DOWRY PAYMENTS IN SOUTH ASIA

by

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ABSTRACT

There is considerable evidence that dowry payments in India have not only increased over the last five decades, but that the custom has spread into regions and communities where it was never practiced before. The aim of this thesis is to understand why these changes have occurred.

A particularly influential explanation is that rising dowries in India are concomitant with population growth. According to this interpretation, a population increase leads to an excess supply of brides since men marry younger women. As a result, dowry payments must rise in order to clear the marriage market. Reductions in the equilibrium age difference will tend to equalize the excess supply of women in the marriage market. It has been reasoned that the severe social and economic pressures associated with older unmarried daughters imply that households of older potential brides are willing to outbid the families of younger brides and that this competitive interaction places upward pressure on dowries. The first substantive chapter of this thesis explicitly models the dynamics of dowry payments when population grows. It points out some difficulties in making the theory reconcile the main observations relevant in the context of demographic change. In particular, there exist conditions under which population growth can cause dowries to decrease if the model is constrained from generating an increasing number of unmarried women.

An alternative explanation is provided in the subsequent chapter which takes into account the phenomenon of caste. The explanation posits a process of modernisation which increases the heterogeneity of potential wealth within each caste. The new income-earning opportunities brought about by development are predominantly filled by men and as a result grooms become a relatively heterogeneous group compared to brides. If we perceive dowry as a bid that a bride makes for a groom of a certain market value, an increase in heterogeneity of grooms will increase the spread of dowries. Men who become more eligible in the marriage market will receive higher dowries, whereas the payments will decrease for those who are less eligible; however, average dowries may remain constant. The explanation as to why dowries also increase for the relatively less desirable grooms, and in turn average dowry payments necessarily increase, relies heavily on particularities of the caste system.

Although there are numerous studies of the dowry phenomenon in India, research pertaining to the custom of dowry in the rest of South Asia is relatively sparse. The aim of the final chapter is to study dowry payments in Pakistan. Since an exploration of how they have evolved through time is not possible due to limitations of the data, the analysis focuses instead on the present role of dowry payments. The investigation concludes that the dowry phenomenon in Pakistan is similar to that occurring in India.

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Chapter 1

Introduction

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 appears to have been widely reinstated in the late Middle Ages. It is well known that in Medieval Europe and later, dowries were common practice among the aristocracy.[1] Nonetheless, the convention of dowry is limited historically to only four percent of the cultures analysed in Murdoch's *World Ethnographic Atlas* and restricted geographically to the Mediterranean and East Asia.[2] The societies in which dowries appear seem to be complex with substantial socio-economic differentiation, and class stratification.[3] Moreover their marriage practices are typically monogamous, patrilineal, and endogamous, i.e., men and women of equal status marry (Gaulin and Boster 1990).

In general, dowry has been associated with pre-mortem female inheritance where a woman retained ownership of her gift during marriage, and could reclaim it for her own welfare if the marriage was dissolved (see, for example, Goody 1976 and Hughes 1985). It has been

[1] Botticini (1997) 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 to 1460. See Hughes (1985) for a historical survey of dowry in Mediterranean Europe.

[2] Murdoch's *World Ethnographic Atlas* examines 1267 societies.

[3] See, for example, Jackson and Romney (1973), Harrell and Dickey (1985), and Gaulin and Boster (1990).

suggested that in the wake of economic development and the consequent social stratification and competition over wealth, there is a tendency to retain valuable productive resources in the direct family line (Goody 1976). Others have observed that under these circumstances women were considered an economic burden since a wife performed little or no income-producing work of the household.[4] Dowry has thus been interpreted as compensation for taking into the family an economically non-productive female member. Dowry has also been considered as a payment for closer political, economic, class, or ethnic alliances valuable to the bride's family in order to preserve the status of the family into subsequent generations (see, for example, Hoch 1989). Gaulin and Boster (1990) have suggested that in monogamous societies with significant social stratification and large differences in wealth among men, dowry is simply a means of female competition for desirable, wealthy husbands. Finally, the notion that dowry is the response to demographic change where men marry younger women, resulting in an excess supply of brides, is not a new argument (Hughes 1985). In fact, Aristotle suggested this reason to explain the rise in the value of dowries in ancient Sparta.[5]

On the sub-continent of India, the custom of dowry has long been practised among upper castes located in northern regions. But in the last five decades or so extraordinary changes in the institution of dowry have become apparent. The custom has not only spread geographically throughout the country into regions and communities where it was never practised before, but has also permeated the social hierarchy and now occurs in lower castes.[6] This on-going diffusion clearly indicates the progressive strength of the custom, but numerous examples of the change from bride-price to dowry in southern India shows its capacity to overturn established traditions.[7] Not only is the incidence of dowry spreading, but there is considerable evidence that the amount of wealth exchanged is steadily increasing. The empirical evidence of Rao (1993a

[4]Boserup (1970) was foremost to link the two clearly. She distinguishes between the two types of societies on the basis of agricultural techniques. Societies marked by shifting cultivation are characterised by widespread participation of women in agricultural labour, therefore women are more valued and hence a bride-price, which is seen as a compensation of the loss of a woman's productive share to her family. In societies marked by plough cultivation, women do less work than men, status of women is lower and hence dowry which is seen as a compensation is given to the man's family for the economically unproductive woman.

[5]Refer to Hughes (1985) for this interpretation of Aristotle's quote. Herlihy (1976) advances this same hypothesis to explain the emergence of dowry in twelfth century Europe. Quale (1988) similarily claims that rising dowries due to demographic change been been linked to female infanticide and with parents entering their daughters into convents in medieval Europe.

[6]See, for example, Paul (1986), Rao (1993b), Kumari (1989), Srinivas (1980), and Sharma (1984).

[7]See, Caldwell et. al. (1983), Billig (1992), Epstein (1973), and Srinivas (1984).

and 1993b) and Deolalikar and Rao (1990), between the period 1921 and 1981, verifies dowry escalation, a phenomenon previously noted by numerous social scientists.[8] Their regressions demonstrate that holding constant groom's characteristics, controlling for the wealth of both families, and imposing a price index, dowry payments have risen. In other words, *real* dowry inflation has occurred.

Indian dowries traditionally comprised a parental gift to the bride (*stridhan*) over which she had property rights. In contrast, modern-day dowry payments represent a transfer of wealth to the groom and his family from the bridal parents to which the bride has no claim. The custom has undergone a transformation from gift-giving to a contractual arrangement in which the family of the groom demands dowry as a compulsory payment for matrimonial union (Paul 1986). Its increasingly coercive nature has been a major cause of domestic abuse against women, resulting at times in bride-burning (kitchen deaths) or other physical harm visited on the wife if dowry payments are not forthcoming.[9] Dowry demands have been known to continue even after ten or more years of marriage (see, for example, Kumari 1989, Paul 1985, Srinivas 1983, and Butalia 1983).

The social consequences of the increase and diffusion of dowry payments are obviously severe. The sums of cash and goods involved may be so large that the bridal family becomes impoverished, which in turn has a devastating effect on the lives of unmarried women who are more and more considered profound economic liabilities. Many observers have also linked the custom of dowry to the practice of female infanticide.

Women's organisations, politicians of all persuasions, social reformers and the news media have all decried the evils of the system and urge its abolition (see, for example, Caplan 1984). But even the Dowry Act of 1961, prohibiting the practice, has been of little avail and the institution is perpetuated in spite of its illegal standing. Some Indian feminists believe that if women did have property rights over the contents of their dowry, the practice would be greatly reduced or eradicated (see, for example, Agrawal 1989 and Kishwar 1988).

The compensation argument for dowry in which the groom's family is paid to take on an

[8] See, for example, Epstein (1973), Srinivas (1984), Paul (1986), Billig (1992), Caldwell et. al. (1983), and Lindenbaum (1981).

[9] Kumari (1989), Chauhan (1995), McCoid (1989), Pawar (1990), Lata (1990), and Pathak (1990) address these issues.

economically unproductive female member does not account for its occurrence in places where women's economic activity has continued.[10] In general there is little support for this view since increasing the economic qualities of women through education and other income-earning capabilities seems to have had little effect on dowries (see, for example, Billig 1992 and Sandhu 1988). As dowries are variable instead of uniform, as suggested by the compensation conjecture, i.e., valuation placed on subsistence cost of a woman net of her domestic contribution, the compensation argument can again be refuted (see Aziz 1983).

Another view is that dowry as a medium of hypergamy (when lower status bridal families match with those of a superior status) sheds no light on why dowry has been increasing and also why it occurs where marriage takes place among men and women of equal social status (see Chauhan 1995).[11]

The emergence of the modern dowry phenomenon, involving both diffusion and inflation, has often been dated and linked to the wake of Independence which offered new economic opportunities.[12] It is important to keep in mind, however, that while dowry is generally associated with social stratification and economic development (unlike bride-price), the custom as it existed in Europe does differ from that in present-day India. In contrast, dowry payments in Europe generally began to decline and disappeared with the advent of modernisation. Moreover, it is far from clear the extent, if any, to which the lower classes in Europe practiced dowry.

Several authors argue that the spread of the custom into lower castes of India is due to the process of "Sanskritization" or lower caste imitation of the dowry practiced among higher castes in order to acquire status (see, for example, Epstein 1973). Such activity among lower castes has been facilitated by increased wealth. The view has also been stated that the increasing significance of class over caste explains the changes found in Indian dowries (see, for example, Chauhan 1995 and Upadhya 1990). Srinivas (1984) explains that the modern dowry became common under the British Regime as men who engaged in white collar jobs were rare, such

[10] Chauhan (1995) argues that such an explanation does not account for the shift from bride-price to dowry, and the occurrence of dowry among lower castes where women's labour participation has persisted. Rajaraman (1983) advances the compensation argument for dowry in India, also discussed by Srinivas (1984) and Beck (1972).

[11] The link between the dowry custom and hypergamy is suggested by numerous authors, see, for example, Srinivas (1984) and Luthra (1983).

[12] See Chauhan (1995), Caldwell et. al. (1983), Paul (1986), Srinivas (1984), Epstein (1973), Billig (1992), and Upadhya (1990).

posts being recent creations of the British colonial government. Since these grooms were a scarce commodity, brides' families paid more to acquire them. In general, the size of dowry increases steeply with the desirable qualities of grooms, where desirable qualities are defined to high degree by the extent of modern education, access to urban employment, and amount of property owned (Caldwell et. al. 1983). Scarcity in highly qualified grooms, exacerbated by caste endogamy, is claimed by many to be the reason behind increasing dowries (Nishimura 1994). Some posit that as castes are endogamous, the accumulated dowry assets remain within the caste as capital while the never-ending process of dowry accumulation serves the caste well and provides funds to take advantage of financial prospects (Nishimura 1994). It is also noted that groom-price serves as a means of preserving endogamous boundaries in a heterogeneous setting (Caplan 1984).

Although the research pertaining to the dowry phenomenon in present-day India does not necessarily identify definitive distinctions between the custom there and the history of dowry elsewhere, it does appear that the severity of the problem is far greater in India. Moreover, the custom in India certainly exists to the detriment of women whereas the general impression of dowry elsewhere is that its underlying function was intended for parents to guarantee the future well-being of their daughters.

The central objective of this thesis is to understand the increase and diffusion of dowries in India. The analysis places the social structure into an economic framework. This procedure is not to deny the existence of other influences which contribute to the custom that cannot be explained using economic techniques, but rather to put forth an explanation which is consistent with both the sociological evidence and economic rationale. The enduring persistence of the dowry phenomenon indicates pressures from underlying forces, like modernisation or caste endogamy, as referred to above. An explanation of how these different forces interact with each other and the tradition of dowry has not yet been provided. The tools of economics and an economic model lend themselves to a comprehensive study of the diverse components that contribute to the dowry phenomenon.

There have been some attempts made by economists to understand dowry payments. At the forefront is the pioneering work of Becker (1991) who envisions marriage as a joint venture offering greater efficiency in production and hence higher expected total output than is

possible if the partners remain single. Market forces determine the assignment of mates and the distribution of returns among them. If the rule of division of output within the marriage is inflexible so that the shares of income of each spouse is not the same as under the market solution, then upfront compensatory transfer will be made between the spouses (or their parents) and efficiency will be restored. Thus, if the wife's share of family income is below her shadow price in the marriage market, then a bride-price will be paid by the groom's family to the bride's family, while a transfer in the reverse is a dowry. Inflexibility could arise due to social custom where, for example, women are not allowed to hold any household income of their own. In the same vein, Grossbard-Shechtman (1993) views marriage as exchanges of spousal labour when individuals devote their time to market labour, spousal labour, and leisure. She creates a quasi-wage for spousal labour (like a shadow price for spouses) and equates demand and supply for different labour activities to determine equilibrium prices. If a woman's spousal labour wage is lower than it should be in equilibrium (say by a law) then she could receive a compensatory payment made prior to marriage. Hence dowry and bride-price originate from rigid rules regarding compensation for spousal labour after marriage. Chan and Zhang (1995) attempt to explain the co-existence of bride-price and dowry by interpreting dowry as a pre-mortem inheritance to daughters which increases the resources available to their daughters' family and raises her threat point, or bargaining position, within her family. The authors retain the conventional interpretation of bride-price, that is, bride-price serves to resolve the inflexibility in sharing suggested by Becker and is assumed to be a lump sum marital transfer made from the groom's family to the bride's family. With a positive bride price, the subsequent reduction in the bride's share of the joint output within the marriage would tend to reduce her welfare, so that altruistic parents have the incentive to ensure her well-being by giving her a dowry as a form of pre-mortem inheritance. In equilibrium, dowry should be just sufficient to guarantee the bride her market determined level of utility. Thus, bride price and dowry are complementary instruments for the enforcement of the efficient marital contract. Echevarria and Merlo (1995) present a model of investment in children conditional on their gender to explain gender differences in education. The authors note that an implication of their investment model is an explanation for the existence of dowries. Assuming individuals are risk averse and have two children; since boys receive more education than girls, total consumption of families

with two boys is lower than that of families with one boy and one girl, and that in turn is lower than the total consumption of families with two girls. By transferring income from families with girls to families of boys, dowry provides a way of smoothing consumption across states of nature. Ex ante, risk averse parents would then be willing to enter such a Pareto improving contract.

Edlund (1996), on the other hand, sets out to explain why relatively scarce women would pay dowries and uses the existence of dowry payments in India to motivate her work. She assumes men are heterogeneous in terms of quality and women are homogeneous. She demonstrates, using a marriage matching framework, that higher quality grooms will receive a higher payment than those of a lower quality. This result was first shown in the model of Stapleton (1988) for implicit marriage markets.

A particularly influential explanation of rising dowries in India reiterates the role of demand and supply. In contrast to the claim of Edlund (1996), despite the fact that there is a higher infant mortality rate for girls in India, there is not a scarcity of brides; in fact the opposite occurs. Caldwell et. al. (1983) first suggested this "marriage squeeze" argument for India which relies on the fact that in a rapidly growing population where grooms marry younger brides, grooms will be in relatively short supply in the marriage market. Since brides reach marriageable age ahead of grooms, increases in population impact upon the population of brides first, thus causing an excess demand for grooms and an increase in price, i.e., dowry inflation. Rao (1993a and 1993b) investigates the reasons behind the steadily rising dowries using retrospective household data from India which provides information on dowries spanning the period 1921 to 1981. Rao finds that a "marriage squeeze", defined by the ratio of the number of women of 'marriageable' age to the number of men of marriageable age (an age which is obviously older) has played a significant role in the rise of dowries.

Given the rapid population growth in India over the last five decades and the fact that there has always been a substantial age gap between brides and grooms, the supposition that the rise in dowry payments is a demographic phenomenon is plausible. However, it is difficult to see that this argument directly explains some of the more complex consequences of the dowry phenomenon. In particular, it does not shed light on why dowry inflation has occurred predominantly in upper castes relative to lower ones and why wealthy families transfer higher

dowries than those poorer, especially since population growth is generally more prevalent within lower income groups. Additionally, demographic change does not clearly justify why the amount of dowry increases dramatically in accordance with the potential wealth of the groom.

Chapter 2 of this thesis attempts to make explicit what has been implicit in the marriage squeeze explanation. It points out some difficulties in making the theory reconcile the main observations relevant in the context of demographic change, namely the average age of brides rising and dowry inflation. When population increases and potential brides are in excess supply, women who do not find matches may either remain unmarried or postpone marriage. In much of South Asia the age gap has narrowed and population growth has been accompanied by the average age of women at marriage rising. Furthermore, all brides and grooms, in general, eventually marry. Hence reductions in the age difference between brides and grooms has served to equalize the excess supply of women in the marriage market. It is demonstrated that there exist conditions under which population growth can cause dowries to decrease if the model is constrained from generating an increasing number of unmarried women.

An alternative explanation for dowry inflation is provided in Chapter 3 which takes into account the phenomenon of caste. The analysis posits a characterisation of modernisation akin to the one described above where, within each caste, members become a more heterogeneous group in terms of potential wealth. The new income earning opportunities brought about by development are predominantly filled by men, and as a result grooms become a relatively heterogeneous group compared to brides. If we perceive dowry as a bid that a bride's family makes for a groom of certain market value, an increase in the heterogeneity of grooms will increase the spread of dowries as demonstrated by Stapleton (1988) and Edlund (1996). However an increase in the spread of dowries does not necessarily lead to a rise in average dowries. Quite plausibly, grooms who have become more eligible in the marriage market via development will receive higher dowries, whereas payments will decrease for those who are less eligible, and in consequence average dowries remain constant. The explanation as to why dowries also increase for the relatively less desirable grooms, and in turn average dowry payments increase, relies heavily on particularities of the caste system.

Although there are numerous studies of the dowry phenomenon in India, research directly pertaining to the custom of dowry in the rest of South Asia is relatively sparse. One exception

is a study by Lindenbaum (1981) who investigates the transition from bride-price to dowry of a predominantly Muslim community in rural Bangladesh. A custom very similar to that occurring in India is described where grooms of newly acquired wealth are able to demand relatively large dowries. The fourth chapter of this thesis is a study of dowry payments in Pakistan. Since an exploration of how dowry payments have evolved through time is not possible due to limitations of the data, the analysis instead focuses on the present role of dowry payments in Pakistan. Support for the groom-price model of dowry payments is similarly found in the context of Pakistan. At first glance, the emphasis on caste in Chapter 3 to explain the dowry phenomenon in India may seem contradicted by the evidence of a similar phenomenon occurring in Muslim communities since the notion of caste is rooted in Hinduism and is not a component of the Islamic religious codes. However, on closer inspection, the characteristics of caste crucial to the explanation of Chapter 3 do occur in Muslim communities of South Asia; which is to say, there exists a hierarchical structure based on inherited occupations in which all groups practice endogamy.[13] The empirical findings of this final chapter therefore do coincide with the theoretical contributions of the two prior chapters.

[13]See, for example, Korson (1971), Dixon (1982), Beall (1995), Eglar (1960), Ahmad (1977), and Lindholm (1985).

Chapter 2

Reconsidering the Marriage Squeeze and Dowry Inflation

2.1 Introduction

There is considerable evidence that real dowry payments, that is, the transfer from brides and their families to grooms at the time of marriage, have risen over the last five decades in India. These payments are substantial and can amount to roughly six times a household's annual income (Rao 1993a). The severe social consequences of rising dowries have motivated a large body of research aimed at explaining the phenomenon. A particularly influential and intuitive explanation is one based on a process demographers term the "marriage squeeze" (see, Rao 1993a and 1993b, Caldwell et. al. 1983, Billig 1992, and Lindenbaum 1981). This marriage squeeze explanation relies on the fact that in a growing population where grooms marry younger brides, grooms will be in relatively short supply in the marriage market. Since brides reach marriageable age ahead of grooms, increases in population impact upon the brides first, thus causing an excess demand for grooms and an increase in the price of husbands, i.e., dowry payments rise.[1] Reductions in the equilibrium age difference, i.e., brides marry at an older age, will tend to equalize the excess supply of women in the marriage market. It has been reasoned that the severe social and economic pressures associated with older unmarried daughters imply

[1] See Rao (1993a and 1993b).

that households of older potential brides are willing to outbid the families of younger brides and that this competitive interaction between older and younger women places upward pressure on real dowries.[2] In a static model, it is simple to show that an increase in dowries can occur when there is an excess supply of brides due to population growth. The more challenging task is to tell a dynamic story which explains how such an increase in dowries can be sustained despite a shrinking marrying age gap as observed. This chapter explicitly models the dynamics of dowry payments when population increases. The model presented is highly abstract but is created to reconcile the two observations of dowry changes and the absence of growing numbers of unmarried women. It is demonstrated that population growth can cause dowries to exhibit a decreasing path if individuals expect the age gap to close at some point in the future.

Over the last five decades rapid population growth has occurred in South Asia and there has always been a substantial age gap between brides and grooms.[3] When population increases and potential brides are in excess supply, women who do not find matches may either remain unmarried, postpone marriage, or match with men from a younger cohort than the one from which they would normally obtain their partners. If all women eventually marry, either the average marrying age of brides increases (some postpone marriage), or that of grooms falls so that the difference between the ages of spouses declines.[4] In much of South Asia the age gap has narrowed and population growth has been accompanied by the average age of women at marriage rising, while that of men has remained relatively stable.[5] Furthermore, all brides and grooms, in general, eventually marry.[6] The empirical record thus seems to suggest that the primary equalizing mechanism in response to population growth in South Asia has been for some women to postpone marriage.

This chapter examines the competitive interaction between older and younger brides under different behavioural assumptions. Consider, for example, an excess supply of brides of mar-

[2]See Rao (1993a and 1993b).

[3]Most societies are characterised by persistent differences in ages of spouses, with men on average marrying women who are younger (see, for example, Casterline et. al. 1986).

[4]The term "marriage squeeze" refers to this decrease in the marriage age-gap. There is a large sociological literature on the marriage squeeze phenomenon, see, for example, Akers (1967), Schoen and Baj (1985), and Schoen (1983).

[5]See, for example, Caldwell et. al. (1983), Rao (1993b), and Foster and Khan (1994).

[6]See, for example, Rao (1993a) where it is reported that in India 99% of men are married by the age of 25 and 99% of women are married by the age of 20.

riageable age, due to population growth, when individuals do not take the future into account (i.e., people are myopic). In this case, brides would compete for available grooms in a spot market and the maximum dowry each bride would be willing to pay is such that she is indifferent between marrying at this high price and remaining single. This maximum willingness to pay increases with income and hence it is the poorest brides who remain unmarried. As population continues to grow, each family has correspondingly more daughters and there are two countervailing effects to this increase in potential brides. First, at each level of wealth, there is a larger demand for grooms (because there are a larger number of brides) and hence the equilibrium price for grooms can increase with population growth. Second, it can also be the case that the maximum willingness to pay for each daughter decreases with the number of daughters and in consequence, for a given income distribution, equilibrium dowry payments may decline through time if this negative effect on dowries outweighs the former positive effect. Women who remain single do not re-enter the marriage market as older brides since they cannot afford to outbid younger wealthier brides for the available grooms. Therefore increasing dowry payments are possible, however, the average age of brides would remain constant and there would be an increasing number of unmarried women.

Alternatively, suppose that when a population increase induces an excess supply of brides, women anticipate the future and expect to either marry now, at the desirable age, or later, when they are older. In this case, some brides postpone marriage and competition (by dowry payment) amongst brides determines which brides wait to marry. The highest payment any bride in this market is willing to offer a groom is such that she is indifferent to whether she marries then or waits until later. If a bride does delay marriage she incurs notable costs since daughters are economic liabilities to their parents and there is a profound social stigma affixed to women who marry older than the "marriageable age". Hence, for women to be willing to delay marriage, the equilibrium dowry payments when they do marry must be lower than what they would have paid had they married earlier. Thus, when older brides do enter the marriage market when population increases, which is the case when all brides eventually marry and the average age of brides increases, the time path of dowry payments is downward sloping.

The objective is to consider the intuition outlined above in a generalized framework of demographic change. Population increase can be conceived of in a number of ways: a sudden

jump in population after which it reverts to its old level; a gradual population increase, where it grows for a number of periods before declining gradually back to its initial level; or a permanent increase in population that leads to continued growth. Each of these cases is explored in the chapter, both when population growth is anticipated by market participants and also when it is not.

The next section provides a simple model of dowry payments. Equilibrium prices are solved for in the bench-mark case of no population growth in Section 2.3. Marriage market equilibria when there is increasing population are characterised subsequently. Extensions of the model are provided in Section 2.5 and Section 2.6 concludes.

2.2 The Model

Time is discrete and in each period an equal number of males and females are born. Agents of each sex are ex-ante identical in all respects and will all eventually reach marrying-age. For exogenous reasons, as discussed above, the minimum permissible age at which brides marry is lower than that of grooms. More formally, potential brides and grooms are assumed to be marriageable if their ages fall within the ranges $[b, \hat{b}]$ and $[g, \hat{g}]$ respectively, where $g > b$.[7] Costs associated with remaining unmarried beyond the earliest marriageable age render it preferable for brides and grooms to marry at b and g, respectively.[8] From the perspective of brides, these costs are increasing with their age, and in a convex manner.[9] The stress on early marriages for females is a predominant feature of the traditional institution of marriage in the areas under consideration (see, for example, Goyal 1988). There is customarily an age after which women are deemed unmarriageable (see, for example, Forbes 1979). One would anticipate convex costs to

[7] One can think of age b denoting an acceptable level of sexual maturity for reproduction and age $\hat{b}$ the point at which women are no longer adequately fertile. For husbands, g may denote an age at which men have acquired a sufficient level of human capital, reasonably, $g > b$.

[8] Since marriage is patrilocal, that is, brides join the household of their grooms upon marriage, the most obvious cost to marriage delay for a bride is the additional financing of her livelihood absorbed by her parents (see, for example, Lindenbaum 1981). More indirectly there are the social costs associated with marrying beyond the socially acceptable age levels for both brides and grooms, however the rules are far more stringent for women. Caldwell et. al. (1982 and 1983), for example, discuss such moral and religious codes which are explicitly linked to the sexual maturity and reproductive capabilities of both brides and grooms.

[9] Increasing costs to delay for brides is argued by proponents of the marriage squeeze explanation, see, in particular, Rao (1993b) and Billig (1992).

delay as the age of brides approaches this critical value, $\widehat{b}$.[10] There is also evidence that grooms prefer younger to older brides, which relates to a much discussed social stigma associated with brides marrying late.[11]

The benefits and costs of marriage are modelled in a highly abstract way. Unmarried grooms receive a lifetime utility of 0. Brides' families, on the other hand, incur a cost to keeping an unmarried daughter which varies according to income, denoted $-\overline{U}(y)$. All desirable qualities of a potential spouse other than their age are held constant.[12] For simplicity, it is assumed that all benefits and costs of marriage occur in one period only and that individuals do not discount the future.[13] Dowry payments, denoted by d, are a transfer from brides' families to those of grooms. These payments are derived endogenously and, as will be established, may potentially vary with the period in which marriage takes place, τ, the time beyond earliest marriageable age that a bride marries, denoted t, and the income of bridal family, y, that is $d(\tau, t, y)$. So, for a bride of family income y marrying in period $\tau = 4$ at age $b + 2$, her dowry payment is denoted $d(4, 2, y)$.

The discussion above suggests that the disutility costs of an older bride are experienced by both the bride and the groom, and hence a bride's age should affect the utility of brides and grooms directly, independent of dowry payments. For brides, this is denoted as a cost, $c(t)$, which is increasing and convex in $t; c'(t) > 0$ and $c''(t) > 0$, while for grooms it is denoted $k(t)$, where $k'(t) > 0$ and $k''(t) \geq 0$ and for simplicity assume also that $c(0) = k(0) = 0$.[14]

[10] This does not directly imply that costs are convex at younger ages, i.e., ages very close to b, and there does not exist research sufficiently in depth to support or counter the assumption that costs are convex at these younger ages as well. It is, however, demonstrated in Section 2.5, that all results of the model are obtained if instead the optimal marrying age, b, is comprised of a range of ages, suppose 15 to 20 years. Presumably then this range could encompass ages close enough to $\widehat{b}$ such that costs are convex after age b. The results pertaining to equilibrium dowry payments do not require costs to be convex, only that they are increasing. Rather, the assumption of convexity is necessary to explain why the age of marriage of brides increases only gradually in the context of population growth. Without this, when brides are in excess supply, rather than postponing marriage until the subsequent period, they might postpone it for a number of periods, resulting in a large jump in the average age of brides rather than a gradual increase. However, in reality, a gradual increase is observed.

[11] See, for example, Forbes (1979), Rao and Rao (1979) and, Kaliappan and Reddy (1987).

[12] The decision to participate in the marriage market is not modelled here. It is implicitly assumed that the benefits of marriage outweigh the costs. Since some of these benefits and costs are derived endogenously in the model, these restrictions are verified when the equilibrium is established. Explicit consideration of such participation constraints is undertaken when considering marriage market equilibria in the context of an increase in population.

[13] Discounting across periods only strengthens the model's results so that, for simplicity, it is omitted.

[14] It is convexity in the total costs associated with brides marrying later, i.e., $c(t)+k(t)$, that is required. Hence $k''(t)$ could be decreasing but at a smaller rate than $c''(t)$ is increasing.

Grooms also experience disutility from marrying at an older age; this cost is represented by $q(i)$, where $g+i$ denotes their marrying age, $q'(i) > 0$, and $q(0) = 0$.[15]

Using a quasilinear specification of utility and recalling that these effects are captured in a single period only, the above considerations yield a relatively simple expression for a bride's utility given marriage in period τ at age $b+t$:

$$U(\tau, t, y) = -d(\tau, t, y) - c(t). \tag{2.1}$$

Similarly, a groom's utility benefit in period τ from marrying at age $g+i$ a bride who is aged $b+t$ is:

$$V(\tau, t, i) = d(\tau, t, y) - k(t) - q(i). \tag{2.2}$$

It may be worth noting that only the costs to delay represented by $c(t)$ are crucial to the analysis. The other costs are imposed mainly to coincide with reality. In particular, $k(t)$ implies that older brides pay higher dowries than younger brides in any given period whereas $q(i)$ is assumed to rationalize why grooms marry at age g instead of older.

2.3 No population growth equilibrium

There are at least two ways in which to perceive the determination of dowry payments. The first is to consider two families who join together and negotiate between themselves to determine the dowry payment. In this conception we can think of dowries as the solution to a Nash bargaining game between the two parties where the determinants of the payment are likely to be family specific. Alternatively, we can suppose that brides compete amongst themselves for available grooms in the marriage market. In this second interpretation, dowry payments are more a function of market forces. Therefore, we can either consider that population growth affects dowry payments because it alters the family specific negotiations or we can posit that it changes the marriage market as a whole. It is the second interpretation which is analysed

[15] Dowry payments are assumed to be independent of i. This is because throughout the analysis, there is no variation in the age of grooms. This result would not change if a groom's age did enter directly into the utility of brides. Furthermore, the social stigma associated with marrying older applies significantly more to brides, so it is unlikely that there are severe costs to brides from marrying older grooms.

here. As a result, when there is no population growth and all brides and grooms marry at the desirable age, in a sense there is no reason for dowry payments to occur. That is, there are no market forces inducing dowry payments to be positive rather if payments occurred in this case, it would have to be the result of a bargaining game between the two families where, for example, women are considered an economic liability and the groom's household is compensated accordingly. The analysis abstracts from this possibility and does not explicitly model the dowry negotiations when there is no population growth. Therefore implicit in the modelling strategy is the assumption that any factor which determines dowry payments in the case of no population growth is independent of demographic change. The case of no population growth is, however, formally considered in what follows.

Suppose population size, N, is constant through time: in each period, N brides and N grooms enter the marriage market. A marriage market equilibrium is a set of prices such that no married individual would prefer to be matched with someone other than their spouse or marry at another age. When individuals do not have any expectations of the future, however, this latter consideration is irrelevant and brides and grooms compete in spot markets for potential spouses. When all brides and grooms are identical, i.e., all brides are the same age and similarly for grooms, only the participation constraints must be satisfied in equilibrium, that is, brides and grooms prefer marriage to remaining single thereafter. There is potentially a large set of marriage transfers which solve the marriage matching equilibrium for a given period in this case. Any division of the surplus to marriage could be an equilibrium, for example, the Nash bargaining solution is $d = (1 - \alpha)\overline{U}(y)$, where α is the bargaining power of the bride's family. The precise mechanism with which dowry payments are determined will be seen to be inconsequential for the purpose of this chapter. Suppose instead the marriage payment determined by whichever mechanism is represented by $\widetilde{d}$. This payment can potentially vary by income since, for a given mechanism, brides with wealthier parents are willing to offer higher payments than those who are poorer. This relationship is depicted in the figure below where because the willingness to pay for a groom increases with income of the bridal family, the demand curve for grooms is downward sloping.

Insert Figure 2.1

Although brides with wealthier parents can afford to pay more than those with less income, they have no incentive to do so since in equilibrium all brides marry identical grooms. Therefore the equilibrium dowry payment, denoted by $\widetilde{d}$ in Figure 2.1, is determined according to the income of the brides with the poorest parents in the marriage market.

In a perfect foresight rational expectations equilibrium, all agents correctly anticipate realized population trajectories and the time paths of equilibrium dowry prices, $d(\tau, t, y)$ for all τ, t, and y. An equilibrium is a set of prices $\left[d(\tau, 0, y), d(\tau, 1, y), ..., d\left(\tau, \widehat{b} - b, y\right)\right]$ with $-\infty < \tau < +\infty$, such that no individual would prefer to marry at a time or an age other than their equilibrium age under this set of prices. Future prices impinge on the current decision to marry since, if prices are anticipated to change, individuals may prefer to defer marriage until they are older in order to benefit from price movements. Brides prefer not to delay marriage one period if and only if:

$$U(\tau, 0, y) \geq U(\tau + 1, 1, y) \tag{2.3}$$

Similarly grooms will not delay provided:

$$V(\tau, 0, 0) \geq V(\tau + 1, 0, 1) \tag{2.4}$$

Additionally, an equilibrium where neither brides nor grooms have incentive to delay requires that grooms do not prefer to match with brides who have delayed marriage:

$$V(\tau, 0, 0) \geq V(\tau, 1, 0) \tag{2.5}$$

With a stationary population, there clearly exist many equilibria in which all individuals marry at the earliest possible age, that is:

Proposition 1 *With zero population growth and under rational expectations it is possible that all individuals marry at the earliest permissible age, g and b for grooms and brides respectively. The time path of dowry payments in such equilibria necessarily satisfies:*

$$d(\tau + 1, 0, y) \in [d(\tau, 0, y) - k(1) - c(1), d(\tau, 0, y) + q(1)] \tag{2.6}$$

for all time periods τ.

Proof: Incentive condition (2.3) yields:

$$d(\tau, 0, y) \leq d(\tau + 1, 1, y) + c(1) \tag{2.7}$$

and condition (2.4) implies

$$d(\tau, 0, y) \geq d(\tau + 1, 0, y) - q(1). \tag{2.8}$$

Finally, from incentive constraint (2.5):

$$d(\tau + 1, 0, y) \geq d(\tau + 1, 1, y) - k(1). \tag{2.9}$$

These three inequalities imply:

$$d(\tau, 0, y) - k(1) - c(1) \leq d(\tau + 1, 0, y) \leq d(\tau, 0) + q(1) \tag{2.10}$$

□.

Corollary 2 *A constant time path of dowry payments, $d(\tau + 1, 0, y) = d(\tau, 0, y)$, is one of the equilibria.*

Equilibrium payments in a given period cannot be precisely determined without adding more structure to the basic framework. There exists a range of possible transfers for which both parties strictly prefer marriage to its alternative as long as $d(\tau, 0, y)$ is positive and less than the loss of income associated with keeping an unmarried daughter, $-\overline{U}(y)$. The restriction (2.6) is required to ensure that neither party has incentive to delay in anticipation of a more favourable dowry price in subsequent periods, and is obtained from equations (2.3) and (2.4). Note that since equal numbers of brides and grooms enter the marriage market each period and no one has incentive to delay, none remain unmarried and all people are married at the minimal marrying ages, g and b. Constant prices across time are consistent with restriction (2.6) and hence dowry payments under rational expectations could be equivalent to when there

are no expectations with regard to the future, i.e., payments are equal to $\widetilde{d}$ in all periods. As before, wealthier bridal parents have no incentive to offer a higher payment than those with less income and hence equilibrium dowry payments which satisfy (2.6) are determined according to the income of the brides with the poorest parents.

The chapter proceeds without fully characterizing all possible dowry equilibria, and without precisely determining dowry prices, since neither of these add to its central argument. Recall that the aim is to examine the time path of dowry payments when there is an *exogenous* increase in the population. It should therefore be assumed that the mechanism which determines marriage payments is independent of demographic changes. Given this, there is no reason to explicitly determine the dowry payment when there is no population growth.

Equilibria with population growth are next considered. Most types of population increase can be characterised by two variables: the rate of population increase and the duration of population increase. Cases which differ by the values of these two parameters are investigated in the following sections.

2.4 Increasing Population Equilibria

Suppose the economy is already in a stationary steady state, that is, prior to a starting period, denoted 0, the economy has experienced no population increase so that equal numbers of brides and grooms enter the marriage market each period. In period 0, there is an increase in population with the number of births rising from N to γN, where $\gamma > 1$.[16] For periods $0 < \tau \leq T$, the population level is equal to $\gamma^{\rho} N$, where ρ is non-negative and can vary across periods τ. Population increase can be conceived of in a number of ways which can be characterised by the variation in the two parameters ρ and T. The parameter ρ determines the rate of increase in the population, if $\rho = 0$, the population remains at the same level across periods, whereas if $\rho = \tau$, for example, population continues to grow at a constant rate. The parameter T reflects the duration of the population change, and thus distinguishes between a finite population increase (a temporary increase) and an infinite one (a permanent increase).

[16] The marriage squeeze argument states that this increase in marriageable women is a function of reduced child mortality rather than increased births as modelled here, however in this model, the distinction is irrelevant.

2.4.1 Myopic Individuals

Suppose the population level is equal to $\gamma^{\rho}N$, where $\rho \geq 0$, during periods $0 < \tau \leq T$. This scenario is illustrated in the figure below.

Insert Figure 2.2

In periods 0 to $b-1$, equal numbers of brides and grooms, N, continue to enter the marriage market. However in period b, brides born in period 0 reach marrying age so that γN brides enter the marriage market and seek matches with the N available men of age g. The number of grooms entering the marriage market does not increase to γN until period g. This causes an excess supply of brides where it no longer remains possible for all brides entering the marriage market to match with a groom at age b. If individuals are myopic and do not consider the future then brides in period b will compete for the short supply of grooms in a spot market. That is, brides anticipate that they will not marry in the subsequent period as they will be deemed too undesirable, or fear that younger brides will always be able to outbid them. This behavior on behalf of brides implies that different periods are not linked through time. In this case, in each period of an excess supply of brides, $b \leq \tau < T + g$, the highest dowry payment brides of age b are willing to offer grooms is such that they are indifferent to marrying in that period and remaining single.

When all brides do eventually marry, as is the case of no population growth, it is clear from Figure 2.1 that it is the income of the poorest bridal family which determines equilibrium dowry payments and hence for a given income distribution, dowry payments remain constant through time. In this sense, the time path of dowry payments is independent of the distribution of income across bridal families. Conversely, when an excess supply of brides induces some brides to never marry, the income of the bridal families who do marry compared to the income of those who do not marry determines equilibrium dowry payments. For example, in the diagram below, d^* is the equilibrium dowry payment which is determined by the lowest parental wealth of the N women who marry in period b, the remaining $(\gamma - 1)N$ women, who are the poorest in the population, never marry.

Insert Figure 2.3

Population growth occurs via an increase in the number of births of each sex and correspondingly a family of a given wealth may have a larger number of children. There are two main consequences of this increase in births for dowry payments. First, holding the income distribution constant, since there are more daughters in each family there is a larger demand for grooms at each level of wealth. Second, the fact that families do have more children can in turn affect their willingness to pay for each daughter's marriage. To examine both of these implications of population growth a more general form of bridal utility is considered. More specifically denote the participation constraint for bridal families as:

$$U(y - nd) \geq \alpha(n)U(y). \tag{2.11}$$

where n is the number of daughters per family and $\alpha(n) \leq 1$ reflects the costs (social and financial) to supporting n unmarried daughters, where $\alpha(0) = 1$ and $\alpha'(n) \leq 0$. Let $\overline{d}(n, y)$ denote the payment which solves (2.11) with equality. It is assumed that parents do not choose n, rather it is determined by the population growth rate, and that parents can choose only to marry all or none of their daughters, i.e., parents treat their daughters equally.

Suppose for now that population growth is distributed equally across all families, that is to say, the number of births of each sex increases for each family. For example in period 0 the number of births of each sex in each family increases from 1 to γ and hence n correspondingly increases from 1 to γ. When families of a given wealth have a greater number of daughters, which is the case when population grows, the maximum they are willing to spend on each daughters marriage, $\overline{d}$, may vary with the total number of their daughters. It may be the case that $\overline{d}$ does not change with n which seems likely when we consider that each family also has a greater number of sons with population growth and whatever amount they spend for their daughters' weddings they will receive for the marriages of their sons. Alternatively since daughters likely marry before sons, because of the age gap between grooms and brides, parents may be credit constrained at the time of their daughters wedding and more so when the number of their daughters increases and hence $\overline{d}$ may decrease with n. It is also conceivable that the costs to supporting unmarried daughters are more severe the greater the number, this is plausible when we consider the stringent social stigma associated with unmarried daughters.

Totally differentiating (2.11) with respect to d and n yields the following:

$$\frac{\partial \bar{d}}{\partial n} = \frac{-\alpha'(n)U(y) - \bar{d}U'(y - n\bar{d})}{nU'(y - n\bar{d})} \tag{2.12}$$

From the above, $\frac{\partial \bar{d}}{\partial n}$ is likely to be decreasing if $\alpha''(n) \leq 0$ and increasing or constant if $\alpha''(n) > 0$.

If $\frac{\partial \bar{d}}{\partial n} \geq 0$ then when the population grows the demand curve for grooms necessarily shifts right. This follows because not only does the willingness to pay for grooms at each level of income increase (since $\frac{\partial \bar{d}}{\partial n} \geq 0$) but for a given bridal parent income there is a larger demand for grooms. This latter effect induces the demand curve to also shift to the right by the amount of the population change. Hence, for example, if in period b the supply of brides at each wealth level is equal to γ and this supply grows to equal γ^2 in the subsequent period, then in period $b+1$ the demand curve will shift to the right by the amount $\gamma^2 - \gamma$. On the other hand, if $\frac{\partial \bar{d}}{\partial n} < 0$ then the demand curve for grooms could shift right or left depending on whether or not the decrease in $\bar{d}$ as a result of an increasing number of daughters (which shifts the demand curve to the left) outweighs the effect of a larger demand for grooms at all income levels (which shifts the demand curve to the right). This net effect on the demand for grooms will in part depend on the slope of the demand curve. In particular the negative effect on demand (via decreasing $\bar{d}$) is more likely to outweigh the positive effect (of a larger number of potential brides) if the demand curve is relatively flat as illustrated in the following two figures.

Insert Figures 2.4 and 2.5

The slope of the demand curve in turn depends on the income distribution. That is, if the income is distributed fairly evenly then the demand curve is relatively flat, whereas the opposite holds true for a relatively steep curve. More generally, even if the net effect of a population increase is a rightward shift of the demand curve for grooms, the occurrence of dowry inflation is conditional on the income distribution across the parents of brides. Consider the following three depictions of the demand curve for grooms which correspond respectively to a uniform income distribution, a distribution skewed to the left where the majority of parents are wealthy, and one skewed to the right where most of the wealth is in the hands of very few families.

Insert Figures 2.6,2.7, and 2.8

It is clear from these figures that when the demand curve shifts to the right, equilibrium dowry payments are more likely to increase if the income distribution is either uniform or skewed to the left. If income is distributed relatively unequally, where the majority of families are poor, equilibrium dowry payments will plausibly not increase with population growth.

Equilibrium dowry payments are determined by equating the demand and supply curves for grooms. The supply of grooms is simply equal to N. The number of grooms demanded at equilibrium price d^* is equal to the number of brides whose parents are willing to pay at least d^* to marry their daughter. To formulate this demand we need to calculate the density function for parents' willingness to pay for a daughter's marriage. Let $f(y)$ represent the density function of brides' parents' income. From the participation constraint for brides, (2.11), we have a relationship between parents' willingness to pay for each daughter and their wealth and the total number of their daughters, represented by $\overline{d}(n, y)$. Using the density function for parental wealth, $f(y)$, it is possible to derive a density function for willingness to pay for a daughters' marriage, denoted $g(\overline{d})$. The total number of brides whose parents are willing to pay at least d^* for a groom is then equal to the left hand side of the following equilibrium condition which equates demand and supply:

$$nN \int_{d^*(n)}^{\overline{\overline{d}}(n)} g(\overline{d}(n))d\overline{d} = N \tag{2.13}$$

where $\overline{\overline{d}}$ is the maximum willingness to pay of the wealthiest bridal parents. The solution to the integral is the proportion of brides willing to pay at least d^* for a groom. To compute the total number of brides who are willing to do so, this proportion must be multiplied by the total number of potential brides which is equal to nN (the number of daughters per family times the number of families). The solution to the above equation yields the equilibrium dowry payment d^*. Differentiating d^* with respect to n will then determine whether or not equilibrium dowry payments increase with population growth. If the relationship is positive then equilibrium dowries do increase with an increase in the number of daughters per family and otherwise they do not.

To better understand the two countervailing effects of population growth on equilibrium dowry payments consider the following example. Suppose that parents are willing to pay a fraction, β, of their income on the marriage of their daughters and that they divide this amount

equally amongst their daughters, hence $\overline{d} = \frac{\beta y}{n}$. Consider a linear density function for parental income $f(y) = 2(1-y)$, where $0 \leq y \leq 1$. Alternative to the above formulation of the equilibrium condition (2.13), we first compute the equilibrium level of parental wealth, denoted y^*, which will determine equilibrium dowry payments:

$$nN \int_{y^*}^{1} 2(1-y)dy = N \tag{2.14}$$

The integral of the above is equal to the proportion of brides' parents with income of at least y^*. Therefore the y^* which solves (2.14) represents the lowest parental wealth of the N brides who marry in equilibrium. The solution to the above is $y^* = 1 - n^{-\frac{1}{2}}$ and hence y^* is increasing with n. Substituting this solution into the functional form of $\overline{d}$ implies that $d^* = \frac{\beta}{n} y^* = \frac{\beta}{n}(1 - n^{-\frac{1}{2}})$. Differentiating d^* with respect to n yields:

$$\frac{\partial d^*}{\partial n} = \beta \left(\frac{3}{2n^{\frac{5}{2}}} - \frac{1}{n^2} \right) \tag{2.15}$$

where the above is negative if $n > \frac{9}{4}$. Therefore if the number of daughters per family increases roughly from 1 to 2 then although y^* increases (thus increasing the wealth which determines equilibrium dowry payments), equilibrium dowry payments d^* can decrease.

Although, population growth necessarily implies that there is a larger demand for grooms at each income level due to the increased number of available brides, the importance of this effect also depends on the type of population growth. More specifically, if the population growth rate is constant, then the wealth which determines equilibrium dowry payments, y^*, increases only until period g after which it remains constant. As demonstrated in the above example, the wealth which determines the equilibrium dowry payment in periods $b \leq \tau < g$ satisfies $(1 - F(y^*))\gamma^{\tau-b+1}N = N$, where $\gamma^{\tau-b+1}$ represents the growth in the number of brides (or daughters per family) in period τ which is growing at a constant rate γ across periods. In period g the supply of grooms also begins to increase at a rate of γ and is equal to $\gamma^{\tau-g+1}N$ for $g \leq \tau < T + g$. As a result, the wealth of brides' parents which determines equilibrium dowry payment in periods $g \leq \tau < T + b$ satisfies $(1 - F(y^*))\gamma^{\tau-b+1}N = \gamma^{\tau-g+1}N$ which implies that $(1 - F(y^*))\gamma^{g-b} = 1$. Hence the wealth which determines equilibrium dowry payments remains constant and d^* will only increase if $\frac{\partial \overline{d}}{\partial n} > 0$. Therefore a steady rise in dowry payments over a

span of time greater than the marriage age gap $(g - b)$ is necessarily predicted only if $\frac{\partial \bar{d}}{\partial n} > 0$, that is when bridal parents of a given wealth have more daughters they are willing to provide a larger dowry for each daughter. Otherwise dowry inflation only ensues if the population is growing at an increasing rate and it is not necessarily so if $\frac{\partial \bar{d}}{\partial n} < 0$.

Throughout the above it is assumed that population growth identically occurs in all families. In reality this is often not the case and in particular poorer families generally have a larger number of children than those with more wealth. In this scenario the demand curve for grooms may only shift to the right for families with less wealth. The figure below illustrates that when this is so a rightward shift of a downward sloping demand curve could have no effect on equilibrium dowry payments.

Insert Figure 2.9

When individuals do not have any expectations about the future, in each period there is an excess supply of brides, grooms extract all the rents and thus push brides down to their reservation utility level. In each period of an excess supply of potential brides some women of age b will marry and pay d^* and the remaining brides will remain unmarried thereafter. Brides with parents of higher wealth will always marry before those who are poorer. Equilibrium dowry payments, d^*, are more likely to increase across periods if population is growing at an increasing rate, if the costs to supporting unmarried daughters are convex in the number of daughters, and if the income distribution across bridal families is skewed to the right, that is the majority of bridal parents are wealthy. Therefore a steadily increasing time path of dowry payments cannot be ruled out, however, the conditions under which this occurs do not necessarily accord with the situation in South Asia, where the majority of families are poor and the rate of population growth has ceased to increase since approximately 1960.[17] Moreover, brides do not have incentive to re-enter the marriage market at older ages as they cannot outbid the younger and wealthier brides for the available grooms. Therefore the average age of brides remains constant (at b) and there is an increasing number of unmarried women. Both of these implications conflict with empirical fact (cited in the introduction of this chapter). If the change

[17]See *The World Development Report* published by The World Bank for annual average population growth rates. The reported rate in India over the period 1960-70 was 2.3% and has since been decreasing; the average growth rate over the period 1990-1995 was 1.8%.

in population is permanent, that is as $T \to \infty$, the conclusions remain the same. The duration of the demographic change is irrelevant when brides are competing in spot markets and not taking the future into account.

2.4.2 Rational Expectations

Suppose instead that brides and grooms correctly anticipate all future competitive behaviour in the marriage market and take this information into consideration when they marry. It will be demonstrated that the main results are independent of variation in the parameter ρ; however in contrast, they significantly differ with the size of T. The central focus of the next sections is to explore equilibria with population growth under rational expectations when T is small (a temporary increase) and large (a permanent increase) respectively. The cases of $\rho = 0$ and $\rho \geq 0$ are, however, investigated independently in the context of a temporary increase. This is purely for expositional purposes since the general results are simply demonstrated in the case of $\rho = 0$.

A Temporary Increase in Population

Case 1: $\rho = 0$ When the population increase is temporary the excess supply of brides will ultimately cease. As a result, all women will eventually marry as long as some postpone their marriage until an older age, i.e., greater than b. Since all brides do marry, equilibrium dowry payments are determined by the poorest bridal parents, as is the case when there is no population growth, depicted in Figure 2.1. For this reason, the main analysis of this section abstracts from the income component of dowry payments and suppresses the notation to $d(\tau, t)$. However, it is explained throughout the exposition why the income of bridal parents and the total number of daughters is irrelevant in this case.

When $\rho = 0$, the population level is equal to γN for $0 \leq \tau \leq T$ after which births revert back to N per period. This is illustrated below in Figure 2.10.

Insert Figure 2.10

In periods 0 to $b-1$, equal numbers of brides and grooms, N, continue to enter the marriage market. However in period b, brides born in period 0 reach marrying age so that γN brides

enter the marriage market and there are only N available men of age g. The number of grooms entering the marriage market does not increase to γN until period g. This causes an excess supply of brides during the interval $g-b$, which immediately implies that rational expectations equilibria like those in Proposition 1 can no longer exist. That is, it ceases to be possible for all brides entering the marriage market to match with a groom at age b. When brides correctly anticipate the time paths of equilibrium dowry prices, an equilibrium in the marriage market is a set of prices such that no brides would prefer to marry at an age other than their equilibrium age under these set of prices. From the convexity of delay costs, it follows that older brides are willing to outbid younger ones, as will be established formally below. As a result, brides in period b correctly anticipate that if they delay their marriage, they will in fact marry in the subsequent period at age $b+1$, as younger brides (aged b) will not have incentive to outbid them. Therefore, in equilibrium, unmatched brides in period b re-enter the marriage market at age $b+1$ in period $b+1$. Their presence further exacerbates the excess supply of brides. The existence of brides of age $b+1$ in the marriage market reflects the excess supply of brides aged b in the preceding period. The supply of brides of age $b+1$ will continue to increase until the supply of grooms correspondingly begins to increase in period g. Consider the following sequence of marriage market entrants occurs where all older brides marry in each period τ:

Period	Supply of b brides	Supply of $b+1$ brides	Supply of g grooms
$\tau < b$	N	0	N
$\tau = b$	γN	0	N
$b+1 \leq \tau < g$	γN	$(\tau - b)(\gamma - 1)N$	N
$g \leq \tau < T+b$	γN	$(g-b-1)(\gamma-1)N$	γN
$T+b \leq \tau < T+g$	N	$(T+g-\tau)(\gamma-1)N$	γN
$\tau \geq n+g$	N	0	N

Table 2.1 - Supply of Brides and Grooms

The above sequences for both brides aged b and grooms aged g are straightforward: the number of brides of age $b+1$ in the marriage market is equal to the excess supply of brides aged b in the prior period. Correspondingly, while the supply of b brides is high relative to grooms, the supply of $b+1$ brides is increasing, when the supply of grooms and brides of age b is equal, the supply of $b+1$ brides is constant and while the supply of b brides is low in comparison to

grooms, the supply of $b+1$ is decreasing. After period $T+g$, the marriage market is again in a steady state equilibrium where equal numbers of brides and grooms of respective ages b and g match. During the periods affected by the population change, (periods $b+1$ to $T+g$), the average age of brides increases and then decreases, thus responding to population increases and decreases, and consequently the marriage-age gap between spouses also adjusts.[18]

In this equilibrium some brides postpone their marriage, however, they do not delay marriage beyond age $b+1$. This is due to the convex costs of delay where, since older brides are willing to pay more than younger ones for a spouse, they always marry before younger brides.

Lemma 3 *Older brides in the marriage market marry before those younger.*

Proof: In any given period, brides of age $b+1$ are willing to pay more than brides of age b for a given groom. To demonstrate this, suppose the contrary; that an unmatched bride aged b in period τ offers a deviation payment so as to outbid an older bride, forcing the latter to marry in period $\tau+1$ at age $b+2$. The highest payment the $b+1$ bride is willing to pay is such that she is indifferent to marrying in periods $\tau+1$ or $\tau+2$. This is the case if the following holds:

$$U(\tau,1) = U(\tau+1,2) \tag{2.16}$$

and hence,

$$d(\tau,1) + c(1) = d(\tau+1,2) + c(2). \tag{2.17}$$

In period $\tau+1$, grooms will marry these older brides of age $b+2$ if they offer a dowry so that grooms are no worse off matching with them relative to those younger (of ages $b+1$ and b). The lowest payment which will attract grooms to these less desirable brides (of age $b+2$) is such that grooms are indifferent to them and those younger:

$$V(\tau+1,0,0) = V(\tau+1,1,0) = V(\tau+1,2,0) \tag{2.18}$$

[18]Foster and Khan (1994) similarly derive a relationship between population increase and changes in age differential between spouses at marriage which is necessary to satisfy marriage market equilibrium.

where the second equality implies:

$$d(\tau+1,1)-k(1)=d(\tau+1,2)-k(2). \tag{2.19}$$

Equations (2.17) and (2.19) yield:

$$d(\tau,1)=d(\tau+1,1)+k(2)-k(1)+c(2)-c(1). \tag{2.20}$$

The payment $d(\tau,1)$ of (2.20) reflects the dowry payment a bride of age $b+1$ in period τ is willing to pay to marry in that period rather than the subsequent one. Younger brides can outbid these older brides with a lower payment than $d(\tau,1)$ because they are preferred by grooms. The smallest deviation payment they can make solves (2.5) with equality and is equal to $d(\tau,1)-k(1)$, i.e., the payment offered by these older brides minus the costs to grooms associated with marrying older women. The deviation payment, $d^*(\tau,0)$ is then equal to:

$$d^*(\tau,0)=d(\tau+1,1)+k(2)-2k(1)+c(2)-c(1) \tag{2.21}$$

Suppose instead that younger brides delay marriage rather than outbidding older brides in period τ. Dowry payments in period τ will be bid up to the point where brides aged b are indifferent to marrying across these two periods, that is, (2.3) must hold with equality. This implies:

$$d(\tau,0)=d(\tau+1,1)+c(1). \tag{2.22}$$

Because of the convexity in delay costs, hence $c(2)-c(1)>c(1)$ and $k(2)-k(1)\geq k(1)$, $d^*(\tau,0)$ is greater than $d(\tau,0)$. Therefore offering the dowry payment $d^*(\tau,0)$ only makes a bride worse off and is not a worthwhile deviation. As a result younger brides do not outbid older brides for grooms and in each period all older brides marry. □

When brides compete to determine which brides delay marriage, brides with wealthier fathers can outbid those who are poorer. As a result, younger brides are on average richer than older brides. However, that older brides are always willing to outbid younger brides is due only to the convex costs to delay and is independent of the wealth of brides. This is because younger brides can always afford to outbid the older brides (as younger women are more desirable to

grooms they can compete with those older by offering a lower price even when their wealth is identical) rather it is not worthwhile for them to deviate from the equilibrium outcome given equilibrium prices as is demonstrated above. Therefore, the wealth distribution across older and younger brides is irrelevant to Lemma 1.

During periods $b+1$ through g, the supply of brides of age $b+1$ is increasing and could potentially surpass the supply of grooms in a given period. If this were the case, then some older brides would also postpone marriage and brides of age $b+2$ would enter into the marriage market of the subsequent period. It is easily demonstrated that the result of the above lemma holds true for brides older than $b+1$.[19]

The entrant sequence of Table 1 is essentially determined by feasibility conditions driven by the restricted number of grooms. What is interesting about this sequence is its implications for the time path of dowry payments. In particular, as the number of age $b+1$ brides increases through time, one may expect that equilibrium dowry payments over time should at least be non-decreasing, or, as marriage squeeze proponents argue, strictly increasing. However this is not the case:

Proposition 4 *Under rational expectations, when there is a temporary increase in the population, older brides make higher dowry payments than younger brides and dowry payments decrease for the duration of the population change for brides of all ages.*

Proof: Under rational expectations, brides take as given the dowry payments in the final period $T+g$, where brides of age b match with grooms aged g. Suppose these payments are equal to $\widetilde{d}$, as described in Section 2.3. In the preceding period $T+g-1$ brides of age b offer a dowry payment equal to $\widetilde{d}$. Brides of age $b+1$ are less desirable to grooms and hence must offer a higher payment, in particular (2.5) must hold with equality which yields $d(T+g-1,1) = \widetilde{d}+k(1)$. In all preceding periods $b \leq \tau \leq T+g-2$, some brides of age b postpone marriage. Competition amongst brides determines which brides wait to marry in the subsequent period and prices are bid up so that brides are indifferent to marrying at ages b and $b+1$, that is, (2.3) must hold

[19] The supply of $b+1$ brides will not exceed that of potential grooms for plausible population increases. This is more likely to occur the larger the spousal age gap, $g-b$. However, even for a very large gap, $g-b=20$, for example, the increase in population must be larger than 5%, for the supply of $b+1$ brides to surpass that of grooms (for a 10 year spousal age gap, the population increase must be larger than 12%).

with equality which implies (2.22) holds for $b \leq \tau \leq T + g - 2$. Grooms marry only in a single period and for $b + 1 \leq \tau \leq T + g - 1$ marry brides of both ages. In equilibrium grooms are indifferent between these two qualities of brides. Thus, because older brides make up for their age by paying higher dowries condition (2.5) holds with equality, which yields:

$$d(\tau + 1, 0) = d(\tau + 1, 1) - k(1). \tag{2.23}$$

for $b + 1 \leq \tau \leq T + g - 1$.

Equations (2.22) and (2.23) imply:

$$d(\tau, 0) = d(\tau + 1, 0) + k(1) + c(1) \tag{2.24}$$

for $b \leq \tau \leq T + g - 2$. Similarly, equation (2.23) defined at τ and (2.22) yield:

$$d(\tau, 1) = d(\tau + 1, 1) + k(1) + c(1) \tag{2.25}$$

for $b + 1 \leq \tau \leq T + g - 2$.

Solving backwards yields:

$$d(\tau, 0) = \widetilde{d} + (T + g - 1 - \tau)[k(1) + c(1)] \tag{2.26}$$

for $b \leq \tau \leq T + g - 2$ and

$$d(\tau, 1) = \widetilde{d} + (T + g - \tau)k(1) + (T + g - 1 - \tau)c(1) \tag{2.27}$$

for $b + 1 \leq \tau \leq T + g - 2$.

Clearly, $d(\tau, 0)$ and $d(\tau, 1)$ are decreasing in τ. Further, it is apparent from equations (2.26) and (2.27) that older brides make higher dowry payments than those younger in equilibrium. □

Once again, the above result is independent of the income distribution of bridal family wealth. Under rational expectations, brides' parents take as given dowry payments in the final period. In the preceding period they offer a payment such that their daughters are indifferent

to marrying in that period and postponing their marriage. Wealthier bridal parents can always outbid those who are poorer and marry their daughters at the desirable marriage age. However, they have no incentive to do so since they can achieve the same outcome by offering a dowry equivalent to what the poorest brides pay in a given period. Therefore the equilibrium time path of dowry payments is determined according to the income of the poorest bridal parents. Similarly, if the amount of dowry parents are willing to offer relative to payments in the final period is decreasing with population growth, due to an increase in the number of their daughters, this will not alter the dowry deflation result. Rather equilibrium payments are only lower as the population continues to grow.

That women postpone marriage in response to population growth is the focus of this chapter, since it is this phenomenon which is occurring in areas undergoing dowry inflation. It is alternatively conceivable that in period b, the excess supply of brides match with younger grooms, aged $g-1$. In this scenario, it is easily demonstrated that the result of dowry deflation also ensues. In this case the costs to grooms of delay matter and dowry payments are denoted $d(\tau, t, i)$. Grooms younger than g are less desirable and in equilibrium, $d(\tau, 0, -1) < d(\tau, 0, 0)$.[20] Grooms receive a payment such that they indifferent to marrying at age $g-1$ and at age g in the subsequent period. Assuming there are no delay costs to grooms for waiting until the desirable age to marry, then in equilibrium, $d(\tau, 0, -1) = d(\tau + 1, 0, 0)$. These two conditions imply $d(\tau + 1, 0, 0) < d(\tau, 0, 0)$ and hence dowry payments decrease.

Proposition 4 naturally leads to the following:

Proposition 5 *Under rational expectations, when there is an increase in the population which lasts T periods, average real dowry payments decrease across periods τ, $b \leq \tau < T + g$, despite the fact that older brides pay higher dowries than younger ones in any period.*

Proof: Consider in a given period τ, $b \leq \tau < T + g$, that the supply of grooms is equal to η, i.e. η is equal either to N or γN. In equilibrium, it is the η oldest brides who marry in period

[20] If grooms younger than g were not less desirable in the marriage market there would be no rationale for why g is the marriageable age of grooms. This would be expected if the ideal age for grooms, g, depends on the time when men have completed their education and entered employment or are prepared to take on household responsibilities.

τ. The average dowry payment in period τ, denoted by $D(\tau)$ can be written as:

$$D(\tau) = \frac{\alpha}{\eta} d(\tau, 0) + \frac{\delta}{\eta} d(\tau, 1) \tag{2.28}$$

where α is the number of b brides marrying in period τ and δ is that of $b+1$ brides and $\frac{\alpha}{\eta} + \frac{\delta}{\eta} = 1$. Given equations (2.22), (2.26) and (2.27), the dowry payments which comprise $D(\tau)$ are necessarily larger than those which comprise $D(\tau+1)$ and therefore any convex combination of these payments leads to $D(\tau) > D(\tau+1)$ for $b \leq \tau \leq T+g-2$. □

The above proposition follows since dowry payments decline over time for both brides of age b and $b+1$ and hence a weighted average of these payments also declines. This is clear from Figure 2.11 where although older brides always pay higher dowry payments than those younger, average dowry payments are less in period $\tau+1$ than in period τ, as illustrated in Figure 2.12.

Insert Figures 2.11 and 2.12

While dowry payments are decreasing across periods, grooms have no incentive to delay marriage. To ensure that neither brides nor grooms have an incentive to delay marriage before or after the period of population change, condition (2.6) must be satisfied for $\tau \leq b-1$ (before) and $\tau \geq T+g-1$ (after). The analysis does not pin down a price before and after the population change, rather payments must remain within the bounds prescribed by (2.6). However, *what is certain is that in any equilibrium sequence of prices during periods when there is an excess supply of brides, dowry payments must decrease.*

In Figure 2.11, dowry payments before the population increase, in period $\tau = b-1$, are higher than those after, in period $\tau = T+g$. This follows because condition (2.6) must be satisfied across periods $b-1$ and b and also across periods $T+g-1$ and $T+g$ where dowry payments are significantly lower in period $T+g$ than in b, as Proposition 4 demonstrates. This implication may be recast if alternatively the population increase is initially unanticipated, but agents' expectations correctly adapt thereafter. The analysis proceeds identically to the above in all periods where the under supply of grooms implies brides delay marriage (in periods $b+1$ to $T+g$). For these periods, the time path of dowry payments is determined as before. However, since the influx of brides into the marriage market in period b is unanticipated, it

is no longer the case that condition (2.6) need hold across periods $b-1$ and b. That is, both brides and grooms in period $b-1$ need not correctly anticipate the dowry payment of period b. Consequently a jump in dowry payments in period b cannot be ruled out in the unanticipated case. Therefore in contrast to Figure 2.11, dowry payments before and after the population increase may be equal to $\widetilde{d}$. However, once again, dowry payments are necessarily decreasing during periods of an excess supply of brides as depicted in the figure below.

Insert Figure 2.13

Throughout the above analysis it is implicitly assumed that both brides and grooms prefer to marry at equilibrium prices than to not marry at all. This assumption is relaxed in what follows. Suppose that T is so large that the overall difference in dowry payments across periods b to $T+g$, is too large to fall between the upper and lower bounds prescribed by the participation constraints of brides and grooms, i.e., between 0 and $\overline{d}$. As a result, when rational brides calculate backwards from $\widetilde{d}$ in the final period, they anticipate that their upper bound, $\overline{d}$, is reached in a period s, where s is after period b. At such a price they are indifferent to either marrying or remaining single and hence it is not worthwhile for them to delay marriage in all periods before s and pay prices higher than the upper bound $\overline{d}$. As a result, the actions of brides mirror those taken in Section 2.4.1, where brides bid up the price so as not to be left unmatched, only richer brides of age b marry until period s. At this point, the number of periods remaining, $T+g-s$, is small enough to accommodate the decreasing payments within the bounds and dowry payments necessarily decline only after period $T+g-s$.

As already emphasized the main results of this section are independent of the distribution of bridal wealth. Additionally it is straightforward to show that a changing wealth distribution similarly has no implications for the dowry deflation result. If bridal wealth is increasing across periods, then in each period τ, younger brides are on average richer than older brides. That older brides are always willing to outbid younger brides is due only to the convex costs to delay and is independent of the wealth of brides. Younger brides can always afford to outbid the older brides even when they have the same wealth (as younger women are more desirable to grooms they can compete with those older by offering a lower price) rather it is not worthwhile for them to deviate from the equilibrium outcome given equilibrium prices. Within each period dowry

payments are determined with respect to the wealth of $b+1$ brides. Increasing the wealth of b brides across time could render payments in the subsequent period higher than they would have been in the case of constant wealth, but as long as brides delay marriage, the decreasing time path of dowry payments ensues, thus only the rate of decline may alter.

This type of population increase cannot therefore explain dowry inflation since the flow of older women into the marriage market, and the need for indifference in delay, logically require dowry deflation rather than the dowry inflation observed. A more general specification of this population increase, where $\rho \geq 0$, is now considered.

Case 2: $\rho \geq 0$ Suppose the population level is equal to $\gamma^{\rho} N$, for $0 \leq \tau \leq T$, after which births revert back to N per period. The restriction on ρ is that it is non-negative, the manner in which ρ increases or decreases across periods is irrelevant. As previously mentioned, $\rho = \tau$ reflects a population which grows at a constant rate, whereas ρ increasing through time reflects an increasing growth rate. Conceivably, population may increase ($\rho \geq \tau$) for a number of periods and then begin to decrease ($\rho \leq T - \tau$) eventually returning to its initial steady state equilibrium after period T.

As in the former population increase ($\rho = 0$), the resulting excess supply of brides leads to the emergence of older brides in the marriage market. Since older brides are willing to outbid those younger, it is always the oldest available brides who marry in each period. In contrast to the former case, here population continues to increase and the growing supply of $b+1$ brides in the market may exceed that of grooms, at which point brides of age $b+2$ enter into the marriage market in the subsequent period. Depending on the rate of population increase, γ, and the duration of the increase, T, this pattern may repeat several times and brides much older than b may eventually enter into the market. If the supply of brides aged b does begin to decline (where ρ begins to decrease across periods), gradually the excess supply of brides decreases, and in turn the number of older brides in the market falls as the above pattern describing the entry of older brides is reversed.

This difference between the two cases, $\rho = 0$ and $\rho \geq 0$, of population increase has implications for equilibrium dowry payments. In particular they depend upon the age of the oldest brides in the market of each period. Denote the entry period of a bride aged $b+t$ by p_t, this

implies that the supply of brides aged $b + t - 1$ (who were the oldest brides in the market) exceeded that of grooms in period $p_t - 1$. If the supply of brides aged b begins to decline, that of grooms continues to grow for an additional $g - b$ periods. Because the relative supply of brides begins to fall, gradually the excess supply of brides decreases and in turn the age of the oldest brides in the market falls. Denote the last period before brides of age $b+t$ cease to exist in the marriage market by f_t. As before, the marriage market returns to a steady state after period $T + g$ at which point the excess supply of brides has been equalized by the relatively high supply of grooms.

The age of the emerging older brides depends on the magnitudes of T, γ, and $g-b$; the larger these variables are, the higher the age of the oldest brides in periods of increasing excess supply of brides. However, the age of these oldest brides in the marriage market can never exceed the age of grooms, g. This is because for ages below g, the supply of grooms lags behind that of brides, but at the same age their numbers are equivalent. In summary, when the population is growing (declining), the average age of brides is increasing (decreasing) and correspondingly the marriage age gap between men and women marrying is decreasing (increasing).[21] Although, the restriction $\rho \geq 0$ encompasses the case of a gradual population increase followed by a steady decline, because all T periods are characterised by an excess supply of brides, we again obtain unambiguous implications concerning the equilibrium time path of dowry prices:

Proposition 6 *Under rational expectations, a population increase causes real dowry payments to decrease, for all aged brides, across periods τ, $b \leq \tau \leq T+g$, even when population continues to grow.*

Proposition 7 *Average real dowry payments also decrease across periods τ, $b \leq \tau \leq T + g$, even though the average age of brides increases when the population continues to grow and older brides pay higher dowries in all periods.*

Proof of these are in the appendix, the intuition follows again from the incentive constraints. In each period, brides of the two oldest ages in the marriage market marry, and it is the

[21] This coincides with the results of Bergstrom and Lam (1991) who similarly demonstrate that there is a large range of population growth rates that can be supported, with no adjustments in the proportions of males and females marrying, by varying the age gap between spouses.

indifference condition of the oldest brides postponing marriage that will always bind:

$$U(\tau, t) = U(\tau + 1, t + 1) \tag{2.29}$$

if $p_{t+1} - 1 \leq \tau < p_{t+2} - 1$ or $f_{t+2} \leq \tau < f_{t+1}$.

The supply of $t + 1$ brides exceeds that of grooms in period $p_{t+2} - 1$. At this point, brides of age t do not marry; rather they delay marriage until they are older. Brides do not marry at this age again until the excess supply of brides has been sufficiently curtailed (by the increasing supply of grooms) such that potential brides who are older cease to exist in the marriage market. Before this point, brides of age t only delay marriage and it is worthwhile for them to do so if:

$$U(\tau, t) \leq U(\tau + 1, t + 1). \tag{2.30}$$

for $p_{t+2} - 1 \leq \tau < f_{t+2}$. In equilibrium, grooms are indifferent to different aged brides in a given period:

$$V(\tau, t - 1, 0) = V(\tau, t, 0) \tag{2.31}$$

for $p_t \leq \tau \leq f_t$. These conditions together yield:

$$d(\tau, t) - d(\tau + 1, t) \geq c(t + 1) - c(t) + k(t + 1) - k(t). \tag{2.32}$$

The main contrast with the previous section is that the difference between payments across periods for a bride of a given age is no longer constant. Instead, it increases as the average age of brides increases. In other words, equilibrium dowry payments are decreasing at a faster rate the older the brides.

Because it is the oldest brides who marry in equilibrium, the average dowry payment in a given period is comprised of those paid by the oldest brides. The incentive compatibility constraint (2.29) implies that the dowry payment of brides in a given period is higher than that of brides a period older in the subsequent period, that is,

$$d(\tau, t) = d(\tau + 1, t + 1) + c(t + 1) - c(t). \tag{2.33}$$

Using the above, together with (2.32), it can be demonstrated that all dowry payments which comprise average dowry payments in period τ, $D(\tau)$, are greater than those of $D(\tau+1)$ and hence average dowry payments are also decreasing. As before, condition (2.10) must be satisfied for $\tau \leq b-1$ and $\tau \geq T+g-1$ to insure that no brides and grooms have incentive to delay marriage before and after the effects of the population change.

As in the previous case, it is implicitly assumed that in all periods, participation constraints for brides and grooms are satisfied. If T is large enough so that the upper bound on dowry payments is reached after period b, the conclusion is identical to that of the previous section. Another possibility that arises for very large T is that the average age of brides increases so much that the oldest brides are beyond the marriageable limit, i.e., older than $\hat{b}$. Suppose this occurs in period $h+1$, that is, in period h the supply of brides of age $b+m=\hat{b}$, for $0<m<g-b$, exceeds the number of potential grooms. At this point, brides prefer to offer a higher dowry payment in period h, rather than go unmarried in the subsequent period. Consequently, $d(h,m)$ increases so that these older brides ensure that they marry in period h as they are deemed too undesirable in the subsequent period and must remain single thereafter. Accordingly, dowry payments in all periods and for brides of all ages in turn increase. This pattern will reoccur in the subsequent period, however, when the supply of brides of age $\hat{b}$ will again exceed the supply of grooms. If T is large enough, the upper limit on the decreasing dowry profile, $d(1,0)$, may exceed $\overline{d}$, at which point dowry payments will again mimic those when individuals are myopic for as many periods as are required.

If the population increase is initially unanticipated in period b, a jump in dowry payments in that period is possible, as in the previous case, and condition (2.6) would not hold. However, as long as individuals' expectations adapt to the existence of a surplus of brides thereafter, new unanticipated increases in the population will not alter the decreasing time path of equilibrium dowry payments. This is because additional increases only imply that the equilibrium incentive conditions hold for a larger number of brides and do not influence the expectations of brides, i.e., that they may have to postpone their marriage because of population growth.

This section demonstrates that even when a population continues to grow for a finite number of periods, real dowry payments must decrease. What is central to the analysis is the existence of an excess supply of brides in the marriage market which is resolved by some brides postponing

marriage until they are older, the manner in which this excess supply changes across periods being irrelevant. An expanding population only implies that the incentive conditions hold for a larger number of brides who are increasingly older in comparison to the previous case where the population increases but does not continue to grow. This is why the implied time path of dowry payments above is analogous to that of Figures 2.11 and 2.12, only the rate of decline differs.

These results are altered, however, when the population grows indefinitely. The implications of a permanent increase are explored next.

A Permanent Increase in Population

Suppose for all periods $\tau > 0$, the number of births is equal to $\gamma^{\rho}N$, $\rho \geq 0$, and thus never reverts back to N. As a result, the excess supply of brides continues to grow beginning in period b. Potentially, in later periods, older brides re-enter the market at an increasing rate and at higher ages. However, as above, the age of the emerging older brides into the market can never exceed the age of grooms g. In time, when brides of age g do enter the marriage market, the number of brides of age g is less than the number of grooms of age g since they reflect the surplus of brides in the marriage market of age $g-1$ in the preceding period. Because the population of brides and grooms of age g is growing at the same rate, the number of brides of age g never catches up to the number of grooms of the same age. Grooms of age g, therefore, continue to match with brides of age g and those younger and in effect:

Proposition 8 *A steady state equilibrium where only brides and grooms of the same age match is never reached in the context of a permanently increasing population.*

For proof of the above see the appendix.

Since the marriage market does not eventually reach a steady state (only same aged brides and grooms match) there is always an excess supply of potential brides. If real dowry payments can only decrease across periods when some brides are postponing marriage, as they did previously, then in this context they will always decrease. However, a perpetually declining path of dowry payments cannot constitute an equilibrium price trajectory since dowry payments must satisfy the participation constraints of both brides and grooms.

Given Proposition 8, the incentive conditions for brides must hold for brides of age $g-1$ indefinitely and consequently real dowry payments should continue to decrease through time. But consider what would happen if they arrived at the lower bound, 0, where at such a price grooms are indifferent to either marrying or remaining single. At this point, brides would prefer to offer a higher payment rather than remain unmarried. But this higher payment would, in turn, increase all prior payments if constraints (2.29), (2.30) and (2.31) hold. Thus any path of decreasing payments is inconsistent. Similarly, an increasing path of dowry payments is also inconsistent as (2.29) must hold in equilibrium if some brides postpone marriage. It can therefore be demonstrated that the only equilibrium is identical to when individuals are myopic where only brides of age b will match.

Proposition 9 *With a permanent increase in population a rational expectations equilibrium is equivalent to when individuals do not anticipate future behavior where the average age of brides remains constant and there is an increasing number of unmarried women.*

Proof of the above is in the appendix.

As already emphasized the implications of a population increase in the above proposition conflict with empirical fact. That is, the average age of brides in increasing and all brides eventually marry. The crucial difference between this type of population growth and that of the previous section is that the increase is permanent. The way in which the population grows is immaterial. Since the excess supply of brides never ceases, brides correctly anticipate that postponing their marriage will not insure that they do in fact marry. As a result, brides compete in spot markets for the available grooms.

It therefore seems safe to conclude that no characterisation of a population increase can explain both the observed patterns of real dowry inflation and a narrowing of the age gap of brides and grooms where all brides eventually marry. These results hold either when individuals have perfectly rational expectations or when they are myopic or if initial changes are unanticipated by people who have a slow adjustment in expectations thereafter.

2.5 Extensions to the Model

A final exposition illustrates that none of the results of the previous section are dependent on the assumption of a single marrying age. Suppose, as is more likely, that the desirable age for brides and grooms to marry falls into a range, say for example 15 to 20 years for brides and 20 to 25 years for grooms, denoted by $b \in [\underline{b}, \overline{b}]$ and $g \in [\underline{g}, \overline{g}]$. Within this range assume that there is no penalty to delay. The consequences of population growth in this context are analogous to that of previous sections where the single ages are replaced by an age range, for example $b = \{20, 21, 22\}$, $b + 1 = \{21, 22, 23\}$, $b + 2 = \{22, 23, 24\}$, and so on. In this case, it will take longer for brides older than the desirable marrying age range to enter into the market. This is because if there is a surplus of brides of age $\underline{b}$, due to population growth, they will re-enter the marriage market in the following period at age $\underline{b} + 1$, however they will still be within the desirable age range. Although similar to the previous characterisation, as time progresses the average age of marriage for women increases and the marriage age gap between brides and grooms decreases when the population is increasing. The results with respect to marriage market dynamics are unaltered, whereas equilibrium incentive compatibility constraints for brides and grooms are. This is because incentive constraints also depend upon grooms' preferences for brides of varying ages, within the desirable age range, and likewise for brides. Let x and y reflect the age of the potential brides and grooms respectively which are defined as x years older than $\underline{b}$ and y years older than $\underline{g}$, where $0 \leq x \leq \overline{b} - \underline{b}$ and $0 \leq y \leq \overline{g} - \underline{g}$. Preferences are such that ages of a potential spouse which fall into the optimal age range are strictly preferred to those which do not. A bride's utility at marriage becomes:

$$U(\tau, t, x, y) = z_b - d(\tau, t, x, y) - c(t) + a(y) \tag{2.34}$$

and for grooms:

$$V(\tau, t, x, y, i) = z_g + d(\tau, t, x, y) - k(t) - q(i) - e(x) \tag{2.35}$$

where t and i are defined as before; t and i periods older than b and g respectively. The implications for equilibrium dowry payments in this context depend upon the preferences of brides and grooms over the ages of potential spouses which fall within the desirable age range.

The following subsections consider the possibilities.

2.5.1 Homogeneous Brides and Grooms

Suppose that all brides are indifferent to grooms of any age within the desirable range and vice-versa. Population growth, which renders an excess supply of younger women, forces some women to enter the marriage pool of the next period rather than the current one. The costs of delaying marriage are incurred, however, only if brides enter the subsequent period at an age $x > \bar{b} - \underline{b}$. If this is not so, that is, the duration of population change, T, is small enough that the supply of brides of age $\bar{b}$ never exceeds the total supply of grooms, there are no delay costs, $t = 0$, for all brides who marry. In this case, all brides are identical from the perspective of grooms so that they make equivalent dowry payments in equilibrium. Given this, the only relevant incentive condition becomes:

$$U(\tau, 0, x, y) = U(\tau + 1, 0, x + 1, y) \tag{2.36}$$

hence,

$$d(\tau, 0, x, y) = d(\tau + 1, 0, x + 1, y). \tag{2.37}$$

Therefore, no real changes in dowry payments occur when population increases. This result persists until the excess supply of brides is large enough so that brides older than $\bar{b}$ must also postpone marriage, at which point these brides will incur delay costs, i.e., $t > 0$ and the results of the previous section ensue. Assuming a range of optimal marrying ages in this context therefore only delays the repercussions of population growth on the marriage market and does not alter the time path of equilibrium dowry payments.

2.5.2 Heterogeneous Brides and Homogeneous Grooms

Alternatively, suppose there is a ranking of brides in the desirable age range where the younger brides are preferred by grooms. It is plausible that age is a more important differentiating factor for brides than for grooms, as the desirability of younger brides is likely to be linked to reproduction capabilities and beauty, both of which are not as relevant to the desirability of a given groom. Hence, suppose that grooms have a ranking over brides in the desirable age

range, whereas brides are indifferent to grooms in the desirable age range.

In this context, brides must pay dowries to render the grooms indifferent, even before population growth. That is, dowry payments satisfy:

$$V(\tau, 0, x, y) = V(\tau, 0, x+1, y) \tag{2.38}$$

for $0 \leq x < \overline{b} - \underline{b}$ and hence,

$$d(\tau, 0, x, y) - e(x) = d(\tau, 0, x+1, y) - e(x+1). \tag{2.39}$$

The incentive condition (2.36) must also hold, which together with (2.39) implies,

$$d(\tau, 0, x+1, y) > d(\tau+1, 0, x+1, y) \tag{2.40}$$

Inequality (2.40) implies that, because some younger brides delay marriage, there is real dowry deflation in some payments. Given (2.38), the implication is that there is real dowry deflation in all payments while the population is growing. The degree of decline in real dowry payments is only enhanced if brides of age $x > \overline{b} - \underline{b}$ enter the market and the declining payments must also account for the delay costs, $c(t)$ and $k(t)$, as before. Therefore the results in all previous sections follow once again.

2.5.3 Heterogeneous Brides and Grooms

Suppose now there is a corresponding ranking of grooms by brides according to their age. Consider older grooms to be ranked higher by brides than younger grooms within the desirable marrying age range, as they signal a higher level of human capital. In an initial equilibrium with no population growth, the number of brides and grooms in each given age group is equal and also equal to the supply in any other age group within the desirable age range. In such an equilibrium, there is positive assortative matching where younger brides marry older grooms; that is, similarly ranked brides and grooms match and there are equal numbers in each rank. Hence $\overline{g}$ grooms will match with $\underline{b}$ brides, $\overline{g} - 1$ with $\underline{b} + 1$ and so on.

Suppose population growth induces an excess supply of $\underline{b}$ brides in period τ and in turn an

excess supply of $\underline{b}+1$ brides in period $\tau+1$. In period $\tau+1$, brides of age $\underline{b}+1$ marry and some $\underline{b}$ brides wait to find matches in period $\tau+2$. Consequently, in period $\tau+1$, $\underline{b}+1$ brides match with grooms of both ages $\overline{g}-1$ and $\overline{g}$ and $\overline{g}$ grooms match with both $\underline{b}$ and $\underline{b}+1$ brides. In other words, in a positive assortative matching equilibrium, when there is population growth, brides of a given age are matched with higher quality grooms across periods. This follows since brides of a certain age are relatively younger than other brides across periods, because the average age of brides is rising, and their relative quality is thus increasing across time. As a result, in a given period, brides marry grooms of their own rank and those of higher quality. In equilibrium they are indifferent to these different quality grooms and the following is satisfied:

$$U(\tau+1,0,x+1,y) = U(\tau+1,0,x+1,y-1). \tag{2.41}$$

On the other hand, when brides postpone their marriage to when they are older, they are matched with lower quality grooms because of their own inferior desirability. Brides who do delay their marriage in equilibrium are indifferent to marrying across periods which implicates matching with lower quality grooms and the following holds:

$$U(\tau,0,x,y) = U(\tau+1,0,x+1,y-1) \tag{2.42}$$

Because brides match on average with higher quality grooms in a given period and with lower quality grooms across periods the intuition for why payments must be lower in the subsequent period is similar to before since now brides incur an additional cost to postponing marriage, i.e., they in turn match with relatively lower quality grooms. The above two conditions yield (2.38) and together with grooms incentive condition (2.39), implies that (2.40) holds. Hence, once again, real dowry deflation occurs due to population growth.

2.6 Conclusions

This chapter demonstrates that population growth does not seem to explain both the observed patterns of real dowry inflation and a narrowing of the age gap of brides and grooms where all brides eventually marry. The "marriage squeeze" is a demographic phenomenon that relates

population growth to a reduction in the age difference between grooms and brides when men marry younger women. Throughout this process there is a surplus of brides of the desirable marrying age. Dowry payments are determined by brides' outside options. If the choice of brides is to marry at the optimal age or to never marry, then the payment women are willing to offer is such that they are indifferent to marrying or remaining single. In this case, dowry inflation can occur principally if the wealth of brides which determines equilibrium payments significantly increasing with population growth which is likely the case if population is growing at an increasing rate. However, as seems more realistic, if the option for brides who do not marry in a given period is to wait until a later period to marry, then the payment they would have made initially is necessarily greater than the payment they are willing to make in a subsequent period as they face costs of waiting and hence the time-path of dowry payments is decreasing.

The essential contribution here has been to explicitly consider the dynamic implications of the marriage squeeze argument. The framework is built only on assumptions which had been previously thought necessary for dowry inflation to occur. That is, men marry younger women and there are costs for women marrying later than the optimal age. If women do anticipate that they will eventually marry, the model developed predicts a decrease in the age difference between spouses with population growth, and that all men and women eventually marry, both of which correspond to the experience of areas undergoing real dowry inflation. Such considerations, however, cannot explain dowry inflation. It therefore may be concluded that a theoretical foundation for the marriage squeeze argument requires that brides who do not marry at the desirable marrying age remain single thereafter and that population growth induces an increasing number of unmarried women. On the other hand, if the excess supply of brides is resolved by an increase in the average age of marriage for women, as demographers argue, population change does not seem to explain increasing dowry payments.

2.7 Appendix

Proof of Proposition 6:

Let $b+m$ reflect the oldest age of brides reached during periods $b < \tau < \frac{T+b}{2}$, necessarily $0 \leq m \leq g-b$. Incentive condition (2.29) implies:

$$d(\tau, s) + c(s) = d(\tau+1, s+1) + c(s+1) \tag{2.43}$$

for $p_{s+1} - 1 \leq \tau < p_{s+2} - 1$ and $f_{s+2} \leq \tau < f_{s+1}$, where $1 \leq s < m-1$. Using (2.31) this becomes,

$$d(\tau, s) - d(\tau+1, s) = c(s+1) - c(s) + k(s+1) - k(s). \tag{2.44}$$

Condition (2.31) further implies that

$$d(\tau, t) - k(t) = d(\tau, s) - k(s) \tag{2.45}$$

for $0 \leq t < s$, thus implying that

$$d(\tau, t) - d(\tau+1, t) = c(s+1) - c(s) + k(s+1) - k(s) \tag{2.46}$$

for $p_{s+1} - 1 \leq \tau < p_{s+2} - 1$ and $f_{s+2} \leq \tau < f_{s+1}$, where $1 \leq s < m-1$ and $0 \leq t \leq s$.

Assuming dowry payments in the final period $d(T+g, 0) = \widetilde{d}$, then dowry payments for all brides marrying in the preceding period are equal to $d(T+g-1, t) = \widetilde{d} + k(t)$. Solving backwards, for periods $f_2 \leq \tau < T+g-1$:

$$d(\tau, t) = \widetilde{d} + (T+g+1-\tau)[k(1) + c(1)] + k(t) \tag{2.47}$$

For all periods $f_{s+2} \leq \tau < f_{s+1}$, where $1 \leq s < m-1$:

$$\begin{aligned} d(\tau, t) &= \widetilde{d} + (T+g+1-\tau)[k(1) + c(1)] + k(t) \\ &\quad + \sum_{i=2}^{s} (f_i - f_{i+1})[k(i) - k(i-1) + c(i) - c(i-1)] \\ &\quad + (f_{s+1} - \tau)[k(s+1) - k(s) + c(s+1) - c(s)] \end{aligned} \tag{2.48}$$

Similarly for period $p_m < \tau \leq f_m$ dowry payments are equal to:

$$\begin{aligned} d(\tau,t) &= \widetilde{d} + (T+g+1-\tau)[k(1)+c(1)] + k(t) \\ &\quad + \sum_{i=2}^{m-1}(f_i - f_{i+1})[k(i)-k(i-1)+c(i)-c(i-1)] \\ &\quad +(f_m-\tau)[k(m)-k(m-1)+c(m)-c(m-1)] \end{aligned} \tag{2.49}$$

For periods $b+1 \leq \tau \leq p_m$, the derivation of equilibrium dowry payments is not as straightforward. Without loss of generality, however, they can be represented for periods $p_s < \tau \leq p_{s+1}$, for $1 \leq s \leq m-1$, by:

$$\begin{aligned} d(\tau,t) &= \widetilde{d} + (T+g+1-\tau)[k(1)+c(1)] + k(t) \\ &\quad + \sum_{i=2}^{m-1}(f_i - f_{i+1})[k(i)-k(i-1)+c(i)-c(i-1)] \\ &\quad +(f_m-p_m)[k(m)-k(m-1)+c(m)-c(m-1)] \\ &\quad + \sum_{i=s+1}^{m}\{(p_i-1-p_{i-1})[k(i-1)-k(i-2)+c(i-1)-c(i-2)]+c(i)-c(i-1)\} \\ &\quad +(p_{s+1}-1-\tau)[k(s)-k(s-1)+c(s)-c(s-1)]+c(s+1)-c(s)+\Omega(t) \end{aligned} \tag{2.50}$$

where $\Omega(t)$ is increasing in t. Equations (2.47), (2.48), (2.49), and (2.50) imply that in all periods $d(\tau,t)$ is decreasing in τ and increasing in t.□

Proof of Proposition 7:

Let n_g^τ denote the number of grooms in period τ, then the brides which marry in each period are the n_g^τ oldest. In period $p_t - 1$, for $1 \leq t \leq m$, the supply of brides into the marriage market is such that only brides aged $b+t-1$ find matches. In periods p_t through to $p_{t+1}-2$, both brides of age $b+t-1$ and $b+t$ marry. Average dowry payments in periods $0 \leq \tau \leq p_m$ can then be characterized as:

$$D(\tau) = \alpha_{t-1}^\tau d(\tau, t-1) \tag{2.51}$$

for $\tau = p_t - 1$ and

$$D(\tau) = \alpha_{t-1}^\tau d(\tau,t-1) + \alpha_t^\tau d(\tau,t) \tag{2.52}$$

for $p_t \leq \tau \leq p_{t+1} - 2$ and $0 \leq t \leq m$ where α_t^τ is the proportion of brides of age $b+t$ marrying in period τ, i.e. $\alpha_t^\tau = \frac{n_t^\tau}{n_g^\tau}$, where n_t^τ is equal to the number of brides of age $b+t$ who marry in period τ. Necessarily $\alpha_t^\tau + \alpha_{t-1}^\tau = 1$. If $D(\tau)$ is defined as in (2.51) then

$$D(\tau+1) = \alpha_{t-1}^{\tau+1} d(\tau+1, t-1) + \alpha_t^{\tau+1} d(\tau+1, t) \tag{2.53}$$

If $D(\tau)$ is defined as in (2.52) then either

$$D(\tau+1) = \alpha_{t-1}^{\tau+1} d(\tau+1, t-1) + \alpha_t^{\tau+1} d(\tau+1, t) \tag{2.54}$$

if $p_t \leq \tau + 1 \leq p_{t+1} - 2$ or

$$D(\tau+1) = \alpha_t^{\tau+1} d(\tau+1, t) \tag{2.55}$$

if $\tau + 1 = p_{t+1} - 1$. Given equations (2.43) and (2.46), it is clear that the dowry payments which comprise $D(\tau)$ are necessarily all larger than the payments which constitute $D(\tau+1)$. Using the fact that $\alpha_t^\tau + \alpha_{t-1}^\tau = 1$ and $\alpha_t^{\tau+1} + \alpha_{t-1}^{\tau+1} = 1$ then $D(\tau) > D(\tau+1)$ for $1 \leq \tau < p_m$.

In periods $\tau \geq p_m$, the supply of grooms is still growing, although the supply of brides of age b has returned to it's steady state level. As a result for $\tau \geq p_m$, as τ increases older brides gradually leave the market. Furthermore, it is possible that for $f_t \leq \tau < f_{t-1}$:

$$D(\tau) = \alpha_{t-1}^\tau d(\tau, t-1) + \alpha_t^\tau d(\tau, t) \tag{2.56}$$

and

$$D(\tau+1) = \alpha_{t-2}^{\tau+1} d(\tau+1, t-2) + \alpha_{t-1}^{\tau+1} d(\tau+1, t-1) + \alpha_t^{\tau+1} d(\tau+1, t) \tag{2.57}$$

where $\alpha_{t-2}^{\tau+1} + \alpha_{t-1}^{\tau+1} + \alpha_t^{\tau+1} = 1$ That is, for $\tau \geq p_m$, as τ increases, older brides are gradually leaving the marriage market while younger brides are again marrying. Therefore $D(\tau)$ is similarly comprised of dowry payments larger than those of $D(\tau+1)$, and by the same reasoning as above, $D(\tau) > D(\tau+1)$ for $p_m \leq \tau < T + g$. □

Proof of Proposition 8:

Let ω_t^τ denote the proportion of brides of age t, $0 \leq t \leq g - b$, in the marriage market in period τ and θ_g^τ denote that of grooms of age g. Hence, $\omega_t^\tau N$ and $\theta_g^\tau N$ are their respective

numbers. Using the depiction of the marriage market of Section 2.4, these proportions are equal to the following:

The proportion of grooms is given by,

$$\theta_g^\tau = 1 \quad for \;\; \tau < g \tag{2.58}$$

$$\theta_g^\tau = \gamma^{\tau-g+1} \quad for \;\; \tau \geq g \tag{2.59}$$

The proportion of brides of age b is,

$$\omega_b^\tau = \gamma^{\tau-b+1} \quad for \;\; \tau \geq b \tag{2.60}$$

whereas for brides of age t where $1 \leq t \leq g-b$,

$$\begin{aligned}
\omega_t^\tau &= 0 \quad for \;\; \tau < p_t && (2.61)\\
\omega_t^\tau &= \omega_{t-1}^{\tau-1} - \theta_g^{\tau-1} \quad for \;\; \tau = p_t && (2.62)\\
\omega_t^\tau &= \omega_t^{\tau-1} + \omega_{t-1}^{\tau-1} - \theta_g^{\tau-1} \quad for \;\; p_t < \tau < p_{t+1} && (2.63)\\
\omega_t^\tau &= \omega_{t-1}^{\tau-1} \quad for \;\; \tau \geq p_{t+1}. && (2.64)
\end{aligned}$$

Solving the above equations recursively in terms of γ^τ produces,

$$\omega_{g-b}^\tau = \gamma^{\tau-g+1} - (g-b) \quad for \;\; \tau \geq p_{g-b} \tag{2.65}$$

Equations (2.65) and (2.59) imply that,

$$\theta_g^\tau - \omega_{g-b}^\tau = g-b \quad for \;\; \tau \geq p_{g-b} \tag{2.66}$$

Hence the number of brides of age g in the marriage market is always smaller than the number of grooms of the same age, and the difference between these two numbers is a constant. Thus for all periods $\tau \geq p_{g-b}$, grooms of age g match with brides of age g and $g-1$. □

Proof of Proposition 9:

First note that since there will always be an excess supply of brides in the market, in

any equilibrium dowry payments must be such that brides are indifferent between marrying at present or delaying one period. If not then the prices would not constitute an equilibrium where some brides postpone marriage. Now consider a potential sequence of payments that is decreasing through time. That is, one which satisfies (2.29) across periods. Such a sequence must inevitably reach the lower bound on dowry payments, 0, where at such a price grooms are indifferent between marrying and remaining single. Suppose this were to occur, say in period z, when brides of age $b+s$ and $b+s+1$ are both marrying. Since the lower bound for grooms has been reached, i.e. $d(z,s)=0$ and $d(z,s+1)=0$ equilibrium conditions (2.29) and (2.31) necessarily imply that $d(z+1,s+1)<0$, at which price grooms will no longer marry. Consequently the excess supply of brides of age s in period z who postpone their marriages will not find matches in the subsequent period. These brides, therefore, would strictly prefer to offer a higher dowry payment than go unmarried, hence $d(z+1,s+1)$ is increased so that $d(z+1,s+1)=0$. But this price increase now renders the preceding sequence of payments inconsistent since it must also respect conditions (2.29), (2.30) and (2.31). Any such paths are therefore inconsistent. It is also immediately obvious that an increasing sequence of payments cannot be an equilibrium, since this also violates (2.29). Therefore an equilibrium where some brides postpone marriage is not possible. Instead the brides who do not marry at age b never marry. Equilibrium dowry payments are bid up to a point where these brides prefer to never marry compared to marrying at age b or at any age older. Because only brides of age b will match, there is an increasing number of older unmarried brides due to the permanent increase in the population. □

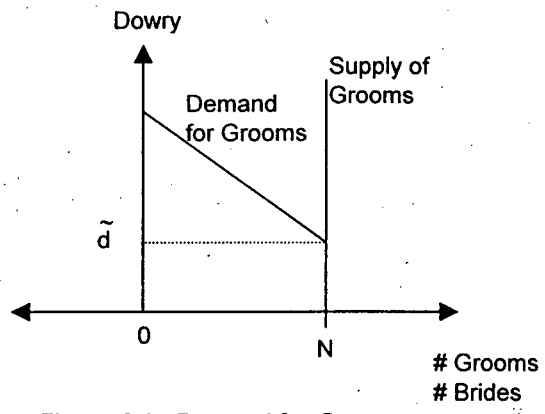


Figure 2.1 - Demand for Grooms

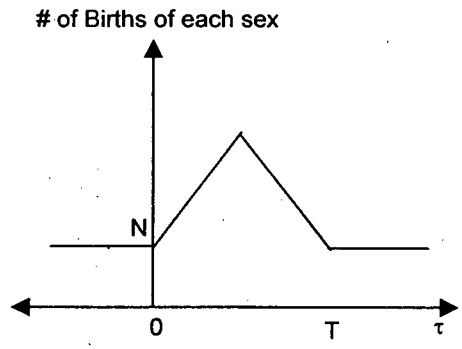


Figure 2.2 - Population Growth

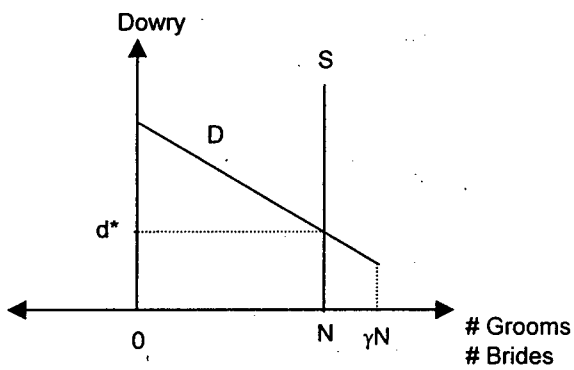


Figure 2.3 - Excess Demand for Grooms

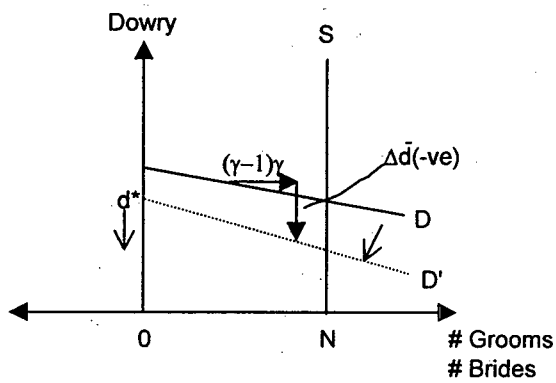


Figure 2.4 - Flat Demand Curve

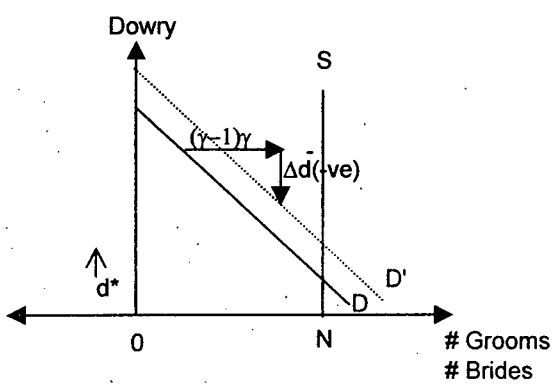


Figure 2.5 - Steep Demand Curve

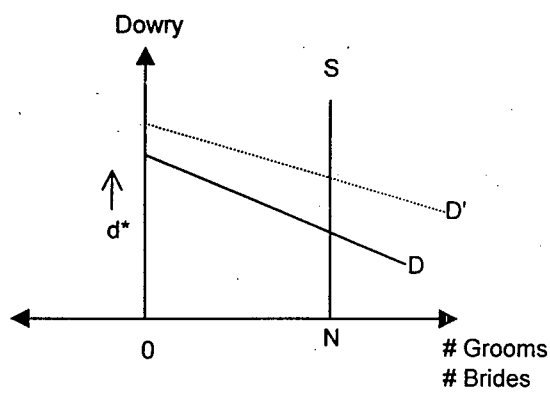


Figure 2.6 - Uniform Income Distribution

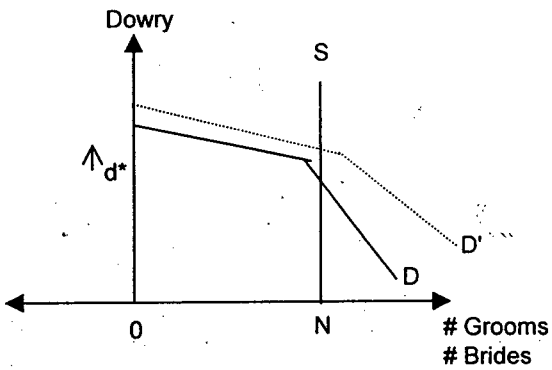


Figure 2.7 - Income Distribution Skewed Left

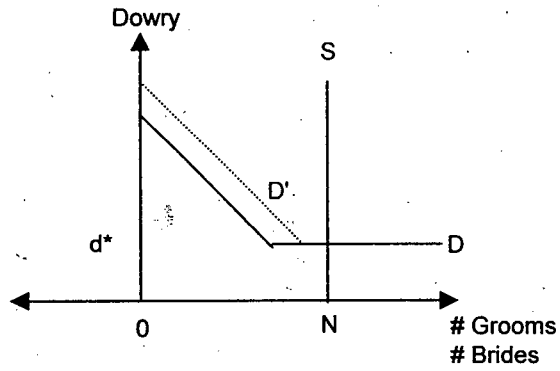


Figure 2.8 - Income Distribution Skewed Right

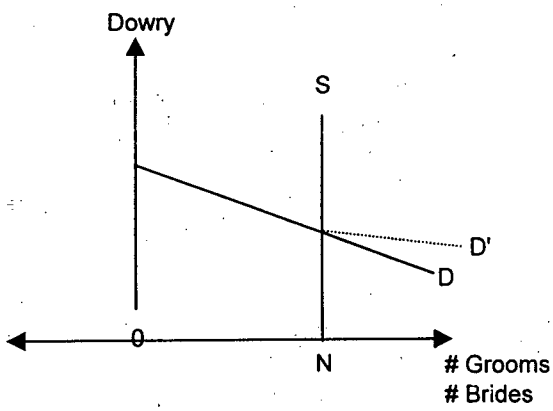


Figure 2.9 - Population Growth amongst the Poor

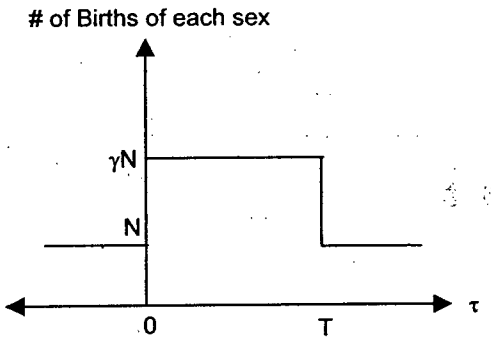


Figure 2.10 - Temporary Population Increase

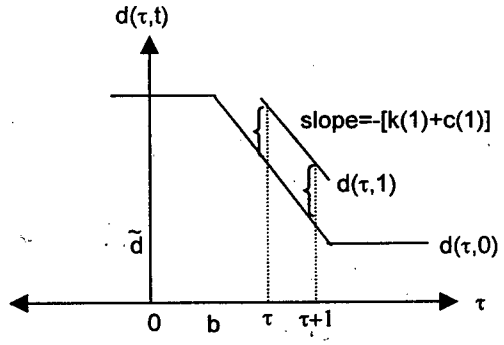


Figure 2.11 - Dowry Payments

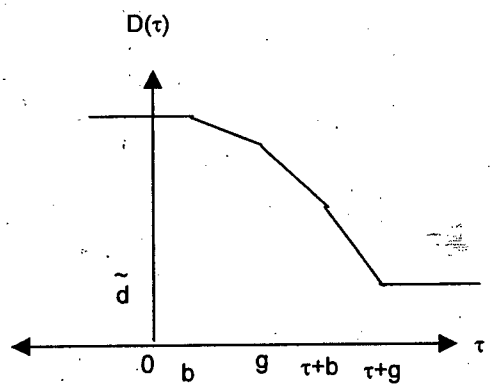


Figure 2.12 - Average Dowry Payments

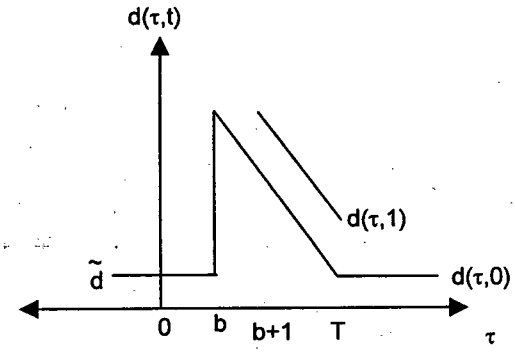


Figure 2.13 - Unanticipated Population Increase

Chapter 3

Development and Dowry Inflation

3.1 Introduction

The last five decades in India have not only been characterised by population growth but also represent a time of significant change and development since Independence in 1947. Many social scientists have linked the Indian dowry diffusion and inflation to new economic opportunities concomitant with modernisation.[1] Some sociologists argue that dowry payments have traditionally existed among upper castes, and that the spread of the custom is due to "Sanskritization", or lower caste imitation of the customs practiced in higher castes in order to acquire status (see, for example, Epstein 1973). Such activity among lower castes has been facilitated by increased wealth. Others claim that the introduction of highly qualified grooms is the reason behind increasing dowries.

Although several contributing factors have been suggested, an explanation of how these different forces interact with each other and the tradition of dowry has not yet been provided and is the focus of this chapter. The analysis places the social structure into an economic framework. This procedure is not to deny the existence of other influences which cannot be explained using economic techniques but rather to put forth an explanation which is consistent with both the sociological evidence and economic rationale. The explanation here takes into account the unique phenomenon of caste. That this component may be important in explaining

[1] See, for example, Paul (1986), Srinivas (1984), Epstein (1973), Billig (1992), Caldwell et. al. (1983), Upadhya (1990), and Chauhan (1995).

the Indian experience of dowry inflation is suggested by comparison with the historical evidence of dowry payments in other societies where, unlike India, dowry payments have declined with modernization.[2]

The explanation in this chapter posits a process of modernisation which increases the heterogeneity of occupations and incomes. This characterisation of modernisation has particular relevance to India where traditionally the caste system innately determined one's occupation, education, and hence potential wealth. A most significant consequence of modernisation in India is the removal of these customary barriers to educational and occupational opportunities for all castes. As a result members of a given caste have become a more heterogeneous group in terms of potential wealth through increased diversification in occupations and educational levels. Therefore, within each caste a proportion of individuals become wealthier while others do not. In other words, modernisation is interpreted as a process which rewards ability independent of caste where it is no longer the case that a higher caste man necessarily obtains the higher paying job; rather this occurs only if he also has the corresponding ability.

The new income earning opportunities brought about by development are predominantly filled by men rather than women. Given the weight placed on incomes as opposed to other personal traits in a poor society, modernisation in India can be described as a process which renders grooms relatively heterogeneous while brides remain a homogeneous group. If we perceive 'a dowry' as a bid that a bride's family makes for a groom of certain market value, an increase in the heterogeneity of grooms will increase the spread of dowries.[3] But indeed, an increase in the spread does not necessarily lead to a rise in average dowries. Quite plausibly, grooms who have become more eligible in the marriage market via development will receive higher dowry payments, whereas payments will decrease for those who are less eligible and in consequence average dowries remain constant. A crucial component of the explanation posited here is to consider the dowry payments received by men who become less attractive as a result of development. If the payments offered to grooms at the bottom of the income distribution in a given caste do not decrease, then a widening of the spread will result in an increase in average dowries. The explanation as to why dowries for relatively less desirable grooms do not decrease

[2]See, for example, Nazzari 1991 and Lambiri-Dimaki 1985.

[3]That dowry payments arise due to a matching problem in the marriage market which consists of relatively heterogeneous grooms is demonstrated by Stapleton (1989) and Edlund (1996),

accordingly relies heavily on the peculiarities of the cultural norms associated with the caste system.

Caste determines a family's social status and, as head of the household, it is the male's caste that determines that of the family. A natural consequence of this cultural norm is that there is a premium on a woman marrying up but a profound stigma against her marrying down the caste ladder while the most severe social stigma for a family is to fail to marry their daughter at all. A man's status, on the other hand, does not diminish by marrying down.

Consider a simple case of a society with two castes and an equal number of brides and grooms in each caste. Suppose the higher caste grooms experience an increase in the spread of their incomes (and hence in their market values). Brides of the higher caste rank these newly diversified grooms in terms of their wealth whereas, from the perspective of lower caste brides, these grooms are valued not only for their wealth but also for their higher caste rank. To make the argument stark, assume preferences are such that a lower caste bride would prefer a higher caste groom irrespective of his income. Then the fact that the developmental process has caused a low ranked high caste groom to become poorer will have no effect on the dowry that a lower caste bride is willing to pay. Because it is to the detriment of women to marry into a lower caste themselves, brides within his caste are willing to make a payment to him which is as much as the amount he would receive from a bride in the lower caste. From the possibility of marrying downward and trading on their caste, a lower bound on the groom's dowry payment emerges. This lower bound is higher than it would have been in the absence of competition from lower caste brides. Since all other dowry payments within a given caste are determined relative to this lower bound, dowry payments of all grooms in that caste increase. In consequence, *real* dowry inflation ensues; that is, holding grooms' quality constant across time, dowry payments for a given quality of groom increase.

In the above story, the number of brides and grooms is assumed equal and brides and grooms marry within caste. If it is the case that there is an excess supply of brides in the marriage market (due to a positive population growth and grooms marrying younger brides) then conceivably all women and men may not find matches within their caste. However, as is demonstrated in Chapter 2 of this thesis, a marriage squeeze does not necessarily lead to an increased number of unmarried women or, in this portrayal, women marrying outside of

their own caste; instead, women postpone marriage until they are older. Nevertheless it is possible that an excess supply of potential brides in the higher caste is resolved by some women marrying down in caste. In this case the lower bound on dowry payments for the less desirable grooms in the higher caste is not determined by what lower caste brides are willing to offer them but rather relative to what higher caste brides pay to marry lower caste grooms. Once again the lowest ranked groom in the higher caste would receive at least as much dowry as the highest ranked groom in the lower caste. However, because the social stigma associated with marrying down in caste is severe, the gain for a bride to marrying in her own caste as opposed to marrying down in caste is high. As a consequence, lower ranked grooms in the higher caste again command a caste premium added to their dowry payment and increasing dowries ensue in the context of population growth.

The main argument of the chapter is demonstrated using an equilibrium matching model of marriage and a development process which increases the variance of the wealth distribution and holds the mean constant. It is further assumed that the benefits of development accrue only to men while women remain homogeneous. The next two sections provide simple formulations of the process of development and preferences respectively based on the available empirical evidence. Equilibrium dowry payments are determined in the case of no development in Section 3.4. A marriage market equilibrium in the context of modernisation is characterised subsequently. The alternative cases when average wealth increases and decreases within castes as a result of development are also investigated. The framework developed here to explain the existence of increasing dowry payments also facilitates an exploration into the circumstances under which the payments may begin to decline in the advanced stages of development and easily incorporates the possibility of women also prospering from modernisation as established in Section 3.6. Section 3.7 concludes.

3.2 Process of Development

Modernisation here is characterised as a process which creates new employment and educational opportunities. Traditionally in India, the caste system innately determined one's occupation, education, and hence potential wealth. Modernisation has rendered some caste specific jobs re-

dundant, created new jobs that do not constitute part of the traditional occupational structure, and removed customary barriers to educational and occupational opportunities and property ownership (see, for example, Singh 1987, Sharma 1984, Kumar 1982, and Singh 1992). A consequence of development has been that members of a given caste have become a more heterogeneous group in terms of both wealth and potential wealth, through increased diversification in occupations and educational levels. This has been well documented in the work of Chauhan (1995), who explicitly links the chronological changes in the Indian dowry custom to the growth of a class structure overlying the traditional caste hierarchy. In particular, the practice of dowry began to notably spread and increase quite rapidly in the period directly after Independence in 1947. This was a time of significant structural change where unprecedented opportunities for economic and political mobility began to open up for all castes and the monopoly of the upper castes began to erode (Jayaraman 1981). In fact, the subsequent spread and escalation of dowry payments culminated in the passage of the Dowry Prohibition Act in 1961 which outlawed the practice as a response to its alarming increase. The act has been to little avail, however, since dowry inflation has persisted despite its illegal standing.

The effects of modernisation in India have been felt much more strongly on the groom's side of the marriage market. This is not surprising since formal job opportunities are filled predominantly by males.[4] Hence it is assumed that increased heterogeneity occurs only amongst grooms while among brides the situation remains fundamentally unchanged.[5]

More formally, consider the population to be segregated into caste groups denoted by i, for $i \in [1, h]$, where $i = 1$ reflects the lowest caste and $i = h$ the highest. In the pre-modernisation world, each male member of caste i has identical corresponding potential wealth equal to Y_i, where $Y_1 < Y_2 < \cdots < Y_h$, this will, for simplicity, be referred to as income from hereon. With development, within caste groups become more heterogeneous; thus some members of caste i have incomes lower than Y_i while others have higher income.

In addition, the pattern of increased heterogeneity seems to have followed a top-down path. In the wake of Independence, many skilled jobs became available due to the departure of the British. These jobs were filled predominantly by members of the higher castes as they had the

[4]The India population census data produced a female participation rate of 16% in 1991 (Mathur 1994).

[5]The case of when women also become a more heterogeneous group via the process of development is considered in Section 6.2.

prerequisite education (Kumar 1982) but following the introduction of affirmative action policies aimed at the lower castes, these higher skilled jobs began to be filled by all castes. Thus, the process of development is modelled as a spreading of the income distribution around Y_i which affects caste groups in a chronological order, first percolating downwards from the highest caste.[6] Therefore, in the first period of development members of caste h have income distributed around Y_h while incomes in other castes are unchanged. In the next period, members of caste $h-1$ follow suit. This continues in all subsequent periods until the process of development ends. In addition, it is assumed that the degree of spreading within a caste increases through time.

For concreteness consider the following evolution of a discrete wealth distribution amongst the men of each caste:

- Period 0: $\{Y_h\}$; $\{Y_{h-1}\}$; $\{Y_{h-2}\}$; $\{Y_{h-3}\}$; $\cdots$; $\{Y_1\}$.
- Period 1:$\{Y_h-\theta, Y_h, Y_h+\theta\}$;$\{Y_{h-1}\}$; $\{Y_{h-2}\}$; $\{Y_{h-3}\}$; $\cdots$; $\{Y_1\}$.
- Period 2: $\{Y_h-2\theta, Y_h-\theta, Y_h, Y_h+\theta, Y_h+2\theta\}$; $\{Y_{h-1}-\theta, Y_{h-1}, Y_{h-1}+\theta\}$; $\{Y_{h-3}\}$; $\cdots$; $\{Y_1\}$.

  $\vdots$

In and prior to Period 0, no development has occurred. In Period 1, members of the highest caste, h have incomes equal to either $Y_h-\theta, Y_h$, or $Y_h+\theta$ and hence become more heterogenous. The degree of heterogeneity continues to increase for members of caste h as time progresses and development also reaches castes below in Period 2. More generally, 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 $1 < i \leq h$, (as in the above depiction, where $s_h = 1$ and $s_{h-1} = 2$). Let periods be denoted by t and we have the following,

$$for \;\; t < s_i \quad y_i \in \{Y_i\} \tag{3.1}$$

$$for \;\; t = s_i + \tau \quad y_i \in \{Y_i - (\tau+1)\theta, \cdots, Y_i + (\tau+1)\theta\} \tag{3.2}$$

[6]That the benefits to development accrue to members of lower castes later than they do to those of upper castes is not crucial to the analysis. The assumption does simplfy the analysis but is imposed mainly to coincide with reality.

where y_i denotes the income of members of caste i and $\tau = 0, 1, 2, 3, 4, \cdots$.

Income levels within a given caste are distributed discretely within a period where the levels of income are θ apart. The supports of the income distribution within a given caste thus increase by θ at both ends each period. This discrete distribution allows marriage market equilibrium conditions to be defined simply over a given groom quality across periods, and enables a closed form investigation of real changes in dowry payments, that is, holding the quality of grooms fixed over time.[7]

Although the income levels are distributed symmetrically around the mean Y_i in each caste i, this does not necessarily imply that the average level of income remains constant across periods. This is only the case if there is an equal number of men in each income group within a given period. Conversely, an income distribution where average wealth is increasing across time occurs when the numbers of men in the high income groups (greater than Y_i) exceed the numbers of those in the low income groups (less than Y_i). If the opposite holds, average wealth decreases across time.

3.3 Preferences

A traditional marriage in India is arranged by the parents of the prospective brides and grooms. Marriage generally unites men and women from the same caste, in fact several studies find assortative mating on the basis of caste close to perfect (see for example, Deolalikar and Rao 1990, Bradford 1985, and Driver 1984). 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 his children are not deprived of his caste membership; a woman marrying outside of her caste, however, loses her membership and her children become the caste of her husband (Nishimura 1994). Hence for a woman to marry up in caste is highly regarded whereas to marry down in caste is detrimental. Parents are obliged to marry their daughter to a man who is of the same or higher caste lest their status be reduced to that of the

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

person who their daughter marries (Rao and Rao 1982, Avasthi 1979).

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 their daughters and the sense of being a liability to one's parents is strong amongst unmarried women. Asymmetries between men and women further extend into the process of selecting mates. Typically, the most important quality of a bride is a good appearance, whereas for a groom is the ability to earn a living, often reflected in his educational level (Rao and Rao 1980, Caldwell et. al. 1983, Billig 1992, Caplan 1984, Hooja 1969, Avasthi 1979, Chauhan 1995).

Thus in the preferences it is assumed that brides are concerned with the quality of a potential spouse where the quality is a function of both his potential wealth, y_i, and his caste, i. The quality of a groom of caste i as perceived by a bride of caste j is denoted $q(i-j, y_i)$. It is assumed that $q(\cdot)$ is increasing in both its arguments and that the following hold:

$$q(\cdot, y_i) - q(\cdot, y_i - \theta) > q(\cdot, y_i + \theta) - q(\cdot, y_i) \tag{3.3}$$

for $y_i \in \{Y_i - \tau\theta, \cdots, Y_i + \tau\theta\}$ for $t = s_i + \tau$, $\tau = 0, 1, 2, 3, \cdots$, and

$$q(i-j, \cdot) - q(i-j-1, \cdot) > q(i-j+1, \cdot) - q(i-j, \cdot) \tag{3.4}$$

for all $i \neq j$. Conditions (3.3) and (3.4) are analogous to concavity conditions for continuous variables. In addition, the following is assumed to hold:

$$q(i-j, y_i) - q(i-j, y_i - \theta) > q(i-j+1, y_i) - q(i-j+1, y_i - \theta) \tag{3.5}$$

for all $i \neq j$ and $y_i \in \{Y_i - \tau\theta, \cdots, Y_i + (\tau+1)\theta\}$ for $t = s_i + \tau$, $\tau = 0, 1, 2, 3, \cdots$. These assumptions on $q(\cdot)$ imply that the absolute utility value of a given groom is greater for lower caste brides compared to those of higher castes, but that brides of lower castes are less sensitive to income changes in higher caste grooms than are brides in higher castes.[8] This is because lower caste brides receive a large benefit from marrying higher than their own caste and consequently

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

are not as concerned with the wealth of a higher caste groom as is a bride of the same caste as the groom, who does not receive any benefit accrued by marrying upward. The bride's family maximizes a utility function, defined over q and a composite family consumption good c, subject to their budget constraint, $y_j \geq pc+d$, where y_j denotes the income of the bridal father, p is the price of c, and d is the dowry payment for a groom of quality q. Assuming separability in q and c and that the budget constraint binds, the utility function for a bride's family is represented by:

$$U = q(i-j, y_i) + u(y_j - d) \tag{3.6}$$

where p is suppressed, $u(\cdot)$ is increasing in its argument, and

$$u(y_j - d + \varepsilon) - u(y_j - d) < u(y_j - d) - u(y_j - d - \varepsilon) \tag{3.7}$$

for all $\varepsilon > 0$. The above is analogous to a concavity condition for continuous variables.

As stated earlier, we assume now that a bride's quality does not enter into the marriage decision of grooms, this shall be relaxed in a later section. Thus the utility function for a potential groom and his family is:

$$V = v(d) \tag{3.8}$$

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

In equilibrium dowry payments are a function of the utility parameters of (3.6) and of time t, that is, $d(i-j, y_i, y_j, t)$. However, since the purpose is to monitor changes in dowry payments for a given quality groom, defined by his income and caste, through time, the notation can be suppressed into $d(y_i, t)$, where y_i denotes an income from the income distribution across caste i grooms.

3.4 Pre-Development Equilibrium

Marriages are monogamous where one bride only matches with one groom. Because quantity does not adjust, dowry payments do not function as a price in equilibrating demand and supply of potential brides or grooms. Instead, dowry payments in the marriage market adjust to

satisfy equilibrium conditions such that grooms and brides who are matched do not prefer to be married to anyone else. A stable marriage market equilibrium exists if there is a set of prices, $d(Y_i, 0)$, $1 \leq i \leq h$, for a given income distribution, such that no unmatched pair would prefer to be matched. 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 (same caste brides are matched with same caste grooms) is an equilibrium.[9] That positive assortative matching is the only stable equilibrium when all men and women have identical preferences respectively over potential mates, is a well known result.[10]

Before development, all grooms within a given caste i have income Y_i, and likewise for the fathers of the brides. To understand how equilibrium dowry payments are determined, consider two castes denoted i and $i+1$. The grooms of the higher caste $i+1$ are more desirable to all of the brides in castes i and $i+1$. Bridal fathers of the higher caste are wealthier and will therefore outbid brides in caste i for these more desirable grooms. Taking the dowry price for caste i grooms, $d(Y_i, 0)$, as given, the highest price a bride of caste i is willing to pay for a groom of caste $i+1$ satisfies the following equation:

$$q(0, Y_i) + u(Y_i - d(Y_i, 0)) = q(1, Y_{i+1}) + u(Y_i - d(Y_{i+1}, 0)) \tag{3.9}$$

When the above holds, a bride of caste i is indifferent to marrying grooms of caste i or $i+1$. The difference between the payments which solve the above equation, $d(Y_{i+1}, 0) - d(Y_i, 0)$, are positively related to $q(1, Y_{i+1}) - q(0, Y_i)$. This latter difference reflects the marginal gain to a caste i bride from marrying a groom of caste $i+1$. In this equilibrium, brides of caste $i+1$ pay $d(Y_{i+1}, 0)$ which solves (3.9) and match with caste $i+1$ grooms. The grooms of caste $i+1$ receive a higher payment than those of caste i, not because caste $i+1$ brides have wealthier fathers, but rather since they are relatively more desirable than lower caste grooms. Brides of caste i also marry within caste and pay $d(Y_i, 0)$ which is determined by an equation analogous

[9] The case where higher caste brides do not have wealthier fathers compared to those of lower castes is considered in Section 6.1.

[10] See, for example, Becker (1991) and Lam (1988) for the case of transferable utility, and Gale and Shapley (1962) for the case of non-transferable utility.

to the above where caste $i-1$ brides are indifferent to caste i or $i-1$ grooms. More generally, in equilibrium the following incentive compatibility constraint must be satisfied for brides:

$$q(0, Y_i) + u(Y_i - d(Y_i, 0)) \geq q(k-i, Y_k) + u(Y_i - d(Y_k, 0)) \tag{3.10}$$

for $i \neq k$, $1 \leq i \leq h$ and $1 \leq k \leq h$.

In equilibrium, brides will 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:

$$q(0, Y_i) + u(Y_i - d(Y_i, 0)) \geq \overline{U} \tag{3.11}$$

$$v(d) \geq \overline{V} \tag{3.12}$$

where $\overline{U}$ and $\overline{V}$ reflect the reservation utilities of an unmarried bride and groom respectively. There can exist several equilibria in which this is the case. More specifically, there exists a marriage payment $d(Y_1, 0) = \overline{d}$ such that all brides and grooms prefer to marry than remain single if the following holds:

$$\varphi(\overline{V}) \leq \overline{d} \leq Y_1 - \psi(\overline{U} - q(0, Y_1)) \tag{3.13}$$

where $\varphi(\cdot)$ and $\psi(\cdot)$ are the respective inverse functions of $v(\cdot)$ and $u(\cdot)$. The above restrictions on $\overline{d}$ directly follow from the participation constraints of brides and grooms, (3.11) and (3.12). The left hand side of (3.13) is the minimum acceptable dowry by grooms and the right hand side is the maximum willingness to pay by brides.

It is assumed that $\overline{U}$ and $\overline{V}$ are sufficiently small so that there exists $\overline{d}$ where both parties prefer marriage to its alternative. Equilibrium payment $\overline{d}$ cannot be precisely determined without adding more structure to the basic framework. As it stands, $\overline{d}$ can be positive (a dowry) or negative (a bride-price).

Assuming $\overline{d}$ exists, we can generate a set of equilibrium prices such that equilibrium conditions (3.11), (3.12), and (3.10) are satisfied.

Proposition 10 *In the pre-development equilibrium, given $\overline{d}$, 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:*

$$\overline{d} < d(Y_2, 0) < \cdots < d(Y_h, 0). \tag{3.14}$$

Proof of the above is in the appendix, but the intuition follows from the incentive compatibility constraint (3.10). Brides compete amongst themselves for the more desirable grooms. Because higher caste brides can always outbid brides in lower castes, in equilibrium brides and grooms marry within caste. Bridal fathers of caste $i+1$ offer identical grooms a dowry payment just large enough to outbid brides of the lower caste, i, for caste $i+1$ grooms. This is because the highest payment offered to caste $i+1$ grooms comes from brides of caste i. The highest payment a bride of caste i is willing to offer to a groom of caste $i+1$ satisfies constraint (3.10) with equality. Since $q(1, Y_{i+1}) > q(0, Y_i)$, reflecting that there is a marginal gain to marrying up in caste for brides, dowry payments are such that (3.14) holds in equilibrium.[11] Therefore, higher dowry payments are transferred in higher castes, a relationship confirmed in numerous studies (see, for example, Paul 1986 and Rao 1993b). Because (3.4) holds, the marginal gain to a bride as a result of marrying up in caste is less than the marginal disutility of a bride to marrying down in caste; it is always worthwhile for a given bride to make the corresponding payment which satisfies incentive compatibility constraint (3.9).[12]

The existence of dowry payments is due to the segregation of grooms into castes. If all grooms were identical in terms of quality, no marriage transfer is necessary to satisfy equilibrium incentive conditions for brides. That is, if dowry payments for all couples are equal to zero, no married woman would prefer to be matched with anyone else if all other grooms are identical from her perspective. Alternatively, when grooms are heterogeneous and brides are homogeneous, as in the above analysis, a marriage market equilibrium exists only if higher

[11] 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 employed to avoid the possibility where higher caste brides are not able to outbid lower caste brides due to credit constraints, as could be the case if $Y_i > Y_{i+1}$. This assumption is relaxed in Section 6. Moreover, in reality the rank order of castes generally corresponds to relative economic position.

[12] It is implicitly assumed that equilibrium dowry payments satisfy the participation constraint of brides. The case for when this assumption does not hold is analysed in Section 6 where due to credit constraints higher caste brides prefer to marry into lower castes than compete with lower caste brides for grooms within their own caste. In reality, however, the families of brides will impoverish themselves before marrying their daughters into a lower caste or never marry them at all.

dowry payments are transferred to higher quality grooms. Otherwise all brides married to lower quality grooms would prefer to match with higher quality grooms if equilibrium dowry payments were equal to zero, and a stable equilibrium in the marriage market would not exist. Therefore it is necessary that higher caste grooms receive larger dowry payments in equilibrium because of their higher marketable traits. That dowry payments occur due to quality differentiation amongst grooms coincides with the general consensus that the custom of dowry is generally confined to socially stratified societies (see, for example, Goody 1973, Harrel and Dickey 1985, Gaulin and Boster 1990, and Jackson and Romney 1973).

Equilibrium marriage payments are a function of the quality differences between grooms, the income of bridal fathers, and of the payment $\overline{d}$. The specification of $\overline{d}$ does not add to the central argument and is omitted (the focus here is to demonstrate how a process of development is consistent with an increasing time path of dowry payments, holding the quality of grooms constant). If we assume that because the lowest caste grooms are of the least desirable quality, the marriage transfer is such that these grooms are pushed down to their reservation utility, and letting $\overline{V}$ be negative, then $\overline{d}$ is feasibly negative and therefore a bride-price. The fact that bride-prices occur in lower castes and dowries in upper castes when no development occurs (as is the case in reality), is therefore consistent with this analysis.

3.5 Development Equilibrium

As previously mentioned, equilibrium dowry payments are not only a function of the relative attributes of grooms but also of the bridal father's wealth. To incorporate this latter consideration into the development process of Section 3.2, assume that a period of development reflects the time difference between two generations; the grooms of period t are the bridal fathers of period $t+1$. Hence, not only does the analysis assume that the number of potential brides and grooms are equal in each period, but also that each pair has exactly two children, one male and one female, who enter the marriage market of the subsequent period. As development progresses, not only are grooms within each caste becoming a more heterogeneous group, but so too are the fathers of the brides. The analysis thus entails a matching problem between these two groups. To keep track of the groups' relative degree of heterogeneity, let $n^t(y_i)$ denote the

number of men in caste i with income y_i in period t.

The process of development described in Section 3.2 comprises two central components affecting real dowry payments through time within a given caste. First, the income distribution spread within each caste increases in later periods of development, that is, men of a given caste become increasingly differentiated. Second, development also affects members in castes below. The effects of these two components on real dowry payments also depend on the form of increased within-caste heterogeneity. The next section focuses on a development process where the wealth distribution is a mean-preserving spread, thus isolating the heterogeneity effect of development on dowry payments. Alternative wealth distributions are considered in the subsequent section in order to explore the wealth effects of the development process.

3.5.1 Heterogeneity Effects of Development

For simplicity, consider a mean-preserving discrete uniform income distribution across periods. Such a distribution can be characterised more formally by,

$$for\ t = s_i + \tau \quad n^t(y_i) = n^t(Y_i) \quad for \quad y_i \in \{Y_i - (\tau+1)\theta, \cdots, Y_i + (\tau+1)\theta\} \tag{3.15}$$

where $\tau = 0, 1, 2, 3, \cdots$. The above implies that the number of men of each income level within a given caste and period is equal.

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

Across-Caste Equilibrium Conditions

Given non-overlapping income distributions across castes, higher caste men have higher incomes. In the marriage market, brides compete amongst themselves for grooms. Because high caste brides have richer fathers, they can outbid those from lower castes. Therefore, in equilibrium grooms and brides will continue to marry within caste as is the case in the pre-development equilibrium of Section 3.4.

For periods $t < s_i$, members of caste i have not yet experienced development, and nor have

the members of castes below. Equilibrium dowry payments in castes i and below are determined by the same conditions as in Section 3.4. Bridal fathers of caste i offer identical grooms a dowry payment just large enough to outbid brides of the lower castes. The highest payment offered to caste i grooms for castes below comes from brides of caste $i-1$ and satisfies the following condition:

$$q(0, Y_{i-1}) + u(Y_{i-1} - d(Y_{i-1}, t)) = q(1, Y_i) + u(Y_{i-1} - d(Y_i, t)). \tag{3.16}$$

where brides of caste $i-1$ are indifferent to grooms of caste $i-1$ or i.

In period $t = s_i$, grooms in caste i become a more heterogeneous group. As in the previous periods, in equilibrium brides of caste i match the highest payment a bride of caste $i-1$ is willing to offer grooms in caste i. Once brides match the payment offered by lower caste brides to the lowest quality groom in caste i (of income $Y_i - \theta$), the payments they make to grooms of wealth higher than $Y_i - \theta$, relative to this payment which acts as a lower bound, are necessarily higher than the payments the lower caste brides would offer. This follows because lower caste brides are less sensitive to income changes in higher caste grooms. In consequence, relative to the lowest income grooms of the same caste, grooms with higher incomes are less valuable to lower caste brides than they are to higher caste brides. Therefore, brides in caste i compete with lower caste brides for the lowest quality groom in their caste and compete amongst 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:

$$q(0, Y_{i-1}) + u(Y_{i-1} - d(Y_{i-1}, t)) = q(1, Y_i - \theta) + u(Y_{i-1} - d(Y_i - \theta, t)) \tag{3.17}$$

where these brides are indifferent to marrying with grooms of their own caste and with the poorest grooms of the caste above.

More generally, the equilibrium incentive compatibility condition at caste margins is:

$$\begin{aligned} &q(0, Y_{i-1} + \tau\theta) + u(Y_{i-1} + (\tau - 1)\theta - d(Y_{i-1} + \tau\theta, t)) = \\ &q(1, Y_i - (\tau + 1)\theta) + u(Y_{i-1} + (\tau - 1)\theta - d(Y_i - (\tau + 1)\theta, t)). \end{aligned} \tag{3.18}$$

for periods $t = s_i + \tau$, where $\tau \geq 1$. The dowry payment for the poorest groom of caste i,

$d(Y_i - (\tau+1)\theta$, in any period $t = s_i + \tau$, $\tau \geq 1$, is determined by competition from castes below. The highest deviation payment offered will be from the richest bridal father of caste $i-1$ of income $Y_{i-1} + (\tau - 1)\theta$. The deviation payment is high enough so that their daughters are indifferent to the richest grooms of their own caste or the poorest grooms in the caste above, i.e., condition (3.18) is satisfied in equilibrium.

Within-Caste Equilibrium Conditions

In the marriage market all brides are competing for all grooms. In the pre-development case, all grooms within a given caste are identical in terms of income as are the bridal fathers. In equilibrium brides and grooms match according to caste, and equilibrium dowry payments are determined only by the across-caste incentive compatibility constraints described in Section 3.4 which determine the highest payment a lower caste bridal father is willing to pay for a higher caste groom. During the process of development, both potential grooms and fathers of the brides of a given caste become increasingly heterogeneous groups where grooms and bridal fathers are now differentiated by both caste and income. As a result, bridal fathers of a given caste do not only compete with bridal fathers of different castes for grooms (as in the pre-development case) but also with brides of their own castes.

As before development, it is still worthwhile in equilibrium for brides to marry within caste. Brides of a given caste compete with brides of lower castes for grooms. The deviation payment that lower caste brides are willing to pay to marry the poorest groom in the higher caste (as represented by condition (3.18)), acts as a lower bound on all dowry payments in the higher caste. Taking this lower bound as given, brides in the higher caste compete amongst themselves for the different grooms within their caste. As all brides within a given caste have identical preferences over potential grooms within that caste, brides with wealthy fathers will be able to outbid those whose fathers have less income. In equilibrium daughters of wealthier fathers are matched with grooms of higher potential wealth. Therefore in the context of development, there is positive assortative matching according to both income and caste. Both of these relationships are found in numerous studies of marriage in India (see, for example, Rao 1993a and Deolalikar and Rao 1990).

Before formally establishing the incentive compatibility conditions which characterise equi-

librium dowry payments within castes, it is necessary to first characterise who matches with whom in equilibrium. As already described, grooms and brides marry according to both caste and income. The pattern of matching is complicated, however, by the assumption that a period of development reflects the time difference between two generations. As a result, a mean-preserving wealth distribution implies that 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 of period $t-1$. Therefore, it is inevitable that some brides in period t, with fathers of a given income level from the wealth distribution of period $t-1$, match with grooms of different income levels. 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 proven in the appendix.

Lemma 11 *A wealth distribution across time characterised by (3.15) and positive assortative matching imply that: (i) for periods $t \geq s_i$, brides with fathers of income Y_i match with grooms of income $y_i \in \{Y_i - \theta, Y_i, Y_i + \theta\}$; (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 $y_i \in \{Y_i - (\tau+1)\theta, Y_i - \tau\theta\}$; and (iii) brides with fathers of income $Y_i + \tau\theta$ match with grooms of income $y_i \in \{Y_i + (\tau+1)\theta, Y_i + \tau\theta\}$.*

The above lemma implies that in equilibrium brides match with different type grooms within their own caste. The equilibrium incentive compatibility constraints are such that a given type of bride is indifferent to the different types of grooms she is matched with. In the initial period of development, $t = s_i$, bridal fathers are still a homogeneous group, all with income equal to Y_i. Therefore in equilibrium all caste i brides are identical and are indifferent to the quality of the different grooms. This is true if the following incentive compatibility constraint is satisfied where brides take as given the highest deviation payment offered by brides in caste $i-1$ for the poorest groom in their caste of income $Y_i - \theta$ (as defined by condition (3.17)); this payment, $d(Y_i - \theta, t)$, acts as a lower bound on all other dowry payments for grooms of caste i:

$$q(0, Y_i - \theta) + u(Y_i - d(Y_i - \theta, t)) = q(0, Y_i) + u(Y_i - d(Y_i, t)) = q(0, Y_i + \theta) + u(Y_i - d(Y_i + \theta, t)). \tag{3.19}$$

In later periods, $t \geq s_i + \tau$, where $\tau \geq 1$, bridal fathers are also a heterogeneous group. In this case, the daughters of poorer bridal fathers of caste i match with the poorer grooms. As in previous periods, taking as given the highest payment offered by brides in caste $i-1$ for these poorest grooms in their caste (as defined by condition (3.18)), in equilibrium these brides are indifferent to the quality of the different grooms they are matched with. Equilibrium dowry payments satisfy:

$$q(0, Y_i - (\tau+1)\theta) + u(Y_i - \tau\theta - d(Y_i - (\tau+1)\theta, t)) = q(0, Y_i - \tau\theta) + u(Y_i - \tau\theta - d(Y_i - \tau\theta, t)), \quad (3.20)$$

Given Lemma 11, brides with wealthier fathers are matched with correspondingly wealthier grooms. In equilibrium, they too are indifferent to the quality of the different grooms they marry. As a result, not only do conditions (3.19) and (3.20) hold for all $t > s_i$, but so must the following:

$$q(0, Y_i + (\tau+1)\theta) + u(Y_i + \tau\theta - d(Y_i + (\tau+1)\theta, t)) = q(0, Y_i + \tau\theta) + u(Y_i + \tau\theta - d(Y_i + \tau\theta, t)). \quad (3.21)$$

for $t \geq s_i + \tau$, where $\tau \geq 1$.

As is clear from the above conditions:

$$d(Y_i - (\tau+1)\theta, t) < \cdots < d(Y_i - \theta, t) < d(Y_i, t) < d(Y_i + \theta, t) < \cdots < d(Y_i + (\tau+1)\theta, t) \quad (3.22)$$

for $t \geq s_i + \tau$, where $\tau \geq 0$. Hence grooms of higher incomes (or potential wealth), within each caste, receive higher dowries. This is a relationship that is verified in numerous case studies which all emphasize the importance of a groom's education, access to employment, and ownership of property in determining his dowry payment (see, for example, Paul 1986, Billig 1992, and Caldwell et. al. 1983).

Equilibrium Dowry Payments

This section explores the time path of dowry payments within a given caste i. Before development occurs in caste i, during periods $t < s_i$, all grooms and bridal fathers within caste i have identical incomes equal to Y_i. In these periods, equilibrium dowry payments must satisfy

the across-caste incentive compatibility constraint (3.16), since brides of different castes compete for the desirable grooms. Because $t < s_i$, equilibrium condition (3.16) also holds for all castes below i. Therefore, holding $\overline{d}$ fixed across periods, real dowry payments remain constant through time;

$$d(Y_i, t-1) = d(Y_i, t) \tag{3.23}$$

for $1 \leq t < s_i$.

When development occurs in period $t = s_i$, dowry payments at caste margins must satisfy the across-caste incentive compatibility constraint (3.17). The highest payment a lower caste bride is willing to pay a higher caste groom in all periods renders her indifferent to whether she marries within her caste or in the caste above. When the caste below has not yet experienced development, i.e., in period $t = s_i$, a bride's utility from marrying within caste remains constant across periods. Condition (3.17), together with the equilibrium condition in the period prior to development ($t = s_i - 1$) across-caste incentive constraint (3.16), implies:

$$q(1, Y_i) + u(Y_{i-1} - d(Y_i, s_i - 1)) = q(1, Y_i - \theta) + u(Y_{i-1} - d(Y_i - \theta, s_i)). \tag{3.24}$$

The above states that the highest dowry payment caste $i-1$ brides are willing to pay for the poorest grooms of caste i is such that they are indifferent to the poorest grooms in that caste across periods $s_i - 1$ and s_i. Condition (3.24) follows because in the across-caste indifference equations, the bridal utility from marrying the poorest grooms in caste i is compared to the utility from marrying within caste which remains constant across periods for brides of the caste $i-1$. We see from equation (3.24) that although the utility from marrying the poorest grooms in caste i remains the same across periods, the equilibrium dowry payments do not. Instead, as would be anticipated, $d(Y_i, s_i - 1) > d(Y_i - \theta, s_i)$.

Other dowry payments in caste i satisfy a within-caste incentive compatibility constraint (3.19) because brides of caste i also compete amongst themselves for the different grooms of their caste. In equilibrium dowries for different grooms are such that caste i brides are indifferent to marrying the different grooms in their caste:

$$q(0, Y_i) + u(Y_i - d(Y_i, s_i)) = q(0, Y_i - \theta) + u(Y_i - d(Y_i - \theta, s_i)) \tag{3.25}$$

The assumption (3.5) renders:

$$q(0, Y_i) - q(0, Y_i - \theta) > q(1, Y_i) - q(1, Y_i - \theta). \tag{3.26}$$

which reflects that caste $i-1$ brides are less sensitive to income changes in caste i grooms than are caste i brides. As already discussed, this follows because caste $i-1$ brides receive a benefit from marrying up in caste whereas caste i brides do not. The above inequality, together with (3.24) and (3.25), yields,

$$u(Y_i - d(Y_i - \theta, s_i)) - u(Y_i - d(Y_i, s_i)) > u(Y_{i-1} - d(Y_i - \theta, s_i)) - u(Y_{i-1} - d(Y_i, s_i - 1)). \tag{3.27}$$

Given the restriction (3.7) on $u(\cdot)$ and that $Y_i > Y_{i-1}$, the above inequality implies that,

$$d(Y_i, s_i) > d(Y_i, s_i - 1). \tag{3.28}$$

Therefore an increase in dowry payments for grooms with income Y_i occurs when caste i experiences the initial stage of development. Because of within-caste competition amongst brides, equation (3.19) holds and in equilibrium,

$$d(Y_i - \theta, s_i) < d(Y_i, s_i) < d(Y_i + \theta, s_i) \tag{3.29}$$

Hence, as a consequence of development, higher dowry payments occur for higher quality grooms, i.e., of potential wealth equal to $Y_i + \theta$. The observance of higher dowry payments over time, however, does not constitute real inflation of payments. Conversely, holding grooms' quality fixed across periods while dowry payments for a given quality groom increase, then real dowry inflation occurs. This is the case with grooms of income Y_i, as verified in (3.28). The dowry payment that poorer grooms receive, $d(Y_i - \theta, s_i)$, is smaller than the dowry payment of the previous period, $d(Y_i, s_i - 1)$. The positive increases in the other dowry payments $d(Y_i, s_i)$ and $d(Y_i + \theta, s_i)$ relative to $d(Y_i, s_i - 1)$ outweigh this negative difference $d(Y_i - \theta, s_i) - d(Y_i, s_i - 1)$ and inflation in average dowry payments also transpires.

The central ingredient of the occurrence of real dowry inflation in the context of development is the substitutability between the two components of a groom's quality, his potential wealth,

y_i, and his caste, i, reflected in inequality (3.26). Because of this substitutability, 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. This follows since within a given caste, grooms are differentiated only by wealth whereas in lower castes, these grooms are valued not only for their wealth but also for their higher caste rank. However, because (3.4) holds, the absolute marginal disutility of a bride of caste i marrying down in caste is greater than the marginal utility from a bride of caste $i-1$ marrying up. 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 brides of lower castes. Condition (3.19) holds in equilibrium so that all dowry payments are relative and hence there is a real increase in all other payments.

This reasoning follows in all periods $t \geq s_i$ and the following ensue.

Proposition 12 *There is real inflation in dowry payments for all grooms within a given caste i, in all periods of development, $t \geq s_i$.*

Proposition 13 *Average dowry payments within each caste are increasing in all periods of development, $t \geq s_i$, under certain restrictions on $q(\cdot)$.*

See the appendix for the proofs. Essentially, grooms who have been made worse off by development in terms of their potential wealth can still trade on their caste status because their caste is of value to lower caste brides. Since brides do gain from marrying a higher caste groom, that he is somewhat poorer is of relatively little importance to them. As a consequence, they offer to pay a higher dowry for a poorer groom than does a bride in his own caste who does not gain a caste benefit upon marriage. Hence the lower bound on dowry payments within a given caste is higher than it would have been in the absence of across-caste competition for grooms. However, because there is a large disutility associated with brides marrying down in caste, it is worthwhile for brides of the same caste to make this higher payment in order to remain within caste. Since dowry payments within caste are determined relatively, dowry payments of all wealthier grooms within the same caste increase as well. Increased heterogeneity implies that in each consecutive period, the poorest groom of a given caste is poorer than in the previous period. By the same argument, with each poorer groom, real dowry payments

within the caste increase. Therefore as the degree of heterogeneity within that caste increases, real dowry increases occur for grooms of any given income.

The payment a lower caste bride is willing to offer the poorest higher caste groom acts as a lower bound on his market payment. This lower bound is determined relative to dowry payments in the lower caste. As demonstrated above, dowry payments are similarly increasing with the degree of heterogeneity in that caste and therefore this lower bound is also increasing with the degree of heterogeneity in castes below. Since all dowry payments in a given caste are determined relative to this lower bound, they too increase with the degree of heterogeneity in castes below.

A given equilibrium condition, across-caste condition (3.16), for example, can be rewritten, without loss of generality, for period $t = s_i - 1$ as:

$$d(Y_i, s_i - 1) - d(Y_{i-1}, s_i - 1) = f(q(1, Y_i) - q(0, Y_{i-1})|Y_{i-1}) \tag{3.30}$$

where $f(\cdot)$ is increasing in its argument. The above states that the difference in dowry payments offered to grooms of castes i and $i-1$, offered by caste $i-1$ brides, is positively related to the marginal valuation of higher caste grooms relative to those of the lower caste, represented by $q(1, Y_i) - q(0, Y_{i-1})$. What lower caste brides are willing to pay these higher caste grooms over and above what they pay for grooms in their own caste is conditional on their fathers' income Y_{i-1}. Using similar notation, equilibrium conditions, (3.17) and (3.19), for period $t = s_i$, imply

$$d(Y_i, s_i) - d(Y_{i-1}, s_i) = f(q(0, Y_i) - q(0, Y_i - \theta)|Y_i) + f(q(1, Y_i - \theta) - q(0, Y_{i-1})|Y_{i-1}) \tag{3.31}$$

Where the first part of the right hand side is the within-caste component and the second is the across-caste component. Subtracting (3.30) from (3.31) yields an expression for the real change in dowry payments across these periods:

$$\begin{aligned} d(Y_i, s_i) - d(Y_i, s_i - 1) &= d(Y_{i-1}, s_i) - d(Y_{i-1}, s_i - 1) \\ &\quad + f(q(0, Y_i) - q(0, Y_i - \theta)|Y_i) \\ &\quad - z(q(1, Y_i) - q(1, Y_i - \theta)|Y_{i-1}) \end{aligned} \tag{3.32}$$

where $z(\cdot)$ is increasing in its argument at a smaller rate than $f(\cdot)$ is.[13] As already emphasized, a sufficient condition for real dowry inflation to occur is (3.5) which implies that $q(0, Y_i) - q(0, Y_i - \theta) > q(1, Y_i) - q(1, Y_i - \theta)$.

In the subsequent period, $t = s_i + 1 = s_{i-1}$, equilibrium conditions (3.18), (3.20), and (3.19) hold for caste i brides and (3.17) and (3.19) for those in caste $i - 1$. Using these conditions, an analogous equation describes the difference between caste dowry payments in period $t = s_i + 1$. This, together with (3.31), produces an expression for the real change in dowry payments of caste i:

$$\begin{aligned} d(Y_i, s_i + 1) - d(Y_i, s_i) &= d(Y_{i-1}, s_i + 1) - d(Y_{i-1}, s_i) \\ &\quad + f(q(0, Y_i - \theta) - q(0, Y_i - 2\theta) | Y_i - \theta) \\ &\quad - z(q(1, Y_i - \theta) - q(1, Y_i - 2\theta) | Y_{i-1}) \end{aligned} \tag{3.33}$$

The above differences, (3.32) and (3.33), demonstrate that the rate of dowry inflation is increasing in the degree of heterogeneity in caste i, represented by the fact that $[q(0, Y_i - \theta) - q(0, Y_i - 2\theta)] - [q(1, Y_i - \theta) - q(1, Y_i - 2\theta)] > [q(0, Y_i) - q(0, Y_i - \theta)] - [q(1, Y_i) - q(1, Y_i - \theta)]$, given the restrictions on $q(\cdot)$. The above also illustrates that the real increase in dowry payments in caste i is positively related to the real increase in dowry payments of caste $i-1$, $d(Y_{i-1}, s_i + 1) - d(Y_{i-1}, s_i)$. Similar equations show that this latter difference is increasing with the degree of heterogeneity in caste $i - 1$ and hence so is the degree of inflation in dowry payments of caste i. Finally, the lower bound on dowry payments in caste i, equal to the deviation payment offered from bridal fathers in the lower caste, is increasing in their income Y_{i-1}. The marginal valuation of caste i grooms from the perspective of caste $i - 1$ brides, $q(1, Y_i - \theta) - q(1, Y_i - 2\theta)$, is also increasing in their income Y_{i-1}. Similarly, dowry payments in caste i, determined relative to this lower bound, are higher the greater the income of the bridal fathers in that caste i and so is the marginal valuation of grooms in caste i, represented by $q(0, Y_i - \theta) - q(0, Y_i - 2\theta)$. As a result, the degree of inflation in caste i dowry payments is increasing in the income disparity between bridal fathers of the two castes, i.e. between $Y_i - \theta$ and Y_{i-1}.

[13] This comparison follows from the restrictions on $u(\cdot)$ which are analogous to assuming concavity for continuous variables. The function $f(\cdot)$ represents the marginal willingness to pay for a higher groom, which is increasing at a decreasing rate.

Although it is the substitutability between the components of $q(\cdot)$ which is the central reason for the occurrence of real dowry inflation during the process of development, these other factors alter the rate of inflation across periods. The relationships between these components and dowry inflation are summarized in the following proposition; their formal proofs are in the appendix.

Proposition 14 *The rate of inflation in dowry payments of a given caste is: (a) increasing in the degree of heterogeneity within that caste; (b) increasing with the degree of heterogeneity in all castes below; and (c) is higher the greater the income disparity between castes.*

In the above analysis it is assumed that there is an equal number of brides and grooms within each caste. Suppose alternatively there is an excess supply of brides (due to positive population growth and grooms marrying younger brides) which is resolved by some brides marrying grooms from lower castes.[14] In this case, the lower bound on dowry payments in caste i would be determined by an across-caste equilibrium condition for caste i brides marrying down as opposed to caste $i-1$ brides marrying up. The higher caste i brides would compete with the lower caste brides to marry their $i-1$ caste grooms. When brides in caste i also match with grooms in caste $i-1$, in equilibrium they are indifferent between these two types of grooms. As a result, the analogous condition to (3.17) in period $t = s_i$ would be:

$$q(0, Y_i - \theta) + U(Y_i - d(Y_i - \theta, t)) = q(-1, Y_{i-1}) + U(Y_i - d(Y_{i-1}, t)) \tag{3.34}$$

Taking as given $d(Y_{i-1}, t)$ and denoting the solution to equality (3.34) by $d^*(Y_i - \theta, t)$ we have the following:

$$d^*(Y_i - \theta, t) - d(Y_{i-1}, t) = f(q(0, Y_i - \theta) - q(-1, Y_{i-1})|Y_i) \tag{3.35}$$

In the case of an excess supply of brides, the lower bound on dowry payments in caste i, $d^*(Y_i - \theta, t)$, is determined relative to what higher caste brides pay to marry with lower caste grooms. Alternatively, when there does not exist an excess supply of brides, the lower bound on dowry payments in caste i is determined by how much lower caste brides are willing to offer

[14] Recall that the analysis of Chapter 2 demonstrates that a marriage squeeze does not necessarily lead to an increased number of unmarried brides or, to coincide with the framework here, some brides marrying out of their caste. Instead the excess supply of brides can be resolved by women marrying at older ages.

these higher caste grooms and the across-caste equilibrium condition (3.17) holds:

$$d(Y_i - \theta, t) - d(Y_{i-1}, t) = f(q(1, Y_i - \theta) - q(0, Y_{i-1})|Y_{i-1}) \tag{3.36}$$

Since $Y_i > Y_{i-1}$ and $q(0, Y_i - \theta) - q(-1, Y_{i-1}) > q(1, Y_i - \theta) - q(0, Y_{i-1})$ from restrictions (3.3), (3.4), and (3.5) on $q(\cdot)$, it follows that $d^*(Y_i - \theta, t) > d(Y_i - \theta, t)$. Because the cost of marrying down in caste is greater than the benefit to marrying up, the marginal gain for a bride marrying in her own caste compared of marrying down in caste is greater than the marginal gain for a bride marrying up in caste as opposed to marrying within her own caste. Accordingly, the lower bound on dowry payments, $d(Y_i - \theta, t)$, in caste i is higher in the case of an excess supply of brides in that caste compared to when there is not. Therefore, an excess supply of brides in a given caste can be consistent with dowry inflation in that caste. As the excess supply of brides grows in the higher caste, some of these brides are forced to marry grooms from the lower caste which incurs greater costs to the higher caste brides due to the profound social stigma associated with marrying down in caste. If, as the excess supply of brides continues to grow, brides in the higher caste match with poorer low caste grooms across time, these costs to marrying down in caste further increase for higher caste women. As a result, the relative value of a given quality groom in caste i would increase over time from the perspective of caste i brides as would his dowry payment and in consequence, real dowry inflation would ensue.

This section formally demonstrated how modernisation can lead to real dowry inflation. Higher quality grooms, in terms of their caste and potential wealth, always receive higher dowry payments in equilibrium, as is found in numerous studies where it is reported that the most apparent feature of dowry payments is that they reflect the relative value and desirability of different types of grooms (see, for example, Upadhya 1990 and Caplan 1984). Increases in dowry payments, while holding the quality of grooms fixed across periods, occurs due to competition from brides of lower castes for the higher caste grooms. In a sense, dowry inflation takes place because endogamy, i.e., marriage within the same caste, persists in equilibrium. That caste endogamy exacerbates rising dowries has been noted by other authors (see, for example, Nishimura 1994 and Caplan 1884). In the above analysis, dowry inflation materializes in higher castes first because members of these castes reap the benefits of modernisation before those

of lower castes.[15] This coincides with the observation that increasing dowries first occurred in upper castes, then over a period of time the phenomenon permeated the lower castes.

3.5.2 Wealth Effects of Development

In the previous section it was shown that a development process which diversified the income of grooms within a given caste could lead to real dowry inflation even when average wealth remained constant. An implication of a discrete mean-preserving wealth distribution is that bridal fathers of a given income match with the same type grooms across all periods and hence the income level of the bridal father which determines the dowry payment for a given quality grooms across time remains constant. For example, bridal fathers of income Y_i are matched with grooms of income Y_i for all periods. Alternatively, if the wealth of bridal fathers grows, dowry payments for a given quality groom could in turn increase. This is referred to here as a within-caste wealth effect on dowry payments. That is, independent of the across-caste competition effects analysed above, real dowry payments can increase as a result of development via changes in within-caste wealth. Whereas the previous analysis isolated the changes in real dowry payments from increasing heterogeneity within castes by adopting a mean-preserving wealth distribution to mimic the process of development, this section considers income distributions which are both mean-increasing and mean-decreasing through time to emphasize the impact of wealth effects on dowry inflation.

An income distribution where individuals are becoming increasingly better off through time is defined formally by,

$$\begin{aligned} n^t(Y_i + (\tau+1)\theta) + n^t(Y_i + \tau\theta) &> n^{t-1}(Y_i + \tau\theta) \\ n^t(Y_i - (\tau+1)\theta) + n^t(Y_i - \tau\theta) &< n^{t-1}(Y_i - \tau\theta) \end{aligned} \tag{3.37}$$

for $t \geq s_i + \tau$, where $\tau \geq 0$. The above implies that the proportion of men made worse off by

[15] None of the results in this section are dependent upon the assumption that 'heterogeneity' spreads to lower castes one period at at time. If the development process affected all castes simultaneously, identical results would ensue. It is only assumed for expositional purposes as the analysis is simpler; and also to coincide with reality, that is, modernisation touches higher castes before lower ones.

development is decreasing over time. Correspondingly, an income distribution where individuals are becoming increasingly worse off over time may be represented by,

$$\begin{aligned} n^t(Y_i + (\tau+1)\theta) + n^t(Y_i + \tau\theta) &< n^{t-1}(Y_i + \tau\theta) \\ n^t(Y_i - (\tau+1)\theta) + n^t(Y_i - \tau\theta) &> n^{t-1}(Y_i - \tau\theta) \end{aligned} \tag{3.38}$$

for $t \geq s_i + \tau$, where $\tau \geq 0$. In the above, the proportion of men made better off by development is decreasing over time.

These distributional considerations will modify the within-caste equilibrium conditions as they will alter who matches with whom. In period $t = s_i$, the equilibrium condition is unchanged as the group of bridal fathers is still a homogeneous group indifferent to all three types of grooms, and condition (3.19) holds in this period. Once the fathers of the brides are also a differentiated group, in periods $t > s_i$ and either of the distributions (3.37) or (3.38) apply, the pattern of matching of Lemma 11 no longer appertains. Because the number of men at one end of the distribution is decreasing across time, the supply of bridal fathers of a given income exceeds the supply of grooms of the same income and as a result, depending on the distribution, are matched with grooms either richer or poorer than themselves. These matching patterns are stated in the following lemmas before establishing the within-caste equilibrium conditions:

Lemma 15 *A wealth distribution across time characterised by a mean-increasing spread, as in (3.37), and positive assortative mating imply that for periods $t \geq s_i + \tau$, for $\tau \geq 1$, brides with fathers of income $Y_i - \tau\theta$ match with at least some grooms of income $y_i \geq Y_i - (\tau - 1)\theta$.*

Lemma 16 *A wealth distribution across time characterised by a mean-decreasing spread, as in (3.38), and positive assortative mating imply that for periods $t \geq s_i + \tau$, for $\tau \geq 1$, brides with fathers of income $Y_i + \tau\theta$ match with at least some grooms of income $y_i \leq Y_i + (\tau - 1)\theta$.*

The above lemmas follow directly from (3.37) and (3.38).

Within-Caste Equilibrium Conditions — Mean-Increasing Distribution

When individuals are becoming increasingly better off, represented by condition (3.37), the matching pattern is altered from a mean-preserving distribution. In particular, as Lemma 15

states, bridal fathers of a given wealth match their daughters with some grooms who are richer than themselves. Since the number of men at the low end of the distribution is decreasing across time, the supply of bridal fathers of low income exceeds the supply of less wealthy grooms. As a result, the daughters of these fathers are matched with grooms richer than themselves in contrast to the matching pattern of Lemma 11. In periods $t \geq s_i + \tau$, where $\tau \geq 1$, the within-caste equilibrium conditions (3.20) and (3.19) hold but with a negative inequality ($\leq$) and condition (3.21) holds with a positive inequality ($\geq$). In addition,

$$q(0, Y_i - \tau\theta) + u(Y_i - \tau\theta - d(Y_i - \tau\theta, t)) \leq q(0, y_i) + u(Y_i - \tau\theta - d(y_i, t)). \tag{3.39}$$

for $y_i \geq Y_i - (\tau - 1)\theta$.

Equilibrium conditions hold with an inequality rather than an equality because, depending on the supply of grooms of a given income, bridal fathers of a given income may match their daughters only with grooms of higher income levels, i.e., with grooms of income y_i. Consider, for example, that the distribution of grooms is such that brides with fathers of income $Y_i - \tau\theta$ match with grooms of incomes $Y_i - \tau\theta$ and $Y_i - (\tau - 1)\theta$ in a given period and (3.39) holds with equality in equilibrium. Suppose in the subsequent period, the number of poorer grooms has decreased substantially and as a result brides with fathers of income $Y_i - \tau\theta$ are now matched only with grooms of the higher income $Y_i - (\tau - 1)\theta$ and (3.39) holds with an inequality instead.

Within-Caste Equilibrium Conditions — Mean-Decreasing Distribution

When individuals are becoming increasingly worse off, represented by condition (3.38), the within-caste equilibrium conditions are modified correspondingly. In this case, as Lemma 16 states, bridal fathers of a given wealth match their daughters with some grooms that are poorer than themselves, in contrast to the matching pattern of Lemma 11. Again, because the number of men at the high end of the distribution is decreasing across time, the supply of bridal fathers of high income exceeds that of wealthy grooms and they must match grooms poorer than themselves with their daughters.

In periods $t \geq s_i + \tau$, where $\tau \geq 1$, the within-caste equilibrium conditions (3.20) and (3.19) hold with a positive inequality ($\geq$) and condition (3.21) holds with a negative inequality ($\leq$).

Additionally,

$$q(0, Y_i + \tau\theta) + u(Y_i + \tau\theta - d(Y_i + \tau\theta, t)) \leq q(0, y_i) + u(Y_i + \tau\theta - d(y_i, t)). \tag{3.40}$$

for $y_i \leq Y_i + (\tau - 1)\theta$.

Effects on Dowry Payments

Independent of whether the wealth distribution is mean-preserving, mean-increasing, or mean-decreasing through time, the across-caste equilibrium conditions remain unaltered. The deviation payments from bridal fathers of the caste below remain the same for given quality grooms, independent of their numbers and hence the lower bound on dowry payments within a given caste is independent of the wealth distribution in that caste. As before, brides of caste i match the payment lower caste brides are willing to offer the lowest ranked grooms in caste i in each period. The payments that higher ranked grooms in caste i receive, relative to this lower bound, do alter, however, according to the wealth distribution amongst bridal fathers within caste i. In particular, wealthier bridal fathers are willing to pay higher dowries, relative to this lower bound, for the more desirable grooms than are poorer fathers. This section focuses on these within-caste wealth effects on real dowry payments by comparing the implications of the three types of income distribution.

When individuals are becoming increasingly better off, represented by condition (3.37), bridal fathers of a given wealth match their daughters with some grooms that are richer than themselves (as Lemma 15 states). In this case, poorer bridal fathers, relative to the mean-preserving distribution scenario, determine the dowry payments for some grooms as reflected by equation (3.39). In consequence, dowry payments for these grooms are lower because less wealthy bridal fathers are not willing to pay as much, relative to the lower bound, as those with higher income. This reasoning leads to the following proposition,

Proposition 17 *In a development process where individuals are becoming increasingly better off through time, the degree of dowry inflation is non-increasing across periods because of within-caste wealth effects.*

Correspondingly, when the wealth distribution is characterised by (3.38), richer bridal fa-

thers, relative to the mean-preserving distribution case, are determining dowry payments for given grooms. Dowry payments for these grooms are therefore higher as shown in the following proposition.

Proposition 18 *In a development process where individuals are becoming increasingly worse off through time, the degree of dowry inflation is non-decreasing across periods because of within-caste wealth effects.*

In contrast, when the wealth distribution evolves symmetrically across periods, i.e., (3.15) holds, there are no pure within-caste wealth effects, as in the above two propositions, because the same type bridal fathers are matched with the same type grooms across all periods. The only wealth effect of a mean-preserving income distribution comes from competition from castes below and is as would be anticipated. The wealthier the members in the caste below, the higher the deviation payment they are willing to make to match with grooms from the caste above. Consequently, payments in the caste above are higher than they would otherwise be and we have,

Proposition 19 *In a development process with a symmetric wealth distribution across time, there are no within-caste wealth effects on real dowry payments but there are across-caste wealth effects; the wealthier the castes below, the higher the dowry payments in castes above.*

The proofs of the above propositions are in the appendix. It is interesting to note that abstracting from the across-caste effects, increasing heterogeneity amongst grooms via development can alone cause real dowry inflation only if the proportion of men made worse off by development increases, that is, a process in which new wealth falls into the hands of relatively few people. Additionally, there is a real deflationary effect caused by increased heterogeneity if an increasing number of individuals benefit from the process of development across time. Further, the existence of wealthier bridal fathers within a given caste does not necessarily lead to real dowry inflation, in fact it only occurs if the majority of men within the caste are becoming worse off because of development. However, the wealthier the bridal fathers in the caste below the higher the dowry payments in castes above.

The above section abstracts from the across-caste effects of real dowry inflation previously examined. Although certain within-caste income distributions across time can lead to a decrease

in dowry payments, real dowry inflation may still occur because wealth effects likely do not outweigh the across-caste effects. Instead, the central conclusion of this section is that if the development process is such that individuals are on average becoming increasingly better off, then the severity of real dowry inflation is less. Alternatively, the severity of the problem is greater if the benefits of development accrue only to a handful of wealthy people to the detriment of the poor.

3.6 Disappearance of Dowry Inflation

In the above analysis, endogamous marriage is the equilibrating matching outcome; all brides and grooms marry within caste. This outcome is well verified by the numerous studies which find assortative mating on the basis of caste close to perfect. However, this equilibrium outcome can cease to occur if the income distributions within castes begin to overlap with those of other castes. In particular, if the grooms at the high end of the wealth distribution of caste $i-1$ have significantly greater incomes than those at the low end of the income distribution of caste i, one would anticipate that matching across these two castes would occur. Brides from caste i would marry down in caste if their potential spouses had high enough incomes to compensate for the loss of status in terms of caste.

Once endogamy breaks down in the event of a more equal income distribution *across castes*, real dowry payments can cease to increase. Alternatively, if women in turn begin to reap the benefits of development and become a more heterogenous group themselves, this also can have a negative impact on dowry payments. Women then have a quality of their own which is of value to grooms and acts as a substitute for a dowry payment. These two components of the development process are investigated independently in the following sections.

3.6.1 Endogamous Marriage Breaks Down

Endogamy will break down at the point where brides of caste i prefer to marry down in caste at equilibrium prices. This will occur when the respective income distributions of caste i and caste $i-1$ begin to overlap, and the equilibrium condition defined at caste margins, condition (3.18) ceases to hold. That is, brides with poorer fathers in caste i prefer to match with rich

grooms in caste $i-1$ for periods $t \geq s_i + \tau$, $\tau > 1$. This is the case if at equilibrium prices the utility for a bride from matching with a rich groom of the lower caste is greater than the utility from marrying a poorer groom in her own caste:

$$\begin{aligned} &q(-1, Y_{i-1} + \tau\theta) + u(Y_i - \tau\theta - d(Y_{i-1} + \tau\theta, t)) > \\ &q(0, Y_i - (\tau+1)\theta) + u(Y_i - \tau\theta - d(Y_i - (\tau+1)\theta, t)). \end{aligned} \tag{3.41}$$

The above inequality is more likely to hold, the larger is $Y_{i-1} + \tau\theta$ relative to $Y_i - (\tau+1)\theta$, which reflects the income disparity between the potential grooms, and the larger is $Y_{i-1} + (\tau - 1)\theta$ relative to $Y_i - \tau\theta$, which is the income disparity between the bridal fathers competing with each other for the grooms. The former income disparity reflects an income difference between grooms large enough that the rich groom of caste $i-1$ becomes desirable to brides from caste i, relative to the grooms they would be matched with from their own caste in equilibrium. The latter income disparity reflects an income difference between the bridal fathers that is large enough so that the dowry payment offered by brides from caste $i-1$ is too large for bridal fathers of caste i to find it worthwhile to pay, and hence they match their daughters with a lower caste groom instead. Additionally, condition (3.41) is more likely to hold if income is significantly more important than caste in determining grooms' quality.

When the inequality (3.41) holds, an equilibrium where people marry out of caste is possible. Brides with wealthy fathers from caste $i-1$ will marry grooms only from the higher caste and brides with poor fathers from caste i will marry grooms from the lower caste. The complicated matching problem when endogamy does break down is not explored in this chapter (where the focus is to explain real dowry inflation when couples marry within their caste).[16] However, the possible impact on dowry payments of across-caste marriages occurring in equilibrium is tentatively explored in this section.

Suppose in periods $t = s_i + 1$ and $t = s_i + 2$ endogamy breaks down and in equilibrium the poorest bridal fathers in caste i are matched with the richest grooms in caste $i-1$ and

[16] The matching problem when endogamy breaks down entails matching bridal fathers of varying wealth levels with grooms, over which the fathers have different preferences depending on their caste. Additionally, the supply of grooms and bridal fathers of given types in a given period is not the same across castes because of the chronological component of development, where members of higher castes become a more heterogenous group before those of lower castes.

the richest bridal fathers in caste $i-1$ are matched with the poorest grooms in caste i. Ignore the wealth effects of a development process by assuming linear utility functions in the quality of the groom and the dowry payment for the bride. Under this assumption, the difference in equilibrium dowry payments is simply a function of the difference in the quality of grooms (i.e., a groom's relative standing). In period $t = s_i$, endogamy persists and the relative dowry payment of the average groom in caste i is given by:

$$d(Y_i, s_i) - d(Y_{i-1}, s_i) = \{q(0, Y_i) - q(0, Y_i - \theta)\} + \{q(1, Y_i - \theta) - q(0, Y_{i-1})\} \tag{3.42}$$

The first component of this difference (in brackets) reflects the value of the quality difference between the average groom in caste i and the poorest groom in caste i; that is, the payment brides in caste i are willing to make for the higher quality groom in their own caste. The second component in brackets reflects the quality difference between the poorest groom in caste i and the average groom in caste $i-1$. This latter component reflects the lower bound on dowry payments in caste i as it is the payment that lower caste brides are willing to make for poorer grooms in the higher caste i.

In the subsequent period $t = s_i + 1$, endogamy breaks down and the poorer bridal fathers of caste i prefer to match with the richer grooms of the lower caste (of income $Y_{i-1} + \theta$) than the poor grooms of their own caste (of income $Y_i - 2\theta$). As a result, rather than the lower bound on dowry payments in their own caste i increasing, as would be the case if they matched the payment caste $i-1$ brides offered for their poorest grooms (of income $Y_i - 2\theta$), the lower bound remains the same; that is, the dowry payment caste $i-1$ brides offer to $Y_i - \theta$ grooms. Therefore the difference in average dowry payments across castes is equal to (3.42). Hence, aside from the difference in dowry payments in the caste below, $d(Y_{i-1}, s_i + 1) - d(Y_{i-1}, s_i)$, there are no real changes in dowry payments across the two periods. If endogamy similarly breaks down in all castes below, then dowry inflation could cease to occur.

Inflation in dowry payments in caste i could also cease if dowry payments in that caste increased to such an extent that brides' participation constraints were no longer satisfied. At these prices, brides of caste i would prefer to marry down in caste. Therefore endogamy would break down and dowry prices in caste i would eventually remain constant across periods once

this were true for all castes.

3.6.2 Women Benefit From Development

The previous sections have abstracted from the possibility of women becoming a more heterogeneous group through the process of development. However, there are several studies which find that, holding groom characteristics constant, there has been a significant increase over time in the schooling of brides (see for example, Deolalikar and Rao 1990, and Billig 1992). Consider a process of development where women also become an increasingly heterogeneous group, in particular where the brides' quality is directly correlated to the income of their fathers.

Before development occurs, assortative matching according to caste is an equilibrium as higher caste families can always pay higher dowries than those of the lower castes. Analogous to the previous analysis, a stable marriage market equilibrium persists if no unmatched pair would prefer to be matched. In equilibrium higher caste brides and grooms compete with the highest offers made by potential spouses from lower castes. In this scenario, dowry payments within a given caste are smaller than when brides were homogeneous. This follows since brides' education acts a substitute for their dowry payment. In the previous case, brides of a higher caste paid as much dowry as lower caste brides were willing to offer higher caste grooms. In this case, higher caste brides can offer less than this payment because grooms also gain from their relatively higher education compared to lower caste brides with correspondingly lower education. However, although dowry payments in the context of no development are lower when brides' quality also matters, an analogous result does not follow in the context of modernisation.

Recall that it is the caste component of groom's quality which is essential to the previous results. Because lower caste brides prefer a higher caste groom irrespective of his income, then the fact that the developmental process has caused a low ranked high caste groom to become poorer will have little effect on the dowry that lower caste brides are willing to pay for him. Because this lower bound on dowry payments has not decreased accordingly, average dowry payments increase. The same intuition does not follow for brides because their caste status is irrelevant from the perspective of grooms. Therefore brides who become worse off as a result of modernisation (since their fathers have become poorer) are valued in the marriage market accordingly and in consequence they must pay a higher dowry for desirable grooms. This results

holds true as long as the caste status of brides is less important to grooms than the caste of grooms is to brides. Therefore because of gender asymmetries with respect to caste, even when women begin to reap comparable benefits to men from development, dowry inflation persists. This is perhaps why it has been observed that increasing the quality of brides has only a meager effect in reducing the dowry problem (see, for example, Saroja and Chandrika 1991).

3.7 Conclusion

In the above analysis, the occurrence of dowry payments is due to the segregation of grooms into castes. Within anthropological and sociological literature, there is a consensus that dowry payments are generally restricted to socially stratified societies. In a sense, dowry payments serve to preserve endogamous marriage, i.e., inhibit lower caste brides from marrying higher caste grooms, and hence in turn preserve the caste or class system. When members of caste groups are no longer homogeneous in terms of occupations and incomes, the only defining feature of a caste is the practice of endogamy.

If modernisation leads to a deterioration of the hierarchical wealth-based class structure as members of different castes attain similar occupations, then the above suggests that real dowry inflation will be observed only if there remains an inherited component to status independent of one's economic value, e.g., caste. Thus in societies where a class structure is observed which reflects only wealth differentiation, dowry payments should occur while real inflation should not. The occurrence of dowry payments is widely documented whereas evidence of real inflation is less so. Stuard (1981) reports that dowry inflation took place amongst Ragusan noble families during the thirteenth and fifteenth centuries where very strict endogamy was practiced; that is, nobles did not match with non-nobles. This scenario coincides with the explanation here for dowry inflation because there is a component to status which is inherited and independent of wealth, i.e., birth into a noble family.

Historically, the custom of dowry existed in most European societies where, in contrast to India, industrialisation led to a decline in payments. However, unlike the caste system, a development process which introduces opportunities for all individuals could work to destroy the class system as the class boundaries are defined only by wealth differentiation. This situation

coincides with Proposition 17 where if the proportion of men made better off by development is increasing, then real dowry deflation may occur. Whereas in India, where the existence of an innate component to status determined by one's caste and the practice of endogamy prohibit the deterioration of the caste system, modernisation has inflationary effects on dowry payments, as demonstrated in Section 3.5.1. This suggests that marriage matching which places less value on the caste of potential mates would negatively effect dowry payments. Interestingly, a case study of Christians in Madras reveals that increasing dowry payments occur among those with a caste affiliation whereas they do not among those who are casteless (see Caplan 1984).

Traditionally, bride-price payments were practiced amongst the lower castes whereas dowry payments occurred within the upper castes (see, for example, Blunt 1969, Srinivas 1978, and Miller 1980). Payments in the pre-development equilibrium of Section 3.4 correspond to the possibility of higher castes paying dowries and lower castes exchanging bride-price payments. Additionally, there are numerous accounts of a transition from bride-price to dowry in the context of modernisation. This transition similarly follows from the analysis where development places an upward pressure on real marriage payments rendering formerly negative payments or bride-prices into positive payments or dowries.

3.8 Appendix

Proof of Proposition 10:

Taking condition (3.9) as given we can show that it is not worthwhile marrying in a different caste, given equilibrium prices. That is,

$$q(0, Y_k) + u(Y_k - d(Y_k, 0)) > q(i + 1 - k, Y_{i+1}) + u(Y_k - d(Y_{i+1}, 0)) \tag{3.43}$$

holds for all $1 \leq k < i$ and $i + 1 < k \leq h$, thus satisfying equilibrium condition (3.10) for all $i \neq k$, $1 \leq i \leq h$ and $1 \leq k \leq h$.

First consider $k < i$ where it will be demonstrated that if (3.43) is satisfied for k it also the case for $k - 1$, $k > 1$.

Suppose $k = i - 1$, then the restriction (3.7) on $u(\cdot)$ implies:

$$u(Y_{i-1} - d(Y_i, 0)) - u(Y_{i-1} - d(Y_{i+1}, 0)) > u(Y_i - d(Y_i, 0)) - u(Y_i - d(Y_{i+1}, 0)) \tag{3.44}$$

together with condition (3.9) we have,

$$u(Y_{i-1} - d(Y_i, 0)) - u(Y_{i-1} - d(Y_{i+1}, 0)) > q(1, Y_{i+1}) - q(0, Y_i) > q(2, Y_{i+1}) - q(1, Y_i) \tag{3.45}$$

where the second inequality follows from restrictions (3.4) and (3.5) on $q(\cdot)$. Inequality (3.45) together with (3.9) defined at $i - 1$ implies that (3.43) is satisfied.

Suppose $k = i - 2$. Given both (3.9) and (3.45) defined at $i - 2$, then the following holds:

$$q(0, Y_{i-2}) + u(Y_{i-2} - d(Y_{i-2}, 0)) > q(2, Y_i) + U(Y_{i-2} - d(Y_i, 0)). \tag{3.46}$$

The restriction (3.7) on $u(\cdot)$ implies:

$$u(Y_{i-2} - d(Y_i, 0)) - u(Y_{i-2} - d(Y_{i+1}, 0)) > u(Y_i - d(Y_i, 0)) - u(Y_i - d(Y_{i+1}, 0)). \tag{3.47}$$

Inequality (3.47) and (3.9) yield:

$$u(Y_{i-2} - d(Y_i, 0)) - u(Y_{i-2} - d(Y_{i+1}, 0)) > q(1, Y_{i+1}) - q(0, Y_i) > q(3, Y_{i+1}) - q(2, Y_i). \tag{3.48}$$

where the second inequality follows from restrictions (3.4) and (3.5) on $q(\cdot)$.

Inequalities (3.46) and (3.48) imply:

$$q(0, Y_{i-2}) + u(Y_{i-2} - d(Y_{i-2}, 0)) > q(3, Y_{i+1}) + U(Y_{i-2} - d(Y_{i+1}, 0)) \tag{3.49}$$

and hence (3.43) is satisfied. Analogous conditions can be derived for $k = i - 3$, using these together with (3.49) we can demonstrate that (3.43) is again satisfied. The same applies for all $1 \leq k < i$.

Now consider $k > i + 1$ where it will be demonstrated that if (3.43) is satisfied for k it also holds for $k + 1$, $k < h$.

Suppose $k = i + 2$, again, restriction (3.7) yields:

$$u(Y_{i+1} - d(Y_{i+1}, 0)) - u(Y_{i+1} - d(Y_{i+2}, 0)) > u(Y_{i+2} - d(Y_{i+1}, 0)) - u(Y_{i+2} - d(Y_{i+2}, 0)) \tag{3.50}$$

Using inequality (3.50) and (3.9) defined at $i + 2$:

$$u(Y_{i+2} - d(Y_{i+1}, 0)) - u(Y_{i+2} - d(Y_{i+2}, 0)) < q(1, Y_{i+2}) - q(0, Y_{i+1}) < q(0, Y_{i+2}) - q(-1, Y_{i+1}). \tag{3.51}$$

where the second inequality follows from restrictions (3.4) and (3.5) on $q(\cdot)$.

Inequality (3.51) shows that (3.43) is satisfied.

Suppose $k = i + 3$, given (3.51) defined at $i + 3$:

$$q(0, Y_{i+3}) - u(Y_{i+3} - d(Y_{i+2}, 0)) > q(-1, Y_{i+2}) - u(Y_{i+3} - d(Y_{i+3}, 0)) \tag{3.52}$$

Restriction (3.7) implies:

$$u(Y_{i+1} - d(Y_{i+1}, 0)) - u(Y_{i+1} - d(Y_{i+2}, 0)) > u(Y_{i+3} - d(Y_{i+1}, 0)) - u(Y_{i+3} - d(Y_{i+2}, 0)) \tag{3.53}$$

and using (3.9) defined at $i + 1$,

$$u(Y_{i+3} - d(Y_{i+1}, 0)) - u(Y_{i+3} - d(Y_{i+2}, 0)) < q(1, Y_{i+2}) - q(0, Y_{i+1}) < q(-1, Y_{i+2}) - q(-2, Y_{i+1}). \tag{3.54}$$

where the second inequality follows from restrictions (3.4) and (3.5) on $q(\cdot)$.

Inequalities (3.52) and (3.54) yield,

$$q(0, Y_{i+3}) - u(Y_{i+3} - d(Y_{i+2}, 0)) > q(-2, Y_{i+1}) - u(Y_{i+3} - d(Y_{i+1}, 0)) \tag{3.55}$$

and hence (3.43) is satisfied. Analogous conditions can be derived for $k = i + 4$, using these together with (3.55) we can demonstrate that (3.43) is again satisfied. The same applies for all $i + 1 < k \leq h$. □

Proof of Lemma 11:

With positive assortative matching and that the total supply of grooms within a given caste is constant for all t, the matching pattern of (i), (ii), and (iii) ensues if in each period $t = s_i + \tau$, for $\tau = 0, 1, 2, 3, \cdots$, and the following hold:

$$\sum_{s=\alpha}^{\tau+1} n^t(Y_i - s\theta) > \sum_{s=\alpha}^{\tau} n^{t-1}(Y_i - s\theta) > \sum_{s=\alpha+1}^{\tau+1} n^t(Y_i - s\theta) \tag{3.56}$$

$$\sum_{s=\alpha}^{\tau+1} n^t(Y_i + s\theta) > \sum_{s=\alpha}^{\tau} n^{t-1}(Y_i + s\theta) > \sum_{s=\alpha+1}^{\tau+1} n^t(Y_i + s\theta) \tag{3.57}$$

for $\alpha = 1, 2, 3, \cdots, \tau$. Given (3.15), conditions (3.56) and (3.57) can be rewritten as:

$$(\tau + 1 - \alpha)n^t(y_i) > (\tau - \alpha)n^{t-1}(y_i) > (\tau - \alpha)n^t(y_i). \tag{3.58}$$

Given (3.15) and using 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 $\tau = 0, 1, 2, 3, \cdots$, can be written as,

$$n^t(y_i) = \frac{1}{3 + 2\tau} n^0(Y_i). \tag{3.59}$$

Using (3.59), (3.58) becomes:

$$\frac{(\tau + 1 - \alpha)}{3 + 2\tau} n^0(Y_i) > \frac{(\tau - \alpha)}{3 + 2(\tau - 1)} n^0(Y_i) > \frac{(\tau - \alpha)}{3 + 2\tau} n^0(Y_i). \tag{3.60}$$

Since $[3+2(\tau-1)][\tau+1-\alpha] > [3+2\tau][\tau-\alpha]$, (3.60) implies that (3.58) is satisfied. □

Proof of Proposition 12:

Consider $t = s_i$, given that $t = s_i < s_{i-1}$, then (3.16) holds across periods and implies that,

$$d(Y_{i-1}, s_i) = d(Y_{i-1}, s_i - 1). \tag{3.61}$$

As already demonstrated in Section 3.5.1, equation (3.16) holds for $t = s_i - 1$ and equation (3.17) holds for $t = s_i$ which together with (3.61) yield (3.24). In equilibrium, equation (3.19) also holds for $t = s_i$, yielding (3.25). Using (3.24), (3.25), and (3.26) we have (3.27). Given restriction (3.7) on $u(\cdot)$ and that $Y_i > Y_{i-1}$, inequality (3.27) implies (3.28).

Consider $t = s_i + 1$. Given that $t = s_i + 1 = s_{i-1}$, from the above analysis (3.28) holds for caste $i-1$:

$$d(Y_{i-1}, s_i + 1) > d(Y_{i-1}, s_i). \tag{3.62}$$

Because $t = s_i + 1 = s_{i-1}$, within-caste equilibrium condition (3.19) holds for caste $i-1$:

$$q(0, Y_{i-1}) + u(Y_{i-1} - d(Y_{i-1}, s_i + 1)) = q(0, Y_{i-1} + \theta) + u(Y_{i-1} - d(Y_{i-1} + \theta, s_i + 1)). \tag{3.63}$$

For $t = s_i + 1$, across-caste equilibrium condition (3.18) holds,

$$q(1, Y_i - 2\theta) + u(Y_{i-1} - d(Y_i - 2\theta, s_i + 1)) = q(0, Y_{i-1} + \theta) + u(Y_{i-1} - d(Y_{i-1} + \theta, s_i + 1)) \tag{3.64}$$

Equations (3.63) and (3.64) imply:

$$q(0, Y_{i-1}) + u(Y_{i-1} - d(Y_{i-1}, s_i + 1)) = q(1, Y_i - 2\theta) + u(Y_{i-1} - d(Y_i - 2\theta, s_i + 1)). \tag{3.65}$$

Using (3.65), (3.62), and that (3.17) holds for $t = s_i$,

$$q(1, Y_i - \theta) + u(Y_{i-1} - d(Y_i - \theta, s_i)) > q(1, Y_i - 2\theta) + u(Y_{i-1} - d(Y_i - 2\theta, s_i + 1)). \tag{3.66}$$

Given that (3.20) holds for $t = s_i + 1$:

$$q(0, Y_i - \theta) + u(Y_i - \theta - d(Y_i - \theta, s_i + 1)) = q(0, Y_i - 2\theta) + u(Y_i - \theta - d(Y_i - 2\theta, s_i + 1)). \tag{3.67}$$

Using,

$$q(1, Y_i - \theta) - q(1, Y_i - 2\theta) < q(0, Y_i - \theta) - q(0, Y_i - 2\theta) \tag{3.68}$$

then (3.66) and (3.67) imply,

$$\begin{aligned} &u(Y_{i-1} - d(Y_i - 2\theta, s_i + 1)) - u(Y_{i-1} - d(Y_i - \theta, s_i)) < \\ &u(Y_i - \theta - d(Y_i - 2\theta, s_i + 1)) - u(Y_i - \theta - d(Y_i - \theta, s_i + 1)) \end{aligned} \tag{3.69}$$

Restriction (3.7) on $u(\cdot)$ and $Y_i - \theta > Y_{i-1}$ implies:

$$d(Y_i - \theta, s_i + 1) > d(Y_i - \theta, s_i). \tag{3.70}$$

Equilibrium condition (3.19) in turn yields,

$$d(Y_i, s_i + 1) > d(Y_i, s_i) \tag{3.71}$$

and

$$d(Y_i + \theta, s_i + 1) > d(Y_i + \theta, s_i) \tag{3.72}$$

Now consider $t = s_i + 2$. Given $t = s_i + 2 = s_{i-1} + 1$ and using the above, we have,

$$d(Y_{i-1}, s_i + 2) > d(Y_{i-1}, s_i + 1) \tag{3.73}$$

and

$$d(Y_{i-1} + \theta, s_i + 2) > d(Y_{i-1} + \theta, s_i + 1) \tag{3.74}$$

Across-caste equilibrium condition (3.18) in the prior period $t = s_i + 1$ implies:

$$\begin{aligned} &q(1, Y_i - 3\theta) + u(Y_{i-1} - \theta - d(Y_i - 3\theta, s_i + 2)) = \\ &q(0, Y_{i-1} + 2\theta) + u(Y_{i-1} + \theta - d(Y_{i-1} + 2\theta, s_i + 2)) \end{aligned} \tag{3.75}$$

and the same condition for $t = s_i + 2$ yields:

$$q(1, Y_i - 2\theta) + u(Y_{i-1} - d(Y_{i-1} - 2\theta, s_i + 1)) =$$
$$q(0, Y_{i-1} + \theta) + u(Y_{i-1} - d(Y_{i-1} + \theta, s_i + 1)) \tag{3.76}$$

Using (3.21), equation (3.75) becomes,

$$q(1, Y_i - 3\theta) + u(Y_{i-1} - \theta - d(Y_i - 3\theta, s_i + 2)) =$$
$$q(0, Y_{i-1} + \theta) + u(Y_{i-1} + \theta - d(Y_{i-1} + \theta, s_i + 2)) \tag{3.77}$$

Equations (3.76) and (3.77) imply,

$$q(1, Y_i - 3\theta) + u(Y_{i-1} - \theta - d(Y_i - 3\theta, s_i + 2)) <$$
$$q(1, Y_i - 2\theta) + u(Y_{i-1} - d(Y_{i-1} - 2\theta, s_i + 1)) \tag{3.78}$$

where the above holds only if:

$$u(Y_{i-1} + \theta - d(Y_{i-1} + \theta, s_i + 2)) < u(Y_{i-1} - d(Y_{i-1} + \theta, s_i + 1)) \tag{3.79}$$

despite $Y_{i-1} + \theta > Y_{i-1}$. From (3.66), (3.67), and (3.19) we know that $d(Y_{i-1} + \theta, s_i + 1)$ is increasing in Y_{i-2} whereas $d(Y_{i-1} + \theta, s_i + 2)$ is increasing in $Y_{i-1} - \theta$. Since $Y_{i-1} - Y_{i-2} > (Y_{i-1} + \theta) - (Y_{i-1} - \theta)$, (3.79) is satisfied.

Given that (3.20) holds and using,

$$q(1, Y_i - 2\theta) - q(1, Y_i - 3\theta) < q(0, Y_i - 2\theta) - q(0, Y_i - 3\theta) \tag{3.80}$$

then,

$$u(Y_{i-1} + \theta - d(Y_i - 3\theta, s_i + 2)) - u(Y_{i-1} - d(Y_i - 2\theta, s_i + 1)) <$$
$$u(Y_i - 2\theta - d(Y_i - 3\theta, s_i + 2)) - u(Y_i - 2\theta - d(Y_i - 2\theta, s_i + 2)) \tag{3.81}$$

Restriction (3.7) and $Y_i - 2\theta > Y_{i-1} + \theta$ imply:

$$d(Y_i - 2\theta, s_i + 2) > d(Y_i - 2\theta, s_i + 1). \tag{3.82}$$

Equilibrium conditions (3.20), (3.19), and (3.21) in turn yield real inflation in all payments $d(Y_i - \theta, t)$, $d(Y_i, t)$, $d(Y_i + \theta, t)$, and $d(Y_i + 2\theta, t)$.

For $t \geq s_i + 3$, the proof is identical to that of $t = s_i + 2$. □

Proof of Proposition 13:

The difference in average dowry payments in caste i across periods $t = s_i$ and $t = s_i - 1$ is equal to:

$$\begin{aligned} D(y_i, s_i) - D(y_i, s_i - 1) &= \frac{1}{3}\{[d(Y_i - \theta, s_i) - d(Y_i, s_i - 1)] && (3.83)\\ &\quad +[d(Y_i, s_i) - d(Y_i, s_i - 1)] && (3.84)\\ &\quad +[d(Y_i + \theta, s_i) - d(Y_i, s_i - 1)]\} && (3.85) \end{aligned}$$

where $D(y_i, t)$ denotes average dowry payments of caste i in period t.

Analogous to the notation of Section 3.5.1, an expression for $d(Y_i, s_i) - d(Y_i, s_i - 1)$ can be written as:

$$d(Y_i, s_i) - d(Y_i, s_i - 1) = f(q(0, Y_i) - q(0, Y_i - \theta)) + k(Y_i) - z(q(1, Y_i) - q(1, Y_i - \theta)) - k(Y_{i-1}) \tag{3.86}$$

where $k(\cdot)$, $f(\cdot)$, and $z(\cdot)$ are increasing in their arguments, and $f(\cdot)$ increases at a faster rate than $z(\cdot)$.

Using the above and equilibrium condition (3.19), the difference in average payments can be rewritten as:

$$\begin{aligned} D(y_i, s_i) - D(y_i, s_i - 1) &= -\frac{1}{3}\{z(q(1, Y_i) - q(1, Y_i - \theta)) + k(Y_{i-1})\}\\ &\quad +\frac{1}{3}\{f(q(0, Y_i) - q(0, Y_i - \theta))| + k(Y_i) -\\ &\quad z(q(1, Y_i) - q(1, Y_i - \theta)) - k(Y_{i-1})\}\\ &\quad +\frac{1}{3}\{f(q(0, Y_i + \theta) - q(0, Y_i)) + k(Y_i) + \end{aligned}$$

$$f(q(0,Y_i) - q(0,Y_i-\theta)) + k(Y_i)]$$
$$-z(q(1,Y_i) - q(1,Y_i-\theta)) - k(Y_{i-1})\} \tag{3.87}$$

Since $Y_i > Y_{i-1}$, a sufficient condition for the above difference to be positive is:

$$2\{[q(0,Y_i)-q(0,Y_i-\theta)]-[q(1,Y_i)-q(1,Y_i-\theta)]\} > [q(1,Y_i)-q(1,Y_i-\theta)]-[q(0,Y_i+\theta)-q(0,Y_i)] \tag{3.88}$$

The restrictions on $q(\cdot)$ listed in Section 3.3 do not insure that (3.88) holds. However, if the above does hold, it can be demonstrated that it is a sufficient condition to insure that average dowry payments increase across all periods $t > s_i$. Condition (3.88) is analogous to restricting the degree of concavity in $q(\cdot)$ for continuous variables. When concavity does hold and the degree of substitutability between caste and income is not perfect, it is reasonable to assume that the marginal gain in quality due to an income increase is lower at higher income levels than at higher caste levels. Condition (3.88) restricts how much lower this rate of increase is. In other words, all dowry payments in period $t = s_i$ are higher than payments in the previous period except for that of the lowest quality groom of income $Y_i - \theta$. Therefore, it is conceivable that average dowry payments actually decrease, due to the existence of these lower payments if the so-called degree of concavity is extremely high. To rule out this unlikely scenario inequality (3.88) is assumed to hold.

Given Proposition 12, the only component of the difference in average dowry payments $D(y_i, s_i) - D(y_i, s_i - 1)$ which is potentially negative is (3.83). For periods $t = s_i + \tau$, $\tau = 1, 2, 3, \cdots$, it can be demonstrated that the potentially negative components of the difference in average dowry payments $D(y_i, s_i + \tau) - D(y_i, s_i + \tau - 1)$ is always greater (less negative) than (3.83) and therefore average dowry payments are increasing across all periods.

This difference for $\tau = 1$ is equal to:

$$D(y_i, s_i+1) - D(y_i, s_i) = \frac{1}{5}[d(Y_i - 2\theta, s_i+1) - d(Y_i - \theta, s_i)] \tag{3.89}$$
$$+\frac{2}{15}[d(Y_i - \theta, s_i+1) - d(Y_i - \theta, s_i)] \tag{3.90}$$
$$+\frac{1}{15}[d(Y_i - \theta, s_i+1) - d(Y_i, s_i)] \tag{3.91}$$
$$+\frac{1}{5}[d(Y_i, s_i+1) - d(Y_i, s_i)] \tag{3.92}$$

$$+\frac{1}{15}[d(Y_i+\theta, s_i+1) - d(Y_i, s_i)] \tag{3.93}$$

$$+\frac{2}{15}[d(Y_i+\theta, s_i+1) - d(Y_i+\theta, s_i)] \tag{3.94}$$

$$+\frac{1}{5}[d(Y_i+2\theta, s_i+1) - d(Y_i+\theta, s_i)] \tag{3.95}$$

Given Proposition 12, the potentially negative components of $D(y_i, s_i+1) - D(y_i, s_i)$ are (3.89) and (3.91). Components (3.89) and (3.91) are greater (less negative) than (3.83) if the following hold:

$$[d(Y_i-2\theta, s_i+1) - d(Y_i-\theta, s_i)] > [d(Y_i-\theta, s_i) - d(Y_i, s_i-1)] \tag{3.96}$$

and

$$[d(Y_i-\theta, s_i+1) - d(Y_i, s_i)] > [d(Y_i-\theta, s_i) - d(Y_i, s_i-1)] \tag{3.97}$$

Similarly, for periods $t = s_i + \tau$, $\tau = 2, 3, \cdots$, sufficient conditions such that potentially negative components of $D(y_i, s_i+\tau) - D(y_i, s_i+\tau-1)$ are decreasing across periods are:

$$[d(Y_i-(l+1)\theta, s_i+\tau)-d(Y_i-l\theta, s_i+\tau-1)] > [d(Y_i-l\theta, s_i+\tau-1)-d(Y_i-(l-1)\theta, s_i+\tau-2)] \tag{3.98}$$

and

$$[d(Y_i-l\theta, s_i+\tau)-d(Y_i-(l-1)\theta, s_i+\tau-1)] > [d(Y_i-l\theta, s_i+\tau-1)-d(Y_i-(l-1)\theta, s_i+\tau-2)] \tag{3.99}$$

for $l = 1, 2, \cdots, \tau$.

Within-caste equilibrium condition ((3.20) yields:

$$\begin{aligned}[d(Y_i-(l+1)\theta, s_i+\tau) \quad - \quad & d(Y_i-l\theta, s_i+\tau-1)] = d(Y_i, s_i+\tau) - d(Y_i, s_i+\tau-1) \\ & -f(q(0, Y_i-l\theta) - q(0, Y_i-(l+1)\theta)) + k(Y_i-l\theta)\end{aligned} \tag{3.100}$$

The same condition implies:

$$\begin{aligned}[d(Y_i-l\theta, s_i+\tau-1)- \quad & d(Y_i-(l-1)\theta, s_i+\tau-2)] = d(Y_i, s_i+\tau-1) - d(Y_i, s_i+\tau-2) \\ & -f(q(0, Y_i-(l-1)\theta) - q(0, Y_i-l\theta)) + k(Y_i+(l-1)\theta)\end{aligned} \tag{3.101}$$

Equations (3.100), (3.101), and restriction (3.3) imply that a sufficient condition for (3.98) and (3.99) to hold is:

$$[d(Y_i, s_i + \tau) - d(Y_i, s_i + \tau - 1)] > [d(Y_i, s_i + \tau - 1) - d(Y_i, s_i + \tau - 2)] \tag{3.102}$$

Equilibrium conditions (3.20), (3.21), (3.18), (3.17) imply that without loss of generality, the difference in dowry payments across periods can be represented by:

$$\begin{aligned} d(Y_i, s_i + \tau) - d(Y_i, s_i + \tau - 1) = \; & d(Y_{i-1}, s_i + \tau) - d(Y_{i-1}, s_i + \tau - 1) \\ & + f(q(0, Y_i - \tau\theta) - q(0, Y_i - (\tau + 1)\theta)) \\ & - z(q(1, Y_i - \tau\theta) - q(1, Y_i - (\tau + 1)\theta) \\ & + k(Y_i - \tau\theta) - k(Y_{i-1} + (\tau - 1)\theta)) \end{aligned} \tag{3.103}$$

Solving backwards from payments in the lowest caste, this difference can be rewritten as:

$$\begin{aligned} & d(Y_i, s_i + \tau) - d(Y_i, s_i + \tau - 1) = \\ & \sum_{j=0}^{\tau} \left\{ \begin{array}{c} f(q(0, Y_{i-j} - (\tau - j)\theta) - q(0, Y_{i-j} - (\tau - j + 1)\theta)) \\ -z(q(1, Y_{i-j} - (\tau - j)\theta) - q(1, Y_{i-j} - (\tau - j + 1)\theta)) \\ +k(Y_{i-j} - (\tau - j)\theta) - k(Y_{i-j-1} + (\tau - j - 1)\theta) \end{array} \right\} \end{aligned} \tag{3.104}$$

Equality (3.104) implies that

$$[d(Y_i, s_i + \tau) - d(Y_i, s_i + \tau - 1)] - [d(Y_i, s_i + \tau - 1) - d(Y_i, s_i + \tau - 2)] >$$

$$f(q(0, Y_i - \tau\theta) - q(0, Y_i - (\tau + 1)\theta)) - z(q(1, Y_i - \tau\theta) - q(1, Y_i - (\tau + 1)\theta) \tag{3.105}$$

The right hand side of the above inequality is positive, given (3.5), and (3.102) is satisfied.

Since the potentially negative components of $D(y_i, s_i + \tau) - D(y_i, s_i + \tau - 1)$ are decreasing across periods and given $D(y_i, s_i) - D(y_i, s_i - 1) > 0$, average dowry payments are increasing across time for a given caste i. □

Proof of Proposition 14:

•(a)

The component of the real change in dowry payments caused by within caste heterogeneity is represented by the second and third lines of expression (3.103). This component, denoted $\Omega(\tau)$, is:

$$\Omega(\tau) = f(q(0, Y_i - \tau\theta) - q(0, Y_i - (\tau+1)\theta)) - z(q(1, Y_i - \tau\theta) - q(1, Y_i - (\tau+1)\theta)) \quad (3.106)$$

Therefore,

$$\Omega(\tau+1) = f(q(0, Y_i - (\tau+1)\theta) - q(0, Y_i - (\tau+2)\theta)) - z(q(1, Y_i - (\tau+1)\theta) - q(1, Y_i - (\tau+2)\theta)) \quad (3.107)$$

Due 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. Equilibrium conditions (3.20), (3.19), and (3.21), imply that

$$d(y_i, s_i + \tau) - d(y_i, s_i + \tau - 1) = d(Y_i, s_i + \tau) - d(Y_i, s_i + \tau - 1) \quad (3.108)$$

for all $y_i \in \{Y_i - \tau\theta, \cdots, Y_i + \tau\theta\}$. Therefore the component of real dowry inflation caused by within caste heterogeneity for all $y_i \in \{Y_i - \tau\theta, \cdots, Y_i + \tau\theta\}$ is equal to $\Omega(\tau)$ of (3.106) □

•(b)

The component of real dowry inflation which reflects heterogeneity in castes below is represented by $d(Y_{i-1}, s_i + \tau) - d(Y_{i-1}, s_i + \tau - 1)$ in (3.103). For periods $t < s_{i-1}$, this component is equal to zero from (3.61). For periods $t \geq s_{i-1}$, this difference is equal to (3.103), 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. Condition (3.108) implies that the component of real dowry inflation which 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 $y_i \in \{Y_i - \tau\theta, \cdots, Y_i + \tau\theta\}$. □

•(c)

The income of bridal fathers affects dowry inflation as the marginal valuation of one grooms

compared to another is greater the higher the income of bridal fathers. That is change in dowry payments across periods of (3.103) 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 $Y_{i-1} + (\tau - 1)\theta$, i.e., 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 disparity across castes. Condition (3.108) implies that the component of real dowry inflation due to the income of bridal fathers is equivalent for all $y_i \in \{Y_i - \tau\theta, \cdots, Y_i + \tau\theta\}$. □

Proof of Proposition 17:

Consider $t = s_i + \tau$, for a given $\tau \geq 1$. The difference in payments which solve (3.20) can be expressed as:

$$d(Y_i - \tau\theta, t) - d(Y_i - (\tau + 1)\theta, t) = f(q(0, Y_i - \tau\theta) - q(0, Y_i - (\tau + 1)\theta)) + k(Y_i - \tau\theta). \quad (3.109)$$

For period $t + 1$, (3.39) holds and we have:

$$d(Y_i - \tau\theta, t+1) - d(Y_i - (\tau+1)\theta, t+1) = f(q(0, Y_i - \tau\theta) - q(0, Y_i - (\tau+1)\theta)) + k(Y_i - (\tau+1)\theta). \quad (3.110)$$

Hence,

$$\begin{aligned} d(Y_i - \tau\theta, t+1) - d(Y_i - \tau\theta, t) &= d(Y_i - (\tau+1)\theta, t+1) - d(Y_i - (\tau+1)\theta, t) \\ &\quad + f(q(0, Y_i - \tau\theta) - q(0, Y_i - (\tau+1)\theta)) \\ &\quad + k(Y_i - (\tau+1)\theta) \\ &\quad - f(q(0, Y_i - \tau\theta) - q(0, Y_i - (\tau+1)\theta)) \\ &\quad - k(Y_i - \tau\theta) \end{aligned} \quad (3.111)$$

Since, $Y_i - (\tau + 1)\theta < Y_i - \tau\theta$, the real wealth effects on dowry inflation are negative. Given that (3.20), (3.19), and (3.21) hold real inflation in all dowry payments $d(y_i, t)$ for $y_i > Y_i - \tau\theta$ is also negatively affected by the wealth effects. □

Proof of Proposition 18:

Consider $t = s_i + \tau$, for a given $\tau \geq 1$, the difference in payments which solve (3.21) is:

$$d(Y_i + \tau\theta, t) - d(Y_i + (\tau+1)\theta, t) = f(q(0, Y_i + \tau\theta) - q(0, Y_i + (\tau+1)\theta)) + k(Y_i + \tau\theta) \quad (3.112)$$

For period $t+1$, (3.40) holds and together with (3.112) implies:

$$\begin{aligned} d(Y_i + \tau\theta, t+1) - d(Y_i + \tau\theta, t) &= +d(Y_i + (\tau+1)\theta, t+1) - d(Y_i + (\tau+1)\theta, t) \\ &\quad +f(q(0, Y_i + \tau\theta) - q(0, Y_i + (\tau+1)\theta)) \\ &\quad +k(Y_i + (\tau+1)\theta) \\ &\quad -f(q(0, Y_i + \tau\theta) - q(0, Y_i + (\tau+1)\theta)) \\ &\quad -k(Y_i + \tau\theta) \end{aligned} \quad (3.113)$$

Since, $Y_i + (\tau+1)\theta > Y_i - \tau\theta$, the wealth effects on dowry inflation are positive.□

Proof of Proposition 19:

Consider $t = s_i + \tau$, for a given $\tau \geq 1$, the difference in payments which solve equilibrium conditions (3.20), (3.19), and (3.21) is:

$$d(Y_i, t+1) - d(Y_i, t) = d(y_i, t+1) - d(y_i, t) \quad (3.114)$$

for all $y_i \in \{Y_i - (\tau+1)\theta, \cdots, Y_i + (\tau+1)\theta\}$. In this case there are no within caste wealth effects as is evident from comparing (3.114) to (3.113) and (3.111).

The across caste wealth effects are seen from equilibrium condition (3.18):

$$d(Y_i - (\tau+1)\theta, t) - d(Y_{i-1} + \tau\theta, t) = f(q(0, Y_i - (\tau+1)\theta) - q(0, Y_{i-1} + \tau\theta)) + k(Y_{i-1} + (\tau-1)\theta) \quad (3.115)$$

The lowest within caste dowry payment $d(Y_i - (\tau+1)\theta, t)$ is increasing in the income of the wealthiest bridal father of caste $i-1$, $Y_{i-1} + (\tau-1)\theta$. Conditions (3.20), (3.19), and (3.21) imply all dowry payments $d(y_i, t)$ are positively related to wealth of the richest bridal father in caste $i-1$, which is increasing in t. □

Chapter 4

Dowry Payments in Pakistan: An Empirical Investigation

4.1 Introduction

As summarised earlier in this thesis, there exists a large body of research aimed at explaining the dowry phenomenon in India. In contrast, to my knowledge, there has been no research pertaining directly to dowry payments in Pakistan and the aim of this chapter is to investigate these payments. An exploration of how dowry payments have evolved through time is not feasible due to limitations of the data; instead I focus on their current role in Pakistan.

The various explanations for the occurrence of dowry can be synthesized into three categories: (1) a transfer of wealth to the groom's household, either to pay for a high quality groom or compensate the family for their superior status; (2) a compensation payment to the groom's household for receiving a bride who is an economic liability; and (3) a pre-mortem inheritance given to the bride. In this investigation, a distinction is made between these three interpretations using a simple theoretical framework. The predictions of these models are subsequently tested using recent data from Pakistan.

The following section briefly outlines the predominant explanations for the existence of dowries. Simple models to illustrate the various roles of dowry payments are provided subsequently. The data used in this study are described in Section 4.4. The method of estimation is given in Section 4.5 after which the estimation results are discussed. Section 4.7 concludes.

4.2 Motivation for Dowry

A woman in Pakistan is entitled by law at marriage to: (i) a dowry and marriage gifts from her parents; and (ii) a dower (*mahr)*, a bridal gift from the groom which is generally intended to provide some insurance for her in the case of divorce (see Patel 1979, Korson and Sabzwari 1984, and Afzal et. al. 1973). Further, Pakistani women have the right to an inheritance and ownership of property. According to Muslim Personal Law (*Shariat*), daughters are entitled to a half of the share which a son inherits from their father. It is noted, however, that the dowry she receives at the time of marriage is usually considered her pre-mortem inheritance, which is typically less than she is entitled to under the law (see Donnan 1988 and Patel 1979).

A naturally related question in the exploration of Pakistani dowries is how this custom differs from those in India. It is important to recall that modern-day dowry payments in India are distinct from the traditional custom of bride-wealth (*stridhan*), a parental gift to the bride (see for example, Paul 1986). The groom could share this gift during the marriage, but ultimately the wife had property rights over its contents. The modern dowry payment, on the other hand, consists of wealth transferred to the groom and his parents from the bride's parents with the bride having no ownership rights over the payment. This modern arrangement is referred to as 'groom-price' and its amount increases dramatically in accordance with the 'desirable' qualities of the groom.[1]

Reports of both increasing dowries (see Sathar and Kazi 1988) and dowers (see Korson and Sabzwari 1984 and Afzal et. al. 1973) in Pakistan do suggest marriage payment inflation, as is the case in India.[2] However, it is unclear whether dowry in Pakistan has prevailed as a transfer to the bride which remains her property throughout the marriage, or whether, as in India, the custom has transformed into a groom-price in which the determinants of the payments are more a function of the characteristics of the groom rather than those of the bride. This chapter addresses this comparison in addition to inquiring if dowry in Pakistan has emerged for another reason.

[1] See, for example, Upadhya (1990), Caplan (1986), Billig (1992), Srinivas (1984), and Bradford (1985) for a discussion of the occurrence of a groom-price in India. See Caldwell et. al. (1983), Rao and Rao (1980), Billig (1992), Caplan (1986), and Hooja (1969) for evidence that the size of the dowry payment correpsond with qualities of the groom.

[2] In efforts to reduce excessive expenditures for weddings, the Dowry and Bridal Gifts Act of 1976 was imposed by the Pakistani parliament. This law placed limits on the value of dowry and dower.

Three categories of interpretation of dowry are listed above in the introduction: the first definition also includes dowry as a medium of hypergamy; that is, when families of lower social status pay a dowry to marry their daughter into a family of superior status.[3] In both conceptions dowry is related to the familial status of the groom and is determined by the groom's status alone or by his relative status among other grooms, (groom-price), or by his households' social status relative to that of the bridal household (medium of hypergamy).

The second interpretation of dowry links the payments to the productivity of women and treats bride-price and dowry payments as opposites. In societies where women are economically productive, a bride-price payment is made to their families to compensate for the loss of a worker. If women do not contribute to household income, dowry is paid to the groom's family as a compensation for an unproductive member. In this case, the primary determinant of dowry is the labour effort of women.

The third definition of dowry is associated with societies in which inheritance flowed to both sons and daughters. In several countries, dowry as a pre-mortem inheritance given to women was written into the constitution, as was traditionally the case in Pakistan. One might expect in such systems that the primary determinant of dowry payments would be the income of the bridal parents.

The aim of the next section is to formally distinguish between these potential roles for dowry payments. It is the mechanism which determines dowry payments in the marriage market which differentiates the varying roles of dowry. In the groom-price model of dowry, brides compete for desirable grooms and payments emerge as prices which solve the marriage matching equilibrium. Alternatively, dowry payments may not function as a market price but rather as the result of negotiations between the two parties of the marriage bargain as in the compensation model. Finally, as a gift from the bridal parents, i.e., the inheritance model, little influence on the size of dowry can be exercised by the groom or his family.

[3]The interpretation of dowry as a medium of acquiring status is a widespread view, see, for example, Tambiah (1973) and Comaroff (1980).

4.3 Models of Dowry

4.3.1 Dowry as a Groom-price

Consider a marriage market of men and women where both are concerned with the quality of their prospective spouse. Potential brides are ranked in terms of their quality b, a combination of their education and parental wealth. It is assumed that better educated brides have wealthier parents, where bridal parental income is denoted I. Grooms are ranked in terms of their quality g, a combination of their education and potential wealth. Higher quality grooms are more educated, have wealthier parents, and household income Y. Denote the respective rankings of brides and grooms as $b_1 \leq b_2 \leq \cdots \leq b_n$ and $g_1 \leq g_2 \leq \cdots \leq g_n$.

Marriages are monogamous where one bride matches with one groom. Dowry payments in the marriage market adjust to satisfy equilibrium conditions such that grooms and brides who are matched do not prefer to be married to anyone else. If all potential brides and grooms are respectively of the same quality, then no marriage payments need occur in equilibrium as it naturally follows that no individual would prefer to be matched with somebody else if all potential spouses are identical. However, if some potential spouses are preferred relative to the others, and brides and grooms respectively have identical preferences over potential spouses, the only stable equilibrium is positive assortative matching, i.e., brides and grooms of similar rank marry.[4] This is because higher ranked brides and grooms can always outbid those of a lower rank since they have wealthier fathers. Denote the dowry payment a bride ranked j offers a groom ranked i by $d^{i,j}$.

In equilibrium, same ranked grooms and brides will marry and equilibrium dowry payments are such that brides of rank i offer to their spouses just enough to outbid lower ranked brides. Taking as given their equilibrium dowry payment, $d^{i-1,i-1}$, the highest payment lower ranked brides will offer a groom of rank i is such that they are indifferent to a groom of their own rank and one ranked above. Therefore the following incentive compatibility condition holds in equilibrium for $i-1$ brides:

[4]This is a well known result in the literature; see, for example, Becker (1991) and Lam (1988) for the case of transferable utility and Gale and Shapley (1962) for the case of non-transferable utility.

$$U(g_{i-1}) - d^{i-1,i-1} = U(g_i) - d^{i,i-1} \tag{4.1}$$

where $U(g_i)$ is the utility of a bride from marrying a groom ranked i.

Grooms do not have incentive to accept the offer from lower ranked brides if the following incentive compatibility constraint holds:

$$V(b_i) + d^{i,i} \geq V(b_{i-1}) + d^{i,i-1} \tag{4.2}$$

where $V(b_i)$ is the utility of a groom from marrying a bride ranked i.

In equilibrium, brides of rank i offer a dowry payment, $d^{i,i}$, such that (4.2) holds with equality. Substituting (4.1) into (4.2):

$$d^{i,i} - d^{i-1,i-1} = [U(g_i) - U(g_{i-1})] - [V(b_i) - V(b_{i-1})] \tag{4.3}$$

This difference in dowry payments is positive if grooms are differentiated more than brides or the marginal benefit to brides marrying is greater than to grooms, reflected by $[U(g_i) - U(g_{i-1})] > [V(b_i) - V(b_{i-1})]$. Both of these implications are very likely in a patriarchal society such as Pakistan where the employment of women is frowned upon and hence women are not only entirely dependent on men, but also are relatively homogeneous in terms of quality compared to men. In equilibrium, higher ranked grooms receive higher dowry payments because of their greater marketable traits. Because the lowest ranked grooms are of the least desirable quality, assume for simplicity that this lowest payment, $d^{1,1}$, is equal to zero and satisfies participation constraints for brides and grooms (i.e., they prefer to marry than remain single at equilibrium prices). Using this simplification, and substituting backwards into (4.3), an expression for dowry payments of i ranked grooms is:

$$d^{i,i} = [U(g_i) - U(g_1)] - [V(b_i) - V(b_1)] \tag{4.4}$$

Dowry payments are increasing in the relative quality of the groom. The status of potential brides could have a deceasing affect on dowry payments only if brides are also a differentiated group. However, if they are relatively homogeneous, positive attributes of brides have meager

reducing effect on dowry payments. The willingness to pay for a high quality groom may increase with the income of bridal parents I although I is also negatively related to dowry payments if it has a strong reducing effect as a status enhancer for brides, i.e., increases b_i. It is important to note that a necessary condition for dowry payments to exist is that grooms are more differentiated than brides in terms of quality, i.e., $[U(g_i) - U(g_1)] > [V(e_i) - V(e_1)]$. If the opposite were true, $d^{i,i}$ of (4.4) would be negative and hence a bride-price would occur in equilibrium.

As mentioned above, dowry payments according to the groom-price model are more likely to occur in the context of groom differentiation and when the benefit to marrying is greater for brides than grooms. Households in rural villages are generally characterised as relatively homogeneous in comparison to urban areas which feature vast wealth differentiation. Moreover, men are typically the central contributors to household income in urban districts and hence dowry payments occurring according to the groom-price model are more likely to flourish in those areas.

4.3.2 Dowry as a Compensation Payment

In the above, dowry is a market price which solves an equilibrium matching problem. Alternative to serving as a price, dowry payments may be the result of a marriage bargain between the two parties. Suppose brides are considered an economic liability if they consume more than they produce or a contributor to household income if they produce more than they consume. Pakistani marriages are arranged by the parents of the groom and bride and are patrilocal, i.e., upon marriage brides join the household of the groom. Traditionally in Pakistan, the custom of *Purdah* restricted a married women to work only within the household. Consequently, in Pakistani society women's work is generally frowned upon and women's labour force participation is not associated with enhanced status (see, for example, Sathar et. al. 1988). Women who are working outside the home are typically the poorest (see, for example, Klein and Nestvogel 1992). In consequence, the majority of women work only within the household. Suppose that working for the groom's household does not require skill and hence all brides are capable of fulfilling the required labour input l independent of their education, e. It is assumed that the demand for female household labour varies by household. In rural areas, this demand may be

determined by the mode of household production and not necessarily by household income. In contrast, in urban areas where the main income earners are men, the demand for female labour is more likely to decrease with the income of the household. Although a bride's education does not directly affect her labour demand, it may contribute positively to other activities such as household decision making.

In the simplest version of the compensation model, a bride's family gains a worker if their daughter does not marry but the family must support her. This net gain is equal to:

$$U^u = (l + e) - c \tag{4.5}$$

where c is their daughter's consumption and $l + e$ is her contribution to the household which increases in her labour input l and her education e. If their daughter marries, they lose a worker and a financial dependent; their net utility is therefore equal to the dowry payment they make to the groom's family:

$$U^m = -d \tag{4.6}$$

Correspondingly, the utility the groom's household obtains from their son marrying is:

$$V^m = (l + e) - c + d \tag{4.7}$$

Assume for simplicity that when their son does not marry the household has a utility equal to zero, that is, $V^u = 0$. Suppose the contribution and cost to keeping a daughter is equal to the contribution and cost from gaining a wife, i.e., $U^u = V^m - d$. In this case, the dowry payment which solves the Nash bargaining game between the two families is equal to:

$$d = c - l - e \tag{4.8}$$

Therefore if a bride consumes more than she produces ($c > l+e$), her parents pay her husband's family a dowry. Alternatively if a bride produces more than she consumes ($c < l + e$) then the groom's family pays the bride's parents a bride-price, i.e., $d < 0$. In this simple representation, dowry occurs if brides are an economic liability. The payment is higher the smaller is the demand for female household labour l and the lower is her education.

Alternatively, suppose the contribution and cost of a woman is different depending on whether she remains in her father's household or joins that of her groom. In principal, across any two households, the demand for female labour and the cost of female consumption may vary. Let l_b denote the female labour demand in a woman's father's household and l_g be that in her groom's household. The costs to financing the livelihood of a woman should be decreasing in the wealth of the household, hence let the cost of female consumption, c, be decreasing in the household income. The solution to the Nash bargaining game in this case is:

$$d = (1-\alpha)[-l_b - e + c(I)] - \alpha[l_g + e - c(Y)] \tag{4.9}$$

where α represents the relative bargaining power of the two families and I is the income of the bridal household and Y is that of the groom. It is assumed here that α is exogenously determined by cultural factors.[5] Since the respective families in this model do not gain from the status of each other in the marriage bargain, there is no reason to consider that the side with higher status (or income) should have greater bargaining power over the other. Given (4.9), d is decreasing in e, I, Y, l_b, and l_g.

The demand for female labour is usually higher and more varied in rural areas compared to urban. This model of dowry would then predict that dowry payments are more varied in rural areas whereas in urban areas they are relatively constant.

4.3.3 Dowry as an Inheritance

Similar to the above formulation, dowries do not constitute a market price, but in this case neither are they the result of a negotiation between two families. Instead, dowry is simply a gift to the bride from her parents. Parents choose e and d to maximize their daughter's future utility. Suppose her utility is equal to the sum of her gain from marrying a groom of a particular quality and her status within the household. A bride's utility from marrying is denoted, by $u(g, l)$ which is positively related to the quality of her groom, g, and related negatively to the groom's household female labour demand, l. A bride's status within the household is equal to $s(d, e)$ where $s(\cdot)$ is increasing in both d and e. We could think of this as the second stage of a

[5] For example, in Hindu tradition, families of the brides, 'wife-givers', have lower status than the grooms' side of the marriage bargain.

two step maximization problem in which the first decision is the amount of resources to allocate to each household member. Alternatively, assume that all daughters are treated equally, and parents wish to ensure them all a utility at least equal to some reservation level $\widetilde{U}$. Bridal parents maximize the following objective function:

$$U(e,d) = u(g,l) + s(d,e) - \widetilde{U} \tag{4.10}$$

subject to the budget constraint:

$$pe + d \leq I \tag{4.11}$$

where p is the price of her education and I is the family income designated to her.

In this representation of dowry payments, the main determinant of d is bridal parents income I. If e and d are complements in determining a bride's status, then d is positively related to e; alternatively if they are substitutes, then d is negatively related to e. The attributes of the groom and his household, represented by $u(g,l)$ are essentially irrelevant to the determination of dowry. Possibly, if their daughter does marry into a high quality household, they may substitute away from her dowry into the dowry of her less fortunate sister in order to guarantee both daughters $\widetilde{U}$. In this case, attributes of the groom's household may be influences, but factors that increase a bride's utility likely diminish the amount of her dowry, i.e., the positive determinants of g are related negatively and l positively.

Generally speaking, in the inheritance model of dowry, dowry payments are either independent of or negatively related to the quality of the groom's household whereas they are related positively to the quality of the bride and her household. The exact opposite is true in the groom-price model of dowry payments where the quality of the groom and his household is the most important positive determinant of dowry payments, and the quality of the bride and her family is either irrelevant (if brides are relatively homogeneous in terms of quality) or has a decreasing effect on dowries. Alternatively, in the compensation model of dowry, high quality families of both grooms and brides correspond to lower dowry payments since the costs of brides (considered economic liabilities) are lower for wealthier households.

Because rural areas are typically more credit constrained than urban areas, we would expect that on average, dowry payments according to the inheritance model are higher in urban areas.

According to the groom-price model of dowry, they should also be prominent in urban areas due to greater wealth differentiation. In contrast, according to the compensation model of dowry, payments should be relatively constant in urban areas, and cease to exist amongst the very wealthy for whom the lifetime consumption of a new bride is not an economic liability.

4.4 Data

The household level data used in this study are from the Living Standards Measurement Study (LSMS) of Pakistan, collected in 1991 under the direction of the World Bank and the Government of Pakistan. The sample is divided equally between Pakistan's urban and rural areas, with provincial shares approximating population shares. The data contains detailed information on the education, income, and all labour activity of individuals. Approximately 4700 households were surveyed, however information on dowries was requested only from females who had married into the household in the past five years. This leaves a female sample eligible for the dowry question of roughly 1300. Approximately 800 of those females responded to the dowry question and of those, roughly 700 received a dowry from their parents, and reported the value and contents of the transfer.

The means and standard deviations of the variables used in the analysis of the dowry sample, (those women who responded to the dowry question,) are listed in tables 4.5 to 4.7 in the Data Appendix. There are twenty observations which were excluded from the sample. Six of these are considered outliers: one reported a dowry equal to approximately 80 times the mean, and 22 standard deviations above the mean; another listed hours of work per week equal to 560; one had a household income equal to roughly 150 times the mean and 25 standard deviations above the mean; and three others had a household income equal to zero. The remaining fourteen eliminated observations are brides who came from outside of Pakistan to marry.[6] These marriages could have been arranged by families to re-establish lost connections or for another reason. In any case, the implications of these arrangements on marriage payments is unknown and likely not a random selection process. Because it is impossible to uncover the reasons for this scenario from the data and to focus solely on the custom of dowry payments in

[6] The majority of these brides migrated from India; a few others from Bangladesh, Afghanistan, and elsewhere.

Pakistan amongst the people of Pakistan, these brides are not considered.

It can be the case that an individual works in more than one type of activity. For example, if an individual does work in family production, she or he may also work outside the home for a wage. The average hours per week in each activity reported in the tables are conditional on individuals working in this activity. Monthly individual incomes of the bride and groom are only their earnings from wage labour, and the reported values are conditional on their working outside the home.[7] Annual household incomes, on the other hand, do include revenue from a family enterprise in addition to total income from all family members. The income of the bride's parents is not available in the data as only the groom's household, where the bride lives, is surveyed. However information on each woman's parents' education, occupation, and geographical location is known. I subsequently estimated the household income for all households in the entire sample of the data (3000 households once eliminating those with household heads and their spouses of an unreasonably young age to be parents of an adult child) using education, occupation, and geographical location of the household head and his spouse as the determinants of income. Coefficients from this estimation were used to form the predicted values of a bride's parents' annual income.

Almost all individuals, 95%, in the sample are Muslim. The majority of families live in extended households, only 13% form nuclear households. This greatly contrasts with the total LSMS sample, where over half of the households are nuclear. This is expected, however, given the selecting criteria of the dowry sample which requests information only from women who married *into* the family in the past five years. The probability that this event occurred is substantially higher in extended households where, by definition, the number of potential adult couples surpasses the single adult couple in nuclear households. Household type is controlled for in the estimations.

The distribution of the dowry sample across provinces and between rural and urban areas very closely matches that of the entire LSMS sample (discrepancies of at most 7%). The survey defines urban areas as all settlements with a population of 5000 or more in 1981. Table 4.4 of the Data Appendix lists a few descriptive statistics from the entire LSMS sample which pertain

[7] All income variables and the value of dowries are in 1991 rupees. There are approximately 25 rupees to the dollar.

to the different regions under study. The most developed of the four regions is Sindh followed by Punjab (the most populated region). Balochistan and the North West Frontier Province (N.W.F.P.) are significantly less urbanized than the former two regions. Balochistan has the lowest literacy rates, population, and employment in the non-agricultural sector, and the highest infant mortality rates. Additional regional characteristics pertaining to gender differences are listed in Table 4.1 (in the Data Appendix) and calculated using the entire LSMS sample (36,000 individuals). In the survey men and women were both asked how many daughters and sons they would like to have if they could start their families over again. The relative preference for daughters compared to sons for women and men are listed below. Using population numbers, a 'marriage squeeze' variable is constructed which is equal to the ratio of females of marrying age (15 to 20) to males of marrying age (20 to 25); a value greater than one reflects an excess supply of brides. The proportion of women who work outside of the home for a wage is also reported. In general women have a higher relative preference for daughters than men. Interestingly, this is not the case in Balochistan which is the least urbanised of the regions and inhabited predominantly by tribal peoples. This may correspond to the often cited notion of a higher relative status for women in tribal culture; however, it is unlikely coincidental that the female population is quite low in comparison to the other regions, as reflected in the marriage squeeze variable (i.e., there is an equal number of brides and grooms although brides are younger in age).

A very large proportion of the sample, 87%, paid a dowry. The region of Balochistan is an exception where only 48% of brides' parents gave a dowry. Dowry payments are always positive (there was no question asked about transfers from the groom's side, i.e., dowers or bride-prices), and the variation in the payments is substantial, (the standard deviation is roughly double the mean). Tables 4.2 and 4.3 list the averages and percentiles of absolute dowry payments and as a proportion of household income. In general, average dowry payments are significantly higher than median dowry payments, thus reflecting that only a small proportion of families give very large dowries. Dowry payments are higher in urban areas; however as a proportion of grooms' household income they are greater in rural areas. Dowry payments are larger in the more developed regions of Pakistan, particularly in Punjab.

The average literacy rate for brides in the dowry sample is 41% in urban areas and only

14% in rural areas. The literacy rate for grooms is relatively greater than brides in rural areas (49%) compared to urban areas (69%). On average 27% of brides work in an income generating activity where they generally engage in household production and only 6% work outside the home. This participation rate for women is significantly higher in rural areas, 42%, than in urban areas where only 11% of women contribute directly to household income. Approximately 71 % of the families have household production where farms are the principal means of production in rural areas and non-agricultural enterprises are predominant in urban areas. Women are more likely to work on family farms than in businesses. Household income in the sample is higher in urban areas than in rural where median incomes in urban areas are approximately twice the size of rural incomes. Similarly, the average income of grooms is roughly twice as high in urban areas than in rural areas.

Correlations between the respective characteristics of brides are listed in tables 4.8 and 4.9 and those of grooms are recorded in tables 4.10 and 4.11. As would be anticipated, the education and age of marriage of brides and grooms is strongly correlated with the education and income of their respective parents. It appears that the education of mothers has a greater influence on that of their daughters than sons. Highly educated brides are more likely to stay at home (as opposed to engaging in an income generating activity), although if they do work, it is usually in the non-agricultural sector. For the most part, brides who have wealthy parents do not work at all aside from work within the home. Well educated grooms have higher earnings and are engaged in the non-agricultural sector.

To uncover patterns of mating, tables 4.12 and 4.13 list correlations between characteristics of grooms and brides. There is strong positive assortative matching (individuals of similar traits marry) with respect to age at marriage and education of spouses. A bride who does not work for income is typically married to a wealthy, highly educated groom who does not work in the agricultural sector. Additionally, the income of brides is negatively related to all positive traits of grooms thus confirming that women generally work outside of the home only do so because the household faces severe financial difficulties. Related correlations yield that a bride who works in family production or outside of the home is likely to be married to a groom who works in family production or agriculture. Although brides residing in wealthy households typically do not participate in an income-generating activity, they do, however, work within the home

and these labour hours are only slightly negatively related (a correlation equal to -0.11) to the income of the household.

4.5 Estimation

I examine the various model of dowry through estimating two main equations: the probability that a dowry is paid, and the value of dowry. The probability that a dowry is paid is represented by the following:

$$P = \beta_P X_P + \varepsilon_P \tag{4.12}$$

where P is equal to one if a dowry is paid and equal to zero otherwise. The vector X_P contains regional dummies and dummies to reflect varying household types, (such as nuclear), to proxy for customs and traditions which may or may not allow for dowry to be transferred. The vector also contains variables which represent the economic and demographic environments such as a marriage squeeze ratio, female labour force participation rate, and average household income. These variables enter into the estimation since phenomena like modernisation and population growth can lead to the existence of the dowry custom. As has been discussed earlier in the thesis, a transition from bride-price to dowry has occurred in parts of South Asia.

The value of dowry, denoted D, is represented by the following equation:

$$D = \beta_D X_D + \varepsilon_D \tag{4.13}$$

The vector X_D contains predominantly individual and family characteristics which pertain to the determinants of dowries in the models of Section 4.3. These include the education, income, parent's income, and labour activity of brides and grooms and also the relative status of individuals. The inheritance model of dowry predicts a negative relationship between dowry and the quality of grooms and their households and a positive one with respect to the quality of brides and their families. The opposite relationships are predicted by the groom-price model. In the compensation model, high quality families of both grooms and brides correspond to low dowries. The labour input of brides is negatively related to dowry payments in the groom-price and compensation models and positively related in the inheritance model.

Alternative to the above, it could be assumed that $X_P = X_D$ and the two equations (4.12) and (4.13) would be estimated as one equation. In such a tobit estimation, it would be implicit that a zero dowry payment is equivalent to no dowry transferred. This procedure seems somewhat restrictive given that the absence of the dowry custom can be a separate phenomenon from merely paying a very low dowry. In other words, there likely exists a type of switching mechanism from the custom of no dowry to paying dowry before dowries are positive. To address this issue, the estimations of the event that a dowry is paid and the value of dowry are analysed independently.

4.5.1 Sample Selection

Before estimating equations (4.12) and (4.13), there are sample selection issues to address. In particular, there are two selection processes which affect the sample of women who paid a dowry: first, not all women eligible for the dowry question responded, and second, some who did respond did not pay a dowry. The latter selection rule is represented by equation (4.12) and the former is as follows:

$$R = \beta_R X_R + \varepsilon_R \tag{4.14}$$

where R is an index function such that $R > 0$ if an eligible women did respond to the dowry question and $R \leq 0$ otherwise. It is most plausible that women did not respond to the dowry question principally because of confusion with respect to the eligibility criteria. That is, women who married recently answered the question but those who married earlier, but were eligible, did not. In essence, the selection process excludes some women who married earlier.

Since the aim of the chapter is to investigate the role of dowry payments in present-day Pakistan, that some women who married earlier were omitted from the sample should not bias the estimates. It may be the case, however, that women did not respond to the dowry question because their parents did not give a dowry. This is perhaps suggested by the fact that regional variation is a determinant of brides' response rate. This follows because the incidence of dowry is plausibly a function of social norms which vary across provinces, whereas confusion with regard to the eligibility criteria is less likely to vary by region and more likely to be individual specific. In this scenario the two selection processes are not independent. To this end , the

inverse Mills' ratio from a regression of the response rates, equation (4.14), is computed and enters into the estimation of the probability of paying a dowry, equation (4.12). The year each female married is used to identify the selection rule into the dowry sample, i.e., the probability that an eligible woman answered the dowry question. It is possible that the custom of dowry has changed through time, and that a retrospective survey on dowry could capture some of these effects. However, because the time period is so short, i.e., five years, it is unlikely that changes in the custom of dowry which may have occurred over a substantial length of time, would be reflected during those five years and thus significantly affect the estimations of (4.12) and (4.13).

An estimation of the value of dowry should only be conditional on the fact that a dowry payment was received, as it is only the dowry-receiving part of the bridal population that is of concern. Therefore, that brides who were not given a dowry are excluded from the sample should not bias estimates of the value of dowry. The estimation of the value of dowry in the next section is therefore considered independent of the sample selection rule that a dowry is paid, represented by (4.12).[8] The dowry sample, may however be biased by the fact that some eligible women who paid a dowry did not answer the dowry question. As a result, the inverse Mills' ratio from the regression of the response rate, equation (4.14), is computed and enters into the estimation of the value of dowry.

4.5.2 Endogeneity

Given the theoretical framework of Section 4.3, possible determinants of dowry are variables reflecting the quality of potential spouses and their families and the work activity of brides. Several of these variables are, however, not necessarily exogenous. More specifically, the education and work activity of brides are such variables. Parents of girls plausibly must decide when their daughters are young, whether to invest more in their daughter's education, or save for her dowry. These variables are then simultaneously determined, although the investment in education occurs prior to the transference of dowry. The labour input of women could either be predetermined before marriage according to characteristics of the groom's household,

[8]It may be worth noting that an estimation conditional on this probability (paying a dowry), using the Heckman procedure, does not alter the results and the inverse Mill's ratio is not a significant determinant of the value of dowry.

or be the result of negotiations during the marriage bargain. That is, bridal parents bargain to lower their daughter's labour input by offering a high dowry payment. Or alternatively a large dowry may confer higher status upon a bride within the household of her in-laws and as a result she is required to work less. Hence a bride's labour input is probably endogenous to dowry determination.

To address these problems of endogeneity, regressions in which the education of brides and their labour input are the dependent variables are run prior to the dowry estimations. Additionally, it is also the case that the labour input of brides is in turn related to their education and because we are considering a marriage market, the direction of causality is again not straightforward. On the one hand, a highly educated bride may be able to bargain for less labour hours within the household. On the other hand, it may also be the case that the labour input of brides is predetermined according to household characteristics, and households with a low female labour demand attract highly educated brides. To this end, an equation for brides' education, E, is first estimated and in turn the predicted values from this regression enter into the estimation of the labour activity of brides. The education of brides is represented by the following:

$$E = \beta_E X_E + \varepsilon_E \tag{4.15}$$

The vector X_E contains the literacy rate of the area where a bride is from and personal characteristics of her parents; in particular their income and her mother's education since (as seen from the correlation results) a mother's education has a greater influence on her daughter's education relative to her son's.

The literacy rate for women in the area where she is from is used to identify the education effect in other equations. Presumably, parents are more likely to educate their daughters in an area where female literacy is high. Since 44% of brides have migrated, for almost half of the observations this literacy rate is distinct from the one in the areas where the couple resides. The average literacy rate is computed using the regional variation in the larger LSMS sample. This produces 50 different literacy rates to correspond to the birth place of brides. Of the brides who did migrate, 4% are from areas in Pakistan which were not included in the larger sample, the literacy rate for this region was predicted from the 1981 Pakistan Census using rates for

1981 and 1991 from other districts in the vicinity.[9]

The number of children that a bride has and the total number of female household members are used to identify the effect of bride's labour input. Incidentally, neither of these variables are strongly correlated with household income (0.02 and 0.16 respectively). The total hours worked by brides, H, are represented by the following equation:

$$H = \beta_H X_H + \beta_{HE} \widehat{E} + \varepsilon_H \tag{4.16}$$

where $\widehat{E}$ is the predicted value from the estimation of equation (4.15). The vector X_H includes the female labour force participation rate, type of household, number of female household members, number of children, and household income. Since a bride's total labour value includes caring for the children, we would expect that her total labour hours are positively related to the number of children she has. If a family uses female labour in household production, it is likely that the demand for individual female labour is lower the greater the total number of females in the household.

As discussed earlier, there is an additional status component to female labour, that is, women who work for income are considered of lower status. To address this issue, a probit estimation of the probability that a bride works in an income-generating activity is also evaluated and depicted as follows:

$$W = \beta_W X_W + \beta_{WE} \widehat{E} + \varepsilon_W \tag{4.17}$$

where W is an index function such that $W > 0$ if a bride does work in an income-generating activity and $W \leq 0$ otherwise. The vector X_W contains the female labour force participation rate, type of household, number of female household members, number of children, and household income.

An alternative approach to estimating H and W is to separate the hours worked inside the home from those contributing to an income-generating activity. However, the restriction of summing the two types of hours together in a regression on the value of dowry is accepted using an F-test and the predicted probability that a bride contributes directly to household income

[9] Ideally data from 1981 would better correspond to the literacy rate when brides in 1991 were of school age. However, given present limitations estimations using such data is infeasible.

is included into the estimations instead.[10]

As a result of the above discussion, the main estimating equations of (4.12) and (4.13) are better represented by:

$$P = \gamma_0 X_P + \gamma_1 \lambda_R + \gamma_2 \widehat{E} + \gamma_3 \widehat{H} + \gamma_4 \widehat{W} + \varepsilon_P \tag{4.18}$$

and

$$D = \alpha_0 X_D + \alpha_1 \lambda_R + \alpha_2 \widehat{E} + \alpha_3 \widehat{H} + \alpha_4 \widehat{W} + \varepsilon_D \tag{4.19}$$

where λ_R is the inverse Mills' ratio from an estimation of equation (4.14) and $\widehat{E}$, $\widehat{H}$, and $\widehat{W}$ are the predicted values from the estimations of (4.15), (4.16), and (4.17) respectively.

4.6 Results

4.6.1 Responded to Dowry Question

The results of a probit estimation of (4.14), the probability that an eligible female answered the dowry question, are listed in Table 4.14 of the Estimation Appendix. The LSMS surveys are administered such that female interviewers conduct the interviews with female members of the household. Thus, information about the status of women and the various activities they undertake is obtained directly from the women themselves rather than from the male members of the household. Given that the response rate of the general female questionnaire is almost perfect, it is probably not the case that women did not respond to the dowry question because of their status within the household which means that variables which reflect the status of women relative to their husbands should not influence brides' decision to respond to the dowry question. Individual traits of the eligible females may alter the response rate since it is conceivable, for example, that lower educated women were less likely to understand the eligibility criteria. The results show, however, that individual characteristics of both grooms and brides are insignificant determinants of the response rate. Variables which determine location enter to proxy for a social custom that may prohibit women from answering the dowry question for fear of embarrassment, or alternatively because confusion with respect to the eligibility criteria was more severe in

[10] The F-statistic approximates zero and hence the restriction is accepted at all levels of significance.

particular regions and these regional dummies do alter the response rate significantly. From the results, it is clear that years of marriage is a most important determinant of whether or not a woman responded. The dummy variables representing the number of years married before the survey year (1991) are negatively related to whether a female responded, that is, those females married earlier (i.e., for more years) were less likely to respond to the dowry question hence providing support for the conjecture that the lack of response was caused by confusion over the eligibility criteria.

4.6.2 Bride's Education

The results from the estimation of a bride's education, equation (4.15), are reported in Table 4.15 of the Estimation Appendix. Aside from the literacy rate of the area where a bride is from, personal characteristics of her parents also enter, in particular their income and her mother's education since (as seen from the correlation results) a mother's education has a greater influence on her daughter's education relative to her son's. As would be expected, the main determinants of a woman's education are her parents income, her mother's education, and the female literacy rate. Being from a rural area is an insignificant determinant, once controlling for female literacy in the region. Higher order terms of bride's parents income enter negatively and insignificantly. To better illustrate the relationship between parents' income and their daughter's schooling, the predicted values of bride's education are computed for varying levels of parental wealth using the coefficients from the estimation and average levels of all remaining variables. This function is plotted in Figure 4.1 and we see that the relationship is linear. Therefore at higher levels of wealth, it seems that parents continue to invest in their daughter's education.

4.6.3 Bride's Labour Input

There is an important distinction between women working in an income-generating activity and those who only work within the home. Perhaps the critical difference is manifested in the social status associated with the two activities. On the other hand, in poorer families, women who also contribute to the household income in the case of necessity could be highly valued in the marriage negotiations. In the analysis, the hours of work in these two types of activities are not separated to concur with the compensation model; however, to isolate

the status component of female labour, the probability that a bride contributes directly to household income is considered.

The results from a probit estimation of the probability that a bride works in an income-generating activity , equation (4.17), are listed in Table 4.16 in the Estimation Appendix. The estimation includes the female labour force participation rate, i.e., the proportion of women who earn a wage outside of the home, in the area where the bride resides. This variable is computed using the regional variation of the entire LSMS sample (36,000 individuals) which produces 300 possible values corresponding to the different sampling locations. This labour force participation rate turns out to be a significant and positive determinant of whether or not a bride works in an income-generating activity. As would be anticipated, when the family has household production, either a family farm or business, a bride is significantly more likely to contribute labour to the enterprise. The number of female household members, household income, and the education of the bride all have negative coefficients and enter the estimation significantly. Residing in a rural area is positively related to the probability that a bride contributes to family income but is insignificant.

A tobit estimation of brides total weekly hours of labour, equation (4.16), includes the same independent variables.[11] From the results reported in Table 4.17, we see that the determinants of brides total labour are different from those which influence her decision to work in an income-generating activity however. In particular, the number of children a woman has is significantly and positively related to her labour hours. The other important determinants are household income and the number of female members which, similar to above, are negatively related to the bride's labour input. Additionally, brides work more hours if the family has a farm. The remaining variables enter into the estimation insignificantly. It may be worth noting, however, that when the two types of labour hours are separated, the coefficients of a bride's education and the labour force participation rate have opposite signs in the independent estimations. That is, brides' education is related significantly and positively to their household labour and the labour force participation rate enters negatively and significantly. In an estimation of brides' labour hours into an income generating activity, the opposite relationships ensue.

[11]The tobit model estimated is a Type 1 tobit according to Amemiya taxonomy. It is estimated using the TOBIT command in STATA.

Recall from the previous section that the predicted values from the above probit and tobit estimations, represented by $\widehat{W}$ and $\widehat{H}$ respectively, will enter into the estimations of the probability of whether a bride receives a dowry, equation (4.18), and the value of dowry, equation (4.19). The predicted labour hours from the tobit estimation which are negative were assigned to zero for the estimations.

4.6.4 Dowry Paid

The results from a weighted least squares estimation of the probability of a bride paying a dowry, equation (4.18), are listed in tables 4.18 to 4.20 in the Estimation Appendix. In each case an unweighted linear probability model was initially estimated, from which the predicted values of the dependent variable where used to compute the weights for the subsequent regression.[12] The inverse Mills' ratio from the estimation of the first selection rule, of whether or not a bride responded to the dowry question, is included in the estimation. Four provincial dummies enter into the estimation to be a proxy for variation in social custom which may or may not allow for dowry to be transferred. Additionally, the female labour force participation rate, the ratio of potential brides to grooms, average household income, and the relative preference for daughters of both men and women are included, all of which vary by geographical location. As mentioned above, computing these variables from the larger LSMS sample (approximately 36,000 individuals) produces 300 values according to the different sampling locations. Variables which reflect the quality of grooms and brides and their respective households are included to test for the possibility that dowry payments are transferred only amongst families highly positioned in society. Since dowries may occur only in households with particular work patterns between the men and women, the labour activities of brides and grooms are considered. Finally, variables which may affect marriage customs and therefore dowries also enter the estimation; these include whether or not the couple form a nuclear family and if the bride migrated for

[12]The weights used are given by $w_i = [\widehat{y}_i(1 - \widehat{y}_i)]^{\frac{1}{2}}$, where $\widehat{y}_i$ is the predicted dependent variable from an unweighted estimation of the linear probability model. For some observations the predicted probability exceeded one (by at most 0.2) and in these cases the predicted value was assigned to 0.99 for the estimation. This procedure decreased the average predicted probability by at most 0.009. There does not appear to be a single predictor which is causing these very high probabilities. Since the average probability of paying a dowry is very high, at 87%, there is substantial scope for higher values of the education and income levels to perfectly predict the occurrence of dowries.

marriage.

The inverse Mill's ratio from the regression of the response rate to the dowry question generally enters positively and significantly into the estimation. In other words the probability of answering the dowry question is correlated with the probability of paying a dowry. This suggests that, it is in fact the case that women did not respond to the dowry question because they did not pay a dowry. Therefore, the low response rate is representative of more than confusion with respect to the eligibility criteria. It should be noted that the significant determinants of the probability that a dowry is paid all remain significant when the inverse Mill's ratio is omitted from the estimation.[13]

Provincial variation is an important determinant of whether a dowry was received at marriage or not. The excluded category is the province of N.W.F.P. As mentioned this region and Balochistan are the poorest regions of Pakistan, with the lowest literacy and female labour force participation rates, and smaller populations.[14] Living in Balochistan in particular significantly lowers the probability that a bride receives a dowry whereas such payments are more prominent in Sindh. The region of Balochistan is populated principally by tribal groups whereas the degree of ubanisation is highest in Sindh.[15] It is interesting to note, that these results echo conclusions elsewhere in the literature on marriage payments where typically the custom of dowry is found in societies with wealth differentiation whereas bride-price is found in those which are relatively homogeneous, agricultural, and tribal.[16] This data does not contain information on bride-prices but the low occurrence of the dowry custom in Balochistan is consistent with general consensus.

Curiously, of all the variables which vary by geographical location, only the preference for daughters by men is a significant determinant of whether or not brides receive a dowry. This variable enters into the estimation positively whereas the preference for daughters by women enters negatively but is insignificant. This relationship is independent of the income effect,

[13]The coefficients on the significant variables are altered by on average one half of a standard error, (no parameter estimates changed by more than 0.8 of a standard error), when the inverse Mill's ratio is included in the estimation.

[14]See Blood (1995) for a country study of Pakistan. See also Klein and Nestvogel (1992) for an analysis of women in Pakistan.

[15]See Blood (1995).

[16]See Goody (1976), Harrell and Dickey (1985), Gaulin and Boster (1990), and Jackson and Romney (1973) for the association between dowry and wealth differentiation. See Goody and Tambiah (1973) for a discussion of brideprice.

where generally it is believed that there is less of a male gender bias in higher income areas since the average income in the area is also included in the regression. Additionally, the relative population of females is controlled for by the marriage squeeze variable.

Brides who migrated for marriage are significantly more likely to receive a dowry. From the total number of brides who migrated, 92% did so for the purposes of marriage. Of those who migrated for this reason, 44% went from rural areas into rural areas, 28% from rural areas into urban areas, 23% from urban areas into urban areas, and the remaining 4% moved from urban areas into rural areas. When these different possibilities enter into the estimation separately, the only one that is significant is brides migrating from one rural area into another. This tentatively rules out the importance of brides moving to wealthier regions, i.e., urban areas, to marry into families of superior status. One explanation for this result perhaps lies in the traditional custom of cross-cousin marriage in Pakistan, where kinship groups are likely to reside within close proximity. There is evidence that this custom is on the decline; however, in some localities it remains an influence in the marriage selection process, especially in rural areas.[17] Dowry payments have a particular role in the reciprocity relationships embedded in this traditional institution and hence are more likely to occur where the custom is practiced.[18]

Surprisingly, household income of the groom's family is negatively related to the probability of receiving a dowry and an insignificant determinant. However, this result changes when lower and higher order terms are included in the regression where lower order terms enter positively and higher order terms are negatively related and are significant. This relationship persists in both rural and urban areas. Grooms' income follows a similar pattern. The income of bridal parents seems to have the opposite effect on the probability that they paid a dowry but is similarly insignificant. That is, lower order terms enter into the estimation negatively and higher order terms are positively related. To see more clearly the relationship between the occurrence of dowry and the income of brides' and grooms' households, the probability of receiving a dowry at various income levels is computed using the coefficients from the weighted least squares estimation (when first and second order income terms are included) and weighted average levels of all remaining variables. The probabilities for varying levels of grooms' household

[17] See, for example, Korson (1971) and Pastner (1979) and (1981).
[18] See, for example, de Munck (1990), Donnan (1988), and Eglar (1960).

income are plotted in Figure 4.2 where we see that although household income may appear negatively related, the quadratic relationship is upwards sloping and linear. Unexpectedly, the relationship between groom's earnings and the probability their wives pay a dowry is essentially negative as seen in Figure 4.3. Although the graph is somewhat concave, the relationship is downward sloping after income levels which are lower than the mean (approximately equal to 1000). On the other hand, Figure 4.4 reveals that the probability of parents given their daughter a dowry is increasing for wealth levels below the mean after which the probability decreases.

The education of grooms, on the other hand, is clearly a significant and positive determinant. A highly educated groom is more likely to be married to a bride who receives a dowry. Higher levels of education have greater importance in urban areas compared to rural. Neither, a bride's education nor her labour input seem to affect her probability of receiving a dowry from her parents although when urban and rural differences are accounted for, if a bride works in an income-generating activity in urban areas she is less likely to receive a dowry. When a bride joins a nuclear family she is less likely to receive a dowry although this is an insignificant determinant. Nonetheless, given that the selection procedure over samples extended households, this may be a more important determinant than the estimation results reveal. The main concern is that dowry may function differently within nuclear households compared to extended households, particularly because the formation of the former is usually considered a sign of modernsiation, or the transformation into a more modern family structure. However, performing a Chow test using the divided sample between nuclear and extended households in the estimation of the value of dowry, it is not possible to reject the hypothesis that the two regressions are the same.[19]

4.6.5 Value of Dowry

The results from the regressions on the value of dowry, equation (4.19), are listed in tables 4.21 to 4.26 in the Estimation Appendix. The central components of the estimations are characteristics which pertain to the determinants of dowries in the models of Section 4.3. These include the education, income, parent's income, and labour activity of brides and grooms. Not only are these the traits which are potentially important in absolute terms, but it is also possible that

[19]The F-statistic is equal to 1.20 and is less than the critical value at all significance levels.

their relative status affects dowry payments. To this end, again using the entire LSMS data set (36,000 individuals), the average male income (from men within the appropriate range of ages), average education level of women and household income by geographical location are calculated which produces 300 different values for each of these variables. Table 4.23 pertains to estimations when average traits are subtracted from individual traits to reflect the relative status of spouses. An additional consideration is that the status difference between the bridal family and that of the groom. To this end, Table 4.25 includes brides' household income subtracted from grooms' household income. Provincial dummies as well as variables which vary by geographical location are also considered and individual traits interacting with an urban dummy variable.

The inverse Mill's ratio from the regression of the response rate to the dowry question generally enters positively and insignificantly into the estimation. It should be noted that the significant determinants of the value of dowry remain significant when the inverse Mill's ratio is omitted from the estimation.[20]

The groom's household income is a positive and significant determinant of the value of dowry. It must be noted, however, that when provincial dummies are also included into the estimation this significance is lost. On the other hand, higher and lower order terms are always significant determinants. In particular, first order terms are positively related to the value of dowry whereas second order terms are negatively related. Again, to better illustrate the relationship between groom's household income and the value of dowry, predicted dowries are computed for varying levels of household using the coefficients from the estimation (when higher order income terms are included in the regression) and average levels of all remaining variables. This function is plotted in Figure 4.5 and we see that the relationship is linear. As is evident from Table 4.24, the negative effect of higher order terms and the positive effect of lower order terms are both larger in rural areas compared with urban areas.

The income of grooms is a significant positive determinant of the value of dowry even when regional variation is considered. The same is true for the relative status of grooms and the importance of both the absolute and relative status of grooms is greater in urban areas in

[20]The coefficients on the significant variables are altered by on average less than one half of a standard error when the inverse Mill's ratio is included in the estimation.

comparison to rural. The significance of grooms' income is lost when higher order terms enter which are also positively related and greater in urban areas but insignificant. As was the case with household income, when plotted, the relationship between the value of dowry and the income of grooms is linear, as depicted in Figure 4.6.

Correspondingly, the education of grooms is positively and significantly related to the dowry of their brides. This relationship is increasing; that is, higher levels of grooms' education enter into the regression more significantly in comparison to lower levels. The positive impact of grooms' income is greater in rural areas compared to urban. This relationship suits the groom-price model of dowry payments where potential grooms are liable to be more differentiated in terms of education in rural areas and distinguished by their income in urban areas where the opportunity for grooms to earn their own living, i.e., independent of household income, is greater.

Bridal parents' income is also a positive and significant determinant of their daughters dowries. In contrast to grooms' household income, higher order terms of bridal parents' income are positively related to the value of dowries and most significant. In the case, plotting the predicted value of dowry against varying levels of brides' parents' income reveals a convex relationship, as illustrated in Figure 4.7. Again, contrary to the grooms' side, the positive effect of these higher order terms on dowries are greater in rural areas. Interestingly, when the relative status of brides' families, with respect to average household income, replaces the absolute value of brides' parental wealth in the regression the sign of the coefficient is the opposite, i.e., negative. This result is particularly significant in urban areas and exactly supports the groom-price model of dowry.

The relative status of the bridal family with respect to that of the grooms enters significantly into the estimation only when regional dummies are excluded from the regression. The sign on this term does support the hypergamy hypothesis of dowry payments; that is dowries are higher when the groom's side is of superior status to that of the bride. Given the significance of the result, however, it seems that it is the groom-price model which is most pronounced.

The work activity of grooms is in general an irrelevant component of dowries and similarly for brides. On the other hand, the education of brides enters significantly and is positively related to their dowry payment. The significance of this relationship is lost, however, when

regional variables enter into the estimation. Additionally, when relative quality is considered and the average education of brides is subtracted from that of brides, the relationship is also insignificant. The importance of brides' education is much less in urban areas compared to rural.

Finally, dowry payments are highest in the province of Punjab. All other variables which vary according to geographical location, such as preference for daughters, the relative supply of potential brides, female labour force participation, and average household income all enter into the estimation insignificantly.

The results from the data seem to support the groom-price model of dowry. This model of dowry payments seems more prominent in urban areas which generally feature greater wealth differentiation. It is the characteristics of grooms which play the most important role in the determination of dowry payments: in areas where grooms are not as differentiated with respect to their individual earnings, such as in rural areas, their education and household income play a more important role instead. Correspondingly, in urban areas characterised by greater wealth differentiation, the relative status of the bride's family, compared to the average, enters negatively. This again supports the groom-price model where qualities of brides have a reducing effect on their dowry payment only if their *relative* status is high. However, because the income of bridal parents is a positive determinant of dowries, particularly in rural areas where a bride's dowry is also somewhat positively related to her education, the inheritance model of dowry cannot be rejected. Moreover, since the traditional custom of dowry in Pakistan is considered an inheritance to daughters, it is likely that this custom still persists in rural areas.

4.7 Conclusion

To my knowledge, this is the first empirical investigation, of dowry payments in Pakistan. In the literature on marriage payments, dowry is posited to have several potential roles and the aim of this chapter was to identify which of these roles pertained to present-day dowry payments in Pakistan. The results of the empirical analysis support the groom-price model in determining the value of these payments. Their occurrence on the other hand, appears less a result of economic forces, and more imbedded in cultural norms. Provincial variation is an important

determinant of the incidence of dowries, however, the results differ greatly between regions of comparable levels of economic development such as Balochistan and N.W.F.P.. Moreover, the probability that brides' parents paid a dowry is not significantly related to the status of either brides or grooms or their families. Rather, traditions rooted in tribal cultures and the practice of cross-cousin marriage may be a more important influence. It appears as though a higher status for women from the perspective of men, reflected in their relative preference for daughters, is positively associated with the occurrence of dowry payments. This would seem to suggest, that from the male perspective, the institution of dowry is not considered detrimental to either women or themselves. Interestingly, this contrasts with the status of women from the perspective of women, where a higher preference for daughters amongst women is negatively related to the occurrence of dowry payments, although this relationship is insignificant in the estimation.

This investigation concludes, therefore, that the dowry phenomenon in Pakistan is similar to that occurring in India. This may appear to contradict the analysis of the previous chapter which emphasizes the importance of caste in the dowry phenomenon occurring in India. However, although caste is rooted in Hinduism and is not a component of Islamic religious codes, for the purposes here caste does exist amongst Muslims in Pakistan. That is to say, there traditionally exists a hierarchical social structure based on occupation, where group membership is inherited and endogamy is practised within the different groups.[21] In contrast, caste amongst Muslims does not rest on the ideology of pure and impure and as a consequence there are fewer social barriers; for example, all groups can sit down to a meal and pray together. Therefore although Pakistani Muslims do not recognise a caste system as it functions in Hindu society, nevertheless a semi-caste system is readily apparent. As a result, if the dowry phenomenon in India is in accordance with the analysis in this thesis, it may be as well in Pakistan. Since restrictions associated with the different castes may not be as severe amongst Muslims compared to Hindus, the severity of the dowry problem may correspondingly be less in Pakistan. This hypothesis is perhaps supported in this analysis by the fact that exorbitant amounts of dowry are not evident.

[21] See, for example, Korson (1971), Dixon (1982), Beall (1995), Eglar (1960), Ahmad (1977), and Lindholm (1985).

4.8 Data Appendix

Table 4.1 - Gender Differences

	Pakistan	Rural	Urban	Punjab	Sindh	Baloch.	NWFP
Female literacy	0.18	0.08	0.29	0.20	0.20	0.09	0.13
Female preference for daughters	0.97	0.99	0.94	0.95	1.03	0.99	0.88
Male preference for daughters	0.85	0.84	0.87	0.81	0.96	0.98	0.73
Relative supply of brides	1.31	1.29	1.33	1.34	1.29	1.04	1.36
Proportion of female earners	0.07	0.10	0.05	0.10	0.07	0.02	0.03

Table 4.2 - Value of Dowry

	Total	Rural	Urban	Sindh	Punjab	Balochistan	N.W.F.P.
Average	26806	21476	31939	16392	35976	9472	12276
25th percentile	6000	5000	10000	5000	9000	2250	3350
50th percentile	14500	10350	18000	10501	19300	6000	8200
75th percentile	31000	22000	40000	22000	47000	15100	15100

Table 4.3 - Dowry as a Proportion of Groom's Household Income

	Total	Rural	Urban	Sindh	Punjab	Balochistan	N.W.F.P.
Average	1.65	2.05	1.27	0.64	2.47	0.40	0.43
25th percentile	0.16	0.17	0.15	0.14	0.23	0.06	0.07
50th percentile	0.37	0.39	0.35	0.31	0.53	0.18	0.26
75th percentile	0.85	0.96	0.77	0.54	1.14	0.40	0.46

Table 4.4 - Profile of total LSMS sample[22]

	Pakistan	Sindh	Punjab	Balochistan	N.W.F.P.
Population (%)	100	27	49	8	16
Rural (%)	51	51	50	45	54
Literacy Rate	28.9	33.2	29.8	16.1	21.5
Male Literacy Rate	39.6	43.5	40.1	27.2	34.4
Female Literacy Rate	17.1	21.9	18.3	4.8	8.2
Infant Mortality Rate[23]	12.1	12.7	11.3	18.0	12.7
Child Mortality Rate[24]	14.2	14.8	13.4	22.0	14.9
Employment in Agriculture[25]	27.4	23.2	29.2	24.6	27.5
Employment in Non-Agriculture	26.4	26.7	27.2	19.5	24.2

[22]The entries of this table are from "Pakistan Integrated Household Survey - Final Results 1991", Mimeo, March 1992, PIHS Project, Federal Bureau of Statistics, Islamabad, Pakistan

[23]The Infant Mortality Rate is equal to the percentage of children who died before reaching one year of age.

[24]The Child Mortality Rate refers to the percentage of children who died before reaching five years of age.

[25]Employment refers to the work activity of all person aged 10 years and older.

4.8.1 Definition of Variables

Regions:

- Punjab
- Sindh
- Balochistan
- North West Frontier Province (N.W.F.P.)
- Urban - settlements with a population of 5000 or more in 1981
- Rural - villages and communities with a population of less than 5000 in 1981.

Dowry:

- Bride's parents paid a dowry
- Value of dowry is in 1991 rupees - Contents: agriculture land, jewelry and currency, household effects, and other goods and property.

Individual characteristics of bride and grooms:

- Literate - able to read and write
- Education Level - years of education
- Works on family farm - contributed to family farming and livestock in the past 12 months
- Works in family enterprise - contributed labour to non-agricultural enterprise in the past 12 months
- Works in agriculture (outside the home) - worked for payment in cash or kind on some other person's farm, either as permanent, seasonal, or casual labour in the past 12 months
- Works in non-agriculture (outside the home) - received payment for off-farm work for a firm or an individual in the past 12 months.
- Earnings from work outside of the home - rupees per month, includes cash and in kind payments.
- Hours worked on family farm - hours per week
- Hours worked on family enterprise - hours per week
- Total hours worked - equal to the sum of hours per week in each activity including household work for females.
- Age at marriage - in years

- Bride works in income generating activity - works on the family farm, in the family enterprise, or for wages outside the household either in agriculture or non-agriculture
- Bride migrated for marriage
- Bride's hours worked in household - activities include: fetching water; gathering firewood; animal care/grazing/herding; preparing dung cakes; milking animals/making ghee; taking meals to field workers; going to the market; grinding flour or musking rice; cooking/baking/washing dishes; cleaning the house/laundry/ironing; stitching/embroidery for household use; child care and teaching.
- Bride's hours worked outside the home - total hours in wage-earning activity (agriculture or non-agriculture)
- Groom's hours worked in agriculture - hours per week
- Groom's hours worked in non-agriculture - hours per week

Parents of brides and grooms:

- Father literate - able to read and write
- Mother literate - able to read and write
- Father works in agriculture - type of work primarily engaged in
- Father from rural area
- Mother from rural area
- Bride's parents' household income - Predicted from bride's parents' education, occupation, and geographical location using an estimation of household income for entire LSMS sample (4140 households) - annual income in 1991 rupees, includes revenue from family farm or enterprise, and total income from all family members.

Household of Groom and Bride:

- Income - annual income in 1991 rupees, includes revenue from family farm or enterprise, and total income from all family members.
- Religion - proportion that are Muslim
- Family farm - household sows crops either on their own land or land rented/sharecropped or household tends livestock.
- Family enterprise - non-agricultural enterprise which produces goods or services or household is involved in retail or trade sector.
- Bride works in home only/Grooms works - Bride does not work in an income generating activity and groom does.
- Both bride and groom work - Both bride and groom work in an income-generating activity.

4.8.2 Summary Statistics

TABLE 4.5 - TOTAL SAMPLE

Variable	Mean	Standard Deviation
Bride paid a dowry	0.87	0.335
Value of dowry	26806	50389
Rural	0.50	0.50
Sindh	0.21	0.41
Punjab	0.55	0.50
N.W.F.P.	0.16	0.37
Balochistan	0.07	0.26
Bride literate	0.27	0.45
Bride's education level	2.29	3.92
Bride works on family farm	0.19	0.39
Bride works in family enterprise	0.02	0.15
Bride works in agriculture	0.05	0.22
Bride works in non-agriculture	0.02	0.13
Bride works in income-generating activity	0.27	0.44
Bride's earnings	310	370
Bride's hours in household work	38.7	28.1
Bride's hours on family farm	14.0	15.1
Bride's hours in family enterprise	23.5	17.2
Bride's hours worked outside the home	19.6	21.3
Bride's total hours of work	43.2	31.8
Bride's age of marriage	18.9	3.61
Groom literate	0.59	0.49
Groom's education level	5.11	4.88
Groom works on family farm	0.22	0.41
Grooms works in family enterprise	0.25	0.43
Groom works in agriculture	0.02	0.13
Grooms works in non-agriculture	0.51	0.50
Groom's earnings	1751	1590
Groom's hours on family farm	33.1	22.0
Groom's hours in family enterprise	55.6	19.4
Groom's hours in agriculture	46.3	23.1
Groom's hours in non-agriculture	40.9	20.9
Groom's total hours of work	42.7	25.7
Groom's age at marriage	22.6	4.62
Bride's father literate	0.29	0.45
Bride's mother literate	0.10	0.30
Bride's father works in agriculture	0.35	0.48
Bride's father from rural	0.75	0.43

TABLE 4.5 (continued)

Bride's mother from rural	0.75	0.43
Bride's parents income (predicted)	67496	30855
Groom's father literate	0.32	0.47
Groom's mother literate	0.06	0.24
Groom's father works in agriculture	0.40	0.49
Groom's father from rural	0.76	0.43
Groom's mother from rural	0.74	0.44
Household income	66475	129731
Household is Muslim	0.95	0.21
Number of female members	3.24	1.66
Number of male members	3.53	1.95
Household has family farm	0.46	0.50
Household has family enterprise	0.41	0.49
Household is nuclear	0.13	0.34
Both groom and bride work	0.25	0.43
Groom works and bride works only in the home	0.61	0.49
Average household income	53035	53181
Average earnings of men	537	534
Household income-Average	13440	128609
Groom's income-Average	412	1297
Bride's parents income-Average	14461	57667
Dowry/Bride's parents' income	0.38	0.47
Dowry/Grooms' household income	1.65	8.39
Groom's Parents' Income-Brides Parents' Income	-1021	129373

TABLE 4.6 - URBAN AND RURAL SAMPLES

Variable	Urban		Rural	
	Mean	S. D.	Mean	S. D.
Bride paid a dowry	0.88	0.33	0.86	0.34
Value of dowry	31956	38968	21476	59568
Sindh	0.25	0.43	0.18	0.38
Punjab	0.50	0.50	0.61	0.49
N.W.F.P.	0.14	0.35	0.17	0.38
Balochistan	0.10	0.31	0.04	0.21
Bride literate	0.41	0.49	0.14	0.34
Bride's education level	3.53	4.61	1.03	2.50
Bride works on family farm	0.06	0.24	0.33	0.47
Bride works in family enterprise	0.02	0.14	0.02	0.16
Bride works in agriculture	0.01	0.09	0.09	0.28
Bride works in non-agriculture	0.02	0.15	0.01	0.09
Bride works in income-generating activity	0.11	0.32	0.42	0.49
Bride's earnings	445	535	247	244
Bride's hours in household work	38.1	26.2	39.3	29.9
Bride's hours on family farm	11.0	15.6	14.5	15.0
Bride's hours in family enterprise	20.0	14.8	26.6	19.6
Bride's hours worked outside the home	20.4	19.4	19.4	22.2
Bride's total hours of work	39.8	28.1	46.7	34.9
Bride's age of marriage	19.42	3.62	18.39	3.53
Groom literate	0.69	0.46	0.49	0.50
Groom's education level	6.27	5.13	3.93	4.33
Groom works on family farm	0.05	0.22	0.38	0.49
Grooms works in family enterprise	0.36	0.48	0.13	0.34
Groom works in agriculture	0.01	0.08	0.03	0.17
Grooms works in non-agriculture	0.54	0.50	0.48	0.50
Groom's earnings	2109	2045	1373	718
Groom's hours on family farm	20.5	15.9	34.7	22.1
Groom's hours in family enterprise	56.4	21.0	53.4	13.8
Groom's hours in agriculture	28.0	28.3	50.0	21.7
Groom's hours in non-agriculture	43.6	19.9	37.8	21.5
Groom's total hours of work	45.3	26.4	40.0	24.7
Groom's age at marriage	23.2	4.35	21.91	4.79
Bride's father literate	0.37	0.48	0.21	0.41
Bride's mother literate	0.16	0.37	0.04	0.19
Bride's father works in agriculture	0.20	0.40	0.51	0.50
Bride's father from rural	0.56	0.50	0.95	0.21
Bride's mother from rural	0.56	0.50	0.95	0.23
Bride's parents income (predicted)	74403	33460	60464	26191

TABLE 4.6 (continued)

Groom's father literate	0.45	0.50	0.18	0.39
Groom's mother literate	0.11	0.32	0.01	0.09
Groom's father works in agriculture	0.15	0.36	0.66	0.47
Groom's father from rural	0.55	0.50	0.96	0.19
Groom's mother from rural	0.51	0.50	0.97	0.18
Household income	76345	92921	56427	158193
Household is Muslim	0.94	0.24	0.96	0.19
Household has family farm	0.18	0.38	0.74	0.44
Household has family enterprise	0.53	0.50	0.30	0.46
Both groom and bride work	0.10	0.30	0.40	0.49
Groom works and bride works only in the home	0.76	0.43	0.47	0.50
Average household income	68934	50276	36848	51206
Average earnings of men	719	676	351	205
Household income-Average	7410	95868	19578	154915
Groom's income-Average	445	1641	379	811
Bride's Parents' income-Average	5469	57777	23616	56177
Dowry/Bride's parents' income	0.44	0.51	0.31	0.41
Dowry/Groom's household income	1.27	4.27	2.05	11.1
Groom's Parents' Income-Bride's Parents' Income	1942	94975	-4037	156932

TABLE 4.7 - REGIONAL SAMPLES

Variable	Sindh		Punjab		Baloch.		NWFP	
	Mean	S. D.	Mean	S. D.	Mean	S.D.	Mean	S.D.
Bride paid a dowry	0.94	0.24	0.91	0.28	0.48	0.50	0.83	0.38
Value of dowry	16312	16460	35976	63513	9472	9247	12276	12573
Rural	0.41	0.49	0.54	0.50	0.30	0.46	0.54	0.50
Bride literate	0.35	0.48	0.31	0.46	0.12	0.33	0.09	0.29
Bride's education level	2.77	4.30	2.72	4.14	0.60	2.21	0.94	2.48
Bride works on fam. farm	0.21	0.41	0.14	0.35	0.12	0.33	0.38	0.49
Bride works in fam. buss.	0.01	0.08	0.02	0.15	0.10	0.30	0.00	0.00
Bride works in agric.	0.04	0.20	0.07	0.26	0.02	0.14	0.01	0.10
Bride works in non-agric.	0.01	0.12	0.02	0.14	0.00	0.00	0.02	0.14
Bride works	0.25	0.44	0.24	0.43	0.20	0.40	0.40	0.49
Bride's earnings	451	255	250	370	171	169	453	555
Bride's hours in home	46.07	33.12	36.62	25.84	37.3	31.4	36.69	25.59
Bride's hours on fam. farm	15.5	16.2	14.5	12.9	24.3	31.0	10.5	13.2
Bride's hours in fam. buss.	14.0	0.00	30.1	19.2	13.6	7.6	0.00	0.00
Bride's hours outside	23.6	21.0	18.6	21.8	0.00	0.00	28.0	21.1
Bride's total hours	51.89	37.74	41.04	28.58	41.6	35.6	41.47	30.91
Bride's age of marriage	18.61	3.79	19.52	3.52	18.00	3.82	17.66	3.3
Groom literate	0.62	0.49	0.61	0.49	0.56	0.50	0.49	0.50
Groom's education level	5.55	5.17	5.53	4.81	3.08	4.91	4.03	4.40
Groom works on fam. farm	0.23	0.42	0.22	0.42	0.10	0.30	0.22	0.41
Grooms works in fam. buss.	0.20	0.40	0.27	0.44	0.22	0.42	0.24	0.43
Groom works in agric.	0.01	0.12	0.02	0.14	0.04	0.20	0.01	0.10
Grooms works in non-agric.	0.55	0.50	0.49	0.50	0.54	0.50	0.53	0.50
Groom's earnings	1893	1322	1774	1795	1916	2013	1398	724
Groom's hours on fam. farm	41.6	24.6	31.2	20.2	37.2	17.6	26.6	22.4
Groom's hours in fam. buss.	58.0	17.7	54.0	16.2	68.4	38.1	53.5	20.4
Groom's hours in agric.	70.0	0.00	43.1	26.3	45.0	4.24	24.0	0.00
Groom's hours in non-agric.	49.7	17.3	40.9	19.8	46.0	10.8	26.4	24.7
Groom's total hours work	49.77	25.94	42.39	23.65	45.4	28.1	33.06	28.17
Groom's age at marriage	22.53	4.79	23.02	4.56	21.1	4.3	21.65	4.52
Bride's father literate	0.32	0.47	0.34	0.47	0.10	0.30	0.17	0.38
Bride's mother literate	0.13	0.33	0.12	0.32	0.04	0.20	0.02	0.14
Bride's father in agric.	0.32	0.47	0.35	0.48	0.28	0.45	0.44	0.50
Bride's father from rural	0.58	0.50	0.80	0.40	0.76	0.43	0.79	0.41
Bride's mother from rural	0.58	0.50	0.80	0.40	0.82	0.39	0.76	0.43
Bride's parents income	62137	38556	69252	31741	76771	14729	64172	17546

TABLE 4.7 (continued)

Groom's father literate	0.39	0.49	0.35	0.48	0.22	0.42	0.18	0.38
Groom's mother literate	0.11	0.31	0.07	0.25	0.02	0.14	0.00	0.00
Groom's father in agric.	0.27	0.45	0.46	0.50	0.36	0.48	0.38	0.49
Groom's father from rural	0.64	0.48	0.81	0.39	0.70	0.46	0.74	0.44
Groom's mother from rural	0.57	0.50	0.81	0.39	0.66	0.48	0.73	0.45
Household income	57148	79874	67406	109583	94011	315368	62736	96090
Household is Muslim	0.87	0.33	0.97	0.16	0.96	0.20	0.98	0.14
Household has family farm	0.36	0.48	0.47	0.50	0.28	0.45	0.62	0.49
Household has family enterprise	0.29	0.45	0.44	0.50	0.42	0.50	0.49	0.50
Both groom and bride work	0.24	0.43	0.23	0.42	0.20	0.40	0.35	0.48
Groom works/bride works home	0.67	0.47	0.63	0.48	0.62	0.49	0.48	0.50
Average household income	55738	67078	51760	52724	68512	50932	46567	27801
Average earnings of men	621	389	503	603	809	707	414	176
Household income-Average	1410	93223	15646	109750	25499	299195	16169	94898
Groom's income-Average	459	1208	418	1350	340	1856	364	840
Dowry/Bride's parents' income	0.29	0.27	0.48	0.56	0.13	0.14	0.19	0.20
Dowry/Groom's household inc.	0.64	1.15	2.47	10.94	0.40	0.70	0.43	0.65
Bride's Parents' income-Average	6399	72666	17492	57905	8259	51648	17605	29273
Number of Observations	142		370		50		106	

4.8.3 Correlations

TABLE 4.8 - BRIDE'S WORK ACTIVITY

BRIDE	Educ.	Farm.	Entp.	Agric.	Non-agric.	Earnings.	At Home	# Child	# fem. memb	House. Income	Ru
Education	1.00										
Family Farm	-0.18	1.00									
Enteprise	-0.04	-0.05	1.00								
Agriculture	-0.10	-0.03	0.06	1.00							
Non-agrc.	0.07	-0.004	-0.02	0.08	1.00						
Earnings	0.07	-0.01	0.09	0.22	0.58	1.00					
Home	0.20	-0.71	-0.22	-0.34	-0.19	-0.22	1.00				
# Child	0.01	0.05	-0.02	0.04	0.09	0.05	-0.02	1.00			
# fem. memb.	0.004	-0.06	-0.02	-0.06	-0.02	-0.05	0.06	-0.012	1.00		
House. Inc.	0.14	-0.12	-0.02	-0.08	0.01	-0.01	0.07	0.02	0.16	1.00	
Rural	-0.32	0.33	0.01	0.19	-0.06	0.02	-0.35	-0.02	-0.003	-0.08	1.(

TABLE 4.9 - BRIDE'S CHARACTERISTICS

BRIDE	Educ.	Mother Lit.	Father Lit.	Father Agric.	Father rural	Age Marr.	Mig. Marr.	Parent's Income
Educ.	1.00							
Mother Lit.	0.49	1.00						
Father Lit.	0.43	0.40	1.00					
Father Agric.	-0.22	-0.16	-0.25	1.00				
Father rural	-0.29	-0.22	-0.17	0.30	1.00			
Age Marr.	0.26	0.13	0.17	-0.04	-0.07	1.00		
Mig. Marr.	0.06	-0.002	0.02	0.02	0.11	0.11	1.00	
Parents' Inc.	0.44	0.57	0.71	-0.34	-0.21	0.14	-0.01	1.00

TABLE 4.10 - GROOM'S WORK ACTIVITY

GROOM	Educ.	Farm.	Entp.	Agric.	Non-Agric	Earnings.	# Child	# male memb.	House. . Income	Rural
Educ.	1.00									
Farm.	-0.20	1.00								
Entp.	0.04	-0.15	1.00							
Agric.	-0.09	-0.02	-0.08	1.00						
Non-agrc.	0.15	-0.32	-0.48	-0.09	1.00					
Earnings	0.29	-0.24	-0.32	-0.01	0.60	1.00				
# Child	0.02	0.01	0.01	0.16	-0.04	0.04	1.00			
# male memb.	0.06	-0.05	0.05	-0.05	-0.10	-0.05	-0.05	1.00		
House. Inc.	0.22	-0.09	0.10	-0.05	0.002	0.23	0.02	0.30	1.00	
Rural	-0.24	0.40	-0.27	0.09	-0.06	-0.15	-0.02	0.002	-0.08	1.00

TABLE 4.11 - GROOM'S CHARACTERISTICS

GROOM	Educ.	Mother Lit.	Father Lit.	Father Agric.	Father rural	Age Marr.	Parent's Income
Educ.	1.00						
Mother Lit.	0.33	1.00					
Father Lit.	0.41	0.29	1.00				
Father Agric.	-0.18	-0.17	-0.29	1.00			
Father rural	-0.12	-0.12	-0.21	0.28	1.00		
Age Marr.	0.27	0.10	0.14	-0.07	-0.06	1.00	
Parents' Inc.	0.22	0.17	0.14	-0.09	-0.04	0.12	1.00

TABLE 4.12 - WORK HOURS AND TRAITS OF SPOUSES

	GROOM								
BRIDE	Educ.	Earnings	Hrs. Farm.	Hrs. Entp	Hrs. Agric.	Hrs. N-A	Tot. hrs.	Age Marr.	Parents' Income
Education	0.51	0.19	-0.17	0.14	-0.07	0.01	0.01	0.25	0.14
Earnings	-0.02	-0.05	0.05	-0.01	0.06	-0.06	-0.02	-0.02	-0.01
Hrs. Farm	-0.14	-0.11	0.38	-0.10	-0.02	-0.12	0.03	-0.11	-0.08
Hrs. Entp.	-0.04	-0.01	-0.04	0.08	-0.01	0.01	0.06	0.01	-0.01
Hrs.Out	-0.09	-0.07	0.10	-0.04	0.22	-0.09	-0.003	-0.11	-0.03
Hrs. In	-0.04	0.06	-0.04	0.05	0.05	0.03	0.06	-0.03	-0.09
Total hrs.	-0.10	0.01	0.08	0.02	0.09	-0.03	0.07	-0.06	-0.11
Age. Marr.	0.24	0.09	-0.05	0.03	-0.05	0.04	0.03	0.41	0.04
Parents' income	0.41	0.18	-0.20	0.12	-0.05	0.03	0.01	0.17	0.13

TABLE 4.13 - WORK ACTIVITIES OF SPOUSES

	GROOM						
BRIDE	Educ.	Earnings	Farm	Entp.	Agric.	Non-Ag.	Parents' Inc.
Education	0.51	0.19	-0.17	0.14	-0.08	-0.02	0.14
Earnings	-0.02	-0.05	0.05	0.002	0.06	-0.06	-0.01
Family Farm	-0.20	-0.11	0.36	-0.11	0.02	-0.08	-0.12
Enteprise	-0.06	-0.01	-0.05	0.03	-0.02	-0.03	-0.02
Agriculture	-0.12	-0.07	0.08	-0.02	0.17	-0.09	-0.08
Non-Agric.	-0.01	-0.03	-0.01	0.03	0.07	-0.06	0.01
Home	0.20	0.13	-0.30	0.09	-0.10	0.10	0.07
Parents' income	0.41	0.18	-0.21	0.13	-0.04	0.02	0.13

4.9 Estimation Appendix

4.9.1 Answered Dowry Question

TABLE 4.14 - PROBIT ESTIMATION OF PROBABILITY OF ANSWERING DOWRY QUESTION

Variable	Coefficient	S.E.	$\frac{\partial F}{\partial X}$	t-statistic
Rural	-0.03	0.13	-0.01	-0.24
Sindh	-0.55	0.13	-0.21	-4.21
Punjab	-0.003	0.12	-0.001	-0.03
Balochistan	-0.46	0.17	-0.18	-2.66
Household income	0.000	0.00	0.00	0.61
Bride literate	0.11	0.18	0.04	0.62
Bride's education level	-0.005	0.02	-0.002	-0.22
Bride works in family production	-0.19	0.10	-0.07	-1.88
Bride works outside the home	-0.28	0.16	-0.11	-1.69
Bride migrated for marriage	0.17	0.09	0.07	1.82
Bride from rural area	-0.10	0.13	-0.04	-0.75
Family is nuclear	0.14	0.09	0.05	1.54
Groom's education level	0.013	0.01	0.005	1.35
Groom works in agriculture	0.26	0.22	0.10	1.17
Groom works in non-agriculture	0.06	0.11	0.02	0.56
Groom works in family business	0.11	0.12	0.04	0.93
Groom's income	0.000	0.00	0.00	1.07
Married for one year	-0.28	0.16	-0.11	-1.76
Married for two years	-0.30	0.16	-0.12	-1.93
Married for three years	-0.36	0.16	-0.14	-2.27
Married for four years	-0.59	0.15	-0.23	-3.82
Married for five years	-1.11	0.16	-0.42	-6.87
Constant	0.75	.19		3.87
Observations	1087			
χ^2 - statistic	155.03			
$\overline{R}^2$	0.11			

4.9.2 Bride's Education

TABLE 4.15 - ESTIMATION OF BRIDE'S EDUCATION (ORDINARY LEAST SQUARES)

Variable	Coefficient	S.E.	t-statistic
Bride's parents' income	0.00003	0.00001	1.950
Bride's mother is literate	3.74	0.53	7.065
Female literacy rate	10.26	1.66	6.163
Bride from rural area	0.35	0.43	0.822
[Bride's parents' income]^2	0.00	0.00	0.055
Constant	-1.70	0.78	-2.196
Observations	649		
F-statistic	74.86		
$\overline{R}^2$	0.36		

4.9.3 Bride's Labour Input

TABLE 4.16 - PROBIT ESTIMATION OF BRIDE WORKING IN INCOME-GENERATING ACTIVITY[26]

Variable	Coefficient	S.E.	$\frac{\partial F}{\partial X}$	t-statistic
Bride's education (predicted)	-0.12	0.04	-0.03	-2.92
Household Income	-0.00	0.00	-0.00	-2.64
Number of children	0.07	0.04	0.02	1.68
Number of female members	-0.12	0.04	-0.03	-2.84
Family farm	1.33	0.15	0.36	8.76
Family business	0.36	0.14	0.10	2.64
Female labour force participation rate	1.58	0.61	0.42	2.60
Rural	0.20	0.16	0.05	1.21
Constant	-1.05	0.21		-5.01
Observations	649			
χ^2-statistic	217.63			
Pseudo R^2	0.29			

TABLE 4.17 - TOBIT ESTIMATION OF BRIDE'S WORK HOURS

Variable	Coefficient	S.E.	t-statistic
Bride's education (predicted)	0.65	0.58	1.12
Household Income	-0.000024	0.00001	-2.26
Number of children	3.56	0.85	4.19
Number of female members	-5.48	0.77	-7.10
Family farm	5.96	3.03	1.97
Family business	1.67	2.63	0.64
Female labour force participation rate	-3.85	13.43	-0.29
Rural	5.74	3.26	1.76
Constant	51.1	3.79	13.48
Observations	649		
χ^2-statistic	92.98		
Pseudo R^2	0.02		

[26]The potential endogeneity of bride's education is dealt with using a two-stage estimation approach. The reported $\overline{R}^2$ from the instrumenting equation is 0.36.

4.9.4 Dowry Paid

TABLE 4.18 - ESTIMATION OF PROBABILITY OF DOWRY PAID (LINEAR PROBABILITY MODEL)[27]

Variable	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
Rural	0.03	0.388	-0.005	0.919	0.04	0.394
Punjab	0.05	0.157	0.06	0.147	0.06	0.121
Sindh	0.14	0.007	0.15	0.003	0.14	0.015
Balochistan	-0.28	0.000	-0.26	0.000	-0.27	0.000
Groom's household income	-0.00	0.355	-0.00	0.300	-0.00	0.254
Bride's parents income	-0.00	0.228	-0.00	0.227	-0.00	0.200
Groom's income	-0.00	0.310	-0.00	0.345	-0.00	0.345
Groom has primary school	0.06	0.066	0.07	0.044	0.07	0.047
Groom has more than primary	0.08	0.023	0.09	0.013	0.09	0.016
Bride's education	0.01	0.301	0.01	0.357	0.02	0.224
Bride works for income	-0.30	0.085	-0.36	0.037	-0.29	0.180
Bride's total work hours	0.002	0.290	0.002	0.202	0.002	0.312
Groom works in non-agric.	0.03	0.405	0.03	0.462	0.02	0.696
Groom works in agric.	-0.10	0.271	-0.10	0.274	-0.10	0.313
Grooms works in fam. bus.	-0.001	0.986	0.01	0.793	0.01	0.893
Household has family bus.	0.01	0.769	0.01	0.842	-0.002	0.952
Household has family farm	0.08	0.239	0.10	0.133	0.07	0.394
Household is nuclear	-0.01	0.857	-0.02	0.728	-0.004	0.932
Bride migrated for marriage	0.06	0.042				
Bride migrated for other reason			-0.06	0.386	-0.06	0.377
Bride mig. for mar.(rural-urban)			0.02	0.695	0.05	0.362
Bride mig. for mar.(rural-rural)			0.13	0.002	0.13	0.004
Bride mig. for mar.(urban-urban)			-0.05	0.400	-0.04	0.528
Inverse Mill's ratio λ_R	0.38	0.084	0.42	0.055	0.49	0.029
Male preference for daughters					0.12	0.024
Female preference for daughters					-0.03	0.541
Female participation rate					-0.10	0.593
Marriage squeeze					-0.03	0.111
Average household income					0.00	0.430
Constant	0.92	0.000	0.95	0.000	0.94	0.000
Observations	628		628		628	
F-statistic	7.21		6.76		5.70	
$\overline{R}^2$	0.16		0.17		0.17	

[27]The weighted least squares method for the linear probability model of paying a dowry was used. Bride's education, the probability that a bride works for income, and brides' total work hours are assumed endogenous. The method of two-stage least squares is used to deal with this problem. The $\overline{R}^2$ of the instrumenting equations are 0.36, 0.29, and 0.02 respectively.

TABLE 4.19 - ESTIMATION OF PROBABILITY OF DOWRY PAID RURAL AND URBAN EFFECTS[28]

Variable	Coefficient	P-value
Punjab	0.07	0.094
Sindh	0.13	0.029
Balochistan	-0.27	0.000
Groom's household income	-0.00	0.199
Bride's parents income	-0.00	0.626
Groom's income	-0.00	0.424
Groom has primary school	0.17	0.001
Groom has more than primary	0.11	0.038
Bride's education	0.02	0.478
Bride works for income	-0.10	0.691
Bride's total work hours	-0.0001	0.968
Groom works in non-agric.	0.06	0.235
Groom works in agric.	-0.06	0.497
Groom works in family bus.	0.02	0.743
Household has family bus.	0.002	0.956
Household has family farm	0.06	0.519
Household is nuclear	-0.01	0.829
Bride migrated for other reason	-0.08	0.281
Bride mig. for mar.(rural-urban)	0.05	0.326
Bride mig. for mar.(rural-rural)	0.14	0.002
Bride mig. for mar.(urban-urban)	-0.02	0.727
Inverse Mill's ratio λ_R	0.40	0.086
Male preference for daughters	0.13	0.015
Female preference for daughters	-0.03	0.630
Female participation rate	-0.12	0.551
Marriage squeeze	-0.03	0.152
Average household income	0.00	0.514

[28]The weighted least squares method for the linear probability model of paying a dowry was used. Bride's education, the probability that a bride works for income, and brides' total work hours are assumed endogenous. The method of two-stage least squares is used to deal with this problem. The $\overline{R}^2$ of the instrumenting equations are 0.36, 0.29, and 0.02 respectively.

TABLE 4.19 (continued)

Variable	Coefficient	P-value
Urban×Groom's income	0.00	0.876
Urban×household income	0.00	0.126
Urban×Bride's parents' income	-0.00	0.521
Urban×Groom has primary	-0.22	0.002
Urban×Groom has more than primary	-0.07	0.365
Urban×Bride's education	-0.004	0.890
Urban×Bride's earns income	-0.42	0.027
Urban×Bride hours of work	0.004	0.081
Constant	0.87	0.000
Observations	628	
F-statistic	4.80	
$\overline{R}^2$	0.17	

TABLE 4.20 - ESTIMATION OF PROBABILITY OF DOWRY PAID NON-LINEAR INCOME EFFECTS[29]

Variable	Coefficient	P-value	Coefficient	P-value
Rural	0.03	0.511		
Punjab	0.07	0.080	0.08	0.075
Sindh	0.13	0.020	0.11	0.059
Balochistan	-0.26	0.000	-0.26	0.000
Groom's household income	0.00	0.062	0.00	0.393
Bride's parents income	-0.00	0.274	-0.00	0.199
Groom's income	0.00	0.468	0.00	0.504
Groom has primary school	0.07	0.055	0.16	0.002
Groom has more than primary	0.08	0.027	0.10	0.063
Bride's education	0.02	0.201	0.01	0.805
Bride works for income	0.08	0.771	0.06	0.847
Bride's total work hours	0.001	0.757	-0.0005	0.861
Groom works in non-agric.	-0.02	0.721	-0.01	0.903
Groom works in agric.	-0.11	0.251	-0.10	0.324
Groom works in fam. bus.	0.01	0.894	0.02	0.644
Household has family bus.	-0.03	0.483	-0.01	0.792
Household has family farm	-0.07	0.503	0.001	0.995
Household is nuclear	-0.01	0.812	-0.02	0.737
Bride migrated for other reason	-0.08	0.283	-0.10	0.176
Bride mig. for mar.(rural-urban)	0.04	0.483	0.04	0.458
Bride mig. for mar.(rural-rural)	0.13	0.004	0.15	0.001
Bride mig. for mar.(urban-urban)	-0.03	0.589	-0.02	0.758
Inverse Mill's ratio λ_R	0.47	0.041	0.39	0.101
Male preference for daughters	0.11	0.025	0.12	0.019
Female preference for daughters	-0.03	0.564	-0.03	0.630
Female participation rate	-0.29	0.174	-0.20	0.381
Marriage squeeze	-0.03	0.134	-0.03	0.161
Average household income	0.00	0.535	0.00	0.588
[Groom's income]^2	-0.00	0.176	-0.00	0.435
[household income]^2	-0.00	0.030	-0.00	0.251
[Bride's parents' income]^2	0.00	0.570	0.00	0.254

[29]The weighted least squares method for the linear probability model of paying a dowry was used. Bride's education, the probability that a bride works for income, and brides' total work hours are assumed endogenous. The method of two-stage least squares is used to deal with this problem. The $\overline{R}^2$ of the instrumenting equations are 0.36, 0.29, and 0.02 respectively.

TABLE 4.20 (continued)

Variable	Coefficient	P-value	Coefficient	P-value
Urban×[Groom's income]			-0.00	0.733
Urban×[household income]			0.00	0.430
Urban×[Bride's parents' income]			0.00	0.939
Urban×Groom has primary			-0.22	0.002
Urban×Groom has more than primary			-0.07	0.379
Urban×Bride's education			0.01	0.813
Urban×Bride's hours of work			-0.41	0.035
Urban×Bride earns income			0.004	0.162
Urban×[Groom's income]^2			0.00	0.538
Urban×[household income]^2			-0.00	0.453
Urban×[Bride's parents' income]^2			-0.00	0.468
Constant	0.96	0.000	0.96	0.000
Observations	628		628	
F-statistic	5.14		4.21	
$\overline{R}^2$	0.17		0.17	

4.9.5 Value of Dowry

TABLE 4.21 - ESTIMATES OF THE VALUE OF DOWRY (ORDINARY LEAST SQUARES)[30]

Variable	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
Groom's household income	0.044	0.036	0.035	0.097	0.04	0.043
Bride's parents' income	0.26	0.004	0.22	0.024	0.27	0.003
Groom's income	4.11	0.016	4.6	0.006	4.0	0.020
Groom has primary school	1114	0.827	-1063	0.834	1644	0.749
Groom has more than primary	12900	0.009	11102	0.025	13349	0.008
Bride's education	4619	0.000	4890	0.001	4340	0.001
Groom's hours in agriculture	-177	0.643	-203	0.591	-256	0.507
Groom's hours non-agriculture	-221	0.026	-191	0.056	-242	0.016
Groom's hours in family production	-18.2	0.827	28.6	0.732	-30.4	0.717
Bride's total hours	-21.7	0.915	-91.5	0.651	12.7	0.951
Brides hours worked for income	6443	0.561	-6919	0.589	1934	0.870
Punjab			14333	0.012		
Sindh			-2317	0.731		
Balochistan			-3011	0.783		
Rural			9045	0.097		
Male preference for daughters					592	0.908
Female preference for daughters					7312	0.345
Marriage Squeeze					1030	0.723
Female participation rate					33101	0.136
Average household income					0.034	0.354
Constant	-10293	0.298	-13909	0.183	-22710	0.110
Observations	564		564		564	
F - statistic	14.91		12.67		10.47	
$\overline{R}^2$	0.21		0.24		0.21	

[30] Bride's education, the probability that a bride works for income, and brides' total work hours are assumed endogenous. The method of two-stage least squares is used to deal with this problem. The $\overline{R}^2$ of the instrumenting equations are 0.36, 0.29, and 0.02 respectively.

TABLE 4.22 - ESTIMATES OF THE VALUE OF DOWRY WITH INVERSE MILL'S RATIO[31]

Variable	Coeff.	P-value	Coeff.	P-value
Groom's household income	0.05	0.020	0.04	0.043
Bride's parents' income	0.23	0.013	0.21	0.038
Groom's income	6.63	0.001	7.5	0.000
Groom has primary school	38.8	0.994	-1165	0.822
Groom has more than primary	9758	0.052	9555	0.058
Bride's education	4525	0.001	4830	0.001
Groom's hours in agriculture	-297	0.411	-280	0.434
Groom's hours non-agriculture	-278	0.007	-260	0.013
Groom's hours in family production	5.92	0.945	39.9	0.646
Bride's total hours	-17.9	0.933	-126	0.554
Brides hours worked for income	13238	0.253	-1452	0.913
Punjab			14298	0.014
Sindh			-1172	0.872
Balochistan			-171	0.988
Rural			8763	0.110
Inverse Mill's ratio λ_R	69917	0.013	27026	0.413
Constant	20524	0.202	-2269	0.896
Observations	553		553	
F - statistic	13.25		11.15	
$\overline{R}^2$	0.21		0.23	

[31] Bride's education, the probability that a bride works for income, and brides' total work hours are assumed endogenous. A two-stage method of estimation is used to deal with this problem. The $\overline{R}^2$ of the instrumenting equations are 0.36, 0.29, and 0.02 respectively.

TABLE 4.23 - ESTIMATES OF THE VALUE OF DOWRY RURAL AND URBAN EFFECTS[32]

Variable	Coeff.	S.E.	P-value	Coeff.	S.E.	P-value
Groom's household income	0.04	0.03	0.154	0.03	0.03	0.183
Bride's parents' income	-0.09	0.16	0.556	-0.04	0.16	0.781
Groom's income	-4.3	3.7	0.239	-4.8	3.76	0.201
Groom has primary school	-1369	6201	0.825	522	6389	0.935
Groom has more than primary	9944	6774	0.143	10211	6825	0.135
Bride's education	20692	2958	0.000	20487	2975	0.000
Groom's hours in agriculture	-73.3	358	0.838	-146.1	338	0.666
Groom's hours non-agriculture	-191.7	99.9	0.051	-245	100	0.015
Groom's hours in family production	28.4	79.8	0.722	63.2	82	0.442
Bride's total hours	-95.2	241	0.693	-18.6	259	0.943
Bride worked for income	-12200	15276	0.425	-14767	16146	0.361
Punjab	9115	5523	0.099	8924	5561	0.109
Sindh	-4326	6601	0.513	-3488	7019	0.619
Balochistan	-7810	10493	0.457	-5605	10953	0.609
Urban×Household income	-0.02	0.04	0.536	0.01	0.04	0.839
Urban×Bride's parents' income	0.24	0.18	0.180	0.20	0.18	0.286
Urban×Groom's income	11.6	3.71	0.002	15.9	3.8	0.000
Urban×Groom has primary	-717	9457	0.940	-3110	9496	0.743
Urban×Groom has more than primary	2078	9191	0.821	-694	9149	0.940
Urban×Bride's education	-18105	3199	0.000	-17772	3231	0.000
Urban×Brides' work hours	-150	287	0.601	-289	300	0.335
Urban×Bride works for income	16489	25595	0.520	32449	26169	0.216
Inverse Mill's ratio λ_R				21188	31197	0.497
Constant	6484	10622	0.542	11334	16784	0.500
Observations	564			553		
F - statistic	12.75			12.09		
$\overline{R}^2$	0.32			0.34		

[32] Bride's education, the probability that a bride works for income, and brides' total work hours are assumed endogenous. A two-stage method of estimation is used to deal with this problem. The $\overline{R}^2$ of the instrumenting equations are 0.36, 0.29, and 0.02 respectively.

TABLE 4.24 - ESTIMATES OF THE VALUE OF DOWRY RELATIVE EFFECTS[33]

Variable	Coeff.	S.E.	P-value	Coeff.	S.E.	P-value
Groom's household income-average	0.04	0.02	0.092	0.03	0.03	0.205
Bride's parents' income-average	-0.03	0.04	0.374	-0.09	0.05	0.088
Groom's income-average	3.7	1.9	0.049	-7.7	3.8	0.045
Groom has primary school	-663	5145	0.897	-2123	6273	0.735
Groom has more than primary	13865	4926	0.005	9426	6599	0.154
Bride's education	7333	1035	0.000	20571	2008	0.000
Groom's hours in agriculture	-172	382	0.653	-31.6	361	0.930
Groom's hours non-agriculture	-167	101	0.099	-153	98.4	0.119
Groom's hours in family production	-20.3	84	0.808	2.9	79.8	0.971
Bride's total hours	-45.6	206	0.825	-149.9	234	0.522
Brides hours works for income	2807	11266	0.803	-12225	15223	0.422
Punjab	12319	5705	0.031	8255	5449	0.130
Sindh	-6746	6642	0.310	-5792	6421	0.367
Balochistan	-416	11052	0.970	-2735	10457	0.794
Urban×[Household income-average]				-0.01	0.04	0.759
Urban×[Bride's parents' income-average]				0.04	0.07	0.584
Urban×[Groom's income-average]				14.1	4.0	0.000
Urban×Groom has primary				805	9515	0.933
Urban×Groom has more than primary				5788	8894	0.515
Urban×Bride's education				-15907	2285	0.000
Urban×Brides' work hours				95.9	249	0.700
Urban×Bride works for income				11010	25650	0.668
Constant	1690	9652	0.861	8141	9202	0.377
Observations	564			564		
F - statistic	11.98			12.25		
$\overline{R}^2$	0.21			0.31		

[33]Bride's education, the probability that a bride works for income, and brides' total work hours are assumed endogenous. A two-stage method of estimation is used to deal with this problem. The $\overline{R}^2$ of the instrumenting equations are 0.36, 0.29, and 0.02 respectively.

TABLE 4.25 - ESTIMATES OF THE VALUE OF DOWRY NON-LINEAR INCOME EFFECTS[34]

Variable	Coeff.	S.E.	P-value	Coeff.	S.E.	P-value
Groom's household income	0.14	0.04	0.000	0.17	0.05	0.001
Bride's parents' income	-0.75	0.20	0.000	-1.6	0.3	0.000
Groom's income	4.4	3.02	0.143	11.9	8.6	0.169
Groom has primary school	-41.8	4920	0.993	1026	5923	0.863
Groom has more than primary	11691	4843	0.016	8240	6535	0.208
Bride's education	3233	1407	0.022	9946	3183	0.002
Groom's hours in agriculture	-173	365	0.635	-134	343	0.697
Groom's hours non-agriculture	-160	104	0.124	-230	104	0.028
Groom's hours in family production	19.2	82.6	0.816	22	77	0.775
Bride's total hours	4.6	201	0.982	113	239	0.636
Brides hours worked for income	-14013	12647	0.268	-9242	14650	0.528
Punjab	14017	5556	0.012	11104	5265	0.035
Sindh	-7442	6626	0.262	-10158	6384	0.112
Balochistan	-726	10581	0.945	-6527	9999	0.514
Rural	8349	5271	0.114			
[Household income]^2	-0.00	0.00	0.001	-0.00	0.00	0.023
[Bride's parents' income]^2	0.00	0.00	0.000	.00001	0.00	0.000
[Groom's income]^2	-.00001	.0002	0.964	-0.006	0.003	0.054
Urban×Household income				-0.09	0.08	0.251
Urban×Bride's parents' income				1.1	0.3	0.000
Urban×Groom's income				-2.8	8.3	0.733
Urban×Groom has primary				-5179	9145	0.571
Urban×Groom has more than primary				1987	8925	0.824
Urban×Bride's education				-7511	3451	0.030
Urban×Brides' work hours				-543	317	0.088
Urban×Bride works for income				6008	24774	0.808
Urban×[Household income]^2				-0.00	0.00	0.712
Urban×[Bride's parents' income]^2				-.000	0.00	0.000
Urban×[Groom's income]^2				.006	.003	0.056
Constant	20005	13381	0.135	40255	12919	0.002
Observations	564			564		
F - statistic	13.48			13.57		
$\overline{R}^2$	0.29			0.38		

[34] Bride's education, the probability that a bride works for income, and brides' total work hours are assumed endogenous. A two-stage method of estimation is used to deal with this problem. The $\overline{R}^2$ of the instrumenting equations are 0.36, 0.29, and 0.02 respectively.

TABLE 4.26 - ESTIMATES OF THE VALUE OF DOWRY BRIDE-GROOM RELATIVE EFFECTS[35]

Variable	Coeff.	S.E.	P-value	Coeff.	S.E.	P-value
Groom's household income-Bride's	0.04	0.02	0.097	0.04	0.03	0.154
Bride's parents' income	0.26	0.10	0.010	-0.06	0.16	0.718
Groom's income	4.6	1.7	0.006	-4.4	3.7	0.239
Groom has primary school	-1063	5064	0.834	-1369	6201	0.825
Groom has more than primary	11103	4930	0.025	9944	6774	0.143
Bride's education	4889	1420	0.001	20692	2958	0.000
Groom's hours in agriculture	-203	377	0.591	-73.3	358	0.838
Groom's hours non-agriculture	-191	100	0.056	-192	97.9	0.051
Groom's hours in family production	28.6	83.7	0.732	28.4	79.8	0.722
Bride's total hours	-91.5	202	0.651	-95.2	241	0.693
Brides hours worked for income	-6919	12783	0.589	-12200	15276	0.425
Punjab	14333	5711	0.012	9115	5524	0.099
Sindh	-2317	6736	0.731	-4326	6602	0.513
Balochistan	-3012	10923	0.783	-7810	10493	0.457
Rural	9045	5436	0.097			
Urban×[Household income-Bride's]				-0.02	0.04	0.536
Urban×Bride's parents' income				0.22	0.18	0.214
Urban×Groom's income				11.6	3.7	0.002
Urban×Groom has primary				-717	9457	0.940
Urban×Groom has more than primary				2078	9192	0.821
Urban×Bride's education				-18105	3199	0.000
Urban×Brides' work hours				-150	286	0.601
Urban×Bride works for income				16488	25595	0.520
Constant	-13909	10434	0.183	6484	10622	0.542
Observations	564			564		
F - statistic	12.67			12.75		
$\overline{R}^2$	0.24			0.31		

[35] Bride's education, the probability that a bride works for income, and brides' total work hours are assumed endogenous. A two-stage method of estimation is used to deal with this problem. The $\overline{R}^2$ of the instrumenting equations are 0.36, 0.29, and 0.02 respectively.

Figure 4.1 - Bride's Education and Bride's Parents' Income

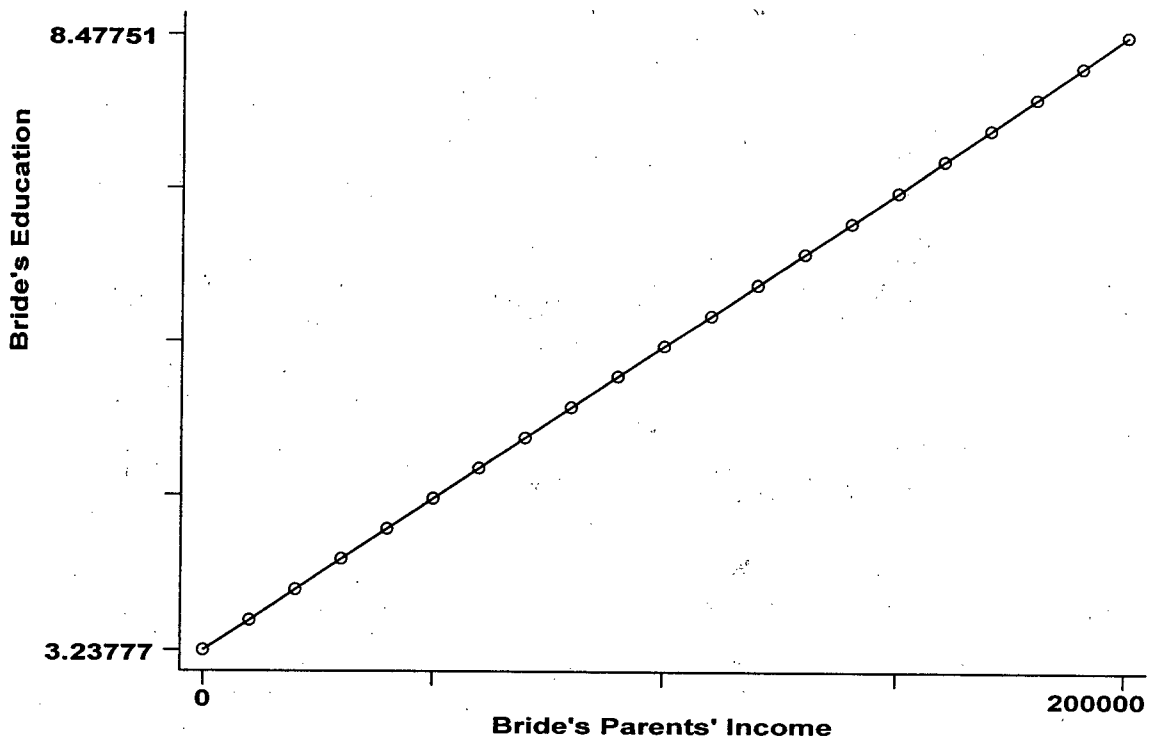


Figure 4.2 - Dowry Paid and Groom's Household Income

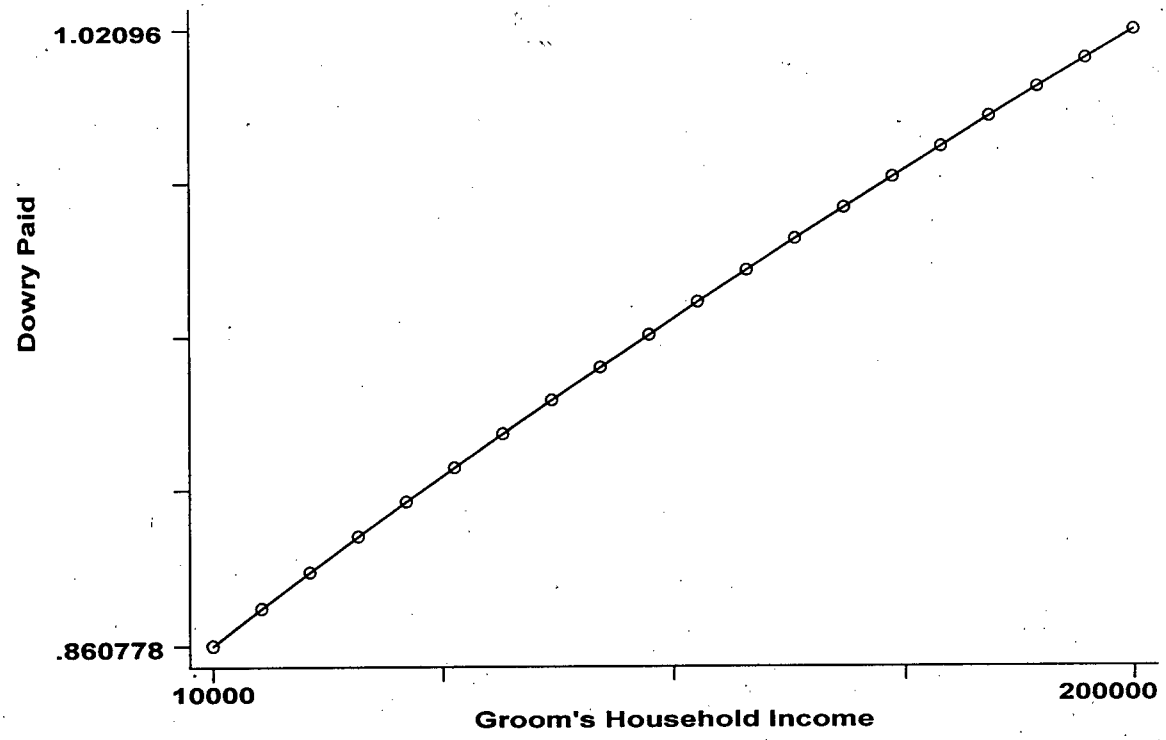


Figure 4.3 - Dowry Paid and Groom's Income

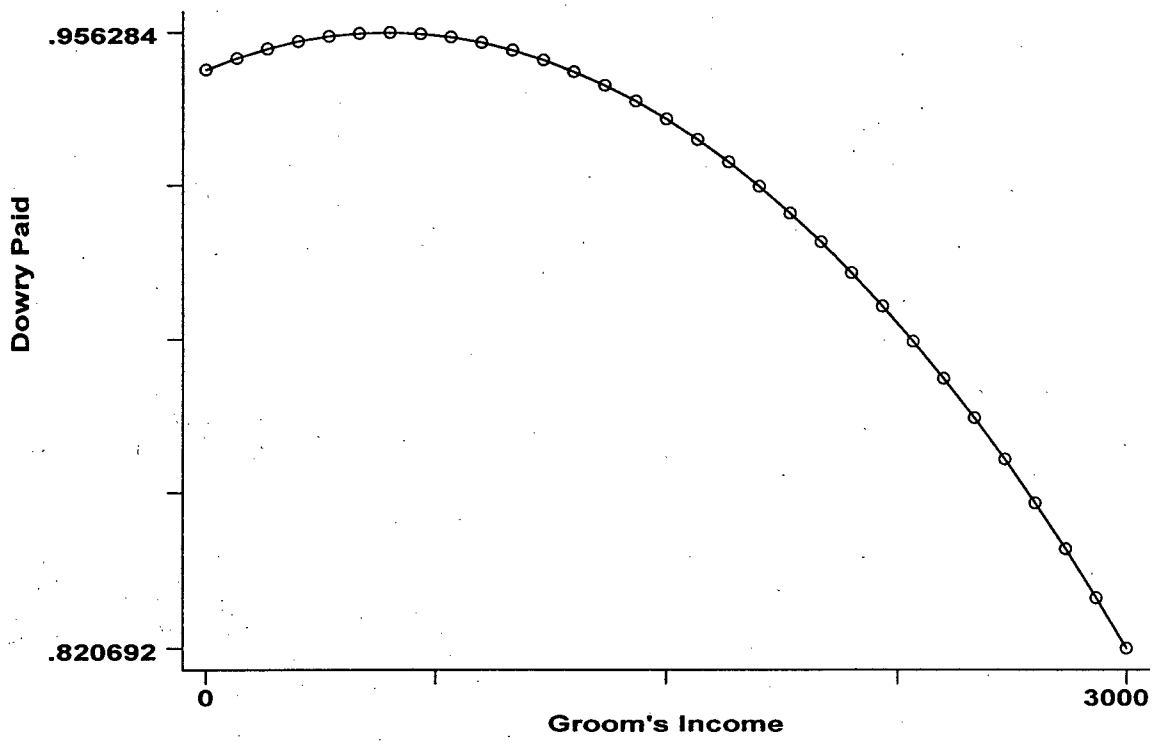


Figure 4.4 - Dowry Paid and Bride's Parents' Income

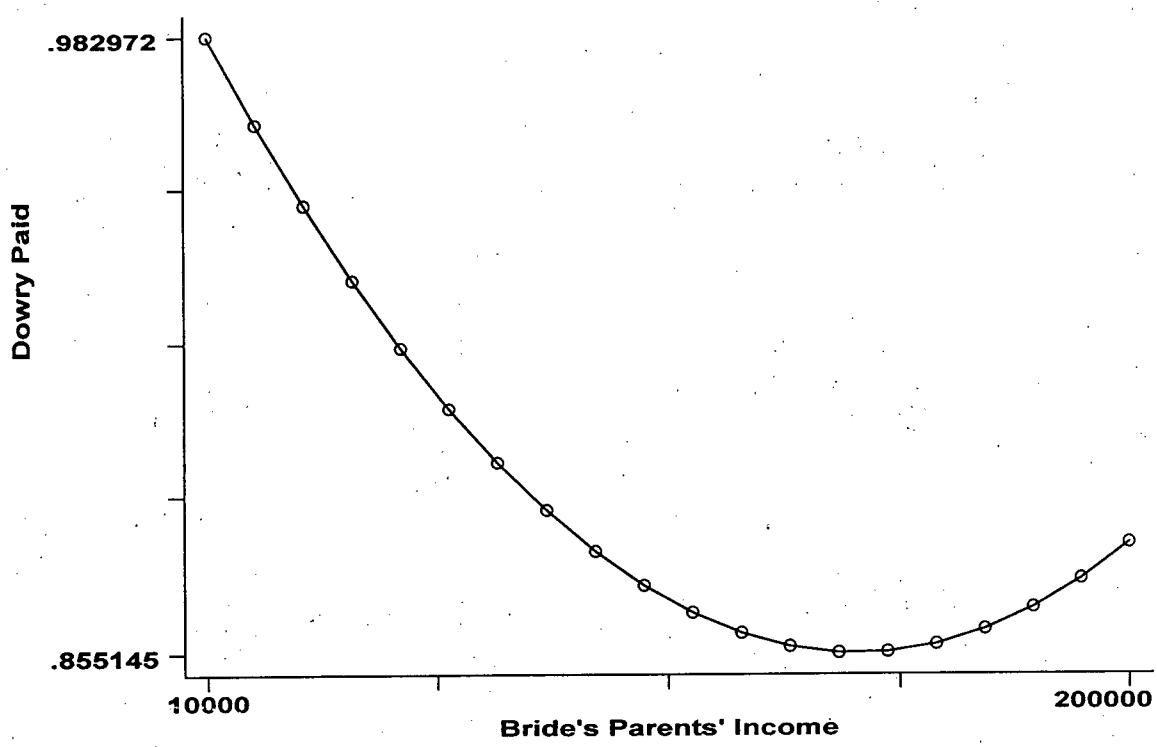


Figure 4.5 - Value of Dowry and Groom's Household Income

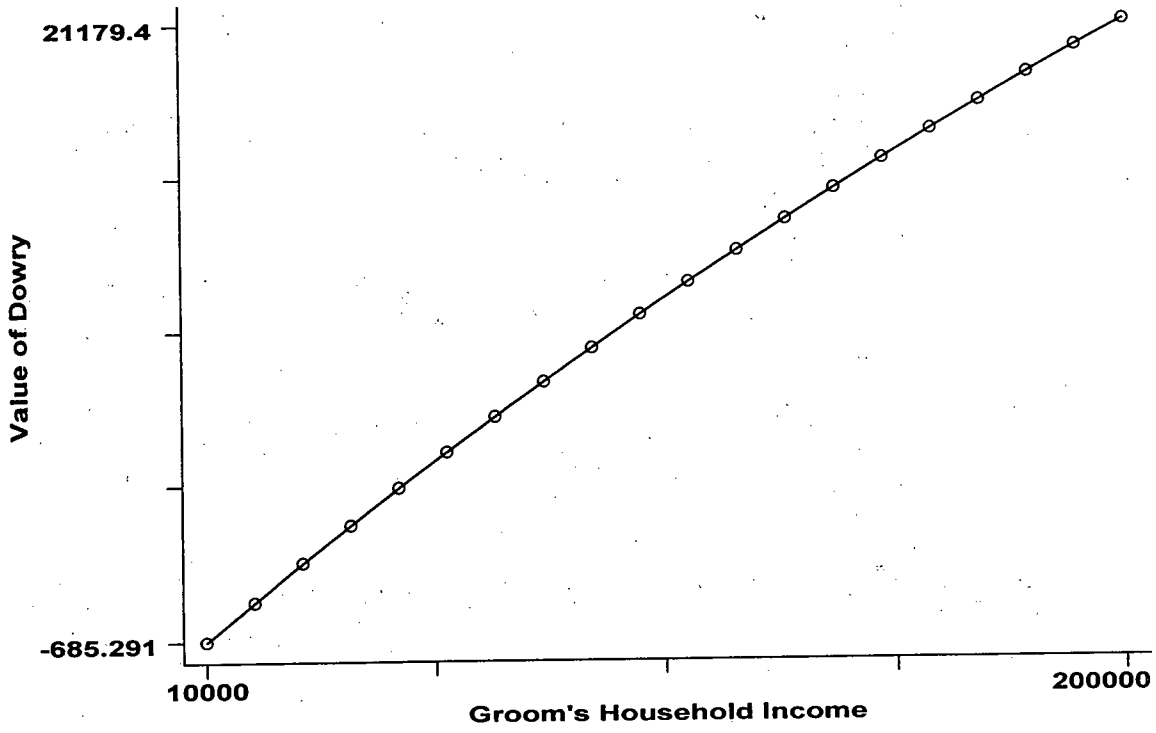


Figure 4.6 - Value of Dowry and Groom's Income

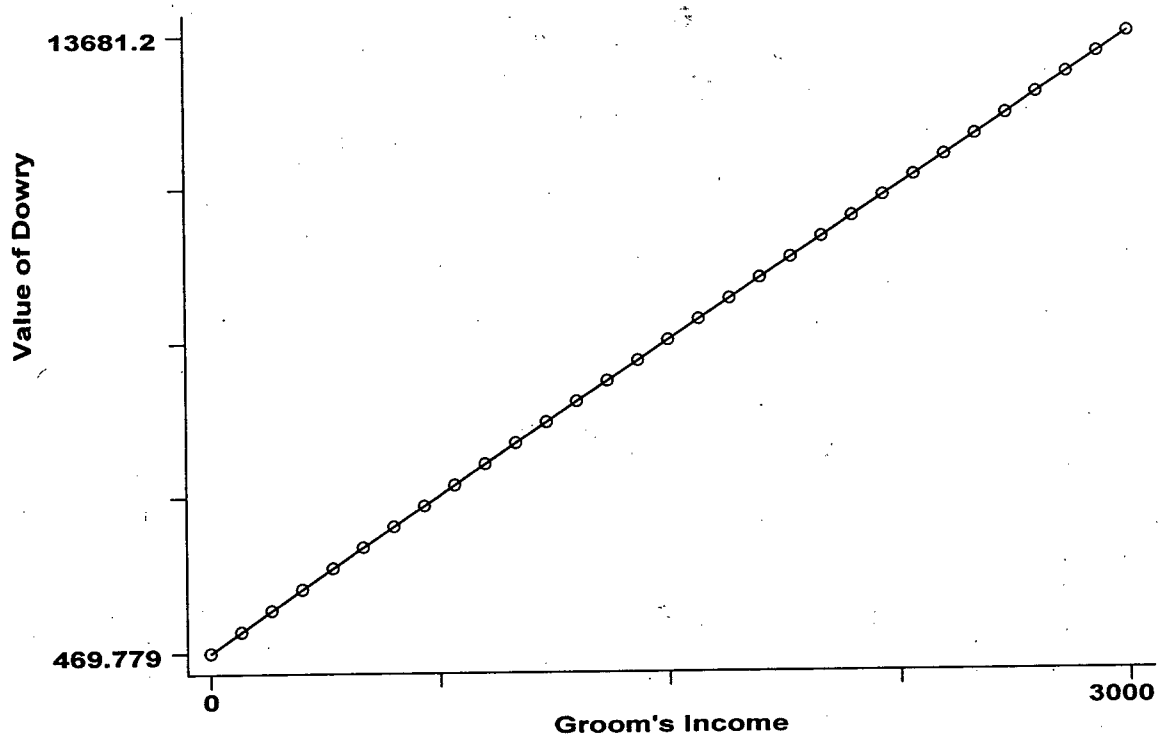
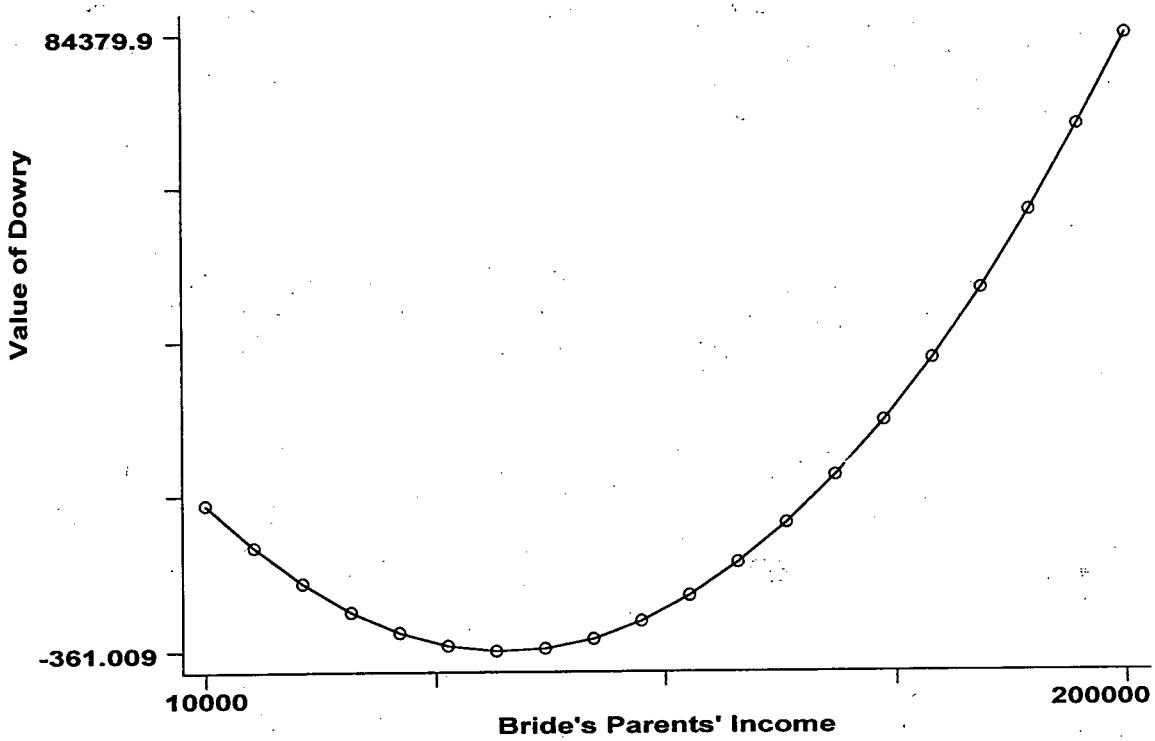


Figure 4.7 - Value of Dowry and Bride's Parents' Income



Chapter 5

Conclusion

The question which motivated this thesis is to explain real dowry inflation in India. The first step was to understand the main existing view amongst economists. To this end, it seemed that extending the essentially static explanation into a dynamic framework was necessary but first conditions under which dowries would likely increase in the static case were considered. In particular, a rise in dowry payments is more likely to occur if population is growing at an increasing rate, if the costs to supporting unmarried daughters are convex in the number of daughters, and if the income distribution across bridal families is skewed to the right. In the dynamic framework, there appeared to be difficulties in making the theory reconcile the two observations relevant to the context of population growth, namely dowry inflation and the average age of brides rising when population growth does not lead to an increased number of unmarried women. It was shown that in this case the predicted time path of dowry payments seems to be decreasing. This conclusion is not meant to be a predictor of reality but rather to point out the difficulty of demonstrating that population growth leads to dowry inflation. This result holds only if women anticipate they will eventually marry, despite the excess supply of brides, as long as they postpone their marriage until they are older than the desirable age. These expectations on behalf of brides are not unrealistic even though it was established that the marriage age gap between grooms and brides can never perfectly close. That is, a steady state in the marriage market where all grooms and brides marry at the same age can never exist if there is initially a difference in marrying ages. However, a steady state can exist where grooms marry brides their own age and those slightly younger. This matching pattern can continue forever and all brides and grooms eventually marry.

The main explanation developed in this thesis focuses on the role of social hierarchy and the process of modernisation. The occurrence of dowry payments is due to the segregation of grooms into castes, but rising dowries emerge due to a development process which threatens the social structure, i.e., lower status or caste individuals begin to accumulate wealth of comparable levels to those of higher status. If there is an inherited component to status independent of wealth, such as is the case in a caste system or in an aristocratic class, the relative ranking of a group can be maintained if same status individuals marry. This endogamous situation can only prevail if dowry payments increase within a given status group.

When women reap comparable benefits from development to men dowry payments will be less, however, because of gender asymmetries embedded in the caste system, the inflationary component of the dowry phenomenon can persist. The analysis suggests that dowry inflation could well cease in the event of a more equal income distribution *across* castes and once caste is relegated to a less important role in the marriage matching procedure.

Despite adherence to particularities of India, the arguments developed in this thesis can be generalised to include somewhat similar social structures found elsewhere in South Asia.

The analysis is consistent with a transition from bride-price payments to dowry where development places an upward pressure on real marriage payments rendering 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 where women generally engage in informal income-earning activities. Similarly, the societies of South India are traditionally matrilineal and in consequence women have a somewhat higher status compared to northern states. When men are also a homogeneous group, as in the pre-development scenario, marriage negotiations which 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 will emerge. Although such rationale can potentially explain the existence of different marriage payments, it must be recognised that the complexity of these traditions is not addressed and may be beyond the scope of economists.

Alternative to the view that dowry acts as a price in a demand and supply model, throughout

the thesis dowry is considered an instrument for matching brides and grooms in the marriage market. In this conception, rather than equilibrating demand and supply, dowry payments serve to satisfy incentive compatibility constraints such that no unmatched pair would prefer to be matched. As a result, it is changes in the relative quality or rankings of individuals which generate equilibrium payments to in turn adjust. In the case of demographic change, it is the fact that population growth induces competition between older and younger brides, who are of different quality, which generates a changing time path of dowry payments. Alternatively, in the analysis of modernisation it is that development alters the relative ranking of grooms which ultimately causes dowry payments to increase over time.

An empirical investigation of the main argument of this thesis is yet to be undertaken. The analysis predicts that an increase in the heterogeneity of incomes within a given caste will cause dowry payments in that caste to rise. An additional implication is that increased income heterogeneity in castes below also has a positive effect on dowry payments in castes above. Furthermore, an increase in the average wealth of lower castes should positively affect dowries in castes above whereas increasing the average wealth within a given caste can have an ambiguous affect on payments in that caste.

Aside from testing the direct implications of the theory, empirically verifying the foundations of the analysis is also necessary. There is considerable support for the two main assumptions, however, they too have yet to be substantiated empirically. In particular, testing for an increasing spread of incomes within caste groups over time is most important. The other crucial assumption is the existence of some substitutability between the value of income and caste in the selection of spouses. This is verified if grooms of the same wealth but in different castes receive dowries in accordance with their caste rank. Such a relationship may be difficult to uncover since higher caste men generally also have higher incomes but will become more apparent as lower caste individuals continue to benefit from development.

More generally, it should be possible to test for a link between modernisation and dowry inflation, and also contrast this with the impact of population growth. This could be done using the regional variation of the degree of development and population growth within India and across time and information on dowries. The available dowry data from India does pertain to five different districts and spans the period 1921-1981. This investigation was not undertaken

in this thesis because of the unavailability of information on the distribution of income, to reflect the degree of income heterogeneity caused by development, in the census of India data. However, this information could perhaps be gathered for various districts from the National Sample Survey of Consumer Expenditures which is periodically collected. The more specific test of wealth heterogeneity in lower castes affecting dowries in higher castes is still infeasible, since like the census data, information on the caste membership of individuals is unavailable and hence it is impossible to construct a caste-specific indicator of development.

The available dowry data are from rural districts located in southern and central India. The regions encompassed in this data, categorized as India's semi-arid tropics, are some of the poorest in the country. Therefore the degree of development in this sample is quite low and a few of the districts are still in a transition from bride-price to dowry. The study of areas undergoing significantly more development would better suit an investigation of the link between dowry inflation and modernisation. This being said, ideally I would endeavor to collect new data pertaining to marriages and dowry payments in such areas.

The well-being of individuals is strongly affected by the dowry phenomenon. In some general sense, if the proportion of daughters to sons is approximately equal, all families it seems would be better off without the institution. A welfare analysis explicitly modelling dowry determination of families who receive dowries for their sons and pay dowries for their daughters may well be worthwhile. Interesting predictions may emerge, particularly with respect to gender asymmetries in investment decisions in children and the timing of these decisions. It has been noted that since giving a large dowry for a daughter may signal the high quality of her family, parents then have incentive to make such substantial payments so that a high dowry for her brother can in turn be expected. Examining such trade-offs between daughters and sons may prove insightful.

Most significantly, the institution of dowry in India is strongly detrimental to women. This study links the relatively low status of women in society to the dowry phenomenon which in turn worsens their position as they are more and more considered a profound economic liability. When women gain economic value through development these negative forces may be somewhat abated. However, a proper examination of the trade-off between investing in a daughter's education and providing for her dowry is necessary to draw such conclusions.

On the one hand, educating a daughter can lower her dowry but at the same time such an investment leaves parents more credit constrained at the time of her marriage when the dowry must be provided. I suspect that the value to parents of their daughter's education is less than what they receive by paying a dowry, as otherwise educating daughters would seem the smaller expenditure. Again, formally exploring these investment decisions may generate interesting implications.

The focus on modernisation as a cause for dowry inflation creates questions with regards to a development process which renders lower castes better off. On the one hand, such a process exacerbates the dowry problem. However, it is also the case that a more equal income distribution across castes will ultimately cause the phenomenon to disappear. Additionally, the impact of particular wealth distributions within each caste are not straightforward and can in fact be counter intuitive. That is, a development process which rewards only a handful of people to the detriment of others actually causes the severity of the problem to be greater. These implications open up an interesting study of the well-being of individuals which interlinks caste-based affirmative action policies and income redistribution programs to their impacts on dowry payments.

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