Marital Transfer and Intrahousehold Allocation:

A Nash-Bargaining Analysis

Wing Suen
The University of Hong Kong

William Chan
The University of Hong Kong

Junsen Zhang
The Chinese University of Hong Kong

Abstract. This paper explores the implications of inter-generational marital transfers on the allocation of resources within a conjugal household. Adopting a Nash bargaining framework with alternative models of the threat points, it is argued that parents have greater incentive to make transfers to a married child than to a single child because of the efficiency gains from joint consumption and production of family public goods and because of the increase in bargaining power of the child in the allocation of private consumption. Such transfers also enhance marital stability by increasing the efficiency gains from marriage.

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Correspondence can be sent to: William Chan, School of Economics and Finance, The University of Hong Kong, Pokfulam Road, Hong Kong (fax: (852)2548-1152, email: wchan@econ.hku.hk).

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I. Introduction

In the conventional economic analysis of the institution of marriage, marital transfers (bride price and dowry) are treated as compensatory transfers between spouses (or their kin) to ensure efficiency in the allocation of resources within the family (Becker 1973, 1981). According to this approach, the assignment of mates and each spouse's share of the family's products is determined in the marriage market. Any inflexibility in the rule for the ex post division of household resources can be circumvented by an up-front transfer at the time of marriage—a bride price if it is from the groom's family to the bride's family, and a dowry if it is in the opposite direction. However, this approach cannot explain why marital transfers often occur in both directions in the same marriage. Nor does it take into account the fact that while bride price is usually paid by the groom's kin to the bride's family, the dowry is generally a transfer from the bride's parents to the bride, which she retains ownership of even if it contributes to consumption in the conjugal household.[1]

We believe that bride price and dowry, rather than being two sides of the same coin, in fact

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[1] In their studies of marital transfers in China, both Freedman (1970) and Chen (1985) highlight women as the only holders of private properties by virtue of their rights over their dowries, in contrast to communal or clan properties owned by men. Ocko (1991) and Stockard (1989) also emphasize the strictly private nature of *ssu-fang ch'ien*, or private fund, a cash transfer that forms an important part of the dowry. It is asserted that "[t]he size of the fund is a closely guarded secret, and even a father-in-law must pay interest if he is forced to borrow from his daughter-in-law" (Watson 1991, p.356). Goitein (1978) also reports that, among Jews living in the Arab world between the tenth and fifteenth centuries, the husband had to return the wife's dowry if he divorced her. Botticini (1999) finds a similar practice in medieval Tuscany.

serve different functions—the former being a compensatory transfer in the conventional analysis while the latter is an inter-generational transfer by the bride's parents to enhance her welfare. Although the theoretical and empirical implications of the lateral, compensatory transfer have been discussed in the literature (see Rao 1993 for an example of the latter), the potential functions of the inter-generational marital transfer have not been accorded much attention. Goody (1973) is perhaps the first to suggest dowry as an inter-generational transfer. Economic implications of the proposition are subsequently explored in Botticini (1999), Botticini and Siow (1999), and Zhang and Chan (1999). Adopting an approach similar to Zhang and Chan's, we extend these works by focusing on the mechanism through which a dowry affects the welfare of a daughter. In particular, we shall dissect the effects of a dowry on resource allocation within a conjugal household and the stability of marriage. We shall also investigate how such effects in turn impact the parents' decision to give inter-generational transfers (which includes dowry) and how this decision is affected by the child's income and marital status. As such, this paper represents an attempt to integrate two strands of research that have hitherto been pursued quite independently of each other: the analysis of inter-generational transfers and the research on intra-household resource allocation. We believe that these two aspects of allocation within an extended context of a family are intricately related to each other, and an appreciation of this relation is crucial to our understanding of many institutional features of marriage, particularly in traditional cultures.

Given our focus on intra-household allocation, the Samuelson (1956) household utility function would be an inadequate analytic tool. A model of great generality, suggested by Chiappori (1992) and Browning, Bourguignon, Chiappori and Lechene (1994), requires only Pareto efficiency for the characterization of the allocation solution. For our purposes, however, a Nash-bargaining approach (Manser and Brown 1980; McElroy and Horney 1981) provides the most convenient structure for analyzing how parental transfers can affect the daughter's welfare by strengthening her bargaining power as well as by raising the efficiency gains from marriage. Specifically, adopting a transferable utility with both private and public family goods, we seek to analyze the implications of marital transfer as a means of shifting the threat point.

This analytic approach yields very interesting, sometimes unexpected, results. With divorce as the threat point, it is found that, because of the inherent efficiency in the production and consumption of public goods in a married household, parents have greater incentive to make transfers to a married daughter than to a single or divorced daughter, particularly if the daughter's earnings are high; in such a case, a larger share of the increase in welfare would then be accrued to the daughter because of the greater bargaining power that comes with higher income. Such strategic considerations imply that, despite potential free-riding by sons-in-law, parents do not necessarily give inefficiently small dowries to their daughters as suggested by Nerlove, Razin and Sadka (1984). One might be tempted to think that since a larger dowry favors the wife and weakens the husband's position, the husband's welfare must be adversely affected. This is actually not the case. Because the utility frontier is shifted outward by the increase in family resources, a smaller share of a larger pie turns out to be a larger slice in absolute terms for the husband.

An important factor driving the major results in this paper is the efficiency in consumption and production of family public goods. Without this efficiency, there is no incentive for the formation of a conjugal family in the first place. It is therefore not surprising that a larger dowry can enhance marital stability by encouraging consumption of family public goods. With a non-cooperative solution as the threat point, the results are somewhat diluted, but the basic structure of the incentives remains intact.

It should be noted that although our discussion centers around the giving of dowry, the analysis is generalizable to inter-generational transfers to children of either sex.[2] The choice of gender and type of transfer in the presentation simply reflects the prevalence and visibility of dowry in many cultures.

The model will be discussed in greater detail in the following section that includes results under alternative models of the threat point. Concluding thoughts are summarized in section III.

II. Theoretical Model

A. The Basic Framework

Consider a model in which altruistic parents cannot directly control their children's decisions and welfare once their children form their own families. We model the allocation of resources within a household as a Nash solution to a bargaining game between husband and wife, so parents can only indirectly influence their child's utility by changing the bargaining structure within the latter's conjugal household. In this framework the incentives for parents to give dowry can be analyzed in terms of how dowry affects the efficiency frontier and the threat points in their daughter's marriage.

Let the daughter's utility in marriage be represented by

$$u_1 = A(q_1 + q_2)c_1 - B_1(q_1), \tag{1}$$

and that of her husband be

$$u_2 = A(q_1 + q_2)c_2 - B_2(q_2), \tag{2}$$

[2]In certain cultures, such as in China, it is often the case that a son's inheritance depends on his marital status. In fact, part of the transfer may be made at the time of the son's marriage, supposedly to help him set up the conjugal household. Such a transfer may serve a similar function for the son as a dowry for a daughter.

where c_i (i=1,2) is spouse i's private consumption, and q_i, his or her contribution to the production of a household commodity, A, the output of which depends on the total amount of inputs. Note that the $A(\cdot)$ function enters into both equations (1) and (2). As such, it represents a family public good, the consumption of which is non-rivalrous. We assume that A and its derivative A' are strictly positive.

The family public good can be broadly interpreted and may include household commodities ranging from a shared domicile and homemade meals to consumption derived from having children. The variable q_i represents a vector of inputs contributed by spouse i to the production of this composite public good. Such inputs may be purchased or self-provided, and they can carry either a utility cost ($B_i(q_i)$, i=1,2), a money cost, or both. Without loss of generality, we shall simplify by taking q_i as a scalar and assuming that $B_i \geq 0$, $B_i' \geq 0$, and $B_i'' \geq 0$.

Our assumed functional form for the couple's preferences implies transferable utility within the family (Bergstrom and Cornes 1983).[3] With transferable utility, members of the family will always behave in ways that maximize joint family income. This simplifies the analysis by allowing the optimal contributions to the public good to be solved independently of the bargaining solution. It is also worth mentioning that the spouses are not assumed to be altruistic toward each other; they care about their partner's actions only insofar as such actions affect the family public good.[4] However,

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[3] This functional form is a variation of the type used by Lam (1988) to analyze assortative matching and by Bergstrom (1989) to study Becker's (1981) rotten kid theorem. Even though strict equivalence to those models would require B_i to be a function of q_1+q_2 rather than of q_i alone as assumed here, the difference would not affect the transferability of utility between spouses, all that is needed for our results.

[4] It is straightforward to generalize the analysis of this paper by assuming that the wife maximizes $u_1 + \gamma_1 u_2$ and the husband maximizes $u_2 + \gamma_2 u_1$, with γ_1 and γ_2 between 0 and 1. See Bergstrom.

altruism toward children is used to motivate inter-generational transfers; the amount that spouse i received from his or her parents is denoted by τ_i.

In a cooperative equilibrium, the contributions to the family public good are always Pareto efficient with appropriate transfers of private goods between the spouses. If s denotes the transfers from the husband to the wife (s can be positive or negative) and p, the money cost of purchased inputs for the production of the family public good (assumed non-negative and identical for both spouses), and if spouse i is endowed with an income of y_i, then $c_1 = y_1 + \tau_1 - pq_1 + s$ and $c_2 = y_2 + \tau_2 - pq_2 - s$. The utility possibility frontier is defined by:

$$\begin{aligned} U_1(y_1,y_2,\tau_1,\tau_2,u_2) \quad &= \max_{q_1,q_2,s} \{A(q_1+q_2)(y_1 + \tau_1 - pq_1 + s) - B_1(q_1) \\ &\quad \text{s.t.} \quad A(q_1+q_2)(y_2 + \tau_2 - pq_2 - s) - B_2(q_2) = u_2\}. \end{aligned} \tag{3}$$

Substituting out the variable s, the above expression can be simplified to:

$$U_1(y_1,y_2,\tau_1,\tau_2,u_2) = \max_{q_1,q_2} \{A(q_1+q_2)(y_1+y_2+\tau_1+\tau_2-p(q_1+q_2)) - B_1(q_1) - B_2(q_2) - u_2\}. \tag{4}$$

Let (q_1^*,q_2^*) be the solution to the maximization problem. This solution will satisfy the condition that the sum of marginal benefits from contributions to the family public good equals the marginal cost to either spouse:

$$A'(q_1^* + q_2^*)\left(y_1 + y_2 + \tau_1 + \tau_2 - p(q_1^* + q_2^*)\right) = B_i'(q_i^*) + pA(q_1^* + q_2^*), \tag{5}$$

$i = 1,2$. For future reference, we also note that, by the envelope theorem,

$$\partial U_1/\partial y_1 = \partial U_1/\partial y_2 = \partial U_1/\partial \tau_1 = \partial U_1/\partial \tau_2 = A(q_1^* + q_2^*). \tag{6}$$

Moreover, because of transferable utility, the slope of the utility possibility curve is

$$\partial U_1 / \partial u_2 = -1. \tag{7}$$

From equation (5), it is obvious that q_1^* and q_2^*, and hence the utility possibility frontier, depend only on total transfers and income ($y_1 + y_2 + \tau_1 + \tau_2$), not on the individual components. This does not, however, imply that the amount that each spouse receives has no impact on intra-household allocation, as the bargaining power of each spouse depends on his or her relative contribution. A larger relative contribution by the wife will shift the allocation along the utility possibility frontier in her favor through a larger side payment, *s*.

To derive the Nash bargaining solution, we need the threat points for the husband and the wife. The next section will develop two models of the determination of threat points. For the moment, these threat points are denoted by $\bar{u}_1$ (for wife) and $\bar{u}_2$ (for husband). The equilibrium can be obtained from the solution to the following maximization problem:

$$\max_{u_2} \left(U_1(y_1, y_2, t_1, t_2, u_2) - \bar{u}_1\right)\left(u_2 - \bar{u}_2\right) \quad \textbf{(8)}$$

The first order condition for this problem satisfies

$$\left(U_1(y_1, y_2, t_1, t_2, u_2^*) - \bar{u}_1\right) - \left(u_2^* - \bar{u}_2\right) = 0, \quad \textbf{(9)}$$

where u_2^* is the equilibrium utility of the husband. Given this value of u_2^*, the equilibrium payoff to the wife is

$$u_1^* = U_1(y_1, y_2, t_1, t_2, u_2^*). \quad \textbf{(10)}$$

We are interested in how parents can use dowry to affect the equilibrium utility of their daughter in marriage. An increase in dowry can be expressed as an increase in τ_1, so the incentive for parents to give dowry is reflected in the partial derivative $\partial u_1^*/\partial \tau_1$. In general, dowry will also change the threat points of marriage. Therefore $\partial \bar{u}_1/\partial \tau_1$ and $\partial \bar{u}_2/\partial \tau_1$ cannot be assumed to be zero. Using equations (9) and (10), the effects of increased dowry on the husband's and the wife's equilibrium utilities are, respectively,

$$\partial u_2^* / \partial \tau_1 = \tfrac{1}{2}\left(\partial U_1/\partial \tau_1 + \partial \bar{u}_2/\partial \tau_1 - \partial \bar{u}_1/\partial \tau_1\right); \tag{11}$$

$$\partial u_1^* / \partial \tau_1 = \tfrac{1}{2}\left(\partial U_1/\partial \tau_1 - \partial \bar{u}_2/\partial \tau_1 + \partial \bar{u}_1/\partial \tau_1\right). \tag{12}$$

It has been argued by Nerlove, Razin and Sadka that inter-generational transfers are under-provided because children have to share the transfers with their spouses. Essentially this argument amounts to saying that $\partial u_1^*/\partial \tau_1 = ½(\partial U_1/\partial \tau_1) < (\partial U_1/\partial \tau_1)$. Our analysis shows that this argument does not extend to a Nash-bargaining framework. If inter-generational transfers help move the threat points in marriage, as we demonstrate in the next section, parents need not have insufficient incentive to give transfers to their married children.[5]

B. Two Models of Marital Threat Points

1. Divorce as Threat Point

Following Manser and Brown and also McElroy and Horney, we can assume that the threat point for Nash bargaining is marital dissolution. Then

$$\bar{u}_1(y_1, \tau_1) = \max_{q_1} \left\{ A(q_1)\left(y_1 + \tau_1 - pq_1\right) - B_1(q_1) \right\}; \tag{13}$$

$$\bar{u}_2(y_2, \tau_2) = \max_{q_2} \left\{ A(q_2)\left(y_2 + \tau_2 - pq_2\right) - B_2(q_2) \right\}. \tag{14}$$

In the above formulation we assume that the wife does not derive any utility from the husband's contribution to the family public good once they are divorced, and vice versa. For example, if q_i

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[5] Zhang (1994) argues that introducing positive assortative matching also helps to mitigate the problem of under-provision of parental transfers.

refers to household furniture, there is effectively no joint consumption of furniture when the couple no longer live together. If q_i refers to effort at child care, our assumption amounts to saying that a divorced parent will discount to zero the contribution to child care from the ex-spouse. This assumption is consistent with the view that altruistic feelings develop through interaction, observation, and spending time together. If the child of a divorced couple spends, say, six days with the mother and one day with the father, it is difficult for the mother to feel the child's joys and sorrows on the day the child is with the father. In a sociological study of child custody, Maccoby and Mnookin (1992) find a widespread tendency of divorced parents to avoid communication. Many parents even cited worries about their children's welfare in the other parent's household.[6] We therefore assume the mother values the child's utility to the extent she knows how much she herself is contributing to child care and she feels the effect of her effort on the child's well-being. If she does not directly observe the former husband's child care effort and how his effort is affecting the child, she discounts it to zero.[7]

Let $\hat{q}_1$ be the optimal input in the production of good A (which is no longer shared or "public" in divorce) by the former wife. It is straightforward to show that $\partial\hat{q}_1/\partial\tau_1$ (= $\partial\hat{q}_1/\partial y_1$) > 0 and $\partial\hat{q}_1/\partial\tau_2$ (= $\partial\hat{q}_1/\partial y_2$) = 0. That is, the woman's contribution to the public good is an increasing function of her own income but is independent of the former husband's income. Furthermore,

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[6] However, Del Boca and Flinn (1994) found that expenditures on children by one divorced parent continue to have significant consumption externality for the other parent. Our assumption that no consumption externality exists following divorce is perhaps more appropriate for time and effort spent on children than for money expenditures.

[7] Notice here that zero is just a convenient normalization. The model will be unchanged if the wife treats the former husband's contribution as some constant, say $\overline{q}_2$. As long as we do not impose the requirement that the wife always treats $\overline{q}_2$ to be equal to the actual q_2 chosen by the former husband, the conclusions in this sub-section will remain the same. If this consistency requirement is imposed, the model will be a Nash equilibrium model, and this is treated in sub-section 2.

equations (13) and (14) imply that $\partial\bar{u}_1/\partial\tau_1 = A(\hat{q}_1)$ and $\partial\bar{u}_2/\partial\tau_1 = 0$. Substituting the latter results into equation (12) and making use of equation (6) for the effect of increased dowries on the equilibrium payoff to the wife in the bargaining solution, we have

$$\partial u_1^* \big/ \partial \tau_1 = \tfrac{1}{2}\Big(A(q_1^* + q_2^*) + A(\hat{q}_1)\Big). \qquad \mathbf{(15)}$$

The first term reflects how a dowry shifts the utility possibility frontier outward; the second term is a strategic effect that derives from the effect of a dowry on the improved bargaining position of the wife. Because of this strategic effect, the marginal utility of a dowry to the daughter is strictly greater than $\tfrac{1}{2}A(q_1^*+q_2^*)$, the solution that would have been obtained if resource allocation within the conjugal family is determined as in Nerlove, Razin and Sadka.

Equation (15) also shows that the marginal utility of dowry is increasing in $A(\hat{q}_1)$. Holding $(y_1 + y_2 + \tau_1 + \tau_2)$ constant, an increase in y_1 or τ_1 will leave q_1^* and q_2^* unchanged but it will increase $\hat{q}_1$. This leads to the following proposition.

Proposition 1. The marginal effect of dowry on the daughter's welfare is an increasing function of the daughter's income, holding constant the total endowment of the daughter and her husband.

More importantly, it can be shown that a transfer has a larger effect on the daughter's welfare when she is married than when she is single or divorced. It follows from the fact that a single or divorced daughter tends to produce and consume less of the "public" good, as established in the following lemma:

Lemma 1. Let $(Q^0,0)$ be the solution to the following problem:

$$\max_{Q,q_2} W(Q,q_2) = A(Q)\big(y_1 + y_2 + \tau_1 + \tau_2 - pQ\big) - B_1(Q - q_2) - B_2(q_2) \qquad \mathbf{(16)}$$

subject to q_2=0.

Then, $Q^* = q_1^* + q_2^* \geq Q^0 \geq \hat{q}_1$ if $W(Q,q_2)$ is concave.

Proof: (i) From the definition of $(Q^0,0)$,

$$\begin{aligned} &A(Q^0)(y_1 + y_2 + \tau_1 + \tau_2 - pQ^0) - B_1(Q^0) - B_2(0) \\ &\quad \geq A(\hat{q}_1)(y_1 + y_2 + \tau_1 + \tau_2 - p\hat{q}_1) - B_1(\hat{q}_1) - B_2(0), \end{aligned} \tag{17}$$

and from the definition of $\hat{q}_1$,

$$A(\hat{q}_1)(y_1 + \tau_1 - p\hat{q}_1) - B_1(\hat{q}_1) \geq A(Q^0)(y_1 + \tau_1 - pQ^0) - B_1(Q^0). \tag{18}$$

Adding the two inequalities yields

$$A(Q^0)(y_2 + \tau_2) \geq A(\hat{q}_1)(y_2 + \tau_2), \tag{19}$$

or $Q^0 \geq \hat{q}_1$.

(ii) By definition, $(Q^0,0)$ = argmax $W(Q,q_2)$ subject to $q_2 = 0$, and (Q^*,q_2^*) = argmax $W(Q,q_2)$. In other words,

$$\frac{\partial W(Q^0,0)}{\partial Q} = 0, \quad \frac{\partial W(Q^*,q_2^*)}{\partial Q} = 0 . \tag{20}$$

Note that $\partial^2 W/\partial Q \partial q_2 = B_1''(Q-q_2) > 0$ by convexity of B_1. Therefore, given concavity of $W(Q,q_2)$, $Q^* \geq Q^0$ if $q_2^* \geq 0$.

Lemma 1 immediately implies that

$$\partial u_1^* / \partial t_1 - \partial \bar{u}_1 / \partial t_1 = ½\left(A(q_1^* + q_2^*) - A(\hat{q}_1)\right) > 0. \tag{21}$$

Equation (21) captures the difference in the impact of a dowry on the utility of a married daughter as opposed to that of a single or divorced daughter. It readily leads to the following result if transfers to children are motivated by altruistic concerns:

Proposition 2. Under Nash bargaining with divorce as the threat point, altruistic parents have greater incentive to give transfers to married daughters than to single or divorced daughters.

The intuition behind these results is not hard to understand. Marriage improves efficiency in both consumption and production of the public good. Even with no additional contribution from the husband, the sharing of consumption alone increases the value of the public good, so that there is a tendency for the wife to increase her input beyond the level when she is single or divorced ($Q^0 > \hat{q}_1$). In additional to this joint consumption effect, the couple can also allocate their resources more efficiently in the production of the public good when the husband's input is not constrained to zero. As the cost of the public good falls with greater production efficiency, more of the good is produced with increased total contribution ($Q^* \geq Q^0$), even if the wife's contribution decreases relative to that in her single or divorced state. Because of the efficiency gain from these two effects, parents will often find that it is more advantageous to give transfers to their married children than to single or divorced children, as each additional dollar of transfer will bring greater "bang for the buck." This is consistent with Botticini's finding that, in medieval Tuscany, daughters who became nuns received smaller transfers from their parents than did their married siblings. Moreover, since bargaining power within a conjugal household depends on each spouse's income, a wife with higher income is in a position to capture a larger share of the increase in welfare that comes with a larger dowry. This gives rise to the positive relationship between the daughter's income and the amount of dowry.

Although a dowry improves the bargaining position of the wife, it does not necessarily hurt the husband. Because a dowry increases the resources available to the family and also because resource allocation is more efficient within marriage than under divorce, the husband will benefit from a larger dowry if the outward shift in the utility possibility frontier is more than enough to offset the strategic effect. In fact, using equation (11) and Lemma 1, we can show that

$$\partial u_2^* \big/ \partial t_1 = \partial u_2^* \big/ \partial y_1 = \tfrac{1}{2}\left(A(q_1^* + q_2^*) - A(\hat{q}_1)\right) > 0. \qquad \textbf{(22)}$$

This establishes the following proposition:

Proposition 3. Under Nash bargaining with divorce as the threat point, the husband benefits from an increased dowry to his wife.

The effects discussed above are, of course, symmetrical. Higher income for the husband will raise the probability and the amount of transfer he receives from his parents, which, in turn, benefits both spouses. In addition, equation (15) also implies that, holding the income and the dowry of the wife constant, an increase in the income of or transfer received by the husband will raise the marginal benefit of a dowry on the wife's welfare, as $A(q_1^*+q_2^*)$ is increasing in y_2, while $A(\hat{q}_1)$ is independent of it. Thus, without resorting to an ad hoc assumption of preference for putting one's wealth on public display, our model predicts that marrying a better endowed husband would, in general, induce the wife's parents to give a larger dowry. Moreover, the value of equation (21) is also increasing in the husband's income. In a world with uncertainty, this translates into a greater probability that the wife will receive a dowry at marriage. Together, equations (15) and (21) imply the following result:

Proposition 4. Holding the wife's income constant, the probability of her receiving a dowry, and the amount she receives, are increasing in the husband's endowment (which includes his income and the transfers he received from his parents).

Propositions 2 and 3 also have implications for the probability of marital dissolution. Because of the efficiency gain in the allocation of family public goods, the utility from marriage is greater than the utility from divorce, and divorce never occurs in equilibrium. For a divorce to occur, there must be some ex ante uncertainty that results in ex post efficient separation in some cases. Our model does not offer a formal analysis of such behavior under uncertainty. However, in a more general setup in which outputs in household production are subject to exogenous shocks, one can imagine that marital dissolution will result if the threat point is moved ex post beyond the utility possibility curve (Becker, Landes and Michael). The greater the distance between (u_1^*, u_2^*) and $(\bar{u}_1, \bar{u}_2)$, the less likely that exogenous shocks can bring the threat point outside the efficiency frontier and, hence, the lower the probability of divorce.[8] Propositions 2 and 3 show that an increase in dowry will raise $u_1^* - \bar{u}_1$ and $u_2^* - \bar{u}_2$ (since $\partial\bar{u}_2/\partial\tau_1 = 0$). The analysis therefore suggests the following result.

Proposition 5. Increased dowry will reduce the probability of divorce.

By encouraging the production and consumption of the family public good, thereby increasing the efficiency gain from the formation and maintenance of a family, parents are able to enhance the stability of their daughter's marriage through the giving of dowry. Again, by symmetry, higher income or more transfer received by the husband has a similar effect. This leads to the prediction that families with higher joint income or endowment tend to be more stable.

So far, the analysis has disregarded any transfer associated with divorce, but it is straightforward to incorporate such considerations. Suppose the government provides financial assistance for divorced women, perhaps in the form of child care support if wives retain custody of their children, and that husbands are bounded by law to pay an alimony to their ex-wives. Then, a

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[8] A model of repeated game also delivers the same result. The greater the utility distance between the cooperative equilibrium and the non-cooperative equilibrium, the greater the punishment from divorce and hence the higher the probability that marriage can be sustained.

divorced couple's utilities are, respectively,

$$\overline{u}_1 = A(q_1)\left(y_1 + t_1 + g + \overline{s}(y_1, y_2, t_1, t_2) - pq_1\right) - B_1(q_1) \quad \textbf{(23)}$$

and

$$\overline{u}_2 = A(q_2)\left(y_2 + t_2 - \overline{s}(y_1, y_2, t_1, t_2) - pq_2\right) - B_2(q_2), \quad \textbf{(24)}$$

where g is the government transfer to the woman and $\bar{s}$ is the alimony she receives from her ex-husband. The latter may depend on the income and wealth of both ex-spouses. For example, a simple rule that splits all income and wealth equally between the spouses will imply $\bar{s}_2 = \bar{s}_4 = -\bar{s}_1 = -\bar{s}_3 = ½$ (where subscripts indicate partial derivatives), while $\bar{s}_3 = \bar{s}_4 = 0$ if transfers from parents are excluded from the settlement. For simplicity, let $\bar{s}_i$ be constant for $i = 1, ..., 4$.

With alimony a function of both spouses' income, it is no longer the case that the divorced wife's utility is independent of her ex-husband's income. Equation (15) must now be modified as follows:

$$\frac{\partial u_1^*}{\partial t_1} = \frac{1}{2}\left(A(q_1^* + q_2^*) + \bar{s}_3 A(\hat{q}_2) + (1 + \bar{s}_3) A(\hat{q}_1)\right) . \quad \textbf{(25)}$$

If $\bar{s}_3 < 0$, the marginal utility of a dowry is smaller than that in the case when a dowry remains the wife's private property in divorce. If the husband can claim part of the wife's dowry (or if the dowry reduces the amount of alimony paid by the husband), parents would naturally be less inclined to give dowry.[9] However, it can be shown that the derivative is increasing in $\bar{s}_i$ for $i = 1, ..., 4$. Thus, any change in provision that favors the wife in the division of income and wealth will enhance the wife's threat point relative to the husband's and provide greater incentive for parents to give dowry.

[9] It is therefore not surprising that dowry is observed primarily in cultures in which the wives' property rights over dowries are well defined and protected. See footnote 1 for a discussion of these cultures.

An increase in government transfer to the divorced wife also has a similar effect.

Although more favorable terms for the wife tend to raise the amount of her dowry, they do not necessarily result in greater marital stability. In fact, holding dowry constant, because an increase in government child care support raises $\bar{u}_1$ but has no first-order effects on u_1^*, u_2^*, or $\bar{u}_2$, the expected gain from marriage (u_1^* - $\bar{u}_1$) is reduced, and there is a higher chance of divorce. This is certainly consistent with the observation that divorce rates are higher where there are more generous government subsidies for divorced women (Honig 1974 and Hannan, Tuma and Groeneveld 1977).

2. Non-Cooperative Threat Point

Recently, Lundberg and Pollak (1993) have proposed a "separate spheres bargaining" model, which uses the non-cooperative equilibrium as the relevant threat point for Nash bargaining. In the case of joint custody, for example, Weiss and Willis (1985) use the non-cooperative solution to characterize the equilibrium, arguing that a divorced couple will find it hard to monitor or enforce any agreement on their contributions to child care. Here, we assume the wife controls q_1 and the husband controls q_2. Let $(\tilde{q}_1,\tilde{q}_2)$ be the non-cooperative Nash equilibrium of the game. Then the threat point for bargaining will be

$$\bar{u}_1(y_1, y_2, t_1, t_2) = A(\tilde{q}_1 + \tilde{q}_2)(y_1 + t_1 - p\tilde{q}_1) - B_1(\tilde{q}_1) \; ; \qquad \textbf{(26)}$$

$$\bar{u}_2(y_1, y_2, t_1, t_2) = A(\tilde{q}_1 + \tilde{q}_2)(y_2 + t_2 - p\tilde{q}_2) - B_2(\tilde{q}_2) \; . \qquad \textbf{(27)}$$

Just as in divorce, the non-cooperating couple fail to internalize the benefits of joint consumption or exploit the efficiency of joint production, resulting in under-provision of the family public good (i.e., $\tilde{q}_1+\tilde{q}_2 \leq q_1^*+q_2^*$).[10] Since the public good is normal, an increase in dowry will always increase the wife's contribution to the public good. The effect of a dowry on the husband's contribution will depend on slopes of the reaction functions. If q_1 and q_2 are strategic complements, then $\partial\tilde{q}_2/\partial\tau_1 > 0$. If $q_1$and q_2 are strategic substitutes, then $\partial\tilde{q}_2/\partial\tau_1 < 0$.

Under the non-cooperative equilibrium, the effect of a dowry on the threat point utility of the wife is

$$\frac{\partial \bar{u}_1}{\partial \tau_1} = A(\tilde{q}_1 + \tilde{q}_2) + A' c_1 \frac{\partial \tilde{q}_2}{\partial \tau_1} \tag{28}$$

where $c_1 = y_1 + \tau_1 - p\tilde{q}_1$. The first term in (28) is the direct effect of a dowry on utility, and the second term is the strategic effect due to the change in behavior of the husband, which is ambiguous. For the husband, the effect of a dowry on his threat point utility is always positive:

$$\frac{\partial \bar{u}_2}{\partial \tau_1} = A' c_2 \frac{\partial \tilde{q}_1}{\partial \tau_1} > 0. \tag{29}$$

This is because when the level of public good contribution is suboptimal, an increase in the wife's contribution will have a first-order impact on the husband's welfare in the form of an intra-household externality.

Inserting equations (28) and (29) into equation (12) and applying the envelope theorem, we can obtain the effect of a dowry on the equilibrium payoff to the wife in the bargaining solution:

$$\frac{\partial u_1^*}{\partial \tau_1} = \frac{1}{2}\left(A(q_1^* + q_2^*) + A(\tilde{q}_1 + \tilde{q}_2) + A' c_1 \frac{\partial \tilde{q}_2}{\partial \tau_1} - A' c_2 \frac{\partial \tilde{q}_1}{\partial \tau_1} \right). \tag{30}$$

More importantly, we can calculate the effect of a dowry on the surplus from cooperation:

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[10] The proof of this result follows the approach in the proof of lemma 1 and will be supplied upon request.

$$\frac{\partial (u_1^* - \bar{u}_1)}{\partial \tau_1} = \frac{1}{2}\left(A(q_1^* + q_2^*) - A(\tilde{q}_1 + \tilde{q}_2) - A' c_1 \frac{\partial \tilde{q}_2}{\partial \tau_1} - A' c_2 \frac{\partial \tilde{q}_1}{\partial \tau_1} \right). \qquad \textbf{(31)}$$

Without further simplification, the sign of the derivative cannot be determined. However, if $q_1$and q_2 are neither strategic complements nor strategic substitutes, then (31) is definitely positive; that is, efficiency gains from marriage will increase with an increase in dowry. As a result, the probability of breakdown of cooperation in marriage will also fall. Another implication is that the marginal utility of income is higher in the cooperative equilibrium than in the non-cooperative equilibrium, giving altruistic parents a greater incentive for inter-generational transfers.

Notice that the assumption about strategic independence is a sufficient but not a necessary condition. For example, suppose utility is of the Cobb-Douglas form: $u_1 = (q_1+q_2)^{\alpha} c_1$; $u_2 = (q_1+q_2)^{\alpha} c_2$. Then it can be shown that $\tilde{q}_1$ and $\tilde{q}_2$ are strategic substitutes and that $\tilde{q}_1+\tilde{q}_2 = \alpha(y_1+y_2+\tau_1+\tau_2)/(\alpha+2)$ where the price of q_1 and q_2 is normalized to one. In contrast, the optimal level of public good under the cooperative equilibrium is $q_1^* + q_2^* = \alpha(y_1+y_2+\tau_1+\tau_2)/(\alpha+1)$. In this example, the threat point utility and the cooperative equilibrium utility are, respectively,

$$\begin{aligned} \bar{u}_1 &= (\alpha)^{\alpha}\left((y_1 + y_2 + \tau_1 + \tau_2)/(\alpha + 2)\right)^{\alpha+1}; \\ u_1^* &= \tfrac{1}{2}(\alpha)^{\alpha}\left((y_1 + y_2 + \tau_1 + \tau_2)/(\alpha + 1)\right)^{\alpha+1}. \end{aligned} \qquad \textbf{(32)}$$

Hence,

$$\frac{\partial u_1^*}{\partial \tau_1} - \frac{\partial \bar{u}_1}{\partial \tau_1} = (u_1^* - \bar{u}_1)\frac{\alpha + 1}{y_1 + y_2 + \tau_1 + \tau_2} > 0, \qquad \textbf{(33)}$$

as $u_1^* > \bar{u}_1$ for all $\alpha > 0$. Moreover, one can show that

$$\frac{\partial^2 u_1^*}{\partial y_1 \partial \tau_1} = u_1^* \frac{\alpha(\alpha + 1)}{(y_1 + y_2 + \tau_1 + \tau_2)^2} > 0 \,. \qquad \textbf{(34)}$$

That is, the marginal utility of income transfers ($\partial u_1^*/\partial\tau_1$) is increasing in the income of the daughter. In this case, all results derived in the previous section carry through qualitatively.

IV. Conclusion

In this paper, we present a Nash-bargaining analysis of the effect of a dowry on the allocation of resources within a family with private and public consumption goods. It is found that dowry in particular, and inter-generational transfers in general, can serve a number of functions that have often been overlooked. Apart from increasing the welfare of the daughter by expanding the utility possibilities of her conjugal family, a dowry given by parents also has the effect of shifting the allocation of consumption in favour of the daughter within her family, even though the son-in-law also benefits indirectly. Because a dowry helps to strengthen her bargaining position, parents do not necessarily make inefficiently small transfers to their daughter simply because the transfers are shared by the son-in-law, as has sometimes been suggested. This effect is reinforced by the efficiency gain in the consumption and production of family public goods by married couples, so that altruistic parents actually have greater incentive to transfer to married children than to single ones. In fact, by giving dowry, parents can increase this efficiency gain, thereby enhancing stability of their daughter’s marriage. Because a better endowed husband would tend to encourage a larger dowry for the wife, rich couples should show a lower probability of divorce. This is supported by empirical evidence in Becker, Landes and Michael (1977).

Cursory observation of the behavior of dowry giving appears to offer some support to our model. In some cultures, married children receive not only transfers at the time of their marriage, but also larger bequests than their single or divorced siblings. Our model's implication that the amount of dowry tends to increase with the income of the bridegroom also appears to be consistent with observations in China, India and various African cultures where dowry still plays a significant role in traditional marriages. Since our model applies to other kinds of inter-generational transfers of wealth as well, including bequests to children of either sex, further testing of the model can be afforded by empirical analyses of such behavior.

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