i^m + y_j^f - (1-\theta)\left[y_i^m + \overline{y^f}(\alpha_T^f)\right] - \theta\left[y_j^f + \overline{y^m}(\alpha_T^m)\right] \\ &= \theta(y_i^m - \overline{y^m}_T) + (1-\theta)(y_j^f - \overline{y^f}_T)\end{aligned}$$

■

Decision to marry in $T-1$

We now consider the decision of a bride j and groom i who are matched in period $T-1$ to marry each other, as opposed to continue searching in period T, which will be determined as discussed in Proposition D (and determined by Equation 12).

Same-type pairs

HH pairs will always marry in period T-1, while LL pairs will never marry in T-1. **Proof.** Since $y_H^g \geq \overline{y^g}(\alpha_T^g)$ for $g = \{M, F\}$ i.e., the H-types will always earn no less than the average, from Equation (12), $\triangle_{HH} \geq 0$ i.e., HH pairs will always marry in period $T-1$. Similarly, since $y_L^g \leq \overline{y^g}(\alpha_T^g)$ for $g = \{M, F\}$ i.e., the L-types will never earn more than the average, from Equation (12), $\triangle_{LL} \leq 0$ i.e., LL pairs will never marry in period $T-1$. ■

Cross-type pairs

The decision for the HL and LH pairs is complicated by the observation that there is a potential gain for the L-type partner to wait and potentially match with a H-type in period T, while a potential loss for the H-type partner in rejecting this match and potentially matching with a L-type partner in period T. This will depend on $\{\alpha_T^m, \alpha_T^f\}$ that are endogenously determined in equilibrium and have to be incentive compatible with the choices made by each individual in the pair.

The only Nash equilibrium that can be sustained is where HL and LH pairs both marry in period T-1. **Proof.** To solve for the Nash equilibrium, we will examine whether the decisions made by an individual is incentive compatible i.e., conditional on the equilibrium, no individual has a profitable unilateral deviation. In particular, we consider the four possible scenarios and check whether it can be sustained as an equilibrium.

Both HL and LH do not marry in period $T-1$: This implies that $\triangle_{LH} \leq 0$ and $\triangle_{LH} \leq 0$, and {LL, HL, LH} pairs search in period T. Hence $\alpha_T^m = \frac{\alpha^m(1-\alpha^f)}{1-\alpha^m\alpha^f}$ and $\alpha_T^f = \frac{\alpha^f(1-\alpha^m)}{1-\alpha^m\alpha^f}$.

Note that since this problem is symmetric in gender, for a gender g (and partner of gender $g' \neq g$):

$$\begin{aligned}
\overline{y^g}(\alpha_T^g) &= \alpha_T^g y_H^g + (1-\alpha_T^g) y_L^g \\
&= \frac{\alpha^g(1-\alpha^{g'})}{1-\alpha^g\alpha^{g'}} \times y_H^g + \frac{1-\alpha^g}{1-\alpha^g\alpha^{g'}} \times y_L^g \\
\Rightarrow y_H^g - \overline{y^g} &= \frac{1-\alpha^g}{1-\alpha^g\alpha^{g'}} \times \triangle y^g \\
\Rightarrow y_L^g - \overline{y^g} &= \frac{\alpha^g(1-\alpha^{g'})}{1-\alpha^g\alpha^{g'}} \times (-\triangle y^g)
\end{aligned}$$

Substituting in Equation (12), we get:

$$\begin{aligned}
\triangle_{HL} &= \theta \frac{1-\alpha^m}{1-\alpha^m\alpha^f} \times \triangle y^m - (1-\theta)\frac{\alpha^f(1-\alpha^m)}{1-\alpha^m\alpha^f} \times \triangle y^f \\
&= \frac{1-\alpha^m}{1-\alpha^m\alpha^f}\Big[\theta\triangle y^m - (1-\theta)\alpha^f \triangle y^f\Big]
\end{aligned}$$

Similarly:

$$\begin{aligned}
\triangle_{LH} &= \theta \frac{\alpha^m(1-\alpha^f)}{1-\alpha^m\alpha^f} \times (-\triangle y^m) - (1-\theta)\frac{1-\alpha^f}{1-\alpha^m\alpha^f} \times \triangle y^f \\
&= \frac{1-\alpha^f}{1-\alpha^m\alpha^f}\Big[-\theta\alpha^m\triangle y^m + (1-\theta)\triangle y^f\Big]
\end{aligned}$$

Put together, if both pairs decide not to marry in period $T-1$, it implies that $\triangle_{LH} < 0$ and $\triangle_{HL} < 0$, which from the above equations imply:

$$\begin{aligned}
\triangle_{HL} < 0 \Leftrightarrow \alpha^f &> \frac{\theta}{1-\theta} \times \frac{\triangle y^m}{\triangle y^f} \\
\triangle_{LH} < 0 \Leftrightarrow \frac{\theta}{1-\theta} \times \frac{\triangle y^m}{\triangle y^f} &> \frac{1}{\alpha^m}
\end{aligned}$$

Satisfying both the above is not possible since $\alpha^g \leq 1$. Therefore, from the first inequality, $\frac{\theta}{1-\theta} \times \frac{\triangle y^m}{\triangle y^f}$¡1 and from the second, $\frac{\theta}{1-\theta} \times \frac{\triangle y^m}{\triangle y^f}$¿1, which is not simultaneously possible. Therefore, this strategy cannot be sustained in equilibrium as one pair will have an incentive to not marry and search in T instead.

HL pairs marry, while LH pairs do not to marry in $T-1$: This implies that $\triangle_{HL} \geq 0$, $\triangle_{LH} \leq 0$, and {LL,LH} pairs search in period T. Hence, $\alpha_T^m = 0$ and $\alpha_T^f = \alpha^f$, which implies that $\overline{y^m}(\alpha_T^m) = y_L^m$ and $\overline{y^f}(\alpha_T^f) = \overline{y^f}$. Substituting it in Equation (12) we get:

$$\triangle_{LH} = (1-\theta)(1-\alpha^f)\triangle y^f \geq 0$$

which is not compatible with their choice of not marrying in period $T-1$.

HL pairs do not marry, while LH pairs marry in $T-1$: This implies that $\triangle_{HL} \leq 0$, $\triangle_{LH} \geq 0$, and {LL,HL} pairs search in period T. Hence, $\alpha_T^m = \alpha^m$ and $\alpha_T^f = 0$, which implies that $\overline{y^m}(\alpha_T^m) = \overline{y^m}$ and $\overline{y^f}(\alpha_T^f) = y_L^f$. Substituting it in Equation (12) we get:

$$\triangle_{HL} = \theta(1-\alpha^m)\triangle y^m \geq 0$$

which is not compatible with their choice of not marrying in period $T-1$.

Both HL and LH marry in period $T-1$: This implies that $\triangle_{LH} \geq 0$ and $\triangle_{LH} \geq 0$, and only LL pairs marry in period T. Hence, $\alpha_T^m = \alpha_T^f = 0$, which implies $\overline{y^g}_T = y_L^g$. Substituting this in Equation (12), we get:

$$\triangle_{HL} = \theta(\underbrace{y_H^m - y_L^m}_{=\triangle y^m}) + (1-\theta)\times 0 = \theta\triangle y^m \geq 0$$

$$\triangle_{LH} = \theta \times 0 + (1-\theta)(\underbrace{y_H^f - y_L^f}_{=\triangle y^f}) = (1-\theta)\triangle y^f \geq 0$$

Therefore, this equilibrium is incentive compatible and can be sustained in equilibrium.

■

Average Dowry

The above equilibrium implies that {HH, HL, LH} pairs match in period $T-1$, while the LL pairs continue to search in period T. Assume that with some (small) probability ε, the negotiations between the bride and groom fail in period $T-1$, which means that these individuals search and are rematched in period T.[71,72] From the discussion in the

[71]This is a simplification of a more complex model in which there is an idiosyncratic match-specific utility value of marriage. For a bride j and groom i matched in period t, this would be a value φ_{ijt} , where the present discounted utility from their marriage would be equal to $s_{ij} + \varphi_{ijt}$ rather than simply s_{ij}; a positive value of φ would indicate that the pair is an idiosyncratically good match (e.g. the bride is skilled at cooking food that the groom prefers), while a negative value indicates a worse than average match (e.g. the families of the bride and groom quarrel when they meet). As a result, even a high type bride matched to a high type groom may prefer not to marry him because of a large negative value of φ. Including match specific shocks to utility is more realistic but has little effect on the main testable prediction of interest, so we have included the simplified model. Still, the exogenous probability of match failure can simply be rationalized within a model of idiosyncratic, match specific shocks, where φ takes on a value of zero with probability (1ε) and a value of k ¡ s_{HH} with probability ε; in the latter case, the match is never preferred by the couple. We elect not to include this probability of failure in the final period T, as its inclusion has little effect on the main predictions of interest.

[72]Note that the previous section assumes $\varepsilon = 0$ to simplify the main insight of the model. For small enough perturbations $\varepsilon \to 0$ i.e., as long as only a few marriages fail to materialize every period, the

previous section, this implies that $\{LL, \varepsilon LH, \varepsilon HL, \varepsilon HH\}$ pairs will search and re-match in period T, which means:

$$\begin{aligned}\alpha_T^m &= \frac{\varepsilon\alpha^m(1-\alpha^f) + \varepsilon\alpha^m\alpha^f}{(1-\alpha^m)(1-\alpha^f) + \varepsilon(1-\alpha^m)\alpha^f + \varepsilon\alpha^m(1-\alpha^f) + \varepsilon\alpha^m\alpha^f} \\ &= \frac{\varepsilon\alpha^m}{\varepsilon\alpha^m + (1-\alpha^m)(1-(1-\varepsilon)\alpha^f)}\end{aligned}$$

Similarly:

$$\alpha_T^f = \frac{\varepsilon\alpha^f}{\varepsilon\alpha^f + (1-\alpha^f)(1-(1-\varepsilon)\alpha^m)}$$

This implies that the dowries paid by the various pairs will be given by:

$$\begin{aligned}d_{HH,T-1} &= (\lambda-\theta)(y_H^m + y_H^f) + \theta(1-\theta)\left[y_H^m + \overline{y^f}(\alpha_T^f) - y_H^f - \overline{y^m}(\alpha_T^m)\right] \\ &= (\lambda-\theta)(y_H^m + y_H^f) + \theta(1-\theta)\left[(1-\alpha_T^m)\triangle y^m - (1-\alpha_T^f)\triangle y^f\right]\end{aligned}$$

$$\begin{aligned}d_{HL,T-1} &= (\lambda-\theta)(y_H^m + y_L^f) + \theta(1-\theta)\left[y_H^m + \overline{y^f}(\alpha_T^f) - y_L^f - \overline{y^m}(\alpha_T^m)\right] \\ &= (\lambda-\theta)(y_H^m + y_L^f) + \theta(1-\theta)\left[(1-\alpha_T^m)\triangle y^m + \alpha_T^f\triangle y^f\right]\end{aligned}$$

$$\begin{aligned}d_{LH,T-1} &= (\lambda-\theta)(y_L^m + y_H^f) + \theta(1-\theta)\left[y_L^m + \overline{y^f}(\alpha_T^f) - y_H^f - \overline{y^m}(\alpha_T^m)\right] \\ &= (\lambda-\theta)(y_L^m + y_H^f) - \theta(1-\theta)\left[\alpha_T^m\triangle y^m + (1-\alpha_T^f)\triangle y^f\right]\end{aligned}$$

$$\begin{aligned}d_{LL,T-1} &= (\lambda-\theta)(y_L^m + y_L^f) + \theta(1-\theta)\left[y_L^m + \overline{y^f}(\alpha_T^f) - y_L^f - \overline{y^m}(\alpha_T^m)\right] \\ &= (\lambda-\theta)(y_L^m + y_H^f) + \theta(1-\theta)\left[-\alpha_T^m\triangle y^m + \alpha_T^f\triangle y^f\right]\end{aligned}$$

$$d_{ij,T} = (\lambda-\theta)(y_i^m + y_j^f)$$

equilibrium discussed in the previous section does not change. However, incorporating ε is important when we calculate average dowry.

Putting this together, the average dowry paid across all the pairs will be given by:

$$\overline{D} = (1-\alpha^m)(1-\alpha^f)d_{LL,T}] + (1-\alpha^m)\alpha^f\Big[(1-\varepsilon)d_{LH,T-1} + \varepsilon d_{LH,T}\Big]$$
$$+ \alpha^m(1-\alpha^f)\Big[(1-\varepsilon)d_{HL,T-1} + \varepsilon d_{HL,T}\Big] + \alpha^m\alpha^f\Big[(1-\varepsilon)d_{HH,T-1} + \varepsilon d_{HH,T}\Big]$$

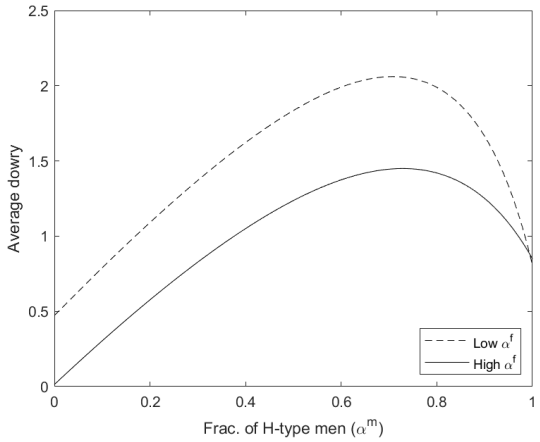
Substituting for above, we get:

$$\overline{D} = (\lambda-\theta)\Big[\overline{y^m}(\alpha^m) + \overline{y^f}(\alpha^f)\Big]$$
$$+ (1-\varepsilon)\theta(1-\theta)\Big[(\alpha^m - \alpha_T^m)\triangle y^m - (\alpha^f - \alpha_T^f)\triangle y^f]$$

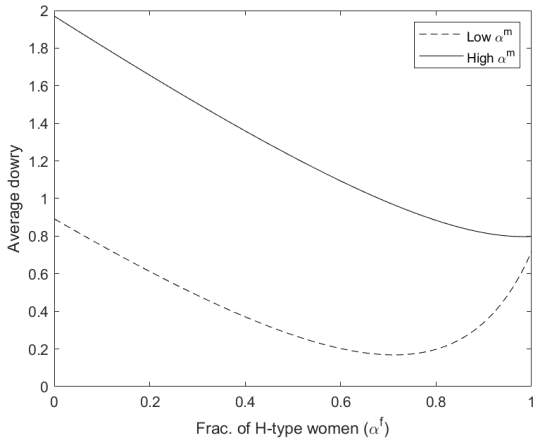
where: $\alpha^g - \alpha_T^g = \dfrac{(1-\alpha^g)(1-\alpha^{g'})(1-\varepsilon)}{\varepsilon\alpha^g + (1-\alpha^g)(1-(1-\varepsilon)\alpha^{g'})}$

Figure D1: Average Dowry and Quality of Men and Women

(a) H-type Men



(b) H-type Women



(c) Average Dowry and Frac. of H-types