# Supplementary appendix to Muslim family law, prenuptial agreements and the emergence of dowry in Bangladesh: dynamic analysis

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**Abstract**

This is a companion paper to Ambrus, Field and Torrero (2008). We extend the theoretical analysis of a marriage market with prenuptial agreements to a dynamic setting, in which individuals can reenter the marriage market after failed marriages. We show that the qualitative conclusions of the static analysis remain valid in the dynamic framework.

## 1 Introduction

This paper extends the static analysis of a marriage market with prenuptial agreements, provided in Ambrus et al. (2008), to an infinite-horizon model with overlapping generations. The model retains the basic framework used in the static analysis. The main new feature of the model is that individuals can reenter the marriage market after failed marriages. This leads to two complications relative to the static analysis: (i) one needs to keep track of the set of women and men from earlier generations who are not settled into a final marriage; (ii) continuation values after separation (divorce or abandonment) have to be determined simultaneously with marriage and separation decisions, since they mutually affect each other. Moreover, part of the continuation value of an individual after separation consists of the present expected value of future dowry payments the individual pays or receives in case of remarrying. Since this influences the total cost that divorce imposes on a woman, the amount of mehr a woman wants to choose in the dynamic framework directly depends on the dowry levels.

## 2 The Model Framework

We consider an overlapping generation model of endowment economy with marriage markets, with time periods $t = ..., -2, -1, 0, 1, 2, ....$ In every period a new cohort of young women and men are born.[1] We assume that each cohort consists of a continuum of women and men, of the same size. All individuals live for an infinite number of periods, and they discount future payoffs using the same constant discount factor $\delta$.[2]

Within each period, the sequence of events is the following: (1) endowments realize: all men receive endowment $e$, and all women receive endowment $e'$; (2) individuals eligible for marriage decide whether to marry and choose a marriage contract (see below for the description of the contract); (3) women and men who want to marry get matched to each other (see the matching technology below), and exchange a transfer (dowry or bride price, depending on the identity of the receiver); (4) the ex ante unknown match qualities of couples realize (see below in more detail); (5) married men decide whether to divorce or abandon their wives; (6) men who decide to divorce pay a transfer to their spouses, the amount of which depends on the marriage contract signed; (7) individuals consume.

Separation, which can be either abandonment or divorce, is a unilateral decision of men. Men who are eligible to marry are: all men from the new cohort, and all men from previous cohorts who either abandoned or divorced their former wives. Women who are eligible to marry are: all women from the new cohort, and all women from previous cohorts who got divorced by their former husbands. Abandoned women (who are still married on paper) are not eligible to marry again.

All individuals have the same utility function, which is additively separable in time. Utilities in each period depend on consumption and marital status in an additively separable manner: $U(c, x) = u(c) + x$, where $c$ is consumption in the given period, and $x$ is the utility from current marital status. Below we focus on the case when $u(c) = c$. Because of the linear utility setup, we also assume that the rate of interest is $r = \frac{1}{\delta} - 1$, otherwise individuals would like to either consume all their lifetime income in period 1, or postpone consumption indefinitely.[3]

We normalize $x$, the utility term from marital status, to be 0 for individuals not in an active marriage (single, divorced, or abandoned). For man $i$, the utility of being married in period $t$ is $X_i + \varepsilon_i^t$. The term $X_i$ is individual-specific and known by the man ex ante, while $\varepsilon_i^t$ is a match-specific random component that is unknown to him before entering the marriage. The latter represents the couple's (or the wife's and in-laws') unobservable level of compatibility. The

[1] This formulation (no initial period and infinitely lived individuals) makes the definition of stationary equilibrium simple, since in such equilibrium the environment is stationary for individuals (conditional on current marriage status). Alternatively, we could specify the model with an initial period and individuals who live for some finite K periods, and look at equilibria that are stationary from period K on. This formulation would have the added complication of the environment not being stationary for individuals, hence we would need to keep track of decisions of individuals of age 1,...,K separately.

[2] As usual, this discount factor can incorporate a constant probability with which an individual dies at the end of any period. That is, the model can be reinterpreted in a way that individuals have finite life-spans with probability 1.

[3] Alternatively, we could simply assume no intertemporal substitution, which is arguably realistic in this setting.

distribution of $X_i$ in a cohort is assumed to be continuous and have strictly positive density over $R$, and have finite first and second moments. The random term $\varepsilon_i^t$ is conditionally independent of $X_i$, and its distribution for any potential bride has the same density function $\varphi()$, which is assumed to be continuous and strictly positive over $R$, and have finite first and second moments. Intuitively, a higher $X_i$ implies that man $i$ is more eager to be married, while a higher $\varepsilon_i$ means that man $i$ has less incentive to separate from his current wife. Once $\varepsilon_i$ is realized for a given wife, it remains the same for all subsequent periods if the man stays with the same woman. However, if the man separates and remarries, a new $\varepsilon_i$ is drawn, which is independent of the previous realization.[4]

In case of abandoning his wife, a man incurs an exogenous cost $q \in R_+ \cup \{\infty\}$. In case of divorce, a man has to pay an amount of money $m_0$, specified by the law, to his wife, plus whatever additional amount $m$ the couple agreed upon in their marriage contract.

To woman $j$, getting married provides individual-specific utility $Y_j$ in each period of her life, which is known by her ex ante.[5] However, being divorced or abandoned imposes socioeconomic costs. The total monetary costs that divorce imposes on the woman is $D_j$, an individual-specific amount that is known ex ante. The monetary value of these costs in case of abandonment is $A_j$, where we assume $A_j \geq D_j - m_0$. This assumption implies that even a woman with mehr 0 would prefer to get officially divorced than abandoned. The distribution of $(Y_j, A_j, D_j)$ in each cohort is assumed to have a continuous density function and finite first and second moments, and the marginal density of $(Y_j, D_j)$ is assumed to be positive over $R^2$.[6]

# 3 Matching technology and equilibrium

Within every period, we assume a frictionless matching technology. We assume that there is a continuum of possible marriage contracts, corresponding to mehr levels $m \in [0, \infty)$, and each of them is assigned a price, that is an amount of transfer that the woman entering a marriage with the given contract has to pay to her husband at the beginning of marriage. We denote the transfer specified for a contract with mehr $m$ by $d(m)$, and refer to it as the dowry attached to mehr level $m$ - although we allow $d(m)$ to be negative, in which case the precise terminology would be bride price. At the beginning of any period, individuals who are eligible to marry observe dowry levels $d(m)$ for $m \in [0, \infty)$, and decide whether to enter the market, and if yes then what contract (what level of $m$) to

[4] Note that as opposed to the static model in Ambrus et al. (2008), here we assume that even if separation occurs in the first period that the couple is married, the random match quality realization does enter the man's utility function (for one period).

[5] Allowing for a random component, as in the case of the utility term for men, would not make any difference, since it is men and not women who decide whether to separate. The import assumption in the model is that men have a lower threshold of match quality realization for wanting to end the marriage.

[6] This formulation allows for $D_j$ to be zero or negative for some women, although it is natural to assume that the variable is strictly positive for most women.

choose.

Let the set of women and men who decide to get married (that is, choose some contract $m$) at some period by $W$ and $M$, respectively. Let $\widetilde{m}_W(w)$ denote the mehr choice of any $w \in W$, and let $\widetilde{m}_M(m)$ denote the mehr choice of any $m \in M$. We say that the marriage market clears at the given period if there is a bijection $\widetilde{b} : W \to M$ that is (i) measure-preserving, i.e. $\lambda_M(\widetilde{b}(W')) = \lambda_W(W')$ for every Borel $W' \subset W$; (ii) matches individuals who want to sign the same contract: $\widetilde{m}_M(\widetilde{b}(w)) = \widetilde{m}_W(w)$ for every $w \in W$.

Note that the definition of market clearing implies that for every $S \subset [0, \infty)$ the following holds: if the sets of women and men choosing contracts from $S$, denoted by $W^S$ and $M^S$ are measurable then $\lambda_M(M^S) = \lambda_W(W^S)$ - that is, supply and demand are equal for all contracts.

So far we only defined market clearing at a given period of time, given decisions of individuals eligible to marry. These decisions depend on expectations on dowry levels and divorce probabilities in subsequent periods. We now define stationary equilibrium in this environment, in which dowry levels stay constant over time, the decisions of women and men are stationary, given these decisions the market clears in every period, and given the dowry function and decisions of others, every individual's marriage and separation decisions are optimal, at any point of time. Strategies are stationary if (i) decisions of individuals whether to marry and what contract to sign do not depend on the time period and on what happened in the market beforehand; (ii) decisions of married men whether to stay in the marriage, abandon, or divorce the current wife only depend on the match quality realization in the current marriage and on the mehr specified in the marriage contract, not on the time period and on what happened in the market beforehand.

**Definition:** A stationary equilibrium in the marriage market consists of a dowry function $d : R_+ \to R$ and a profile of stationary strategies of individuals such that: (i) given that dowries belonging to different levels of mehr are constantly $d$, the decisions of all individuals at any point of time are sequentially rational; (ii) given the profile of strategies, the market almost surely clears at every period.

From now on, for ease of exposition, we refer to stationary equilibrium simply as equilibrium.

# 4 Basic properties of equilibrium

The first result we derive states that in any equilibrium, for any mehr level there is a critical value such that a match quality realization below this value induces the man to separate, while a match quality realization above this value induces him to stay in the marriage forever. In essence, men face an optimal stopping time problem. Moreover, this critical value is decreasing in the level of mehr, meaning that mehr serves as an exit barrier for the man. For all proofs, see the Appendix.

We assume throughout that $q \neq m_0$. For any $m \geq 0$, let $c_m = \min(q, m_0 + m)$.

**Claim 1:** In equilibrium, there is a critical value $\varepsilon^c$ such that if the marriage contract specifies $m \geq 0$, then a match quality realization smaller than $\varepsilon^c - \frac{1-\delta}{\delta}(c_m - c_0)$ induces him to separate at the end of the first period of marriage, while a match quality realization larger than $\varepsilon^c - \frac{1-\delta}{\delta}(c_m - c_0)$ induces him to stay in the marriage forever. If $q > m_0$ then every separation is divorce, and if $q < m_0$ then every separation is abandonment.

Claim 1 implies that in equilibrium, contingent on the marriage contract all men separate under the same contingencies - that is, the probability that man $i$ separates from his current wife does not depend on $X_i$. The reason behind this is that match quality enters linearly in the utility functions of men. The term $c_m$ is the effective cost of a marriage contract with mehr $m$ for the man, contingent on separation. Note that it strictly increases only as long as $m_0 + m < q$, otherwise the man should optimally choose abandonment and avoid paying divorce transfers. The term $\frac{1-\delta}{\delta}(c_m - c_0)$ is the amount of match quality reduction a man is willing to endure in a marriage with mehr $m$, relative to a marriage with 0 mehr. If $q > m_0$ then in equilibrium women never specify mehr levels which could make the husband prefer abandonment over divorce. If $q < m_0$ then mehr is inconsequential, since for any feasible mehr level abandonment is less costly for a man than official divorce.

The next claim reveals an important feature of the dowry function in equilibrium.

**Claim 2:** In equilibrium, there is $d_0 \in R$ such that $d(m) = d_0 + \pi(m)$ for every $m$ chosen in equilibrium, where $\pi(m) \equiv \int\limits_{-\infty}^{\varepsilon^c - \frac{1-\delta}{\delta}(c_m - c_0)} \varphi(x)(c_m - c_0)dx + \int\limits_{\varepsilon^c - \frac{1-\delta}{\delta}(c_m - c_0)}^{\varepsilon^c} \varphi(x)\frac{\delta}{1-\delta}(\varepsilon^c - x)dx$.

The dowries in equilibrium contracts can be decomposed as a sum of the base level dowry $d_0$, and the price of the mehr specified in the contract, $\pi(m)$. The price of mehr is increasing in $m$, and it exactly compensates the groom for the expected extra cost that the mehr imposes on him. To see this, note that the first term in the expression for $\pi(m)$ is the expected cost that that mehr $m$ imposes on the man by increasing the amount of transfer he has to pay in case of divorce (which occurs after match quality realizations bad enough that mehr $m$ cannot keep the man in the marriage), while the second term is the expected cost that mehr $m$ imposes on the man by keeping him in a less than ideal marriage (which occurs after match quality realizations that are bad enough such that the man would divorce if the mehr was specified to be 0, but not when the specified mehr is $m$).

Note that if $q < m_0$ then $\pi(m) = 0$ for every $m \in R_+$, since in this case $c_m = c_0$ for every $m \in R_+$. In this parameter region, mehr is inconsequential, and therefore mehr levels specified in marriage contracts are indetermined. On the other hand, if $q > m_0$ then there is a unique optimal mehr choice for any woman, characterized by the next result.

Define $D^* = m_0 - \delta d_0$ and $D^{**} = q - \delta d_0 - \delta\pi(q - m_0)$.

**Claim 3:** Suppose $q > m_0$. Then in any period in which woman $j$ chooses to marry:

(i) If $D_j \leq D^*$ then she chooses $m = 0$;

(ii) If $D^* < D_j < D^{**}$ then the $m$ she chooses is the unique solution to the equation $m = D_j + \delta[d_0 + \pi(m)] - m_0$;

(iii) If $D^{**} \leq D_j$ then she chooses $m = q - m_0$;

To interpret the above result, note that if woman $j$ in equilibrium chooses a mehr level $m$, the over all cost of being divorced, from the point of view of the period of divorce, is $D_j + \delta[d_0 + \pi(m)]$. In particular, $D_j$ is the direct social cost that the divorce imposes on her, while $d_0 + \pi(m)$ is the dowry that she has to pay to marry again next period with the same contract, the present value of which is $\delta[d_0 + \pi(m)]$. Women in equilibrium choose a mehr level that minimizes the difference between $m_0 + m$, that is the total compensation they receive in case of divorce, and the above over all cost, subject to two constraints: the nonnegativity requirement on $m$, and the constraint that $m \leq q - m_0$. The latter is because $m > q - m_0$ implies that the husband strictly prefers abandonment to divorce. Note that the result implies that every couple chooses a mehr level that maximizes the joint surplus of the couple, subject to the constraints $m \geq 0$ and $m \leq q - m_0$. If neither of these constraints bind, the mehr level is specified such that the husband decides to divorce exactly after match quality realizations for which the sum of continuation values of the spouses are higher in case of divorce than in case of staying together.

Since the mehr a woman $j$ chooses in equilibrium only depends on $D_j$, for any equilibrium, we can define function $m : R_+ \to R_+$ such that $m(D)$ is the amount of mehr that a woman with marriage utility parameter $D$ chooses in the equilibrium, if she decides to marry.

Lastly, we characterize individuals' choices whether to get married or not in equilibrium. Let $X^c$ be defined implicitly by: $\frac{u(e)}{1-\delta} = d_0 + \int\limits_{-\infty}^{-\frac{1-\delta}{\delta}c_0 - X^c} \varphi(\varepsilon)[u(e) + X^c + \varepsilon - c_0 + \delta\frac{u(e)}{1-\delta}]d\varepsilon + \int\limits_{-\frac{1-\delta}{\delta}c_0 - X^c}^{\infty} \varphi(\varepsilon)\frac{u(e)+X^c+\varepsilon}{1-\delta}d\varepsilon \qquad (*)$

Note that the right hand side of (*) is continuous and strictly increasing in both $d_0$ and $X^c$, and it goes to $-\infty$ and $+\infty$ as $X^c$ goes to $-\infty$ and $+\infty$, which means that $X^c$ is well-defined.

**Claim 4:** In equilibrium, any man $i$ with $X_i > X^c$ gets married at any period he is eligible to marry, and any man $i$ with $X_i < X^c$ stays single for all periods. Moreover, $\varepsilon^c = -X^c - \frac{1-\delta}{\delta} m_0$.

Let $Y_I^c(y)$ be defined implicitly by:

$$\frac{u(e')}{1-\delta} = -d_0 - \pi(m(y)) + \int_{-\infty}^{-X^c - \frac{1-\delta}{\delta} m(y)} \varphi(x)(u(e') + Y_I^c(y) + m_0 +$$

$$m(y) - y + \delta \frac{u(e')}{1-\delta})dx + \int_{-X^c - \frac{1-\delta}{\delta} m(y)}^{\infty} \varphi(x) \frac{u(e') + Y_I^c(y)}{1-\delta} dx \qquad (**)$$

Let $Y_{II}^c(y)$ be defined implicitly by:

$$\frac{u(e')}{1-\delta} = -d_0 + \int_{-\infty}^{-X^c} \varphi(x)(u(e') + Y_{II}^c(y) - y)dx + \qquad (***)$$

$$\int_{-X^c}^{\infty} \varphi(x) \frac{u(e') + Y_{II}^c(y)}{1-\delta} dx$$

$$-y + \delta$$

Claim 3 implies that the right-hand sides of (**) and (***) are strictly decreasing and continuous in $d_0$. Moreover, the right-hand side of (**) is strictly increasing and continuous in $Y_I^c(y)$, while the right-hand side of (***) is strictly increasing and continuous in $Y_{II}^c(y)$. Finally, the right-hand sides of bothe equations go to $-\infty$ and $+\infty$ as $Y_I^c(y)$ and $Y_{II}^c(y)$ go to $-\infty$ and $+\infty$. This implies that $Y_I^c(y)$ and $Y_{II}^c(y)$ are well-defined.

**Claim 5:** If $q > m_0$ then in equilibrium, woman $j$ gets married at any period she is eligible to marry if $Y_j > Y_I^c(D_j)$, and stays single for all periods if $Y_j < Y_I^c(D_j)$. If $q < m_0$ then in equilibrium, woman $j$ gets married at any period she is eligible to marry if $Y_j > Y_{II}^c(A_j)$, and stays single for all periods if $Y_j < Y_{II}^c(A_j)$.

It is now possible to show that there is only one level of $d_0$ consistent with stationary equilibrium. The intuition is that the mass of women wanting to marry in any cohort is continuous and decreasing in $d_0$, going to 0 and 1 as $d_0$ goes to $+\infty$ and $-\infty$. Similarly, the mass of women wanting to marry in any cohort is continuous and increasing in $d_0$, going to 0 and 1 as $d_0$ goes to $-\infty$ and $+\infty$. Therefore, there is only one level of $d_0$ at which the market clears. Note that once $d_0$ is pinned down, if $q > m_0$ then all variables of interest (how many individuals marry from each cohort, what mehr levels couples choose, separation decisions of men) are uniquely determined by the claims above, hence equilibrium in our model is essentially unique. The same holds if $q < m_0$, with the exception of the mehr choices, which are inconsequential and hance undetermined.

**Proposition 1:** *(existence and uniqueness)* For any $q$ and $m_0$, there exists an equilibrium. Moreover, for any two equilibria the following hold:

(i) if $q > m_0$ then the set of mehr levels chosen in equilibrium is the same: $[0, q - m_0]$;

(ii) $d(m)$ is the same for any $m \in [0, q - m_0]$;

(iii) the set of women and men who decide to marry in each cohort are the same, up to a set of individuals of measure 0;

(iv) a woman marrying in both equilibria chooses exactly the same $m$ in both equilibria.

# 5 Regime Changes and Theoretical Predictions

## 5.1 Description of legal regimes in the model

We think about the marriage market before 1961 as a regime in which both alimony payments and the cost of abandonment for men are low. We refer to this period as Regime I, and assume that during this period $m_0 = m_0^I$ and $q = q^I$. An immediate conclusion from our model is that if $q^I > m_0^I$ then mehr levels specified in marriage contracts have to be small, since given a mehr level higher than $q^I - m_0^I$ a man would strictly prefer abandonment to divorce. Since women prefer the latter, it is not optimal for them to choose mehr levels that induce abandonment.

We model the legal change in 1961 as an increase in $q$ to a level that makes abandonment prohibitively costly.[7] We refer to the period between 1961 and 1974 as Regime II, and assume that during this period $q = \infty$ and $m_0 = m_0^{II} = m_0^I$. Note that Claim 3 implies that in this regime every marrying couple signs a contract that maximizes the joint utility of the couple, subject to the nonnegativity constraint on mehr. If the latter constraint does not bind for woman $j$ then she is perfectly compensated for the costs divorce imposes on her: she is paid the sum of the social cost $D_j$ and the present value of the extra dowry she needs to pay next period when remarrying, $\delta(d_0 + \pi(m))$. If the $m \geq 0$ constraint binds then woman $j$ is "overcompensated" in case of divorce.

Finally, we model the change in 1974 as an increase in the contract-independent alimony transfer, $m_0$.[8] We refer to the period after 1974 as Regime III, and as-

[7] As we argue in Section 5, this primarily applies to nonremote districts, where people in this period had access to legal institutions.

[8] As we argue in Section 5, this again primarily applies to nonremote districts. The expansion of legal enforcement institutions to remote areas at the same time implies that the legal change in these areas also increased $q$ to a prohibitively high level (the same change as what occurred in nonremote districts in 1961).

sume that during this period $m_0 = m_0^{III} > m_0^{II}$.

## 5.2 The Change from Regime I to Regime II

Here we investigate the consequences of the 1961 change, which made abandonment and polygamy prohibitively costly.

The next result shows that if $q^I > m_0^I$ then the regime change unambiguously increases both mehr and dowry for every (marrying) woman in our model. The intuition for this is the following. Suppose first that the regime change does not change the level of base dowry. Then Claim 2 implies that dowry payments belonging to the set of mehr levels that were contractible in Regime I do not change, and Claim 1 implies that conditional on any mehr level in this range, the probability of divorce is unchanged. These imply that every woman type who marries in Regime I also marries in Regime II. Furthermore, the set of contractible mehr levels is $R_+$ in Regime II, hence woman types whose divorce costs are larger than threshold $D^{**}$ are strictly better off in Regime II. Claim 5 implies that a positive measure of these women types do get married, which concludes that the number of women in each cohort is larger in Regime II than in Regime I. At the same time, Claim 4 implies that the number of men deciding to marry in each cohort stays the same. This contradicts that the market clears in both regimes, and indeed the base dowry needs to be higher in Regime II than in Regime I, to restore equilibrium in the market. The increase in base level dowry, by Claim 3, increases mehr $m$ women specify in equilibrium, which also increases $\pi(m)$, the mehr-dependent part of the dowry. All in all, both mehr and total dowry has to increase for every woman who decides to marry.

If $q^I < m_0^I$ then the regime change unambiguously increases the dowry for every (marrying) woman. In this case there is yet another effect increasing $d_0$, coming from an increase in the number of women returning to the market, relative to the number of men returning, which increases the relative supply of women. In particular, in regime I for this parameter region separation always implies abandonment, meaning that no women return to the market after failed marriages. After the regime change though, since all separation means divorce, all women with failed marriages return to the market.

**Proposition 2:** *(change from polygamy to monogamy increases mehr and dowry)* The change from regime I to regime II increases the dowry payment for every marrying woman. If $q^I < m_0^I$ then the change from regime I to regime II also increases the chosen mehr payment for every marrying woman.

## 5.3 The change from Regime II to Regime III

The next theorem shows that the 1974 legal change unambiguously decreases the mehr of every woman, and decreases the dowry of all women who specify nonzero mehr in equilibrium.

**Proposition 3:** *(an increase in the mandatory divorce transfer decreases both dowry and mehr)* The change from Regime II to Regime III decreases the mehr of any woman type who marries in both regimes, and it decreases the dowry payment of every woman type who marries in both regimes and is not constrained by the nonnegativity of mehr in Regime III.

Note that the result implies that all women who choose positive mehr in Regime III pay less dowry than in Regime II.

The intuition behind the result is that a higher contract-independent transfer "crowds out" some of the mehr specified in marriage contracts, leading to smaller levels of contracted mehr. If there was no nonnegativity constraint on mehr (that is, some couples could specify negative mehr) then every woman's mehr would decrease by exactly $m_0^{III} - m_0^{II}$. Hence, equilibrium base level dowry and the mehr levels would adjust in a way that all dowries remained the same, and exactly the same set of woman and man types entered the market (in particular, men would be exactly compensated for the increase in $m_0$ by a corresponding increase in $d_0$). That is, mehr would decrease and dowries would stay unchanged. However, the nonnegativity constraint on mehr implies that after the legal change there are more women who are forced to acquire inefficiently high exit barriers for their marriages. This means that if base level dowry increases by the amount that exactly compensates men for the increase in $m_0$ then the regime change would decrease the number of marrying women in each cohort, while leaving the number of marrying men unchanged. This contradicts that markets clear in both regimes, and indeed the base dowry has to be smaller than the amount that exactly compensates men for the increase in $m_0$. Hence, if a woman specifies a nonzero mehr after the regime change (the nonnegativity constraint does not bind), then the regime change decreases the price of her dowry by more than the increase in base level dowry. That is, her total dowry decreases.

The result implies that the regime change decreases average mehr, but does not necessarily imply that average dowry decreases as well. since the dowry payment of those women who specify zero mehr after the change might increase. For example, if $m_0$ is already very high, implying that most women specify zero mehr, a further increase in mandatory alimony payments is likely to increase average dowry levels. However, if most women specify positive mehr levels in their marriage contracts even after the increase in the mandatory alimony payment, which is the the case empirically, then average dowries are likely to fall after an increase in $m_0$, as the next example shows.

Consider a scenario in which there are two types of women and two types of men in the market. Women of type I have marriage value parameter $Y = 0.25$ and divorce cost $D = 0$, while women of type II have marriage value parameter $Y = 10$ and divorce cost $D = 3.5$. In any given cohort, the mass of type I women is 0.2, while the mass of type II women is 0.8. Men of type I have marriage value parameter $X = -10$, while men of type II have marriage value parameter $X = -1$. In any given cohort, the mass of type I men is 0.1, while the mass of type II men is 0.9. Assume also that the distribution of match qualities is $N(0, 1)$.

In the above market, it can be shown that the only equilibrium when $m_0 = 0$

implies $d_0 = d(0) \approx 0.68$ (see the Appendix for the computations). Women of type I are indifferent between marrying and not marrying, and a 0.1 mass of them stay out of the market, while a 0.1 mass of them marry and choose $m \approx 1.99$ and pay a dowry of $d(1.99) \approx 2.4$ (they do not have a direct cost from divorce, but remarrying requires them to pay dowry amount again next period, which is why they specify positive mehr). Women of type II all get married, choose $m \approx 11.23$ and pay dowry $d \approx 8.59$. Men of type I do not marry, while men of type II all marry, and indifferent between marrying type I women with low levels of mehr and type II women with high levels of mehr. Intuitively, the aversion of type I men to marry creates a shortage of men in the market, which pushes $d_0$ up to a level that makes type I women indifferent between marrying or staying single.

Consider now the introduction of a mandatory alimony payment such that $m_0 = 9$. This amount is much higher than the mehr type I women specified before the change, and in the unique equilibrium type I women are forced out of the market. This creates a shortage of women in the market, which decreases dowry levels for the same levels of $m_0 + m$. In particular, in the new regime $d_0 \approx 6.4$, which is lower than $d(9) \approx 7.41$ in the old regime (note that mehr 9 in the old regime provides the same total transfer from husband to wife in the old regime as mehr 0 in the new regime). However, it is still too high for women of type I, who are better off not marrying in the new regime. In the meantime, women of type II all marry, choose $m \approx 0.08$, and pay dowry $d \approx 6.45$. Men of type II are indifferent between marrying or not, and a 0.1 mass of them stays single in equilibrium, while the remaining 0.8 mass get married, to type II women.

Note that the regime change decreases the dowry payment of type II women, who are not bound by the nonnegativity constraint on mehr, from 8.59 to 6.45. By Claim 3, this reflects a general result. In the example this also implies that the average dowry level in the market decreases, too, from $\frac{1}{9}2.4 + \frac{8}{9}8.59 \approx 7.9$ to 6.45. The average mehr level also decreases, from $\frac{1}{9}1.99 + \frac{8}{9}11.23 \approx 10.2$ to 0.08.. This shows that in our model it is possible that an increase in $m_0$ decreases average dowry (and mehr) levels.

# 6 References

Ambrus, Attila, Erica Field and Maximo Torrero (2008): "Muslim family law, prenuptial agreements and the emergence of dowry in Bangladesh," *mimeo, Harvard University.*

# 7 Appendix

**Lemma 1:** In stationary equilibrium, any man $i$'s continuation expected payoff, at any point when he is eligible to marry is finite, and it only depends on $X_i$.

**Proof:** If man $i$ never gets married, his continuation value at the beginning of every period is $\frac{u(e)}{1-\delta}$. Because of the stationarity of the decision problem that man $i$ faces in equilibrium, if getting married is ever an optimal choice for man $i$, then it is optimal for him to get married every time he is eligible to marry. Moreover, the optimal choices of mehr are the same every time he is eligible to marry. Similarly, the stationarity of the problem implies that if it is optimal for man $i$ to stay in a marriage with mehr $m$ and match quality realization $\varepsilon'$ for one more period, then it is optimal for man $i$ to stay in a marriage with mehr $m$ and match quality realization $\varepsilon \geq \varepsilon'$ forever. Let $m^*$ be an optimal mehr choice for man $i$ in equilibrium. The above implies that there is $\varepsilon^* \in R \cup \{\infty\} \cup \{-\infty\}$ such that it is optimal for man $i$ to separate from a marriage with mehr $m^*$ at the end of the first period of marriage if match quality realization is less than $\varepsilon^*$, and it is optimal for man $i$ to stay in the marriage if match quality realization is larger than $\varepsilon^*$. Moreover, $q < m + m^*$ implies that man $i$ separates from the marriage through abandonment, while $q > m + m^*$ implies that man $i$ separates from the marriage through divorce. This means that the continuation expected payoff of man $i$ if eligible to marry, $V_i$, satisfies: $V_i = d(m^*) + \int\limits_{-\infty}^{\varepsilon^*} \varphi(x)[u(e) + X_i + x - \min(q, m + m^*) + \delta V_i]dx + \int\limits_{\varepsilon^*}^{\infty} \varphi(x)\frac{u(e)+X_i+x}{1-\delta}dx$. This implies $V_i = \frac{1}{1-\delta F(\varepsilon^*)}[d(m^*) + \int\limits_{-\infty}^{\varepsilon^*} \varphi(x)[u(e) + X_i + x - \min(q, m + m^*)]dx + \int\limits_{\varepsilon^*}^{\infty} \varphi(x)\frac{u(e)+X_i+x}{1-\delta}dx] < \infty$. The expected continuation values of two men with the same marriage value parameter $X$ are equal because the same strategies yield them the same payoffs. ■

Given a stationary equilibrium, let $V(X)$ denote the expected continuation payoff of a man with marriage value parameter $X$, when eligible to marry.

**Lemma 2:** In a stationary equilibrium, there exists $\widehat{X} \in R$ such that $X_i > \widehat{X}$ implies that man $i$ marries with probability 1 when eligible to marry, and $X_i < \widehat{X}$ implies that man $i$ never marries. For any $X', X'' \geq \widehat{X}$, we have $V(X'') - V(X') = \frac{X''}{1-\delta} - \frac{X'}{1-\delta}$.

**Proof:** Note that for any man $i$ with $X_i > -d(0)$ it is strictly better to marry with mehr 0 than stay unmarried. Let now man $j$ be a man for whom marrying when eligible is an optimal choice. Man $i$ when eligible to marry can obtain expected payoff $V(X_j) + \frac{X_i - X_j}{1-\delta}$ by imitating an optimal strategy for man $j$ that involves always getting married when eligible. Similarly, Man $j$ when eligible to marry can obtain expected payoff $V(X_i) + \frac{X_j - X_i}{1-\delta}$ by imitating an optimal strategy for man $j$ that involves always getting married when eligible. The first observation establishes $V(X') - V(X) \geq \frac{X'}{1-\delta} - \frac{X}{1-\delta}$, while the second one establishes $V(X') - V(X) \le \frac{X'}{1-\delta} - \frac{X}{1-\delta}$, implying $V(X'') - V(X') = \frac{X''}{1-\delta} - \frac{X'}{1-\delta}$. Then optimality implies that any man $i'$ with $X_{i'} > \widehat{X} \equiv X_i - (1-\delta)(V(X_i) - \frac{u(e)}{1-\delta})$ marries with probability 1 when eligible, while any man $i'$ with $X_{i'} < \widehat{X}$ never marries. ■

**Lemma 3:** There is $\varepsilon^c \in R$ such that $\varepsilon^c = (1-\delta)V(X) - \frac{1-\delta}{\delta}\min(q, m_0) - u(e) - X$ for every $X \ge \widehat{X}$. Moreover, any man who in equilibrium gets married and chooses mehr 0 stays in the marriage forever if the match quality realization is higher than $\varepsilon^c$, and separates from the wife if the match quality realization is lower than $\varepsilon^c$.

**Proof:** Because of the stationarity of the decision problem, a married man either finds it optimal to stay in a marriage forever, or separate at the end of the first period of marriage, immediately after the match quality was revealed. For man $i$, the net payoff difference between staying in a marriage with $m = 0$ and match quality realization $\varepsilon$ versus separating is $\delta\frac{u(e)+X+\varepsilon}{1-\delta} + c_0 - \delta V(X)$. Rearranging yields that $\varepsilon > (1-\delta)V(X) - \frac{1-\delta}{\delta}c_0 - u(e) - X$ implies that staying in the marriage forever is better than immediately divorcing, while $\varepsilon < (1-\delta)V(X) - \frac{1-\delta}{\delta}c_0 - u(e) - X$ implies that immediately divorcing is better. Let $\varepsilon^c(X) \equiv (1-\delta)V(X) - \frac{1-\delta}{\delta}c_0 - u(e) - X$. By Lemma 2, $(1-\delta)V(X) - \frac{1-\delta}{\delta}c_0 - u(e) - X$ is the same for all $X \ge \widehat{X}$. ■

**Proof of Claim 1:** Consider a marriage with mehr $m \ge 0$. Let $V(X)$ be the equilibrium continuation payoff of a man with marriage value parameter $X$ if eligible to marry. Lemma 3 implies that $\delta\frac{u(e)+X+\varepsilon}{1-\delta} < -c_0 + \delta V(X)$ iff $\varepsilon < \varepsilon^c$. Note that a man with marriage value parameter $X$ separates from the marriage if $\delta\frac{u(e)+X+\varepsilon}{1-\delta} < -c_m + \delta V(X)$, and stays in the marriage if $\delta\frac{u(e)+X+\varepsilon}{1-\delta} > -c_m + \delta V(X)$. The above imply that a man with marriage value parameter $X$ separates from the marriage if $\varepsilon > \varepsilon^c - \frac{1-\delta}{\delta}(c_m - c_0)$, and stays in the marriage if $\varepsilon > \varepsilon^c - \frac{1-\delta}{\delta}(c_m - c_0)$.

If $q < m_0$ then $c_m - c_0$ for every $m \ge 0$. This implies that abandonment is always less costly for a man than divorce, hence separation in equilibrium implies abandonment. Suppose now that $q > m_0$. For $m \in [0, q-m_0)$ men strictly prefer divorce to abandonment. For $m \ge q-m_0$, $c_m = c_{q-m_0}$, and for $m > q-m_0$ men strictly prefer abandonment to divorce. Then since $A_j > D_j$ for every woman $j$, for small enough $\varepsilon > 0$ every woman strictly prefers specifying a mehr $q-m_0-\varepsilon$ then a mehr that induces the husband to choose abandonment with positive probability. This implies that all women choose mehr levels $m \in [0, q-m_0]$ and separation implies divorce with probability 1. ■

**Proof of Claim 2:** Consider any two mehr levels $m$ and $m'$ that are chosen by someone in equilibrium. By the definition of equilibrium this implies that these mehr levels are chosen by some men in equilibrium, too. By Claim 1, for any man the difference in expected utility between choosing $m$ versus $m'$

is: $d(m)-d(m')-\int\limits_{-\infty}^{\varepsilon^c-\frac{1-\delta}{\delta}(c_m-c_0)}\varphi(x)(m-m')dx-\int\limits_{\varepsilon^c-\frac{1-\delta}{\delta}(c_m-c_0)}^{\varepsilon^c-\frac{1-\delta}{\delta}(c_{m'}-c_0)}\varphi(x)\delta\frac{\varepsilon^c-x}{1-\delta}dx.$ Since this term is the same for all men, either all men are indifferent between the two mehr levels, or all men strictly prefer one versus the other. The latter contradicts that both $m$ and $m'$ are chosen by some men in equilibrium. Hence, $d(m)-d(m')-\int\limits_{-\infty}^{\varepsilon^c-\frac{1-\delta}{\delta}(c_m-c_0)}\varphi(x)(m-m')dx-\int\limits_{\varepsilon^c-\frac{1-\delta}{\delta}(c_m-c_0)}^{\varepsilon^c-\frac{1-\delta}{\delta}(c_{m'}-c_0)}\varphi(x)\delta\frac{\varepsilon^c-x}{1-\delta}dx=$ $0$ for any $m$,$m'$ chosen in equilibrium. This implies that there is $d_0\in R$ such that $d(m)=d_0+\pi(m)$, where $\pi(m)\equiv\int\limits_{-\infty}^{\varepsilon^c-\frac{1-\delta}{\delta}(c_m-c_0)}\varphi(x)(m-m')dx+$ $\int\limits_{\varepsilon^c-\frac{1-\delta}{\delta}(c_m-c_0)}^{\varepsilon^c}\varphi(x)\delta\frac{\varepsilon^c-x}{1-\delta}dx.$ ■

**Proof of Claim 3:** Note that for any $D\geq D^*$ there is only one $m\in R_+$ which satisfies $m=D+\delta[d_0+\pi(m)]-m_0$, since $\frac{\partial\pi(m)}{\partial m}\leq\int\limits_{-\infty}^{\varepsilon^c}\varphi(x)dx<1$. Let $m^*(D)$ denote this value for $D\geq D^*$.

Assume now that in equilibrium it is optimal for woman $j$ to marry and choose mehr level $m$. Then for any $m'\in(0,q-m_0)$, the increased utility for woman $j$ to be in a marriage with mehr $m'$, relative to being in a marriage with mehr 0 is $\int\limits_{-\infty}^{\varepsilon^c-\frac{1-\delta}{\delta}(c_{m'}-c_0)}\varphi(x)m'dx+\int\limits_{\varepsilon^c-\frac{1-\delta}{\delta}(c_{m'}-c_0)}^{\varepsilon^c}\varphi(x)(m_0-D_j-\delta d(m))dx.$ The first integral term is the expected increase in divorce-contingent transfers to the woman for match quality realizations that induce divorce given mehr $m'$, and the second term is the net benefit for the woman from the husband staying in the marriage for match quality realizations between $\varepsilon^c-(1-\delta)(c_{m'}-c_0)$ and $\varepsilon^c$. Note that the expression is continuous in $m'$. Hence, $A_j>D_j+m_0$ implies that if the probability of abandonment given mehr level $q-m_0$ is positive, then woman $j$ would be better off choosing mehr level $q-m_0-\delta$ for small enough $\delta>0$ rather than mehr level $q-m_0$. Hence, mehr level $q-m_0$ has to induce divorce with probability 1, in case of separation. Moreover, no woman chooses mehr level $m>q-m_0$, since the latter implies abandonment with probability 1 in case of separation, therefore $A_j>D_j+m_0$ implies that the woman would be better off by choosing mehr level $q-m_0$. The above imply that if $m$ is an optimal mehr choice for woman $j$, it has to be that $m\in\underset{m'\in[0,q-m_0]}{\arg\max}\int\limits_{-\infty}^{\varepsilon^c-\frac{1-\delta}{\delta}m'}\varphi(x)m'dx+\int\limits_{\varepsilon^c-\frac{1-\delta}{\delta}m'}^{\varepsilon^c}\varphi(x)(D_j-m_0+\delta d(m))dx-\pi(m').$ Recall from Claim 2 that $\pi(m')=\int\limits_{-\infty}^{\varepsilon^c-\frac{1-\delta}{\delta}m'}\varphi(x)m'dx+\int\limits_{\varepsilon^c-\frac{1-\delta}{\delta}m'}^{\varepsilon^c}\varphi(x)\delta\frac{\varepsilon^c-x}{1-\delta}dx.$ This means that the marginal net utility gain for woman $j$ by increasing $m'$ over the interval $(0,q-m_0)$ is $\varphi(\varepsilon^c-(1-\delta)m')[D_j-m_0+\delta d(m)-m']$, which is positive iff $D_j - m_0 + \delta d(m) > m'$.

The above imply that if $D_j \leq D^*$ then since $0 > D_j - m_0 + \delta d(m)$, the optimal mehr choice for woman $j$ is 0. If $D_j \geq D^{**}$ then since $0 < D_j - m_0 + \delta(d_0 + \pi(q - m_0))$, the optimal mehr choice for woman $j$ is $q - m_0$. Finally, if $D^* < D_j < D^{**}$ then the optimal choice for woman $j$ is mehr level $m$ that is the unique solution to $m = D_j + \delta[d_0 + \pi(m)] - m_0$. ■

**Proof of Claim 4:** By Lemma 3, $\varepsilon^c = (1-\delta)V(X) - \frac{1-\delta}{\delta}m_0 - u(e) - X$ for any $X \geq \widehat{X}$. In particular, by substituting in $X = \widehat{X}$, $\varepsilon^c = (1-\delta)V(\widehat{X}) - \frac{1-\delta}{\delta}m_0 - u(e) - \widehat{X}$. Since $V(\widehat{X}) = \frac{u(e)}{1-\delta}$, the above implies $\varepsilon^c = -\widehat{X} - \frac{1-\delta}{\delta}m_0$. Writing out the expected equilibrium payoff of a man with marriage value parameter $\widehat{X}$, using the above result, yields:

$$d_0 + \int_{-\infty}^{-\widehat{X}-\frac{1-\delta}{\delta}m_0} \varphi(\varepsilon)[u(e) + \widehat{X} + \varepsilon + \delta\tfrac{u(e)}{1-\delta}]d\varepsilon + \int_{-\widehat{X}-\frac{1-\delta}{\delta}m_0}^{\infty} \varphi(\varepsilon)\tfrac{u(e)+\widehat{X}+\varepsilon}{1-\delta}d\varepsilon.$$

This expected payoff has to be equal to $\frac{u(e)}{1-\delta}$, which implies that $\widehat{X} = X^c$, as defined in (*). ■

**Lemma 4:** In stationary equilibrium, any woman $j$'s continuation expected payoff, at any point when she is eligible to marry is finite, and if $q > m_0$ then it only depends on $Y_j$ and $D_j$, while if $q < m_0$ then it only depends on $Y_j$ and $A_j$.

**Proof:** Analogous arguments that we used in Lemma 1 to establish finiteness of continuation payoffs of men eligible to marry establish the finiteness of continuation payoffs of all women eligible to marry. If $q > m_0$ then Claim 3 implies that every woman when marries chooses a mehr level that induces the husband to divorce (not abandon) in case of separation. Then the continuation expected payoffs of women $j$ and $j'$ with $Y_j = Y_{j'}$ and $D_j = D_{j'}$ are equal because the same strategies yield the same expected payoffs for them. If $q < m_0$ then any match quality realization $\varepsilon > \varepsilon^c$ induces a man to stay in the marriage, in which case woman $j$'s realized utility only depends on $Y_j$, while any match quality realization $\varepsilon < \varepsilon^c$ induces a man to abandon his wife, in which case woman $j$'s realized utility depends on $Y_j$ and $A_j$. ■

Let $W(Y, D)$ denote the continuation expected payoff of a woman with marriage market value $Y$ and divorce cost $D$ when eligible to marry, for every $Y$ and $D$.

**Proof of Claim 5:** Suppose $q > m_0$. Fix any $D \geq 0$. Let woman $j$ be such that $D_j = D$ and $Y_j > -d(0) - D$. The latter condition implies that woman $j$ strictly prefers to marry with contract $m = 0$ to staying single. Hence $W(Y_j, D) > \frac{u(e')}{1-\delta}$, and in equilibrium woman $j$ always gets married whenever she is eligible to marry. Consider now any woman $j'$ such that $D_{j'} = D$, and marriage is an optimal choice for $j'$. The stationarity of the decision problem that woman $j'$ faces then implies that there is an optimal strategy for woman

$j'$ that implies getting married whenever she is eligble. The above imply that woman $j$ can guarantee a payoff of $W(Y_{j'}, D) + \frac{Y_j - Y_{j'}}{1-\delta}$ by following an optimal strategy for woman $j'$, and woman $j'$ can guarantee a payoff of $W(Y_j, D) + \frac{Y_{j'} - Y_j}{1-\delta}$ by following an optimal strategy of woman $j$. This establishes $W(Y_{j'}, D) = W(Y_j, D) + \frac{Y_{j'} - Y_j}{1-\delta}$. Then any woman $j'$ such that $D_{j'} = D$ and $Y_{j'} > Y_j + (1 - \delta)(\frac{u(e')}{1-\delta} - W(Y_j, D)) \equiv Y_I^c(D_j)$ marries whenever eligible, while any woman $j'$ such that $D_{j'} = D$ and $Y_{j'} < Y_j + (1-\delta)(\frac{u(e')}{1-\delta} - W(Y_j, D)) \equiv Y_I^c(D_j)$ never marries. Threshold $Y_I^c(D_j)$ has to satisfy that any woman $j$ with $D_j = D$ and $Y_j = Y_I^c(D)$ has to be indifferent between never marrying, and marrying whenever eligible. Writing this out gives equation (**), which concludes the proof.

Suppose $q < m_0$. Analogous considerations as above establish that for any $A \in R_+$, any woman $j$ with $A_j = A$ gets married whenever she is eligible if $Y_j > Y_{II}^c(A)$, and never gets married if $Y_j < Y_{II}^c(A)$. ■

**Proof of Proposition 1:** By Claim 3, in any equilibrium base level dowry $d(0) = d_0$ determines $d(m)$ for every $m \geq 0$. Below we establish that there exists exactly one value of $d_0$ consistent with stationary equilibrium.

Claims 4 and 5 imply that $d_0$ uniquely determines the mass of men and women in each cohort who decide to get married. Moreover, men and women who marry in equilibrium, with the exception of a set with measure 0 (those who are exactly indifferent between marrying or not) get married whenever they are eligible to marry. Claim 3 implies that if $q > m_0$ then every separation implies divorce, and every marrying woman's mehr choice is uniquely determined. If $q < m_0$ then every separation is abandonment. Claims 1 and 4 imply that $d_0$ uniquely determines the probability that the man decides to separate, for any given level of $m$.

The above imply that $d_0$ uniquely determines the mass of men and women in the market, at any given period. Also note that the mass of individuals deciding to marry and choosing a marriage contract is finite at any point of time, for any $d_0$. To see this, recall that from each cohort, the mass of men who decide to get married (at any period at which they are available) is $1 - F(X_c(d_0))$, where $F$ is the c.d.f. of marriage utility parameter in a cohort. Moreover, for any mehr level, a man remains in a given marriage forever for all match quality realizations above $\varepsilon^c(d_0)$. Hence, the mass of men actively in the market at any period is bounded from above by $\frac{1}{1 - \int_{\varepsilon^c(d_0)}^{\infty} \varphi(x)dx}(1 - F(X_c(d_0)))$. An analogous argument establishes that the mass of women choosing a marriage contract in a given period is finite as well.

Consider first $q > m_0$. Note that in equilibrium the total supplies of women and men (actively) in the market at any point of time have to be equal. Claim 4 implies that $X^c$ is continuous and strictly increasing in $d_0$, and that $X^c \to -\infty$ if $d_0 \to -\infty$, and $X^c \to \infty$ if $d_0 \to \infty$. This implies that the mass of men deciding to marry in each cohort is continuous and strictly increasing in $d_0$, and it goes to 0 if $d_0 \to -\infty$, while it goes to 1 if $d_0 \to \infty$. Claim 5 implies that $Y^c(D)$ is continuous in both $d_0$ and $D$, and strictly decreasing in $d_0$ for every fixed $D \geq 0$. Moreover, for any $\overline{D} > 0$ and any $\overline{Y} > 0$ there is $\overline{d_0} > 0$ such that $d_0 > \overline{d_0}$ and $D \in [0, \overline{D}]$ imply $Y^c(D) < -\overline{Y}$, and that $d_0 < -\overline{d_0}$ and $D \in [0, \overline{D}]$ imply $Y^c(D) > \overline{Y}$. This implies that the mass of women deciding to marry in each cohort is continuous and strictly decreasing in $d_0$, and it goes to 0 if $d_0 \to \infty$, while it goes to 1 if $d_0 \to -\infty$. Therefore, there is exactly one level of $d_0$ at which the mass of men in any cohort wanting to marry (as opposed to stay single forever) is equal to the mass of women in any cohort wanting to marry. Since every separation implies divorce and almost every women and man who ever marry in equilibrium return to the marriage market with probability 1 when becoming eligible to marry again (by Claims 4 and 5), a necessary and sufficient condition for the masses of men and women wanting to marry at a given time period is that the masses of men and women from a given cohort wanting to marry are equal. By Claim 4, in any equilibrium base level dowry $d(0) = d_0$ determines $d(m)$ for every $m \in [0, q - m_0]$, establishing pat (ii) of the proposition. Claim 3 implies parts (i) and (iv) of the proposition, while Claims 4 and 5 imply part (iii).

Consider next $q > m_0$. Analogous considerations to the ones made in the previous paragraph establish that the mass of men deciding to marry in each cohort is continuous and strictly increasing in $d_0$, and it goes to 0 if $d_0 \to -\infty$, while it goes to 1 if $d_0 \to \infty$; similarly, the mass of women deciding to marry in each cohort is continuous and strictly decreasing in $d_0$, and it goes to 0 if $d_0 \to \infty$, while it goes to 1 if $d_0 \to -\infty$. Since in this parameter region every separation implies abandonment, in equilibrium at any given time the set of women currently in the market is equal to the set of women from the current cohort currently in the market. Hence, the mass of women actively in the market at any period is continuous and strictly decreasing in $d_0$, and it goes to 0 if $d_0 \to \infty$, while it goes to 1 if $d_0 \to -\infty$. At the same time, any man getting married at some period stays in the marriage with probability $1 - \Phi(\varepsilon^c)$ and returns to the marriage market with probability $\Phi(\varepsilon^c) < 1$. Therefore, if the mass of men from each cohort deciding to marry is $\Pi_M$, the total mass of men in the market at any point of time is $\frac{1}{1-\Phi(\varepsilon^c)}\Pi_M$. This concludes that the mass of men actively in the market at any period is continuous and strictly decreasing in $d_0$, and it goes to $\infty$ if $d_0 \to \infty$, while it goes to 0 if $d_0 \to -\infty$. Therefore, there is exactly one level of $d_0$ such that the masses of women and men actively in the market are equal at all times.

Finally, if the masses of men and women wanting to marry at any time are equal, then since men are indifferent among all mehr levels, there is obviously a profile of mehr choices by men such that the market clears, establishing the existence of equilibrium. ■

**Lemma 5:** Suppose $q > m_0$. Given a fixed $m_0$ and $q$, the amount of mehr any marrying woman chooses is weakly increasing in $d_0$.

**Proof:** Consider any woman $j$ wanting to marry. Recall from Claim 3 that $D_j \leq D^*$ implies that woman $j$ chooses $m = 0$, while $D_j \geq D^{**}$ implies that woman $j$ chooses $m = q - m_0$. Also note that both $D^*$ and $D^{**}$ are strictly decreasing in $d_0$. Hence, to prove the claim, it is enough to show that the unique solution to $m = D_j + \delta[d_0 + \pi(m)] - m_0$ is increasing in $d_0$. Recall that $\pi(m) \equiv \int_{-\infty}^{-X^c - \frac{1-\delta}{\delta}c_m} \varphi(x)(c_m - c_0)dx + \int_{-X^c - \frac{1-\delta}{\delta}c_m}^{-X^c - \frac{1-\delta}{\delta}c_0} \varphi(x)\frac{\delta}{1-\delta}(\varepsilon^c - x)dx$, and that $X^c$ is strictly decreasing in $d_0$. Hence, $D_j + \delta[d_0 + \pi(m)] - m_0$ is strictly increasing in $d_0$, which implies that the m which solves the equation $m = D_j + \delta[d_0 + \pi(m)] - m_0$ is strictly increasing in $d_0$. ■

**Proof of Proposition 2:** First note that if $d_0$ remains unchanged after the regime change, then if $q > m_0$ then Claim 3 implies that every woman who marries in both regimes chooses a weakly higher $m$ in Regime I than in Regime II, and that a positive fraction of marrying women choose strictly higher $m$. If $q < m_0$ then in regime I $\pi(m) = 0$ for all $m \geq 0$, while in Regime II $\pi(m) > 0$ for all $m > 0$ and by Claim 3 a positive fraction of women specify $m > 0$.

By Claim 2 the above imply that the dowry payment of every marrying woman is higher in Regime I than in Regime II, and that it is strictly higher for a positive fraction of women.

Next, note that by Claim 4, if $d_0$ remains unchanged after the regime change, the mass of men wanting to marry in each cohort stays constant. However, $Y^c(D)$ decreases for every $D > q^I - m_0^I$, since any woman $j$ with $D_j > q^I - m_0^I$ is strictly better off in Regime II than in Regime I, since her mehr choice is no longer constrained by the constraint $m \leq q^I - m_0^I$. Continuity of $Y^c(D)$ then implies that the mass of women in each cohort wanting to marry strictly increases. Since in Regime II all separations involve divorce, the above contradict that $d_0$ clears the market in both Regime I and Regime II. Furthemore, since the supply of man in the market is strictly increasing in $d_0$, while the supply of men is strictly decreasing in $d_0$, the unique equilibrium $d_0$ has to be higher in Regime II. Lemma 5 then establishes that if $q^I > m_0^I$ then all marrying women choose a strictly higher mehr in Regime II than in Regime I. This, together with the increase in $d_0$ establishes that the dowry payment of all marrying women is strictly higher in Regime II than in Regime I. If $q^I < m_0^I$ then the increase in $d_0$ by itself establishes that the dowry payment of all marrying women is strictly higher in Regime II than in Regime I. ■

**Proof of Proposition 3:** Let $d_0^{II}$ and $d_0^{III}$ denote the equilibrium base level dowries in regimes II and III. Suppose $d_0^{III} = d_0^{II} + \pi(m_0^{III} - m_0^{II})$. Then for any man, the expected utility from marrying remains the same. To see this, note that $d_0^{III} = d_0^{II} + \pi(m_0^{III} - m_0^{II})$ implies that the dowry belonging to any mehr $m \geq 0$ in Regime III is exactly the same as the dowry belonging to mehr $m + m_0^{III} - m_0^{II}$ in Regime II. This implies the claim, since $c_m$ in Regime III is the same as $c_{m+m_0^{III}-m_0^{II}}$ in Regime II (both are equal to $m + m_0^{III}$), and in both regimes men are indifferent among all available mehr levels in equilibrium. The above implies that the supply of men remains the same in Regime III as in Regime II. Similarly, the expected utility of any woman $j$ such that $D_j \geq m_0^{III} - \delta d_0^{III}$ is the same in Regime III as in Regime II. To see this, denote the optimal mehr choice of woman $j$ (as defined in Claim 3) in Regime II by $m_j^{II}$. Then choosing mehr level $m_j^{II} - (m_0^{III} - m_0^{II})$ in Regime III yields the same expected utility for woman $j$, and it yields strictly higher expected utility than any other mehr choice. However, for any woman $j$ such that $D_j < m_0^{III} - \delta d_0^{III}$, the expected utility from getting married in Regime III is strictly lower than the expected utility from getting married in Regime II, since the optimal mehr choice in Regime III, that is $m = 0$, yields a strictly lower expected utility than the optimal mehr choice in Regime II. This implies that $Y^c(D)$ strictly increases for $D < m_0^{III} - \delta d_0^{III}$. Continuity of $Y^c()$ then implies that the mass of women wanting to marry in each cohort is strictly smaller in Regime III than in Regime II. Since by Claims 4 and 5 almost all marrying women and men remarry with probability 1 whenever they are eligible to marry, and by Claim 3 all separation implies divorce, the above contradicts that the total supply of men and women wanting to marry at a given period are equal in both regimes. Indeed, since the mass of men wanting to marry from a given cohort strictly increases in $d_0$ and the mass of women wanting to marry from a given cohort strictly decreases in $d_0$, the above argument establishes that $d_0^{III} < d_0^{II} + \pi(m_0^{III} - m_0^{II})$.

Let woman $j$ be such that she wants to marry in both regimes. Let $m_j^{II}$ denote the optimal mehr choice of this woman in Regime II. Note that $d_0^{III} = d_0^{II} + \pi(m_0^{III} - m_0^{II})$, by Claim 3, would imply that the optimal mehr choice of woman $j$ in Regime III is $\max(0, m_j^{II} - m_0^{III} + m_0^{II})$, which is weakly lower than $m_j^{II}$, and it is strictly lower than $m_j^{II}$ for $m_j^{II} \neq 0$. Then $d_0^{III} < d_0^{II} + \pi(m_0^{III} - m_0^{II})$ and Lemma 5 imply that the optimal mehr choice of woman $j$ in Regime III is weakly lower than $m_j^{II}$, and strictly smaller than $m_j^{II}$ for $m_j^{II} \neq 0$.

Let now woman $j$ be such that she wants to marry in both regimes, and $D_j \geq m_0^{III} - \delta d_0^{III}$ (that is, by Claim 3, the nonnegativity constraint on mehr does not bind for woman $j$ in Regime III). Let $m_j^{III}$ denote the optimal mehr choice of this woman in Regime III. Then $d_0^{III} < d_0^{II} + \pi(m_0^{III} - m_0^{II})$ implies that $d(m_j^{III})$ in Regime III is strictly lower than $d(m_j^{III} + m_0^{III} - m_0^{II})$ in Regime II. Note that $d_0^{III} = d_0^{II} + \pi(m_0^{III} - m_0^{II})$ would imply that the optimal mehr choice of woman $j$ in Regime II is $m_j^{III} + m_0^{III} - m_0^{II}$. Then Lemma 5 and $d_0^{III} < d_0^{II} + \pi(m_0^{III} - m_0^{II})$ imply that in Regime II woman $j$ chooses a higher mehr than $m_j^{III} + m_0^{III} - m_0^{II}$. This concludes that both the mehr and the total dowry payment of woman $j$ is strictly higher in Regime II than in Regime III. ■

*Computations for the example in 3.5.3.:*

1. Regime I: $m_0 = 0$.

It is straightforward to show that in equilibrium type I women have to be indifferent between marrying or not. Claims 2-4 then imply that in equilibrium:

$$\frac{1}{.1} = d_0 + \int_{-\infty}^{\varepsilon^c} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (1-\varepsilon^c + x + 9)dx + \int_{\varepsilon^c}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} 10(1-\varepsilon^c + x)dx$$

$$m = .9 \times (.5 + \int_{-\infty}^{\varepsilon^c - \frac{1}{9}m} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} m dx + \int_{\varepsilon^c - \frac{1}{9}m}^{\varepsilon^c} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (.9 \frac{\varepsilon^c - x}{.1}) dx)$$

$$-d_0 - \int_{-\infty}^{\varepsilon^c - \frac{1}{9}m} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} 1.8583 dx - \int_{\varepsilon^c - \frac{1}{9}m}^{\varepsilon^c} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (.9 \frac{\varepsilon^c - x}{.1}) dx +$$

$$\int_{-\infty}^{\varepsilon^c - \frac{1}{9}m} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (1.25 + m + 9) dx + \int_{\varepsilon^c - \frac{1}{9}m}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} \frac{1.25}{.1} dx = 10$$

, where $m$ is the mehr chosen by type I women.

The solution is: $\{[\varepsilon^c = 1.1943, d_0 = 0.68350, m = 1.993]\}$.

Then the dowry payment of type I women is:

$$0.68350 + \int_{-\infty}^{1.1943 - \frac{1}{9}1.993} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} 1.993 dx + \int_{1.1943 - \frac{1}{9}1.993}^{1.1943} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (.9 \frac{1.1943 - x}{.1}) dx = 2.3979.$$

The optimal mehr choice of type II women is given by:

$$3.5 + .9 \times (0.68350 + \int_{-\infty}^{1.1943 - \frac{1}{9}m} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} m dx + \int_{1.1943 - \frac{1}{9}m}^{1.1943} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (.9 \frac{1.1943 - x}{.1}) dx)$$

The solution is: $\{[m = 11.229]\}$.

Therefore, the dowry payment of type II women is given by:

$$0.68350 + \int_{-\infty}^{1.1943 - \frac{1}{9}11.229} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} 11.229 dx + \int_{1.1943 - \frac{1}{9}11.229}^{1.1943} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (.9 \frac{1.1943 - x}{.1}) dx = 8.5876$$

2. Regime II: $m_0 = 9$.

It is straightforward to show that in equilibrium type II men have to be indifferent between marrying or not. Claim 4 then implies $\varepsilon^c = 1$. The condition for type II men to be indifferent between marrying or not is then given by:

$$d_0 - \int_{-\infty}^{1-\frac{9}{9}} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} 9 dx + \int_{1-\frac{9}{9}}^{1} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (.9 \frac{1-x}{.1}) + \int_{-\infty}^{1} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (1 - 1 + x + .9 \frac{1}{.1}) dx + \int_{1}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} \frac{1-1+x}{.1} dx = 10.$$

The solution to this is $d_0 = 6.4096$.

It is straightforward to verify that at this level of $d_0$ it is strictly better for type I women to stay out of the market than marrying with any nonnegative level of mehr.

The optimal mehr choice of type II women is given by:

$$m = 3.5 + .9 \times ( \int_{-\infty}^{1-\frac{m}{9}} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} m dx + \int_{1-\frac{m}{9}}^{1} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (.9 \frac{1-x}{.1}) dx) - 9.$$

The solution to this is: $\{[m = 0.0787]\}$.

The dowry payment of type II women:

$$d \ = \ 6.4096 + \int_{-\infty}^{1-\frac{9.0787}{9}} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} 9.0787 dx + \int_{1-\frac{9.0787}{9}}^{1} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (.9^{\frac{1-x}{.1}}) dx - \int_{-\infty}^{1-\frac{9}{9}} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} 9 dx - \int_{1-\frac{9}{9}}^{1} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} (.9^{\frac{1-x}{.1}}) dx \ .$$

The solution to this is $d = 6.4488$.