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Why Dowry Payments Declined with Modernization in Europe but Are Rising in India

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In contrast to most dowry-oriented societies in which payments have declined with modernization, those in India have undergone significant inflation over the last five decades. This paper explains the difference between these two experiences by focusing on the role played by caste. The theoretical model contrasts caste- and non-caste-based societies: in the former, there exists an inherited component to status (caste) that is independent of wealth, and in the latter, wealth is the primary determinant of status. Modernization is assumed to involve two components: increasing average wealth and increasing wealth dispersion within status (or caste) groups. The paper shows that, in caste-based societies, the increases in wealth dispersion that accompany modernization necessarily lead to increases in dowry payments, whereas in non-caste-based societies, increased dispersion has no real effect on dowry payments and increasing average wealth causes the payments to decline.

I.   Introduction

This paper is motivated by the dramatic dowry inflation occurring in India today. Evidence shows that real dowry payments, the transfer of wealth from bridal families to grooms and their families at the time of

marriage, have risen over the last five decades. Rao (1993a, 1993b) and
Deolalikar and Rao (1998) show that, from 1921 to 1981, when grooms'
characteristics are held constant, the wealth of both families is controlled
for, and a real price index is imposed, the price of husbands went up
significantly. The Pearson correlation of coefficients between dowries
in this sample and the year of marriage is .15.[1] The relative unavailability
of data on dowry payments has limited the scope of empirical analysis;
however, this escalation in Indian dowries has been previously recog-
nized by numerous social scientists and continually remarked on in the
media.[2] A case study in Delhi by Paul (1985) did not estimate dowries,
but in his raw sample, average real dowry payments increased from 3,998
rupees in 1920–29 to 71,173 rupees in 1980–84. Interviews from a study
in Goa by Ifeka (1989) showed that highest-quality grooms who received
a dowry of 2,000 rupees in 1920 could command between 500,000 and
1 million rupees in 1980 (there was a 14-fold increase in prices over
this time period). The amounts of these dowries can be astronomical.
In the sample used by Deolalikar and Rao, average dowries are equal
to 68 percent of total assets before marriage and can amount to six
times the annual wealth of the bridal family. Case studies document
payments between as much as U.S.$60,000 and $130,000 (see, e.g., Billig
1992; Joshi 1992). The work of Deolalikar and Rao further shows that
the wealth of the bridal family is an insignificant determinant of dowry
payments and therefore throws doubt on the idea that this dowry in-
flation is only a wealth effect. That this is so is perhaps also demonstrated
by the political outcry against the so-called dowry "evil" and the fact
that the alarming escalation of dowry payments culminated in the pas-
sage of the Dowry Prohibition Act in 1961, which outlawed the practice.
The act has been to little avail, however, since dowry inflation has per-
sisted despite its illegal standing. In addition to real dowry inflation,
the custom of dowry payments has spread geographically and socially
throughout India into regions and communities in which it was never
practiced before (Srinivas 1980; Sharma 1984; Paul 1985; Kumari 1989;
Rao 1993a).[3]

[1] Since dowry payments in India were traditionally most predominant in the northern
regions of the country and in urban areas, the data used in these studies, which come
from rural districts in south central India, likely underestimate the value and degree of
inflation in dowry payments across the entire country.
[2] See Edlund (2001), who also analyzes the data used in the studies by Deolalikar and
Rao. Within the sociological literature, see, e.g., Epstein (1973), Lindenbaum (1981),
Caldwell, Reddy, and Caldwell (1983), Srinivas (1984), Paul (1985), and Billig (1992).
[3] Various authors have documented the transition from bride-price to dowry in southern
India (Epstein 1973; Caldwell et al. 1983; Srinivas 1984; Billig 1992). Similarly, dowry
payments now take place in rural areas whereas they were once largely restricted to urban
life (Caplan 1984; Paul 1985). The custom has also permeated the social hierarchy: typ-
ically, the practice is adopted by the upper castes, then over a period of time passes down
into lower castes, eventually reaching the Harijans, the lowest caste (Caldwell et al. 1983;
Upadhya 1990; Billig 1992).

The social consequences of this increase in dowry payments are severe. The sums of cash and goods involved are often so large that the payment can lead to impoverishment of the bridal family. This has a devastating effect on the lives of unmarried women, who are increasingly considered burdensome economic liabilities. The custom of dowry has been linked to the practice of female infanticide and, among married women, to the more obvious connection with bride burning and dowry death, that is, physical harm visited on the wife if promised dowry payments are not forthcoming.[4] The National Crime Bureau of the Government of India reports approximately 6,000 dowry deaths every year. Numerous incidents of dowry-related violence are never reported, and Menski (1998) puts the number at roughly 25,000 brides who are harmed or killed each year.

Income transfers from the family of a bride to the groom or his parents (dowry), or from the groom's parents to the bride's parents (bride-price), have existed for many centuries. The dowry system dates back at least to the ancient Greco-Roman world (Hughes 1985). With the barbarian invasions, the Greco-Roman institution of dowry was eclipsed for a time as the Germanic observance of bride-price became prevalent throughout much of Europe; but dowry was widely reinstated in the late Middle Ages.[5] It is well known that in medieval Europe and later, dowries were common practice among most, if not all, social and economic groups.[6] Nonetheless, the convention of dowry has been historically limited to only 4 percent of the cultures analyzed in Murdock's *Ethnographic Atlas* (1967) and restricted geographically to Europe and East Asia.[7] The societies in which dowries appear seem to exhibit substantial socioeconomic differentiation and class stratification.[8] Moreover, their marriage practices are typically monogamous, patrilineal (i.e., class status follows from the husband's status), and endogamous (i.e., men and women of equal status tend to marry) (Gaulin and Boster 1990). Marriage patterns in India follow these lines precisely; individuals are

[4] Kumari (1989), Sood (1990), Chauhan (1995), and Bloch and Rao (2002) address these issues. Sen (1990) estimates that 30 million women are missing in India because of female infanticide.

[5] The purpose of dowry payments is much discussed in the sociological literature. Of particular importance is the degree of property rights the daughter has over the transfer. Refer to Botticini and Siow (2002) for a historical synopsis of dowries and inheritance rights.

[6] Botticini (1999) studies the dowry system in a Tuscan town between 1415 and 1436. Stuard (1981) investigates dowries transferred among the nobles of medieval Ragusa (Dubrovnik) during 1235–1460. See Hughes (1985) for a historical survey of dowry in Mediterranean Europe.

[7] Murdock's *Ethnographic Atlas* examines 1,267 societies.

[8] This is in contrast to more homogeneous tribal societies in which bride-price is pervasive. For comparisons of marriage payments across societies, see Murdock (1967), Goody (1973), Jackson and Romney (1973), Harrell and Dickey (1985), and Gaulin and Boster (1990).

ranked according to caste, same-caste marriage is essentially universal, and, in the rare cases of across-caste marriage, the husband's caste determines that of the children.[9]

Dowry escalation has also occurred in other societies.[10] There are reports of dowry inflation in Roman times and among medieval and early modern noble families across Europe.[11] Dowry inflation is well documented to have occurred in the late Middle Ages and early Renaissance cities of Italy (see, e.g., Chojnacki 1974; Molho 1994); laws were also imposed to limit their size in the fifteenth and early sixteenth centuries, but they, too, seemed to be largely ignored.[12] Some of these samples, however, do not properly correct for changes in the cost of living and currency values, but recent work by Botticini and Siow (2002) confirms that average real dowry payments increased from 406.3 lire in 1260–99 to 1,643.0 lire in 1420–35 in the city of Florence.[13] China also seems to have experienced an episode of dowry inflation among the upper classes during the Sung period, 960–1279 (see, e.g., Ebrey 1991, 1993).[14] However, the general pattern in Europe was one of decline and eventual disappearance of dowry with modernization (see, e.g., Goody 1983; Lambiri-Dimaki 1985).[15] The Indian experience of dowry increases and diffusion with modernization stands in stark contrast and remains unexplained.[16]

[9] Reddy and Rajanna (1984) examine the Registrar of Marriage in Warangal District, where the population is 18,700,000, and find that, on average, seven intercaste marriages occurred each year between 1974 and 1980.

[10] Dowries in early modern European societies commonly amounted to several times the family's income (see, e.g., Cooper 1976).

[11] For example, Stuard (1981) finds that dowry payments among a sample of nobles in medieval Ragusa increased eightfold between 1235 and 1460, whereas prices at most tripled. Stone (1965) shows that dowries among the British aristocracy during the sixteenth and seventeenth centuries almost trebled whereas prices increased by only a third. According to Saller (1984), Roman dowries increased in the early to mid Republic but appeared to have reached their peak in the second century B.C. See also Dewald (1980) and Amelang (1986), respectively, for reports of dowry inflation in sixteenth-century France and seventeenth-century Spain.

[12] For example, the Senate enacted the first limit on Venetian dowries in 1420, and payments were abolished by the law of 1537. Dowries were limited by law in 1511 in Florence.

[13] This information was kindly supplied by Maristella Botticini. Refer to table 5 in their paper.

[14] It should be noted, however, that in no period was China a dowry society comparable to India (see Tambiah 1973). China was historically both a bride-price- and dowry-paying society; dowry ceased to play an important role after the Sung period. Although bride-price payments are still common, in general, dowry has virtually disappeared (see, e.g., Engel 1984; Ebrey 1991). See Zhang and Chan (1999) for an analysis of the coexistence of dowries and bride-prices in Taiwan and Watson and Ebrey (1991) for an overview of marriage in China.

[15] This is also documented for Brazil by Nazzari (1991).

[16] Another more straightforward economic explanation for dowry inflation than the one provided here recognizes dowry payments as a price that increases with a scarcity of grooms. This "marriage squeeze" argument relies on the fact that, in a rapidly growing population

The present paper explains this difference by emphasizing the crucial role played by caste (inherited status) in the marriage market. The model developed here contrasts caste- and non-caste-based societies. In the former, there exists an inherited component to status (caste) that is independent of wealth; in the latter, wealth is the primary determinant of status. Modernization comprises two components: an increase in average wealth across the society and increased wealth dispersion within status groups. The paper's main result is that, in the caste case, the increased dispersion in wealth accompanying modernization necessarily leads to increases in dowry payments, whereas in the noncaste case, increased dispersion has no real effect on dowry payments and increasing average wealth causes the payments to decline.

Marriage is analyzed using a matching model in which dowries are solved as an equilibrium payment made by a bride's family for a groom of a certain market value. An increase in the dispersion of grooms' market values (i.e., wealth) should be expected to increase the spread of dowries.[17] The somewhat surprising result demonstrated here is that, in equilibrium, this also raises average payments when caste (or inherited status) plays a role. That is, dowry inflation occurs in caste-based societies. To understand the argument simply, consider a society in which there are two castes and brides rank grooms in terms of both wealth and caste. Suppose that there is some substitutability between these two components, and recall that caste is patrilineal. Substitutability implies that, because brides gain by marrying up in caste, lower-caste brides are less sensitive to income differences in higher-caste grooms than higher-caste brides. To make the argument even more stark, assume that preferences are such that lower-caste brides are indifferent between grooms of different incomes in the higher caste; that is, only caste matters to them. Now suppose that higher-caste grooms experience an increase in the spread of their incomes (and hence in their market

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in which grooms marry younger brides, grooms are in relatively short supply in the marriage market (see, e.g., Caldwell et al. 1983; Billig 1992; Rao 1993*a*, 1993*b*). Since brides reach marriageable age ahead of grooms, increases in population affect brides first, thus causing an excess demand for grooms and an increase in price, i.e., dowry inflation. However, it has been shown by Anderson (2000) that this theory is untenable when modeled in a dynamic framework. That is, population growth cannot explain dowry inflation if women who do not find matches at the "desirable" marrying age can reenter the marriage market when older, as generally occurs. Second, most societies are characterized by persistent differences in ages of spouses, with men, on average, marrying women who are younger (see, e.g., Casterline, Williams, and McDonald 1986), and population growth; however, the convention of dowry is limited historically to relatively few cultures. The empirical evidence for this argument is inconclusive (see Edlund 2000). Notwithstanding this, it is worth noting that the explanation for dowry inflation in this paper can still occur with population growth, i.e., a surplus of brides.

[17] That dowry payments can arise as a result of a matching problem in the marriage market that consists of relatively heterogeneous grooms is demonstrated by Stapleton (1989) and Edlund (1996).

values) with modernization. The fact that the development process has
caused a lowly ranked (in terms of income) high-caste groom to become
poorer will have no effect on the dowry that a lower-caste bride is willing
to pay for him. Brides of his caste, however, value him less and therefore
wish to pay less, but because brides of his caste will forfeit their caste
ranking if they marry into a lower caste, they are willing to match the
higher payments he is offered from brides in the lower caste. These
payments act as a lower bound on the groom's dowry payment. Even
though this groom has a lower income and is therefore less valued by
brides in his caste, his caste status remains, and competition from lower-
caste brides partially insulates him from his lower earning power. The
other grooms in the high caste in turn receive equilibrium dowry pay-
ments higher than this lower bound since they also have higher caste
status but also have correspondingly higher wealth. As a result, average
dowry payments increase in this caste-based society when wealth be-
comes more heterogeneous within groups even though grooms' average
wealth has not changed.

In the absence of caste, however, an increase in dispersion is shown
to simply lead to an increase in the dispersion of dowry payments, with
no real inflation. Thus in societies in which the class structure reflects
only wealth differentiation, equilibrium dowry payments may occur, but
the model predicts that dowries should not inflate with increased wealth
dispersion. Moreover, Section IIIA demonstrates that if individuals, on
average, become increasingly better off with modernization, such so-
cieties will exhibit dowry deflation. This decreasing wealth effect can
also occur in caste-based societies, but Section IIIB establishes conditions
under which the inflating effect outweighs it.

It seems indisputable that the modernization process entails increas-
ing average wealth. When socially stratified societies are considered, the
way in which this increased wealth is distributed across groups is also
an important component. This aspect is characterized by the assumption
of increased dispersion in wealth within status groups. In the present-
day Indian context, the evidence strongly supports this assumption. Tra-
ditionally, one's caste (status group) innately determined one's occu-
pation, education, and, hence, potential wealth in India. Modernization
in India has weakened customary barriers to education and occupational
opportunities for all castes and, as a result, increased potential wealth
heterogeneity within each caste (see Singh [1988] for a survey of case
studies that analyze upward and downward occupational mobility within
caste groups). Studies show how the caste hierarchy is being steadily
undermined by economic forces and that a middle class is rapidly emerg-
ing. However, despite larger numbers of individuals from lower and
intermediate castes benefiting from the more achievement-based system,
occupational change is greatest among the higher castes. The recent

work of Darity and Deshpande (2000) and Deshpande (2000) constructs a measure of inequality that is a combination of between-group and within-group disparities. Using the National Sample Survey of India for the state of Kerala, one of the lowest-disparity regions in the country, Deshpande performs calculations that demonstrate that within-caste disparity is strongest among the upper castes.

This characteristic of modernization seems also to have played a role during the Sung period in China, when dowry inflation occurred. There the size of the educated class grew rapidly and, as a consequence, created much competition among the educated but nonaristocratic class for elite positions. This contrasts with the prior T'ang period, where there existed a very small number of ruling aristocrat families with no possibility for other classes to acquire elite positions (see, e.g., Ebrey 1991). In much of pre-industrial Europe, status group was also essentially determined by birth, where the basis of society was agricultural and was ruled by the landed aristocracy. There also modernization created new economic opportunities that tended to increase the dispersion of incomes within status groups. The growing importance of trade and commerce, beginning in the thirteenth and fourteenth centuries, led to a growth in urbanization and the emergence of a middle class and rising social tensions, so that by the late fifteenth century and early sixteenth century the medieval ordering of society bore little resemblance to the social structure of that day.[18] Further industrialization in the eighteenth and nineteenth centuries brought about the abolition of feudalism and legal rights contingent on birth. As Stearns (1967) documents, modernization eventually led to the decline of the aristocracy and inherited status and created a new society in which wealth became the principal criterion of social standing.[19] This is in great contrast to present-day India, where, despite the economic forces that cut across caste groupings, the inherent caste hierarchy remains rigid. This paper argues that it is this key difference between the modernization processes in present-day India and pre-industrial Europe that explains why dowries are increasing in India and declined in Europe. As mentioned above, the theoretical model predicts that societies based on inherited status will experience inflating dowry payments with modernization whereas non-status-based societies will see a decline. This explanation is also consistent with other instances of dowry inflation that similarly confirm the model's prediction of the importance of inherited status.

The central focus of the paper is to explain why modernization affects

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[18] During this time the levels of urbanization were highest in the areas of northern Italy, southern Germany, the Low Countries, and Spanish Kingdoms.

[19] The social changes did not occur precisely at the same time nor at the same rate across Europe. In particular, the decline of the importance of inherited status occurred first in the west of Europe and then later in the east and south (see Stearns 1967).

dowry payments differently in caste-based compared to wealth-based societies. The main model of the paper, described in Section II, develops a matching framework for analyzing the marriage market and dowry payments. In the marriage market, individuals trade on two goods: potential wealth and caste (inherited status). The model differs from the marriage market and parental investments literature, where spouses typically match according to only one good (potential wealth).[20] Here the rules of caste inheritance (or patrilineal descent) are used to develop a tractable analytical structure. Because increased wealth dispersion has no effect on real dowry payments in a wealth-based society, the paper isolates the two components of modernization and first explores the impact of increased wealth dispersion only in a caste-based society in Section IIC. Section III then analyzes the impact of increasing average wealth on dowry payments in both wealth- and caste-based societies. Section IV presents a conclusion.

II.   The Model

The model is developed for the general case of a caste-based society that is segregated into caste groups denoted by i, for $i \in \{1, \ldots, h\}$, where $i = 1$ denotes the lowest caste and $i = h$ the highest. Caste is used throughout the paper to refer to the inherited component of status, which is independent of wealth. For an analysis of societies that are not caste-based, I simply collapse the set of caste groups into a single element so that the only differentiating feature is wealth.

A.   Preferences

A traditional marriage in dowry-paying societies is arranged by the parents of the prospective brides and grooms. Marriage generally unites men and women from the same caste (or status group); in fact, several studies find that assortative mating on the basis of caste in India is close to perfect (see, e.g., Driver 1984; Bradford 1985; Deolalikar and Rao 1998). However, the rules of a traditional Hindu marriage do allow for across-caste marriages between males of higher castes and females of lower castes, although the opposite is condemned (Rao and Rao 1982; Avasthi 1979). If a man marries a woman from another caste, he and

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[20] See, e.g., Lam (1988) and Becker (1991) for an analysis of marriage matching equilibria in which premarital investments are treated as exogenous and matching occurs according to potential wealth of brides and grooms. Peters and Siow (2002) instead treat premarital investments as endogenous and study equilibria in which children use these investments to compete for spouses. The model of Laitner (1991) considers spouses who vary by their individual potential wealth and transfers from their parents. Botticini and Siow (2002) analyze a marriage matching equilibrium according to potential wealth and determine equilibrium dowry payments.

his children are not deprived of his caste membership; a woman marrying outside her caste, however, loses her membership, and her children take on the caste of her husband (Nishimura 1994). Hence for a woman, marrying down in caste is highly detrimental, whereas marrying up in caste may not be. Parents are pressured to marry their daughter to a man who is of the same or higher caste, lest their status be reduced to that of the person whom their daughter marries (Avasthi 1979; Rao and Rao 1982). Similar preferences existed for parents in the elite classes of medieval and Renaissance Europe, where social status also passed through the male line and there existed strong prejudices against daughters' marrying "down" (i.e., marrying men from a lower status group) (see, e.g., Chojnacki 1974; Johansson 1987).

Not only are there differences between men and women in potential partnerships, but also the importance of marriage is significantly greater for women. Families have an immense responsibility to marry off their daughters, and the sense of being a liability to one's parents is strong among unmarried women. Asymmetries between men and women further extend into the process of selecting mates. Typically, in India, the most important quality of a bride is a good appearance, whereas for a groom it is the ability to earn a living, often reflected in his educational level (see, e.g., Hooja 1969; Avasthi 1979; Rao and Rao 1980; Caldwell et al. 1983; Caplan 1984; Billig 1992; Chauhan 1995).

I capture these features in the following assumption.

ASSUMPTION 1. The quality of a groom in caste i, as perceived by a bride of caste j, is denoted $q(i - j, y_{ik})$, where $q(\cdot)$ is increasing and concave in both its arguments. Both arguments are substitutable; hence

$$q(i - j, y_{ik}) - q(i - j, y_{ik} - \theta) > q(i - j + 1, y_{ik}) - q(i - j + 1, y_{ik} - \theta) \quad (1)$$

for all $i \neq j$, where y_{ik} is the kth element from the income distribution of caste i.

Assumption 1 implies that the absolute utility value of a given groom is greater the lower the caste of the bride, but brides of lower castes are less sensitive to income differences in higher-caste grooms than higher-castes brides are.[21] This characterizes the feature of hierarchical societies in which lower-caste brides receive a benefit from marrying higher than their own caste. Substitutability between characteristics consequently implies that low-caste brides are not as concerned with the wealth of higher-caste grooms as brides of the groom's same caste, who do not receive any such benefit to marrying at their family's level.

In a wealth-based society, there is no caste component to a groom's quality; that is, $q(\cdot)$ is a function only of his income.

The bride's family maximizes a utility function, defined over q and a

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[21] In the event of not marrying, a bride keeps the caste of her father.

composite family consumption good c, subject to its budget constraint, $y_{jm} \geq pc + d$, where y_{jm} denotes the income of the bridal father (i.e., the mth element from the income distribution of caste j), p is the price of c, and d is the dowry payment for a groom of quality q.[22] Assuming separability in q and c and that the budget constraint binds, we can represent the utility function for a bride's family by

$$U = q(i - j, y_{ik}) + u(y_{jm} - d), \tag{2}$$

where p is suppressed since it plays no role. The function $u(\cdot)$ is increasing and concave.[23]

For simplicity, assume that a bride's quality does not enter directly into the marriage decision of grooms; this will be relaxed in a later section. The utility function for a potential groom and his family is

$$V = v(d), \tag{3}$$

where $v(\cdot)$ is increasing in d.

In equilibrium, dowry payments are a function of the utility parameters of (2), the incomes of both families, and of time, t (since income distributions are varying through time), that is, $d(i - j, y_{ik}, y_{jm}, t)$. However, since the purpose is to monitor changes in dowry payments for a given quality groom, defined by his income and caste, through time, it will be seen that the notation can be compressed into $d(y_{ik}, t)$.

B. Premodernization Equilibrium

Equilibrium dowry payments for the benchmark premodernization case, with grooms homogeneous within each caste, are first considered. Premodernization income levels are defined as follows.

ASSUMPTION 2. In the premodernization context, each male member of caste i has identical corresponding potential wealth equal to Y_i, where $Y_1 < Y_2 < \cdots < Y_h$.

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[22] It is implicitly assumed that each family has only one bride. Introducing more than one daughter into the analysis will alter the level of income available for the marriage of each daughter but will not affect the general results.

[23] If separability between c and q was not assumed, i.e., $U = u(q, c)$, all the main results of the paper would follow as long as $U_{12}(\cdot) \leq 0$. It is implicit in the representation above that brides and their families do not get a direct benefit from the dowry payment. This is a simplification given that dowries can form an inheritance for daughters rather than a price for their husbands. These differences are much discussed in the sociological literature and are not the focus here, where the aim is to explain changes in dowry payments over time. The main results of the paper would hold if instead brides also received a direct benefit from the dowry. This could be simply modeled in the framework above by assuming that the cost of a dowry is less than one; i.e., $-\alpha d$, where $0 < \alpha < 1$, entered into utility instead of $-d$. Including such a benefit proportionately shifts all equilibrium dowry payments upward (since parents have an additional motive to offer a dowry). However, the main result of inflation persists even though dowry levels are altered.

I take dowry payments in the lowest caste as numeraire. The price for the lowest-caste grooms is pinned down by participation constraints for both brides and grooms by arbitrarily dividing the surplus to marriage. An equilibrium is a set of prices, $d(Y_i, 0)$, $1 \leq i \leq h$, for a given income distribution, such that no bride or groom can be made better off by marrying someone else. In the marriage market, brides of different castes compete for grooms of varying qualities in rank order of their caste. All potential brides prefer men of higher castes, but since brides of higher castes have wealthier fathers and are subsequently willing to offer higher dowries than lower-caste brides, assortative matching according to caste is an outcome.[24] That equilibria with positive assortative matching are the only stable equilibria when all men and women have identical preferences over potential mates has been established elsewhere.[25]

In equilibrium, brides make large enough payments at marriage to ensure that they are not outbid by a lower-caste bridal family. In the case of the lowest caste, prices are such that grooms and brides prefer to marry than remain unmarried. The participation constraints for brides and grooms are

$$q(0, Y_i) + u(Y_i - d(Y_i, 0)) \geq \bar{U} \tag{4}$$

and

$$v(d) \geq \bar{V}, \tag{5}$$

where $\bar{U}$ and $\bar{V}$ denote the reservation utilities of an unmarried bride and groom, respectively. There can exist many potential equilibria in which (4) and (5) hold. More specifically, there exists a marriage payment $d(Y_1, 0) = \bar{d}$ such that all brides and grooms in the lowest caste prefer to marry than remain single if the following holds:

$$\varphi(\bar{V}) \leq \bar{d} \leq Y_1 - \psi(\bar{U} - q(0, Y_1)), \tag{6}$$

where $\varphi(\cdot)$ and $\psi(\cdot)$ are the respective inverse functions of $v(\cdot)$ and $u(\cdot)$. Restrictions (6) on $\bar{d}$ directly follow from the participation constraints of brides and grooms, (4) and (5). The left-hand side of (6) is grooms' minimum acceptable dowry and the right-hand side is brides' maximum willingness to pay. It is assumed that $\bar{U}$ and $\bar{V}$ are sufficiently small so that there exists a $\bar{d}$ in which both parties prefer marriage to

[24] The case in which higher-caste brides do not have wealthier fathers is considered later.
[25] See, e.g., Lam (1988) and Becker (1991) for the case of transferable utility and Gale and Shapley (1962) and Eeckhout (2000) for the case of nontransferable utility. Uniqueness of the equilibrium generally holds when there is a monotonic ordering of brides and grooms, which is the case here. Previous literature does not allow for payments; however, equilibrium dowry payments in this model maintain the ordering.

its alternative. Equilibrium payment $\bar{d}$ cannot be precisely determined without adding more structure to the basic framework. As it stands, $\bar{d}$ can be positive (a dowry) or negative (a bride-price). Assuming a numeraire $\bar{d}$, however, we can generate a set of equilibrium prices.

PROPOSITION 1. In the premodernization equilibrium, given a $\bar{d}$ satisfying (6), there exists a set of equilibrium prices, $d(Y_i, 0)$, $1 < i \leq h$, for a given income distribution such that dowry payments are higher in higher castes:

$$\bar{d} < d(Y_2,\ 0) < \cdots < d(Y_h,\ 0). \tag{7}$$

The proof of the proposition is in the Appendix. To understand how dowry payments are determined, consider equilibrium conditions for members of a given caste i. The binding incentive compatibility constraints can be expressed in terms of only two castes, i and $i-1$. This follows because the highest price offered for a groom in caste i from all castes below is from the caste just below, $i-1$. Since it is never worthwhile for higher-caste brides to marry down, because of concavity in caste, the amount a higher-caste bride is willing to offer to marry into a lower caste is less than the amount the lower-caste brides are willing to pay grooms in their own caste. Hence, offers from castes higher than i are not binding constraints.

The grooms of the higher caste i are more desirable to all the brides in castes $i-1$ and i. Bridal fathers of the higher caste are wealthier and will therefore outbid brides in caste i for these more desirable grooms. With the dowry price for caste $i-1$ grooms, $d(Y_{i-1}, 0)$, taken as given, the highest price a bride of caste $i-1$ is willing to pay for a groom of caste i satisfies the following equation:

$$q(0,\ Y_{i-1}) + u(Y_{i-1} - d(Y_{i-1},\ 0)) = q(1,\ Y_i) + u(Y_{i-1} - d(Y_i,\ 0)), \tag{8}$$

where a bride of caste $i-1$ is indifferent between marrying grooms of castes $i-1$ and i. The difference between the payments that solve (8), $d(Y_i, 0) - d(Y_{i-1}, 0)$, is positively related to $q(1, Y_i) - q(0, Y_{i-1})$, the marginal gain to a caste $i-1$ bride from marrying a groom of caste i. In this equilibrium, brides of caste i pay $d(Y_i, 0)$, which solves (8), and match with caste i grooms for all $1 < i \leq h$. The grooms of caste i receive a higher payment than those of caste $i-1$, not because caste i brides have wealthier fathers, but rather because they are relatively more desirable than lower-caste grooms.[26] Because of concavity in $q(\cdot)$, the mar-

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[26] That higher dowry payments are transferred in higher castes is a relationship confirmed in numerous studies (see, e.g., Paul 1985; Rao 1993a). It is perhaps worth noting that wealth differentiation among caste groups is not necessary for this result; a caste premium alone would be sufficient since $q(1, Y) > q(0, Y)$ for all Y. The assumption of increasing wealth in rank order of caste is imposed to avoid the possibility of higher-caste brides unable to outbid lower-caste brides. This assumption is relaxed later.

ginal gain to a bride from marrying up in caste is less than the marginal disutility of marrying down in caste; it is always worthwhile for a given bride to make the corresponding payment that satisfies the incentive compatibility constraint (8).

Equilibrium marriage payments are a function of the quality differences between grooms, the income of bridal fathers, and numeraire payment $\bar{d}$. The specification of $\bar{d}$ does not add to the central argument and is not explored further (I focus here on how a process of modernization affects the time path of dowry payments; the initial starting point for that path is not relevant).[27] It is possible that, because lowest-caste grooms are the least desirable, the marriage transfer is such that these grooms are pushed down to their reservation utility, and therefore $\bar{d}$ is feasibly negative (i.e., a bride-price). The analysis is thus not inconsistent with the occurrence of bride-prices in lower castes and dowries in upper castes in the premodernization case (as observed in reality).[28]

C. Increasing Within-Group Wealth Dispersion

Modernization has two components in our framework: an increase in average wealth and an increase in dispersion within caste groups. In this subsection we shall consider the impact of the increase in dispersion and delay consideration of increasing average wealth to Section IV.

The effects of modernization are typically felt more strongly on the groom's side of the marriage market since formal job opportunities are filled predominantly by males.[29] Hence it will be assumed for now that

[27] There is a substantial literature that does analyze the existence of dowries. See, e.g., Becker (1991), Grossbard-Shechtman (1993), Zhang and Chan (1999), and Botticini and Siow (2002).

[28] Traditionally, bride-price payments were practiced among the lower castes whereas dowry payments occurred within the upper castes (see, e.g., Blunt 1969; Srinivas 1978; Miller 1980). Additionally, there are numerous accounts of a transition from bride-price to dowry in the context of modernization (see, e.g., Lindenbaum 1981; Caldwell et al. 1983; Billig 1992). These accounts fit well with the analysis here, where it will be demonstrated that development places an upward pressure on real marriage payments, turning formerly negative payments (or bride-prices) into positive payments (or dowries). However, the initial existence of bride-prices in lieu of dowries is not explained. Bride-prices in India are typically associated with lower castes residing in rural areas and are more common in southern regions. It can be reasoned that the value of a bride is higher in poorer families in which women generally engage in informal income-earning activities. Similarly, some societies of South India are traditionally matriarchal, and in consequence, women have a somewhat higher status compared to those in northern states. This could lower initial dowry levels by increasing the share of marriage surplus accruing to bridal families. When men are also a homogeneous group, as in the predevelopment scenario, marriage negotiations that reward this higher value for women could induce bride-prices to occur. Once only men begin to reap the benefits of development, the relative value of men and women can be overturned and dowry payments emerge.

[29] The female labor force participation rate in the formal sector is approximately 16 percent (see, e.g., Mathur 1994).

increased wealth dispersion occurs only among grooms, whereas among brides the situation remains unchanged. This assumption is relaxed in a later section.

For simplicity, the within-caste group spreading of the income distribution around Y_i, which denotes the premodernization income level in caste i, is assumed to affect caste groups in chronological order, percolating downward from the highest caste. This accords with the Indian context, where the pattern of increased heterogeneity seems to have followed a top-down path but, in any case, does not qualitatively affect results.[30] In the first period of modernization, members of caste h have incomes distributed around Y_h, whereas incomes in other castes are unchanged. In the next period, members of caste $h - 1$ follow suit, and so on. Denote the period in which caste i undergoes its first increase in heterogeneity by s_i, where $s_h = 1$ and $s_{i-1} = s_i + 1$ for $1 < i \leq h$. Let periods be represented by t. Then we make the following assumption.

ASSUMPTION 3. The evolution of wealth follows

$$y_i \in \{Y_i\} \quad \text{for } t < s_i \tag{9}$$

and

$$y_{ik} \in \{Y_i - (\tau + 1)\theta, \ \ldots, \ Y_i + (\tau + 1)\theta\} \quad \text{for } t = s_i + \tau, \tag{10}$$

where y_{ik} denotes the kth income of members of caste i and $\tau = 0, 1, 2, 3, 4, \ldots$.

The wealth distribution thus evolves according to the following order: period 0:

$$\{Y_h\}; \ \{Y_{h-1}\}; \ \{Y_{h-2}\}; \ \{Y_{h-3}\}; \ \ldots \ ; \{Y_1\};$$

period 1:

$$\{Y_h - \theta, \ Y_h, \ Y_h + \theta\}; \ \{Y_{h-1}\}; \ \{Y_{h-2}\}; \ \{Y_{h-3}\}; \ \ldots; \ \{Y_1\};$$

period 2:

$$\{Y_h - 2\theta, \ Y_h - \theta, \ Y_h, \ Y_h + \theta, \ Y_h + 2\theta\}; \ \{Y_{h-1} - \theta, \ Y_{h-1}, \ Y_{h-1} + \theta\};$$

$$\{Y_{h-3}\}; \ \ldots; \ \{Y_1\}.$$

This pattern continues for all periods after.

A discrete distribution has been chosen so as to allow marriage market

[30] In the wake of independence, many skilled jobs became available after the departure of the British. These jobs were filled predominantly by members of the higher castes who had the prerequisite education (Kumar 1982). Following the introduction of affirmative action policies aimed at the lower castes, these higher-skilled jobs began to be filled by all castes. However, this assumption does not necessarily suit the development process, as it existed in pre-industrial Europe, where the middle classes were likely affected before the elite. In any case, the assumption is made in order to simplify the exposition, and it does not alter the main results, as will be made clearer later.

equilibrium conditions to be defined simply over a given groom quality across periods and to enable a closed-form investigation of real changes in dowry payments.[31]

To focus only on the role of increasing heterogeneity, consider a mean-preserving, discrete, and uniform income distribution across periods: Let $n^t(y_{ik})$ denote the number of men in caste i with income y_{ik} in period t.

ASSUMPTION 4. The evolution of wealth satisfies, for $t = s_i + \tau$,

$$n^t(y_{ik}) = n^t(Y_i) \quad \text{for } y_{ik} \in \{Y_i - (\tau + 1)\theta, \ldots, Y_i + (\tau + 1)\theta\}, \quad (11)$$

where $\tau = 0, 1, 2, 3, \ldots$, and $\sum_k n^t(y_{ik}) = \sum_k n^{t+1}(y_{ik})$ for all t.

Assumption 4 implies that the numbers of men of each income level within a given caste and period are equal and that the total supply of grooms remains constant across periods.

With modernization, not only are grooms within each caste becoming a more heterogeneous group, but so too are the fathers of the brides. We can calibrate the time length of a period so that it reflects the time difference between two generations: the grooms of period t are the bridal fathers of period $t + 1$. With assortative matching, grooms and brides marry according to both caste and income. The pattern of matching is complicated, however, by the time difference between two generations. Since, in any given period t, bridal fathers are less dispersed than grooms, brides with fathers of a given income level match with grooms of different income levels. This follows since, given assumption 4, the number of grooms of a given income level in period t is necessarily smaller than the number of bridal fathers of a corresponding income in period $t - 1$. Positive assortative matching then implies that the brides with the highest-income fathers within the income distribution of period $t - 1$ are matched with grooms of the two highest income levels from the income distribution of period t. A similar reasoning follows for low-income bridal fathers and grooms. This pattern of matching of grooms and brides is formally established in the following lemma and proved in the Appendix.

LEMMA 1. A wealth distribution that satisfies assumptions 2, 3, and 4 and positive assortative matching implies that (i) for periods $t \geq s_i$, brides with fathers of income Y_i match with grooms of income $y_{ik} \in \{Y_i - \theta, Y_i, Y_i + \theta\}$; (ii) for periods $t \geq s_i + \tau$, where $\tau \geq 1$, brides with fathers of income $Y_i - \tau\theta$ match with grooms of income $y_{ik} \in \{Y_i - (\tau + 1)\theta, Y_i - \tau\theta\}$; and (iii) brides with fathers of income $Y_i + \tau\theta$ match with grooms of income $y_{ik} \in \{Y_i + (\tau + 1)\theta, Y_i + \tau\theta\}$.

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[31] A marriage matching framework, analogous to the one here, for a continuous distribution of grooms and brides is considered in the search model of Burdett and Coles (1997); however, they do not analyze the occurrence of marriage payments.

For now, assume that the income distributions of each caste do not overlap. That is, as modernization progresses, the richest groom in caste $i - 1$ has less income than the poorest groom in caste i. This assumption is relaxed later.

1. Equilibrium Dowry Payments

The following proposition states the effect on dowry payments within a given caste i of its first increase in wealth dispersion. The more complicated time path of payments in all subsequent periods is considered in proposition 3.

PROPOSITION 2. A real increase in dowry payments for grooms with mean income Y_i occurs when caste i experiences its initial increase in wealth dispersion.

Proof. When modernization occurs in period $t = s_i$, grooms in caste i become a more heterogeneous group. Brides in caste i compete with lower-caste brides for the lowest-quality groom in their caste and compete among themselves for those of higher quality. The highest payment caste $i - 1$ brides are willing to pay for the lowest-quality groom in caste i satisfies

$$q(0, \ Y_{i-1}) + u(Y_{i-1} - d(Y_{i-1}, \ s_i)) = q(1, \ Y_i - \theta)$$
$$+ \ u(Y_{i-1} - d(Y_i - \theta, \ s_i)). \quad (12)$$

This condition, together with the equilibrium condition in the period prior to modernization ($t = s_i - 1$), incentive constraint (8), implies

$$q(1, \ Y_i) + u(Y_{i-1} - d(Y_i, \ s_i - 1)) = q(1, \ Y_i - \theta)$$
$$+ \ u(Y_{i-1} - d(Y_i - \theta, \ s_i)). \quad (13)$$

Given lemma 1, in equilibrium, brides match with different type grooms within their own caste. Brides take as given the highest-deviation payment offered by brides in caste $i - 1$, for the poorest groom in their caste, $d(Y_i - \theta, \ t)$ (as defined by condition [12]), and offer payments to the higher-quality grooms (with income Y_i and $Y_i + \theta$), which solve

$$q(0, \ Y_i - \theta) + u(Y_i - d(Y_i - \theta, s_i)) = q(0, \ Y_i) + u(Y_i - d(Y_i, s_i))$$
$$= \ q(0, \ Y_i + \theta)$$
$$+ \ u(Y_i - d(Y_i + \theta, s_i)). \quad (14)$$

Equation (1), together with (13) and (14), yields

$$u(Y_i - d(Y_i - \theta, s_i)) - u(Y_i - d(Y_i, s_i)) > u(Y_{i-1} - d(Y_i - \theta, s_i))$$
$$- u(Y_{i-1} - d(Y_i, s_i - 1)). \quad (15)$$

Given the concavity of $u(\cdot)$ and given that $Y_i > Y_{i-1}$, (15) implies that

$$d(Y_i, s_i) > d(Y_i, s_i - 1). \quad (16)$$

Therefore, real dowry inflation occurs. Q.E.D.

Recall that in the first period of modernization the income of bridal fathers is unchanged, so that the result above is independent of any wealth effects on the demand side. The reason for the real dowry inflation is the substitutability between the two components of a groom's quality: his potential wealth, y_{ik}, and his caste, i. Because of this substitutability, grooms who have been made worse off by modernization, in terms of their potential wealth, can still trade on their caste status because it is of value to lower-caste brides. Since brides gain from marrying a higher-caste groom and this gain is partially substitutable with income, his lower income is of relatively little importance to them. As a consequence, a poorer groom in caste i is worth more to a bride from caste $i - 1$ than he is to a bride from his own caste, in absolute terms. However, because $q(\cdot)$ is concave, the loss in utility from marrying down in caste is greater than the utility gain from marrying up, and brides of caste i are thus willing to outbid brides of caste $i - 1$ in order to marry the poorer grooms of their own caste, although they are paying a higher price than they would have in the absence of competition from lower-caste brides. Condition (14) holds in equilibrium, so that all dowry payments are determined relatively and there is a real increase in all other payments. The following proposition, which is proved in the Appendix, shows this to be the case in all periods of modernization.

PROPOSITION 3. There is real inflation in dowry payments for all grooms within a given caste i, for $1 < i \leq h$, in all periods of modernization, $t \geq s_i$.

Since there is real dowry inflation for all grooms, average dowry payments in all castes also rise.

Increases in dowry payments in a caste-based society occur because of competition from lower-caste brides for higher-caste grooms. In other words, dowry inflation arises as an endogenous response to a modernization process that threatens the traditional social hierarchy, that is, individuals of different castes having comparable income levels. In reality, this does not mean that we should observe active across-caste competition. Instead it implies that the observed dowry inflation is serving to maintain the incentive compatibility of within-caste marriage when it is threatened by increasing wealth heterogeneity across caste groups.

If incentive compatibility were to fail, then the caste system would be eroded since high-caste grooms would prefer to marry down in caste and accept larger offers from low-caste brides. In this sense, the model here suggests that inflation in dowry payments has served to preserve same-caste marriage and, in turn, preserve the caste system. When caste members are no longer homogeneous in occupations and incomes, as is now the case in India, the only defining feature of caste becomes same-caste marriage. Writers on the pre-industrial European episodes of dowry inflation also argued that increased dowry payments played a central role in maintaining endogamous (inherited status) marriages.[32] The results in this section show the mechanism through which such an effect is possible.

In the Indian context, the temporal connection between dowry inflation and income heterogeneity has already been noted by Chauhan (1995), who explicitly links the chronological changes in the Indian dowry custom to increased wealth differentiation. She notes the spread of dowry practices and the increase in payments directly after independence in 1947. This was a time of significant structural change in which unprecedented opportunities for economic and political mobility began to open up for all castes (see also Jayaraman 1981). Others have similarly linked Indian dowry diffusion and inflation to new economic opportunities concomitant with modernization (see, e.g., Epstein 1973; Caldwell et al. 1983; Srinivas 1984; Paul 1985; Upadhya 1990; Billig 1992; Chauhan 1995). Some sociologists argue that the spread of dowry payments from upper to lower castes is due to "Sanskritization," or lower-caste imitation of the customs practiced in higher castes in order to acquire status (see, e.g., Epstein 1973). Such activity among lower castes has been facilitated by increased wealth. While I do not argue with their interpretation, the theory here provides an explanation of the same facts based on economic reasoning.

2.   Comparative Statics and Empirical Predictions

Although it is the substitutability between the components of $q(\cdot)$ that is the central reason for the occurrence of real dowry inflation during the process of modernization, other factors alter the rate of inflation across periods. These relationships are summarized in the following proposition, which is proved in the Appendix.

PROPOSITION 4. The rate of inflation in dowry payments of a given caste (a) is increasing in the degree of wealth dispersion within that

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[32] This has been argued by Stuard (1981) for Ragusa, Molho (1994) for Florence, Saller (1984) for Rome, Stone (1965) for England, and Chojnacki (1974) and Queller and Madden (1993) for Venice.

caste, (b) is increasing in the degree of dispersion in all castes below, and (c) is higher the greater the income disparity between the rich of the lower castes and the poor of the higher castes.

The cause of dowry inflation is across-caste competition forcing a lower bound on dowry payments within caste. Further increases in dowry payments occur when this lower bound is further increased. Effect a lowers the income of the poorest groom in a given caste, but this is relatively unimportant to brides of the lower castes, because of substitutability in $q(\cdot)$, so that equilibrium dowry payments required from brides of his own caste fall less than proportionately. Since within-caste payments then reflect only the income differences between other grooms and the poorest one, all other payments also rise. Similarly, effect b occurs because increased dispersion in lower castes raises dowry payments in those lower castes and hence raises the highest bid, which is determined relative to these payments, that the richest brides there will make for the poorest groom in one's own caste. Since the lower bound again rises, all other grooms' payments rise accordingly to maintain incentive compatibility in assortative matching. Finally, effect c follows because, the larger the income of high-caste bridal fathers, relative to the highest bidders from the lower castes, the larger the increase in dowry payments relative to this lower bound.

In the analysis above, dowry inflation affects higher castes first because members of these castes reap the benefits of modernization before the lower castes. This coincides with the observed empirical record in India (see, e.g., Sharma 1984; Srinivas 1984; Paul 1985). However, none of the results in this section depends on the assumption that modernization spreads to lower castes one period at a time. This can be seen from the previous proposition. Since inflation occurs because across-caste competition forces a lower bound on within-caste dowry payments, increasing the lower castes' dispersion before, or simultaneously with, one's own caste implies qualitatively identical results. As the proposition shows, all increases in dispersion, whether within own caste or within another, work the same way, so the result is not affected by the ordering of those increases.

3.   Disappearance of Dowry Inflation

In the analysis above, endogamous marriage is the equilibrium matching outcome; all brides and grooms marry within caste. This corresponds with India, where assortative matching on the basis of caste is close to perfect. However, the model predicts that this will cease to be an equilibrium if income distributions across castes become more equal. In particular, a sufficient condition for some brides and grooms to begin to marry across castes is represented by the following proposition.

PROPOSITION 5. Endogamy breaks down if the following condition holds:

$$q(0, Y_{i-1}^{rich}) - q(-1, Y_{i-1}^{rich}) < q(1, Y_i^{poor}) - q(0, Y_i^{poor}) \qquad (17)$$

for $1 < i \leq h$, where Y_i^{poor} denotes the lowest income in caste i and Y_{i-1}^{rich} the highest in caste $i - 1$ in a given period t.

Given that $q(\cdot)$ is concave in its first element, relative caste status, condition (17) holds only if grooms at the high end of the wealth distribution in caste $i - 1$, those with income Y_{i-1}^{rich}, have significantly greater incomes than those at the low end of the income distribution of caste i, with income Y_i^{poor}. Therefore, with sufficient overlap in incomes across castes, within-caste incentive compatibility breaks down and matching across castes occurs; some brides from caste i marry down in caste since their spouses have high enough incomes to compensate for the loss of status in terms of caste.

Recall that dowry inflation occurred as an endogenous response to modernization when individuals married within caste. This implies that once endogamy breaks down and intercaste marriages begin to occur because it is no longer worthwhile for poor high-caste brides to outbid richer low-caste grooms, then dowry inflation should decline.

PROPOSITION 6. (a) The number of intercaste marriages increases as income inequality across caste groups decreases. (b) Real dowry payments are nonincreasing with modernization with sufficient income equality across caste groups such that (17) holds for all $1 < i \leq h$.

Condition (17) is very stringent since it requires that endogamy breaks down in all castes. This follows from proposition 4, where dowry payments in a given caste are increasing with dowry payments in all castes below; therefore, for dowry inflation to cease in a given caste, it must also cease in all castes below. It is also important to note that proposition 6 requires sufficient equality *across* castes, but it does not require equality *across* society. With income inequality across society held constant, condition (17) will hold if there is a sufficiently large income redistribution across castes. This will eventually follow if the development process is such that ability is more accurately rewarded, rendering previously homogeneous castes, where potential wealth was inherited, heterogeneous to the extent that the income distributions across castes significantly overlap.

Another way dowry payments can fall is for women to start to have value in the marriage market.[33] If we adapt the model of Section III*A* so that grooms also directly benefit from the caste and economic value

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[33] There are several studies that find that, when groom characteristics are held constant, there has been a significant increase over time in the schooling of brides (see, e.g., Deolalikar and Rao 1998; Billig 1992).

of their potential spouse, the following proposition can be demonstrated.

PROPOSITION 7. (a) The level of equilibrium dowry payments is decreasing in the quality of brides; however, (b) dowry inflation persists with modernization if the grooms' caste is relatively more important than the brides' caste in determining status; and (c) the more important the grooms' caste is relative to the brides' caste, the higher the rate of inflation caused by modernization, with the division of marriage surplus held constant.

Proposition 7 is proved in the Appendix with a simple two-period, two-caste version of the adapted model. In this case, the level of dowry payments is lower when brides are valuable since this value acts as a substitute for their dowry payment. However, increased income dispersion across both brides and grooms can still have an inflationary effect if the importance of grooms' caste is larger than that of brides, which is always true in a patrilineal society. This follows because it is the caste component of grooms' quality that is essential to the inflation result of the previous section; therefore, the result persists if their caste is more important than their brides' in determining status.

Recall that it was the grooms' caste that maintained the marriage market value of those whose income fell with modernization. In a patrilineal society, no such effect is present for brides if they forfeit their own caste ranking when marrying down. Consequently, proposition 7 implies that, because of gender asymmetries with respect to caste, even when women begin to reap benefits comparable to those of men from modernization, dowry inflation can persist. This is perhaps why it has been observed that increasing the quality (in terms of education and productivity) of brides has had only a meager effect in reducing the dowry problem in India (see, e.g., Sandhu 1988; Saroja and Chandrika 1991; Deolalikar and Rao 1998).

III. Increasing Average Wealth

I now turn to the more standard component of the modernization process, a rise in average wealth. I first consider how this aspect affects dowry payments in a non-caste-based society. We shall see that the effects are similar in a caste-based society; however, the wealth dispersion effects discussed in the previous section must also be taken into account in that case.

With the notation developed earlier, increasing average wealth necessarily implies that

$$\sum_k n^t(y_{ik})y_{ik} > \sum_k n^{t-1}(y_k)y_{ik}, \tag{18}$$

where $y_{ik} \in \{Y_i - (\tau + 1)\theta, \ldots, Y_i + (\tau + 1)\theta\}$ for $t = s_i + \tau$, $\tau = 0, 1, 2,$ 3, ...

A. Wealth-Based Society

In a wealth-based society, potential spouses simply match according to income; that is, brides with wealthy fathers are matched with high-income grooms. Dowry payments can occur in such a society, just as they did in the premodernization case of the previous section, where wealthier grooms receive higher dowry payments. With the wealth distribution held constant, dowry payments decline if women begin to benefit from modernization since the economic value of brides then acts as a substitute for their dowry payment. As already discussed, dowry inflation as a result of increased wealth dispersion does not occur in a wealth-based society. In fact, increased wealth dispersion may instead lead to a decline in average dowry payments if brides' preferences for grooms' quality are concave in income. To see this, consider moving from a period in which all grooms have income Y_i and receive dowry payment $d^*(Y_i)$ to one in which grooms are uniformly distributed around Y_i. In equilibrium there will be a spread in dowry payments accordingly; brides are indifferent between marrying the different-quality grooms (who now vary by income), and hence lower-quality grooms receive payments less than $d^*(Y_i)$ and higher-income grooms receive larger payments. If brides' preferences for grooms' quality are concave in income, average dowry payments can decrease across periods, since then the lower dowry payments have a larger negative impact on average dowry payments than the positive impact of the higher dowry payments, compared to the previous period in which average dowry payments are equal to $d^*(Y_i)$.[34]

Real dowry payments also change with the population's average wealth. This works in a seemingly counterintuitive direction in a matching framework. When individuals become increasingly better off, the supply of wealthy grooms necessarily exceeds the supply of wealthy bridal fathers. As a result, in a matching model of marriage, bridal fathers of a given wealth match their daughters with grooms richer than they are. This implies that, for a given quality groom, poorer bridal fathers are

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[34] This decreasing effect on average dowry payments is also present in the caste case. Similarly, because the development process is such that the lowest-quality grooms in period $t + 1$ are of lower quality than the lowest of the previous period, the payments received by the lowest-quality grooms could conceivably decrease average dowry payments across periods even though dowry payments for all other grooms are increasing. However, a minimal restriction on the concavity of $q(\cdot)$ rules this out, i.e., $2[f(q_2(0, y_i - \theta)) - f(q_2(1, y_i - \theta))] > f(q_2(1, y_i - \theta))$, where $f(\cdot)$ is increasing.

determining dowry payments across time. Therefore, in other words, real dowry deflation occurs when average wealth is increasing.

PROPOSITION 8. Real dowry payments are nonincreasing in a wealth-based society when income distributions satisfy first-order stochastic dominance across periods:

$$\sum_{y_{ik} \le y} n^t(y_{ik}) < \sum_{y_{ik} \le y} n^{t-1}(y_{ik}), \tag{19}$$

where $y_{ik}, \bar{y} \in \{Y_i - (\tau + 1)\theta, \ldots, Y_i + (\tau + 1)\theta\}$ for $t = s_i + \tau$, $\tau = 0, 1, 2, 3, \ldots$.

Proposition 8, which is proved in the Appendix, establishes a sufficient condition for the case in which dowry payments are nonincreasing across periods. This time path for dowry payments is predicted for most cases of increasing average wealth. The exception would be a wealth distribution in which, although the total number at the top end of the income distribution is decreasing across time, average wealth could still be increasing (i.e., [18] is satisfied) if the number of the richest people at the top end of the distribution is sufficiently large. Therefore, with the exception of extremely unequal income distributions, we should expect that dowry payments are nonincreasing when average wealth is increasing. Since dowry payments are nonincreasing for all grooms, average dowry payments should also be nonincreasing. However, this latter result is not as straightforward to demonstrate since there are several effects to consider.[35]

Proposition 8 points out that a more simple explanation for dowry inflation, which treats grooms as a normal good and posits an increase in the expenditure on grooms when average wealth increases, is unlikely to hold in a matching model of marriage. Conversely, it suggests a force leading dowry payments to decline with modernization in a wealth-based society such as postindustrial Europe.

B.   Caste-Based Society

Though dowry payments are likely to decline with increases in average wealth in a wealth-based society, they need not do so in a caste-based one. Counteracting the force for decline working through proposition 8 is the already analyzed effect of increased wealth dispersion within caste groups. The following proposition establishes a sufficient condition under which the counteracting effect dominates.

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[35] On the one hand, the larger the increase in average wealth, the greater the dowry deflation across grooms; however, there also exists a larger number of high-quality grooms. In addition, concavity implies that richer grooms have lower marginal value than poorer ones.

PROPOSITION 9. Real dowry inflation occurs if

$$f(q(0, Y_i - z\theta) - q(0, Y_i - (z + 1)\theta)|Y_i - z\theta)$$

$$- f(q(1, Y_i - z\theta) - q(1, Y_i - (z + 1)\theta)|Y_{i-1})$$

$$> f(q(0, Y_i + (z + 1)\theta) - q(0, Y_i - z\theta)|Y_i - z\theta)$$

$$- f(q(0, Y_i(z + 1)\theta) - q(0, Y_i - z\theta)|Y_i - (z - 1)\theta), \qquad (20)$$

where $z \geq 1$ and $f(a - b \mid y)$ is increasing in y and $a - b$ and represents that the marginal valuation of grooms is conditional on bridal father income, y.

Proposition 9 is proved in the Appendix. Condition (20) ensures that the positive caste effect of modernization outweighs the negative income effect on equilibrium dowry payments. The condition does not look very intuitive but has a simple interpretation. It suggests that inflation is likely to occur if there exists sufficient income disparity across castes, that is, if $(Y_i - z\theta) - Y_{i-1}$ is sufficiently larger than $(Y_i - z\theta) - [Y_i - (z - 1)\theta] = \theta$ and if the benefit to marrying up in caste, independent of the income benefit, is sufficiently large.

For a caste-based society, the main conclusion is that the severity of dowry inflation is mitigated by increases in average wealth, especially if they are relatively uniformly spread. In a wealth-based society, dowry payments will decline if, on average, individuals experience an increase in wealth.[36]

IV.   Conclusion

This paper offers an explanation of why dowry payments are increasing in present-day India whereas they declined with industrialization in Europe. It is argued that the key difference between these two societies is that the early industrial period in Europe saw wealth take precedence over inherited status as the primary determinant of social class. In contrast, the process of modernization in India has led to virtually no effect on caste's central role in determining status.

When caste breaks down, the model predicts that the forces of modernization tend to cause a decline in dowry payments. So continued dowry inflation, and its attendant problems in India, should decline when endogamy breaks down and caste ceases to be an important de-

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[36] Related work is the growth model by Cole, Mailath, and Postlewaite (1992), who also study two equilibria, one in which status is inherited and the other in which status is determined by wealth. Daughters are differentiated by an exogenous characteristic, whereas sons are differentiated by their status. In their analysis, there are greater intergenerational transfers to sons in the wealth-based society, where it is easier to improve their relative ranking in the marriage market.

terminant of status. This suggests a role for government in attempting to formally weaken the importance of caste. Affirmative action laws to date have removed customary barriers to educational and occupational opportunities and property ownership for members of the lower castes. These types of policies should have an effect in the long run since, as the paper demonstrated, endogamy will eventually break down when there is sufficient income equality across caste groups.

In short, where marriage matching places less value on the caste of potential mates, there should be less inflation in dowry payments. Interestingly, in a set of 105 interviews conducted by Krishnakumari, Geetha, and Shantha Mohan (1984) in the city of Bangalore, 29 percent of respondents believed that intercaste marriage would greatly reduce the problem of dowry. A case study of Christians in Madras revealed that increasing dowry payments occurred among those with a caste affiliation, whereas among those who were casteless there was no comparable effect (see Caplan 1984). Caplan concludes that this provides evidence that dowry payments should be seen as a means of "preserving endogamous boundaries in a heterogeneous setting" (p. 216). This accords precisely with the argument in this paper. Here dowry inflation arises as an endogenous response to same-caste matching in the marriage market when there is increased wealth dispersion (or heterogeneity). Although research pertaining to dowry payments in the rest of South Asia is relatively sparse, there are some reports of increasing dowries in Pakistan (see Sathar and Kazi 1988). This may appear to contradict the emphasis on caste in explaining dowry inflation since caste is rooted in Hinduism and is not a component of Islamic religious codes. However, for the purposes here, caste does exist among Muslims in Pakistan. That is, there traditionally exists a hierarchical social structure based on occupation, where group membership is inherited and endogamy is practiced within the different groups (see, e.g., Korson 1971; Ahmad 1977; Dixon 1982; Lindholm 1985; Beall 1995).

The theoretical finding in this paper is also consistent with other observed instances of dowry inflation. A persistent feature of these previously noted dowry inflations is that they tended to occur in societies in which inherited status was an important component of social standing and endogamy was practiced. Molho (1994) establishes a link between high rates of endogamy among high-status lineages and dowry inflation in late medieval Florence. Saller (1984) makes the same connection in his analysis of dowry inflation in Roman marriages, and so does Stuard (1981) among Ragusan noble families during the thirteenth and fifteenth centuries. Moreover, the analysis of this paper predicts dowry inflation when the modernization process threatens the traditional social hierarchy; that is, individuals of different status groups have comparable wealth levels. This is exactly in accord with Stone (1965, p. 647),

who notes that dowries in England trebled when "daughters of the nobility were faced with growing competition from daughters of the squirearchy." This is similarly argued by Chojnacki (1974), who links dowry inflation in early Renaissance Venice to competition between the oldest noble clans and newer ones, where the relative newcomers sought status by means of higher dowries and the more ancient families fought to preserve theirs by the same means. This paper argues that dowry inflation ceased in these once endogamous societies because endogamy eventually broke down. This occurred with modernization when lower-status individuals gained increasing wealth and the significance of inherited status declined.

The decline and disappearance of dowries are not extensively documented, and as a result it is difficult to prove or disprove the claim of this paper.[37] The support for the argument presented here can only be suggestive and lies mainly in the timing of dowry disappearance with the breakdown of endogamy. Saller (1994) reports that Roman dowry payments, throughout the late Republic and Principate, remained stagnant and may have declined. This may correspond to another feature of Roman social history: the rapid disappearance of old senatorial families and the concomitant entry of new families into the aristocracy and the consequent exogamy that characterized Roman aristocracy at least after 300 A.D., as documented by Shaw and Saller (1984). Lambiri-Dimaki (1985) marks the advent of industrialization as the turning point in the history of dowry in Europe. She links the decline and disappearance of dowries to the changes that followed, among which include "a new social ethos which placed greater value upon individual achievement than upon inherited status" (p. 177). Similarly, Nazzari (1991) links the decline of dowries in nineteenth-century Brazil to the development of capitalism and its repercussions, among which included the transformation of a hierarchical clan-based society into a more individualistic one divided into classes based on wealth, not birth. Once the preservation of inherited status ceases to be important, endogamy, an essential constituent of stratified social order, is no longer necessary. Accordingly, as Stone (1977) documents, beginning in eighteenth-century Britain, mate selection gradually became more free and dowries grew less important in marriage negotiations (except among the highest nobility). Similarly, although the general rule in eighteenth-century France was endogamy, interstratum unions did begin to occur (typically between the new bourgeoisie and the old nobility) (see Barber 1955).

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[37] An exception is the work of Nazzari (1991), who studies the disappearance of dowry payments in São Paulo, Brazil. There, dowries, a European institution introduced by the Portuguese, were prominent in the seventeenth century and declined in the nineteenth century. She too notes that dowries were important when nobility conferred more status than wealth.

Intermarriage between the landed aristocracy and successful bourgeois families had occurred even earlier, at least by the seventeenth century, in the cities of northern Italy (see Watts 1984). Nineteenth-century Brazil was also characterized by a freer selection of potential spouses.[38]

Notwithstanding this, other reasons for dowry disappearance that have previously been suggested likely also played a role. Dowries are commonly described as a form of inheritance given to daughters that may simply decline if becoming an inferior way of providing brides with future wealth relative to investing in daughters' human capital (see, e.g., Goody 2000). A more subtle explanation for dowry disappearance is suggested by Botticini and Siow (2002), who posit that parents transfer dowries to daughters and bequests to sons to solve a free-riding problem. They consider patrilocal societies in which daughters join the households of their husbands and married sons remain with their parents. If married daughters share in the parents' bequests, sons will not get the full benefits of their efforts to extend the family wealth and as a result will supply too little effort. In order to mitigate this free-riding problem, altruistic parents give bequests to sons and dowries to daughters. Dowry payments in this context will disappear when the development process is such that male children are less likely to work and live with their parents.

Like the explanation in this paper, these theories attribute the decline and disappearance of dowry to aspects of modernization. A point of contrast, however, is the present paper's linking of the breakdown in inherited status to the decline and disappearance of dowry. The theory here thus has observably different implications and allows, at least in principle, the possibility of empirically distinguishing it from previous explanations.

Appendix

Proof of Proposition 1

Given condition (8) for all i, where $1 \leq i < h$, it can be shown that it is not worthwhile deviating to marry in a different caste, given equilibrium prices.

Suppose the contrary, that it is worthwhile to marry down in caste for a bride in caste i, that is,

$$q(-k, \ Y_{i-k}) + u(Y_i - d(Y_{i-k}, \ 0)) > q(0, \ Y_i) + u(Y_i - d(Y_i, \ 0)) \qquad \text{(A1)}$$

holds for k, where $1 \leq k < i$. This can be rewritten as

$$u(Y_i - d(Y_{i-k}, \ 0)) - u(Y_i - d(Y_i, \ 0)) > q(0, \ Y_i) - q(-k, \ Y_{i-k}). \qquad \text{(A2)}$$

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[38] Nazzari (1991) notes how the existence of laws that punished marriages between partners of unequal status, in eighteenth-century Portugal and early nineteenth-century Brazil, is evidence that the incidence of unequal unions was growing during those times.

Inequality (A2) can in turn be rewritten as

$$\sum_{j=1}^{k} [u(Y_i - d(Y_{i-j}, 0)) - u(Y_i - d(Y_{i-j+1}, 0))] > q(0, Y_i) - q(-k, Y_{i-k}). \quad \text{(A3)}$$

Concavity of $u(\cdot)$ implies that the following must also be true:

$$\sum_{j=1}^{k} [u(Y_{i-j} - d(Y_{i-j}, 0)) - u(Y_{i-j} - d(Y_{i-j+1}, 0))] > q(0, Y_i) - q(-k, Y_{i-k}). \quad \text{(A4)}$$

With equilibrium condition (8), the left-hand side of (A4) is equal to

$$\sum_{j=1}^{k} [q(1, Y_{i-j+1}) - q(0, Y_{i-j})]. \quad \text{(A5)}$$

The right-hand side of (A4) is equivalent to

$$\sum_{j=1}^{k} [q(-j+1, Y_{i-j+1}) - q(-j, Y_{i-j})]. \quad \text{(A6)}$$

Concavity of $q(\cdot)$ implies that (A6) is larger than (A5), and hence (A1) is contradicted.

Now suppose that it is worthwhile to marry up in caste for a bride in caste i, that is,

$$q(k, Y_{i+k}) + u(Y_i - d(Y_{i+k}, 0)) > q(0, Y_i) + u(Y_i - d(Y_i, 0)), \quad \text{(A7)}$$

for $1 \le k \le h - i$. This can be rewritten as

$$u(Y_i - d(Y_i, 0)) - u(Y_i - d(Y_{i+k}, 0)) < q(k, Y_{i+k}) - q(0, Y_i). \quad \text{(A8)}$$

Inequality (A8) can in turn be rewritten as

$$\sum_{j=1}^{k} [u(Y_i - d(Y_{i+j-1}, 0)) - u(Y_i - d(Y_{i+j}, 0))] < q(k, Y_{i+k}) - q(0, Y_i). \quad \text{(A9)}$$

Concavity of $u(\cdot)$ implies that the following must also be true:

$$\sum_{j=1}^{k} [u(Y_{i+j-1} - d(Y_{i+j-1}, 0)) - u(Y_{i+j-1} - d(Y_{i+j}, 0))] < q(k, Y_{i+k}) - q(0, Y_i). \quad \text{(A10)}$$

With equilibrium condition (8), the left-hand side of (A10) is equal to

$$\sum_{j=1}^{k} [q(1, Y_{i+j}) - q(0, Y_{i+j-1})]. \quad \text{(A11)}$$

The right-hand side of (A10) is equivalent to

$$\sum_{j=1}^{k} [q(j, Y_{i+j}) - q(j-1, Y_{i+j-1})]. \quad \text{(A12)}$$

Concavity of $q(\cdot)$ implies that (A12) is smaller than (A11), and hence (A7) is contradicted.

Equilibrium condition (8) implies that $\bar{d} < d(Y_2, 0) < \cdots < d(Y_h, 0)$ since $q(1, Y_{i+1}) > q(0, Y_i)$ for all i, where $1 \le i < h$. Q.E.D.

Proof of Lemma 1

With positive assortative matching, the matching pattern of parts i and ii will hold in period $t = s_i + 1$; that is, grooms with income $Y_i - 2\theta$ match with bridal fathers with income $Y_i - \theta$, and grooms with income $Y_i - \theta$ match with bridal fathers with income $Y_i - \theta$ and Y_i if

$$n^t(Y_i - 2\theta) + n^t(Y_i - \theta) > n^{t-1}(Y_i - \theta) > n^t(Y_i - 2\theta). \tag{A13}$$

Similarly, the matching pattern of parts i and ii will hold in period $t = s_i + 2$ if

$$n^t(Y_i - 3\theta) + n^t(Y_i - 2\theta) > n^{t-1}(Y_i - 2\theta) > n^t(Y_i - 3\theta) \tag{A14}$$

and

$$[n^t(Y_i - 3\theta) + n^t(Y_i - 2\theta) - n^{t-1}(Y_i - 2\theta)] + n^t(Y_i - \theta)$$

$$> n^{t-1}(Y_i - \theta)$$

$$> n^t(Y_i - 3\theta) + n^t(Y_i - 2\theta) - n^{t-1}(Y_i - 2\theta), \tag{A15}$$

where $n^t(Y_i - 3\theta) + n^t(Y_i - 2\theta) - n^{t-1}(Y_i - 2\theta)$ reflects the excess supply of grooms with income $Y_i - 2\theta$ who match with bridal fathers with income $Y_i - \theta$ instead of those with income $Y_i - 2\theta$. Inequality (A15) can be rewritten as

$$n^t(Y_i - 3\theta) + n^t(Y_i - 2\theta) + n^t(Y_i - \theta) > n^{t-1}(Y_i - 2\theta) + n^{t-1}(Y_i - \theta)$$

$$> n^t(Y_i - 3\theta) + n^t(Y_i - 2\theta).$$

The matching pattern of part iii will hold if conditions identical to those above are satisfied for higher-income grooms and bridal fathers, that is, substituting the minus sign for a plus in the income levels of the inequalities above.

More generally, the matching pattern of parts i, ii, and iii ensues if, in each period $t = s_i + \tau$, for $\tau \geq 0$, the following conditions hold:

$$\sum_{z=\alpha}^{\tau+1} n^t(Y_i - z\theta) > \sum_{z=\alpha}^{\tau} n^{t-1}(Y_i - z\theta) > \sum_{z=\alpha+1}^{\tau+1} n^t(Y_i - z\theta), \tag{A16}$$

$$\sum_{z=\alpha}^{\tau+1} n^t(Y_i + z\theta) > \sum_{z=\alpha}^{\tau} n^{t-1}(Y_i + z\theta) > \sum_{z=\alpha+1}^{\tau+1} n^t(Y_i + z\theta) \tag{A17}$$

for $\alpha = 1, 2, 3, \ldots, \tau$. Given (11), conditions (A16) and (A17) can be rewritten as

$$(\tau + 1 - \alpha)n^t(y_i) > (\tau - \alpha)n^{t-1}(y_i) > (\tau - \alpha)n^t(y_i). \tag{A18}$$

Given (11) and under the assumption that the total supply of grooms within a given caste i is constant across periods t, the number of grooms of each income level in periods $t \geq s_i + \tau$, for $\tau \geq 0$, can be written as

$$n^t(y_i) = \frac{1}{3 + 2\tau} n^0(Y_i). \tag{A19}$$

From (A19), (A18) becomes

$$\frac{\tau + 1 - \alpha}{3 + 2\tau} n^0(Y_i) > \frac{\tau - \alpha}{3 + 2(\tau - 1)} n^0(Y_i) > \frac{\tau - \alpha}{3 + 2\tau} n^0(Y_i). \tag{A20}$$

Since $[3 + 2(\tau - 1)](\tau + 1 - \alpha) > (3 + 2\tau)(\tau - \alpha)$, (A20) implies that (A18) is satisfied. Q.E.D.

Proof of Proposition 3

From (16), we know that $d(Y_i, s_i) > d(Y_i, s_i - 1)$.

Without loss of generality, a given equilibrium condition, (14), for example, can be rewritten as

$$d(Y_i, t) - d(Y_i - \theta, t) = f(q(0, Y_i) - q(0, Y_i - \theta) \mid Y_i),$$

where $f(a - b \mid y)$ is increasing in y and $a - b$ and represents that the difference in dowry payments, $d(Y_i, t) - d(Y_i - \theta, t)$, is conditional on bridal father income, Y_i.

For periods $t > s_i + 1$, the more general (than [12]) equilibrium incentive compatibility condition at the caste margins is

$$q(0, Y_{i-1} + \tau\theta) + u(Y_{i-1} + (\tau - 1)\theta - d(Y_{i-1} + \tau\theta, t)) =$$

$$q(1, Y_i - (\tau + 1)\theta) + u(Y_{i-1} + (\tau - 1)\theta - d(Y_i - (\tau + 1)\theta, t)) \qquad (A21)$$

for periods $t = s_i + \tau$, where $\tau \geq 1$. Similarly, additional (to [14]) within-caste equilibrium conditions are

$$q(0, Y_i - (\tau + 1)\theta) + u(Y_i - \tau\theta - d(Y_i - (\tau + 1)\theta, t)) =$$

$$q(0, Y_i - \tau\theta) + u(Y_i - \tau\theta - d(Y_i - \tau\theta, t)) \qquad (A22)$$

for the poorer grooms and

$$q(0, Y_i + (\tau + 1)\theta) + u(Y_i + \tau\theta - d(Y_i + (\tau + 1)\theta, t)) =$$

$$q(0, Y_i + \tau\theta) + u(Y_i + \tau\theta - d(Y_i + \tau\theta, t)) \qquad (A23)$$

for the richer ones. Equilibrium conditions (14), (A22), and (A23) must hold for all $t \geq s_i + \tau$, where $\tau \geq 1$.

Equilibrium conditions (A21), (14), and (A22) for caste i and (14) and (A23) for caste $i - 1$ imply that, for $\tau \geq 0$,

$$d(Y_i, s_i + \tau) - d(Y_{i-1}, s_i + \tau) = f(q(1, Y_i - (\tau + 1)\theta)$$

$$- q(0, Y_{i-1} + \tau\theta) \mid Y_{i-1} + (\tau - 1)\theta)$$

$$+ \sum_{k=0}^{\tau} f(q(0, Y_i - k\theta)$$

$$- q(0, Y_i - (k + 1)\theta) \mid Y_i - k\theta)$$

$$+ \sum_{k=1}^{\tau} f(q(0, Y_{i-1} + k\theta)$$

$$- q(0, Y_{i-1} + (k - 1)\theta) \mid Y_{i-1} + (k - 1)\theta). \qquad (A24)$$

Using (A24) defined for periods τ and $\tau + 1$, we have

$$d(Y_i, s_i + \tau + 1) - d(Y_i, s_i + \tau) = d(Y_{i-1}, s_i + \tau + 1) - d(Y_{i-1}, s_i + \tau)$$
$$+ f(q(1, Y_i - (\tau + 2)\theta) - q(0, Y_{i-1}$$
$$+ (\tau + 1)\theta) \mid Y_{i-1} + \tau\theta) - f(q(1, Y_i - (\tau + 1)\theta)$$
$$- q(0, Y_{i-1} + \tau\theta) \mid Y_{i-1} + (\tau - 1)\theta)$$
$$+ f(q(0, Y_i - (\tau + 1)\theta)$$
$$- q(0, Y_i - (\tau + 2)\theta) \mid Y_i - (\tau + 1)\theta)$$
$$+ f(q(0, Y_{i-1} + (\tau + 1)\theta)$$
$$- q(0, Y_{i-1} + \tau\theta) \mid Y_{i-1} + \tau\theta).$$

This implies that the following also holds:

$$d(Y_i, s_i + \tau + 1) - d(Y_i, s_i + \tau) > d(Y_{i-1}, s_i + \tau + 1) - d(Y_{i-1}, s_i + \tau)$$
$$+ f(q(1, Y_i - (\tau + 2)\theta) - q(0, Y_{i-1}$$
$$+ (\tau + 1)\theta) \mid Y_{i-1} + \tau\theta) - f(q(1, Y_i - (\tau + 1)\theta)$$
$$- q(0, Y_{i-1} + \tau\theta) \mid Y_{i-1} + \tau\theta)$$
$$+ f(q(0, Y_i - (\tau + 1)\theta) - q(0, Y_i$$
$$- (\tau + 2)\theta) \mid Y_i - (\tau + 1)\theta)$$
$$+ f(q(0, Y_{i-1} + (\tau + 1)\theta)$$
$$- q(0, Y_{i-1} + \tau\theta) \mid Y_{i-1} + \tau\theta),$$

since $Y_{i-1} + (\tau - 1)\theta < Y_{i-1} + \tau\theta$. This can be expressed more simply, without loss of generality, as

$$d(Y_i, s_i + \tau + 1) - d(Y_i, s_i + \tau) > d(Y_{i-1}, s_i + \tau + 1) - d(Y_{i-1}, s_i + \tau)$$
$$+ f(q(0, Y_i - (\tau + 1)\theta) - q(0, Y_i$$
$$- (\tau + 2)\theta) \mid Y_i - (\tau + 1)\theta Y_i)$$
$$- f(q(1, Y_i - (\tau + 2)\theta) - q(1, Y_i$$
$$- (\tau + 1)\theta) \mid Y_{i-1} + \tau\theta). \qquad (A25)$$

The final component of the right-hand side of (A25) follows because any two equilibrium conditions $q(a) - q(b) = u(y - d(b)) - u(y - d(a))$ and $q(b) - q(c) = u(y - d(c)) - u(y - d(b))$ imply that $q(a) - q(c) = u(y - d(c)) - u(y - d(a))$, where a, b, and c represent different grooms.

For $\tau = 0$, that is, $t = s_i < s_{i-1}$, (8) implies that $d(Y_{i-1}, s_i + \tau + 1) = d(Y_{i-1}, s_i + \tau)$, and hence the right-hand side of (A25) is positive given (1) and $Y_i - (\tau + 1)\theta > Y_{i-1} + \tau\theta$.

Solving (A25) backward from payments in the lowest caste, d, we can rewrite the difference above as

$$d(Y_i,\ s_i + \tau) - d(Y_i,\ s_i + \tau - 1) >$$

$$\sum_{j=0}^{\tau-1} [f(q(0,\ Y_{i-j} - (\tau - j)\theta) - q(0,\ Y_{i-j} - (\tau - j + 1)\theta) \mid Y_{i-j} - (\tau - j)\theta)$$

$$- f(q(1,\ Y_{i-j} - (\tau - j)\theta) - q(1,\ Y_{i-j} - (\tau - j + 1)\theta) \mid Y_{i-j-1} + (\tau - j - 1)\theta)]$$

$$+ f(q(0,\ Y_{i-\tau}) - q(0,\ Y_{i-\tau} - \theta) \mid Y_{i-\tau}) - f(q(1,\ Y_{i-\tau})$$

$$- q(1,\ Y_{i-\tau} - \theta) \mid Y_{i-\tau-1}) \tag{A26}$$

for $\tau \geq 1$. Given (1), $Y_{i-j} - (\tau - j)\theta > Y_{i-j-1} + (\tau - j - 1)\theta$ for $0 \leq j \leq \tau - 1$, and $Y_{i-\tau} > Y_{i-\tau-1}$, the right-hand side of (A26) is positive. Q.E.D.

Proof of Proposition 4

Part a: The component of the real change in dowry payments, represented by (A25), caused by within-caste heterogeneity is represented by $\Omega(\tau)$, for $t = s_i + \tau$, where

$$\Omega(\tau) = f(q(0,\ Y_i - \tau\theta) - q(0,\ Y_i - (\tau + 1)\theta)) - f(q(1,\ Y_i - \tau\theta)$$

$$- q(1,\ Y_i - (\tau + 1)\theta)). \tag{A27}$$

Therefore,

$$\Omega(\tau + 1) = f(q(0,\ Y_i - (\tau + 1)\theta) - q(0,\ Y_i - (\tau + 2)\theta))$$

$$- f(q(1,\ Y_i - (\tau + 1)\theta) - q(1,\ Y_i - (\tau + 2)\theta)). \tag{A28}$$

Owing to the restrictions on $q(\cdot)$, $\Omega(\tau + 1) > \Omega(\tau)$. Therefore, the degree of dowry inflation increases with within-caste heterogeneity because within-caste heterogeneity increases with τ. Conditions (14), (A22), and (A23) imply that the component of real dowry inflation caused by heterogeneity for all $y_i \in \{Y_i - \tau\theta, \ldots, Y_i + \tau\theta\}$ is equal to $\Omega(\tau)$ of (A27).

Part b: The component of real dowry inflation that reflects heterogeneity in castes below is represented by $d(Y_{i-1},\ s_i + \tau) - d(Y_{i-1},\ s_i + \tau - 1)$ in (A25). For periods $t < s_{i-1}$, this component is equal to zero from (8). For periods $t \geq s_{i-1}$, this difference is represented by (A25), where i is replaced by $i - 1$ in the notation. Given that $\Omega(\tau + 1) > \Omega(\tau)$, equivalently the dowry difference $d(Y_{i-1}, s_i + \tau) - d(Y_{i-1},\ s_i + \tau - 1)$ is increasing in τ as heterogeneity in caste $i - 1$ increases, thus increasing the degree of real dowry inflation in payments of caste $i - 1$ and caste i. Conditions (14), (A22), and (A23) imply that the component of real dowry inflation that reflects heterogeneity in castes below is equal to $d(Y_{i-1},\ s_i + \tau) - d(Y_{i-1},\ s_i + \tau - 1)$ for all $y_i \in \{Y_i - \tau\theta, \ldots, Y_i + \tau\theta\}$. Expression (A26) demonstrates that dowry inflation in caste i is increasing in the within-caste heterogeneity of all castes below denoted $i - j$ for $1 \leq j \leq \tau$.

Part c: The change in dowry payments across periods of (A25) is increasing in $Y_i - \tau\theta$ and decreasing in $Y_{i-1} + (\tau - 1)\theta$. Therefore, the degree of dowry inflation is increasing in the difference between $Y_i - \tau\theta$ and $Y_{i-1} + (\tau - 1)\theta$, that is, between the incomes of the richest bridal father in caste $i - 1$ and the poorest bridal father in caste i. The larger this difference, the greater the income dis-

parity across castes. Conditions (14), (A22), and (A23) imply that the component of real dowry inflation due to the income of bridal fathers is equivalent for all $y_i \in \{Y_i - \tau\theta, \ldots, Y_i + \tau\theta\}$. Expression (A26) demonstrates that dowry inflation in caste i is increasing in the income disparity across all castes $i - j$ for $1 \leq j \leq \tau$. Q.E.D.

Proof of Proposition 5

An equilibrium of endogamy is supported if higher-caste brides outbid lower-caste brides to marry in their own castes. As demonstrated in proposition 3, the highest bid from lower-caste brides is represented by the equilibrium incentive compatibility condition at the caste margins, equation (A21). Brides of the higher caste will match this deviation payment if their utility is higher compared to the best alternative of marrying down in caste:

$$q(0, \ Y_i - (\tau + 1)\theta) + u(Y_i - \tau\theta - d(Y_i - (\tau + 1)\theta, \ t)) \geq$$

$$q(-1, \ Y_{i-1} + \tau\theta) + u(Y_i - \tau\theta - d(Y_{i-1} + \tau\theta, \ t)) \qquad \text{(A29)}$$

in a given period $t = s_i + \tau$, where $\tau \geq 1$. With the notation of proposition 3, condition (A29) can be expressed as

$$d(Y_i - (\tau + 1)\theta, \ t) - d(Y_{i-1} + \tau\theta, \ t) \leq f(q(0, \ Y_i - (\tau + 1)\theta)$$

$$- q(-1, \ Y_{i-1} + \tau\theta) \mid Y_i - \tau\theta). \quad \text{(A30)}$$

Condition (A21) can be represented by

$$d(Y_i - (\tau + 1)\theta, \ t) - d(Y_{i-1} + \tau\theta, \ t) = f(q(1, \ Y_i - (\tau + 1)\theta)$$

$$- q(0, \ Y_{i-1} + \tau\theta) \mid Y_{i-1} + (\tau - 1)\theta). \quad \text{(A31)}$$

Conditions (A30) and (A31) imply that

$$f(q(1, \ Y_i - (\tau + 1)\theta) - q(0, \ Y_{i-1} + \tau\theta) \mid Y_{i-1} + (\tau - 1)\theta) \leq$$

$$f(q(0, \ Y_i - (\tau + 1)\theta) - q(-1, \ Y_{i-1} + \tau\theta) \mid Y_i - \tau\theta). \quad \text{(A32)}$$

Therefore, a sufficient condition for these two incentive compatibility conditions to not hold is

$$q(0, \ Y_i - (\tau + 1)\theta) - q(-1, \ Y_{i-1} + \tau\theta) < q(1, \ Y_i - (\tau + 1)\theta)$$

$$- q(0, \ Y_{i-1} + \tau\theta). \quad \text{(A33)}$$

Q.E.D.

Proof of Proposition 6

Part *a:* Suppose that there is sufficient income equality across castes such that (17) holds in a given period $t = s_i + \tau$, where $\tau \geq 1$. This implies that

$$q(0, \ Y_{i-1} + \tau\theta) - q(-1, \ Y_{i-1} + \tau\theta) < q(1, \ Y_i - (\tau + 1)\theta)$$

$$- q(0, \ Y_i - (\tau + 1)\theta). \quad \text{(A34)}$$

As a result, grooms with income $Y_i - (\tau + 1)\theta$ marry down in caste, and hence $n'[Y_i - (\tau + 1)\theta]$ intercaste marriages occur. In periods $t > s_i + \tau$, some grooms in

caste i are poorer and some grooms in caste $i-1$ are richer than in period $s_i + \tau$. Condition (A34) holds for all grooms with income $y_i < Y_i - (\tau + 1)\theta$ and for all grooms with $y_{i-1} > Y_{i-1} + \tau\theta$. As a result, the number of intercaste marriages in a given period $t = s_i + \tau + \alpha$ $(\alpha \geq 1)$ is at least equal to $\sum_{a=1}^{\alpha} n^t[Y_i - (\tau + a + 1)\theta]$. When the number of grooms of each income level in a given period $t = s_i + \tau$, for $\tau \geq 0$, can be written as $n^t(y_i) = [1/(3 + 2\tau)]n^0(Y_i)$,

$$n^{s_i+\tau}[Y_i - (\tau + 1)\theta] = \frac{1}{3 + 2\tau} n^0(Y_i) \tag{A35}$$

and

$$\sum_{a=1}^{\alpha} n^{s_i+\tau+a}[Y_i - (\tau + a + 1)\theta] = \frac{\alpha + 1}{3 + 2(\tau + \alpha)} n^0(Y_i). \tag{A36}$$

The right-hand side of (A36) is larger than the right-hand side of (A35).

Part b: Without loss of generality, suppose that there is sufficient income equality across castes such that (17) holds in the first period of modernization for a given caste i, $t = s_i$.

In the period before modernization, $t = s_i - 1$, assortative matching according to caste occurs and, as before, equilibrium dowry payments satisfy (8):

$$q(0, \ Y_{i-1}) + u(Y_{i-1} - d(Y_{i-1}, \ s_i - 1)) = q(1, \ Y_i - \theta)$$

$$+ \ u(Y_{i-1} - d(Y_i - \theta, \ s_i - 1)). \tag{A37}$$

In period $t = s_i$, brides in castes i and $i-1$ compete for grooms. The highest payment caste $i-1$ brides are willing to pay for the lowest-quality groom in caste i satisfies (12). As proposition 5 demonstrates, when (17) holds, high-caste brides are not willing to match this offer from lower-caste brides and instead they match with grooms in the lower caste with income Y_{i-1} and the lower-caste brides match with the higher-caste grooms with income $Y_i - \theta$. As in the previous period, high-caste brides still find it worthwhile to match with grooms with income Y_i. They outbid the lower-caste brides for these grooms, and the highest payment the lower-caste brides are willing to pay satisfies

$$q(0, \ Y_{i-1}) + u(Y_{i-1} - d(Y_{i-1}, \ s_i)) = q(1, \ Y_i) + u(Y_{i-1} - d(Y_i, \ s_i)). \tag{A38}$$

Since no modernization has occurred in castes below, so that $d(Y_{i-1}, \ s_i) = d(Y_{i-1}, \ s_i - 1)$, conditions (A37) and (A38) imply that $d(Y_i, \ s_i) = d(Y_i, \ s_i - 1)$ so that there is no real change in dowry payments across periods.

As demonstrated in part a, in later periods of modernization there are a larger number of intercaste marriages as the income distributions across castes continue to overlap. Since (17) also holds for all grooms with income $y_i < Y_i - \theta$, as long as grooms with income Y_i match according to caste, equilibrium dowry payments for grooms with income Y_i will satisfy (A38) and there is no change in real dowry payments across periods as long as (17) also holds in all castes below, since then there is no real change in $d(Y_{i-1}, \ s_i)$ either.

As uniformity across caste groups increases, some brides in the lower caste may become rich enough so that it is no longer worthwhile for grooms with income Y_i to marry in caste. Suppose that this occurs in a given period $t = s_i + \tau$, so that it becomes worthwhile for grooms with Y_i to marry down in caste and match with the richest brides, whose fathers have income $Y_{i-1} + (\tau - 1)\theta$. Real dowry payments for these grooms with income Y_i could increase across periods, $t > s_i + \tau$, if they match with bridal fathers who have higher incomes

across time. In this case, even though the lower caste is growing richer, they do not match with richer grooms, that is, those with income $y_i > Y_i$. As a result, the number of intercaste marriages is nonincreasing, which contradicts part a. Q.E.D.

Proof of Proposition 7

Consider a simple two-period model of two castes in which preferences of the bride are represented by (2) and those of the groom are similarly represented by

$$V = r(j - i, \ e_{jm}) + v(y_{ik} + d), \tag{A39}$$

where e_{jm} represents the education (or economic value) of the bride; it is the mth element from the distribution of education levels across brides in caste j. In the initial period, denoted 0, there is no modernization and all grooms and brides within a given caste are homogeneous. In the subsequent period, modernization occurs in the highest caste, denoted 2, so that both brides and grooms become more heterogeneous; that is, grooms have incomes $\{Y_2 - \theta, \ Y_2, \ Y_2 + \theta\}$ and brides have education levels of $\{e_2 - \lambda, \ e_2, \ e_2 + \lambda\}$.

Part a: First consider equilibrium dowry payments in the premodernization period. An equilibrium of assortative matching implies that incentive compatibility conditions must hold across brides and grooms so that no individual prefers to marry in a caste different from his or her own. For brides this implies

$$q(0, \ Y_1) + u(Y_1 - d_0^1(Y_1, \ 0)) \geq q(1, \ Y_2) + u(Y_1 - d_0^1(Y_2, \ 0)) \tag{A40}$$

and

$$q(0, \ Y_2) + u(Y_2 - d_0^2(Y_2, \ 0)) \geq q(-1, \ Y_1) + u(Y_2 - d_0^2(Y_1, \ 0)), \tag{A41}$$

where $d_m^j(y_{ik}, \ 0)$ represents the dowry payment offered to a groom in caste i with income y_{ik} from a bride in caste j with education level $e_j + m\lambda$.

For grooms this implies

$$r(0, \ e_1) + v(Y_1 - d_0^1(Y_1, \ 0)) \geq r(1, \ e_2) + v(Y_1 - d_0^2(Y_1, \ 0)) \tag{A42}$$

and

$$r(0, \ e_2) + v(Y_2 - d_0^2(Y_2, \ 0)) \geq r(-1, \ e_1) + v(Y_2 - d_0^1(Y_2, \ 0)). \tag{A43}$$

In addition, participation constraints, represented by conditions (4) and (5), must be satisfied for brides and grooms in caste 1. With the notation of proposition 3, conditions (A40)–(A43) imply that equilibrium dowry payments in caste 2 must satisfy

$$d_0^1(Y_1, 0) + f(q(1, Y_2) - q(0, Y_1) \mid Y_1) - h(r(0, e_2) - r(-1, e_1) \mid Y_2)$$

$$\leq d_0^2(Y_2, 0) \tag{A44}$$

$$\leq d_0^1(Y_1, 0) + f(q(0, Y_2) - q(-1, Y_1) \mid Y_1) - h(r(1, e_2) - r(0, e_1) \mid Y_2),$$

where $h(a - b \mid y)$ is increasing in $a - b$ and nonincreasing in y by concavity of groom family income. It represents that the difference in equilibrium dowry payments, $d_0^2(Y_2, \ 0) - d_0^1(Y_1, \ 0)$, is conditional also on groom family income. Suppose that the division of the marriage surplus is represented by the fraction

α such that equilibrium dowry payments, which satisfy (A44), can be represented by

$$d_0^2(Y_2, 0) = d_0^1(Y_1, 0) + \alpha[f(q(0, Y_2) - q(-1, Y_1) \mid Y_1)$$
$$- h(r(1, e_2) - r(0, e_1) \mid Y_2)]$$
$$+ (1 - \alpha)[f(q(1, Y_2) - q(0, Y_1) \mid Y_1)$$
$$- h(r(0, e_2) - r(-1, e_1) \mid Y_2)]. \tag{A45}$$

From (A45) we see that equilibrium dowry payment, $d_0^2(Y_2, 0)$, is lower the higher quality of brides in that caste.

Parts b and c: Now consider the determination of equilibrium dowry payments for members of caste 2 in the first period of modernization. Equilibrium incentive compatibility conditions that support assortative matching for brides become

$$q(0, Y_1) + u(Y_1 - d_0^1(Y_1, 1)) \geq q(1, Y_2 - \theta) + u(Y_1 - d_0^1(Y_2 - \theta, 1)), \tag{A46}$$

$$q(0, Y_2 - \theta) + u(Y_2 - d_{-1}^2(Y_2 - \theta, 1)) \geq q(-1, Y_1) + u(Y_2 - d_{-1}^2(Y_1, 1)), \tag{A47}$$

$$q(0, Y_2 - \theta) + u(Y_2 - d_{-1}^2(Y_2 - \theta, 1)) \geq q(0, Y_2) + u(Y_2 - d_{-1}^2(Y_2, 1)), \tag{A48}$$

$$q(0, Y_2) + u(Y_2 - d_0^2(Y_2, 1)) \geq q(0, Y_2 - \theta) + u(Y_2 - d_0^2(Y_2 - \theta, 1)), \tag{A49}$$

$$q(0, Y_2) + u(Y_2 - d_0^2(Y_2, 1)) \geq q(0, Y_2 + \theta) + u(Y_2 - d_0^2(Y_2 + \theta, 1)), \tag{A50}$$

$$q(0, Y_2 + \theta) + u(Y_2 - d_1^2(Y_2 + \theta, 1)) \geq q(0, Y_2) + u(Y_2 - d_1^2(Y_2, 1)). \tag{A51}$$

Similarly, for grooms we have

$$r(0, e_1) + v(Y_1 - d_0^1(Y_1, 1)) \geq r(1, e_2 - \lambda) + v(Y_1 - d_{-1}^2(Y_1, 1)), \tag{A52}$$

$$r(0, e_2 - \lambda) + v(Y_2 - d_{-1}^2(Y_2 - \theta, 1)) \geq r(-1, e_1) + v(Y_2 - d_0^1(Y_2 - \theta, 1)), \tag{A53}$$

$$r(0, e_2 - \lambda) + v(Y_2 - d_{-1}^2(Y_2 - \theta, 1)) \geq r(0, e_2) + v(Y_2 - d_0^2(Y_2 - \theta, 1)), \tag{A54}$$

$$r(0, e_2) + v(Y_2 - d_0^2(Y_2, 1)) \geq r(0, e_2 - \lambda) + v(Y_2 - d_{-1}^2(Y_2, 1)), \tag{A55}$$

$$r(0, e_2) + v(Y_2 - d_0^2(Y_2, 1)) \geq r(0, e_2 + \lambda) + v(Y_2 - d_1^2(Y_2, 1)), \tag{A56}$$

$$r(0, e_2 + \lambda) + v(Y_2 - d_1^2(Y_2 + \theta, 1)) \geq r(0, e_2) + v(Y_2 - d_0^2(Y_2 + \theta, 1)). \tag{A57}$$

Incentive conditions (A46)–(A57) imply that, with the division of marriage sur-

plus held constant, equilibrium dowry payments for the average groom in caste 2 can be represented by

$$d_0^2(Y_2, 1) = d_0^1(Y_1, 1) + \alpha[f(q(0, Y_2 - \theta) - q(-1, Y_1) \mid Y_1)$$

$$- h(r(1, e_2 - \lambda) - r(0, e_1) \mid Y_2)]$$

$$+ (1 - \alpha)[f(q(1, Y_2 - \theta) - q(0, Y_1) \mid Y_1)$$

$$- h(r(0, e_2 - \lambda) - r(-1, e_1) \mid Y_2)]. \tag{A58}$$

Since no changes have occurred in caste 1, $d_0^1(Y_1, 1) = d_0^1(Y_1, 0)$. Therefore, (A45) and (A58) imply that the change in dowry payments across periods is equal to

$$d_0^2(Y_2, 1) - d_0^2(Y_2, 0) = (1 - \alpha)[f(q(0, Y_2) - q(0, Y_2 - \theta) \mid Y_2)$$

$$- f(q(1, Y_2) - q(1, Y_2 - \theta) \mid Y_1)]$$

$$- \alpha[h(r(0, e_2) - r(0, e_2 - \lambda) \mid Y_2)$$

$$- h(r(1, e_2) - r(1, e_2 - \lambda) \mid Y_1)]. \tag{A59}$$

The right-hand side of (A59) is increasing in

$$\{[q(0, Y_2) - q(0, Y_2 - \theta)] - [q(1, Y_2) - q(1, Y_2 - \theta)]\} -$$

$$\{[r(0, e_2) - r(0, e_2 - \lambda)] - [r(1, e_2) - r(1, e_2 - \lambda)]\},$$

which is higher the more important grooms' caste is relative to brides' caste. Q.E.D.

Proof of Proposition 8

Dowry payments are increasing for a groom of quality y_g, matched with a bride whose father's income is equal to y_b, in period t, if grooms of quality y_g are matched with bridal fathers with income $y_b + \theta$ in period $t + 1$, $y_b + 2\theta$ in period $t + 2$, and so on. In other words, a necessary condition for dowry payments to be increasing for such a groom is that the supply of grooms and bridal fathers satisfy the following condition:

$$\sum_{y_{ik} \leq y_g} n^{t+\alpha}(y_{ik}) \geq \sum_{y_{ik} \leq y_b + \alpha\theta} n^{t+\alpha-1}(y_{ik}) \tag{A60}$$

for $\alpha \geq 0$, $y_g \in \{Y_i - (\tau + 1)\theta, \ldots, Y_i + (\tau + 1)\theta\}$, and $y_b \in \{Y_i - \tau\theta, \ldots, Y_i + \tau\theta\}$ for $t = s_i + \tau$, where $\tau = 0, 1, 2, 3, \ldots$. Given lemma 1 and that equilibrium dowry payments are increasing (i.e., bridal fathers matched with a given groom are increasingly wealthier over time), $y_b \geq y_g - \theta$, for all t. Then (A60) necessarily implies that

$$\sum_{y_{ik} \leq y_g} n^{t+\alpha}(y_{ik}) \geq \sum_{y_{ik} \leq y_g} n^{t+\alpha-1}(y_{ik}) \tag{A61}$$

for $\alpha \geq 1$, which contradicts (19). Q.E.D.

Proof of Proposition 9

In the absence of real wealth effects, as demonstrated in proposition 3, dowry inflation will ensue because of the across-caste effects. If grooms of a given quality are matched with richer bridal fathers across time, then real dowry payments will increase. If grooms with a given quality of income are matched with poorer bridal fathers across time, then dowry payments may decline. Since all dowry payments are determined relatively, dowry payments for a given groom with income y_g are more likely to decline if all grooms with income less than y_g are also matching with poorer bridal fathers across time. Consider the extreme case in which all grooms are matched with the poorest bridal fathers possible and hence are the most likely to exhibit dowry deflation across periods. The within-caste equilibrium conditions imply that, for a groom with income $y_{ik} \in \{Y_i - (\tau + 1)\theta, \ldots, Y_i + (\tau + 1)\theta\}$, where $\tau \geq 0$,

$$d(y_{ik}, s_i + \tau) - d(Y_{i-1}, s_i + \tau) =$$

$$f(q(1, Y_i - (\tau + 1)\theta - q(0, Y_{i-1} + \tau\theta) \mid Y_{i-1} + (\tau - 1)\theta))$$

$$+ f(q(0, y_{ik}) - q(0, Y_i - (\tau + 1)\theta) \mid Y_i - \tau\theta + f(q(0, Y_{i-1} + \tau\theta)$$

$$- q(0, Y_{i-1}) \mid Y_{i-1} - (\tau - 1)\theta). \tag{A62}$$

Using (A62) and solving backward, we get

$$d(y_{ik}, s_i + \tau) - d(y_{ik}, s_i + \tau - 1) >$$

$$\sum_{j=0}^{\tau} [f(q(0, Y_{i-j} - (\tau - j)\theta) - q(0, Y_{i-j} - (\tau - j + 1)\theta) \mid Y_{i-j} - (\tau - j)\theta)$$

$$- f(q(1, Y_{i-j} - (\tau - j)\theta) - q(1, Y_{i-j} - (\tau - j + 1)\theta) \mid Y_{i-j-1})]$$

$$+ \sum_{j=1}^{\tau-1} [f(q(0, Y_{i-j}) - q(0, Y_{i-j} - (\tau - j)\theta) \mid Y_{i-j} - (\tau - j)\theta)$$

$$- f(q(0, Y_{i-j}) - q(0, Y_{i-j} - (\tau - j)\theta) \mid Y_{i-j} - (\tau - j - 1)\theta)]$$

$$+ f(q(0, y_{ik}) - q(0, Y_i - \tau\theta) \mid Y_i - \tau\theta) - f(q(0, y_{ik})$$

$$- q(0, Y_i - \tau\theta) \mid Y_i - (\tau - 1)\theta), \tag{A63}$$

where the first component of the right-hand side comes from the positive across-caste effect on dowries. The second two components represent the negative income effects on dowries. The difference above is always positive if the across-caste effect outweighs the income effect. This is always true if condition (20) holds. If this extreme case holds, then all other possible differences in dowry payments are larger than (A62). Q.E.D.

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