CENTRE FOR HOUSEHOLD, INCOME, LABOUR AND DEMOGRAPHIC ECONOMICS

Working Papers

A gender-neutral approach to gender issues.

A. Cigno

ChilD n. 19/2006

e-mail: de-child@unito.it
Web site: http://www.child-centre.it

A gender-neutral approach to gender issues.*

Alessandro Cigno
University of Florence

Abstract

It is not necessary to assume gender discrimination, or that men and women have different preferences, to explain why a woman might supply less labour, and get less consumption than her husband. Nor is it necessary to assume that parents like sons better than daughters to explain why a girl might receive less education than a boy. All that is needed is some recognition that childbirth affects the father's and the mother's earning capacity asymmetrically, and that the human capital effect of withdrawing from the labour market is irreversible.

Key-words: domestic division of labour, child care, bargaining with endogenous threat point, non cooperation, dowries, education, irreversibility.

JEL classification: D13, J12, J13, J24.

In this paper, I attempt to explain a number of facts, adverse to women, without assuming that the latter are discriminated against in the labour market, that mothers love children more fathers, or that parents treat sons better than daughters. Nor do I assume that individual behaviour is subject to any sort of social conditioning – in particular, that women feel compelled to stay at home and look after their children just because they are women. I do this not because I believe it to be necessarily true in all circumstances, but in order to show that none of those assumptions is necessary to explain why, for example, girls might receive less education than boys, and women might participate in the labour market less than men or get less than their fair share of household consumption. I also provide a rationale for the institution of the dowry, and point out a possible link between compulsory education and non-cooperative marriages.

*Paper to the XVIII ISER Workshop "Gender and Economics", Siena, 2005.

For analytical convenience, as well as because of its intuitive appeal, I shall assume that parents are altruistic towards their children in the sense that they derive direct utility from the latter's well-being. But similar results can be achieved if we assume that parents are ultimately self-interested, and that any apparent generosity is actually a rational response to the existence of a self-enforcing family constitution (Cigno, 2006). By contrast, I do not assume that spouses are altruistic to each other. That, too, is only an analytically convenient simplification, but much the same results are obtained if we allow for mutual altruism so long as people care for their own consumption at least a little more than they do for their partner's.

The approach I follow is in the tradition of Manser and Brown (1980), McElroy and Horney (1981), and Lundberg and Pollak (1996). In those seminal contributions, the allocation of family resources, and the distribution of consumption between husband and wife, are modelled as a Nash-bargaining game with exogenous threat point. Two more recent contributions, Lundberg and Pollak (2003), and Basu (2006), endogenize the threat point by making the reserve utility of the spouses depend on their actions. The actions modelled in these two papers have (or, rather, are modelled as if they had) no lasting consequences. If the action in question stopped, the game could be plaid all over again with the same initial conditions.

I shall model family interactions as a game (not necessarily cooperative) with endogenous reserve utilities as in the last two papers, but take the consequences of certain individual actions to be *irreversible*. The actions in point are the birth of a child (which I assume to be an inevitable consequence of marriage, but in a more general formulation would be the outcome of a further decision), and the allocation of the couple's time between labour and child care. Assuming that human capital accumulates not only with formal education, but also with work experience, the consequences of withdrawing from the labour market to look after a child include not only an immediate loss of earnings, but also a permanent loss of earning potential.

In order to explain why women might supply less labour and get less consumption than their husbands without assuming either sex discrimination, or different preferences and endowments, I focus on the case where the only ex-ante difference between husband and wife is of sex. Sex differentiation is modelled by stipulating that a child requires at least a certain amount of specifically maternal time. Above that minimum, the father's and the mother's time are perfect substitutes in the production of child care. That is sufficient to explain also why parents might give a daughter less education than a son, without assuming that they like boys better than girls. Children are modelled as a local public good. The analysis builds on Cigno (1991), and Cigno and Rosati (2005).

1 The basic model

Take a woman, f, and a man, m. If they marry, they have one child. I assume that f and m have exactly the same preferences and endowments. I further assume that a child needs t_0 units of maternal time. That is the only asymmetry between the sexes I shall allow. Above t_0, the father's time is perfectly substitutable for the mother's in the care of the child.

Suppose that f and m get married. Let a_i denote i's consumption $(i = f, m)$. Let c be the amount of money, and t the total amount of time over and above t_0, that the couple spends on the child. The utility of partner i over what is left of his or her life is given by

$$U_i = u(a_i) + \beta U^*(c,t), \ 0 < \beta \leq 1. \tag{1}$$

The term $U^*(c,t)$ may be interpreted as the maximum lifetime utility that the child can achieve given c and t. The constant β is a measure of parental altruism. The functions $u(.)$ and $U^*(.)$ are increasing and concave. Since $\beta U^*(c,t)$ is the same for both partners, the child's well-being has the nature of a local public good.

At marriage, i is endowed with a stock of human capital, h_i. After marriage, the stock accumulates at the rate αh_i (where α is a positive constant, the same for f and m) per unit of work experience. If h_i is produced entirely by education, this formulation of the on-the-job learning technology implies that well educated workers learn from experience more quickly than less well educated ones. After marriage, i's wage rate is given by

$$w_i = (1 + \alpha L_i) h_i \omega, \tag{2}$$

where ω is the market rate of return to human capital, and L_i the amount of time worked by i. By using the same value of ω for both partners, I am effectively saying that there is no sex discrimination in the labour market.

Since neither f nor m derives utility from leisure, the time not spent in the care of the child is inelastically supplied to the labour market. Normalizing the time endowment of each partner to unity, the woman's labour supply is then

$$L_f = 1 - t_0 - t_f, \tag{3}$$

where t_f is the amount of time, in addition to t_0, that she spends caring for the child. The man's labour supply is

$$L_m = 1 - t_m, \tag{4}$$

where t_m is the amount of time that he spends caring for the child.

For the assumption that t_f and t_m are perfect substitutes,

$$t_f + t_m = t. \tag{5}$$

I shall assume that t will never be so large, that the woman could not look after her child single-handed,

$$t_0 + t \leq 1. \tag{6}$$

1.1 Efficiency

An efficient allocation of domestic resources maximizes some weighted average of the utilities of the two partners,

$$\Lambda = \lambda U_f + (1 - \lambda) U_m,\ 0 \leq \lambda \leq 1, \tag{7}$$

subject to (5), and to the couple's joint budget constraint. Using (2) – (4), we can write the latter as

$$a_f + a_m + c = ((1 - t_0 - t_f)[1 + \alpha(1 - t_0 - t_f)] h_f + (1 - t_m)[1 + \alpha(1 - t_m)] h_m) \omega. \tag{8}$$

Since U_i is not a function of t_i, we can characterize first the efficient allocation of any given t between f and m by finding the (t_f, t_m) that minimizes the child's opportunity-cost

$$p(t_0 + t) \equiv ((t_0 + t_f)[1 + \alpha(1 - t_0 - t_f)] h_f + (1 - t_m)[1 + \alpha(1 - t_m)] h_m) \omega, \tag{9}$$

subject to (5), and then look for the efficient levels of all the other variables.

The solution to the cost-minimization problem is illustrated in Figure 1. The straight line with absolute slope equal to unity is an isoquant, satisfying (5). The convex-to-the-origin curves, with absolute slope,

$$-\frac{dt_f}{dt_m} = \frac{1 + 2\alpha(1 - t_0 - t_f)}{1 + 2\alpha(1 - t_m)} \frac{h_f}{h_m}, \tag{10}$$

diminishing as t_m is substituted for t_f, are isocosts satisfying

$$p(t_0 + t) = \text{const.}$$

For any (h_f, h_m) satisfying

$$\frac{h_f}{h_m} \leq \frac{1 + 2\alpha}{1 + 2\alpha(1 - t_0 - t)}, \tag{11}$$

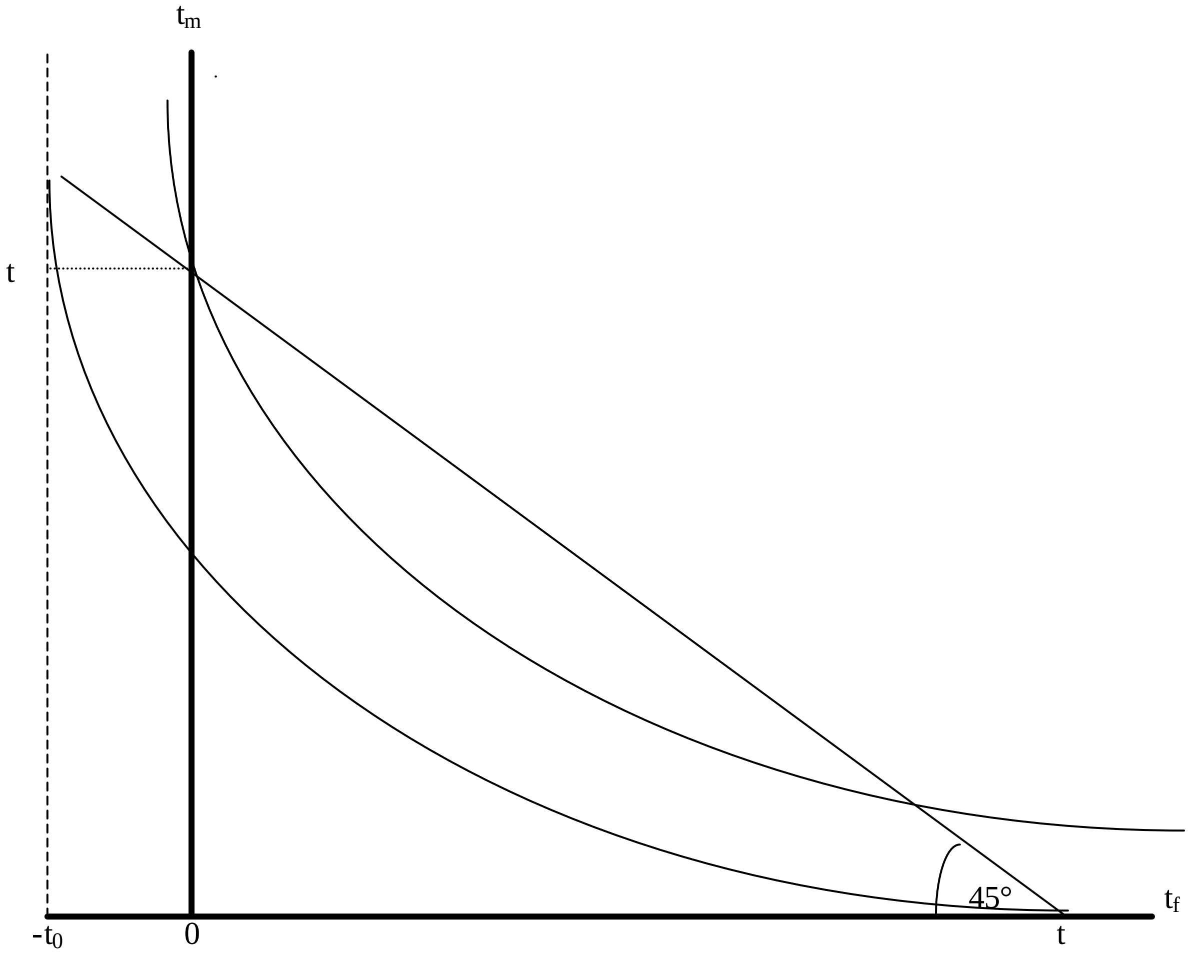

Figure 1. Efficient division of labour

$p\,(t_0 + t)$ is minimized if the mother looks after the child single-handed ($t_f = t$, $t_m = 0$). For the opportunity-cost to be minimized at the opposite corner ($t_f = 0$, $t_m = t$), f's human capital endowment would have to be strictly larger than m's. For f and m matched at random, the chances of that are obviously less than 50/50.

The picture in Figure 1 is drawn under the assumption that

$$h_f = h_m = h. \tag{12}$$

That is the assumption I shall make through the rest of this section. In that case, it is efficient for the mother to take complete responsibility for the care of the child, and for the father to specialize completely in market work. Given this domestic division of labour, the woman will end up with less human capital than her husband despite starting out with the same endowment.

Given (12), an efficient (a_f, a_m, c, t) maximizes (7) subject to

$$a_f + a_m + c = ((1 - t_0 - t)\,[1 + \alpha\,(1 - t_0 - t)] + 1 + \alpha)\,h\omega. \tag{13}$$

It will thus satisfy the first-order conditions

$$\lambda u'\,(a_f) = \beta U_c^* = (1 - \lambda)\,u'\,(a_m) \tag{14}$$

and

$$\frac{U_t^*}{U_c^*} = 1 + 2\alpha\,(1 - t_0 - t)\,h\omega. \tag{15}$$

It is clear from (14) that the weight attributed to each spouse affects only the distribution of parental consumption. In view of (10), the allocation of time depends only on human capital endowments. The allocation of household income between parental consumption and expenditure for the child equates the child's MRS of money for child-care time to the marginal opportunity-cost of the latter.

1.2 Bargaining

Suppose that λ, and thus the distribution of the private consumption good between the partners, is the outcome of a Nash-bargaining game. Suppose, also, that this game is plaid *before* the wedding. This implies that the parties can credibly commit (*e.g.*, by signing a legally binding contract) to a division of the benefits before the marriage takes place. Let R_i denote i's ex-ante reserve utility. Assuming, for simplicity, that the best alternative to the prospected wedding is singlehood, this utility is the same for both partners,

$$R_i = u\,((1 + \alpha)\,h\omega) \equiv R,\ \ i = f, m. \tag{16}$$

Bargaining will maximize

$$\Pi = (U_f - R)(U_m - R), \tag{17}$$

subject to (1) – (8). The solution is illustrated in Figure 2.

Let a superscript B identify the value taken by a variable in the solution to this constrained maximization problem. The point **R**, with coordinates (R, R), is the threat point of the game. The concave-to-the-origin curve is the utility-possibility frontier implied by (1), (5) and (8). The continuous, convex-to-the-origin curve is a contour of (17). Since **R** lies on the 45° line, Π is maximized at point **B**, with coordinates (U^B, U^B). Since **B** is a point on the utility-possibility frontier, the equilibrium is efficient. In this bargaining equilibrium, the spouses have the same utility level. Since the public good is equally valued by both partners, the consumption of the private consumption good must be the same too.

What if a binding pre-marital commitment to $\left(a_f^B, a_m^B, c^B, t^B, t_m^B\right)$ is either impossible, or too costly? If the woman accepts to take complete responsibility for the care of the child, she will then expose herself to the risk of opportunistic bargaining on her husband's part. Once the child-care season is over, and the woman's human capital potential irretrievably curtailed, f's reserve utility will in fact fall to

$$R_f' = u\left((1 - t_0 - t)\left[1 + \alpha\left(1 - t_0 - t\right)\right] h\omega\right) < R,$$

while m's will remain the same,

$$R_m' = u\left((1 + \alpha) h\omega\right) = R.$$

Her bargaining power will consequently fall.

In Figure 2, the ex-post threat point is **R'**, with coordinates $\left(R_f', R_m'\right)$. Given this new threat point, the contours of Π look like the dotted, convex-to-the-origin curve shown. As **R'** lies to the left of **R**, the ex-post bargaining equilibrium is represented by point **B'**, with coordinates $\left(U_f^{B'}, U_m^{B'}\right)$. As **B'** lies on the utility-possibility frontier, North-West of **B**, it is clear that the allocation is still efficient, but less favourable to the woman.

1.3 Non-cooperation

As an alternative to engaging in ex-post bargaining, f might prefer to retain control over her own earnings (*e.g.*, by having a separate bank account), and contribute money and time to the care of the child in a non-cooperative fashion. As m would then do the same, the outcome would be a Cournot-Nash equilibrium. Bergstrom (1996) describes a

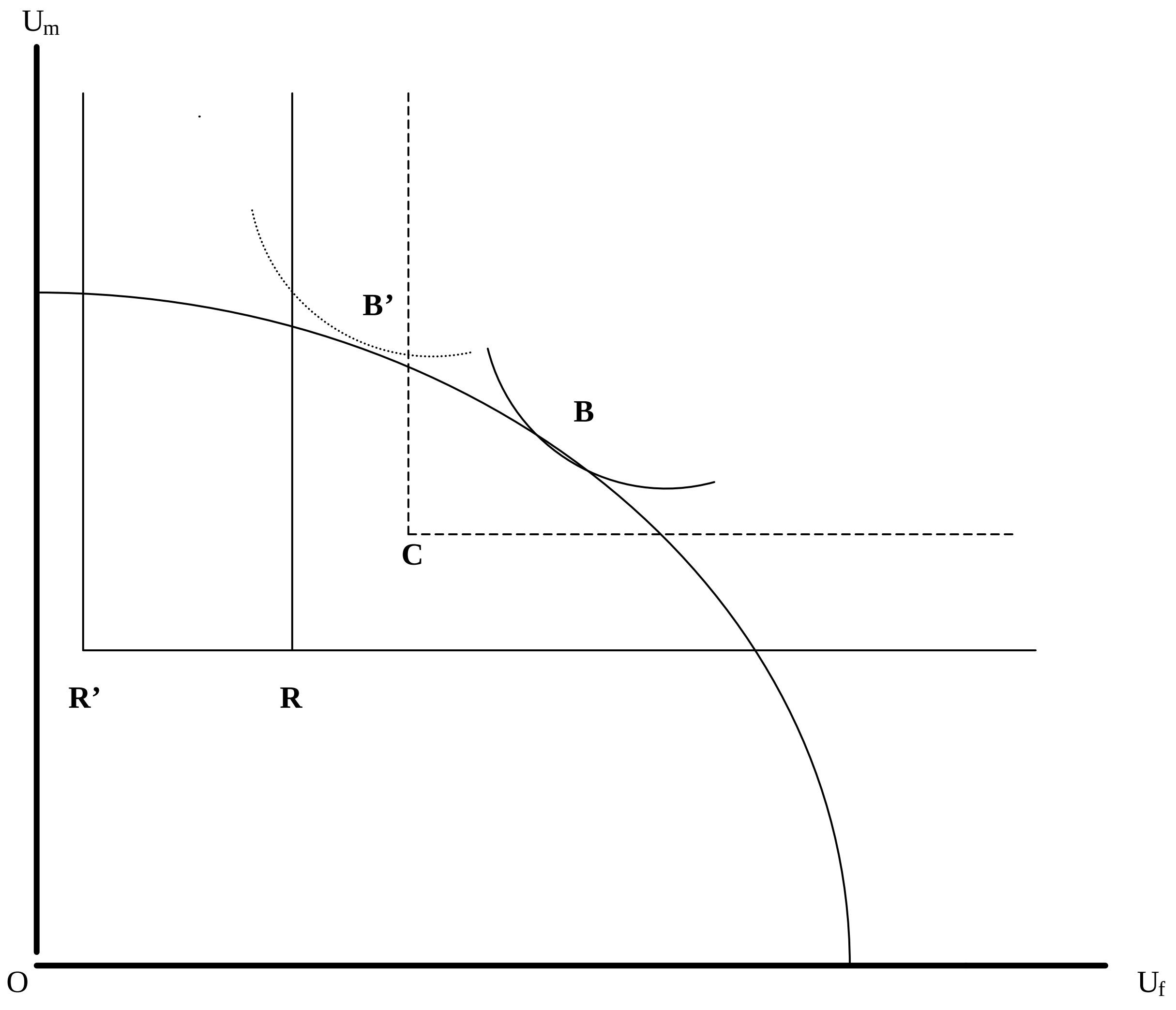

Figure 2. Ex-ante bargaining, ex-post bargaining and non-cooperative equilibrium

non-cooperative marriage as a kind of war of attrition ("harsh words and burnt toast"). But the hallmark of a Cournot-Nash equilibrium is lack of communication, not attrition. It thus seems more appropriate to characterize a non-cooperative marriage as one where the spouses lead effectively separate lives, foregoing the efficiency gain that would come from division of labour just to prevent conflict. A third possibility is that f and m decide to stay single. Since this case is not very interesting,[1] however, I shall assume that marriage is always better than no marriage for both parties.

In a non-cooperative marriage, the joint budget constraint (8) is replaced by two individual budget constraints, one for each partner. Using (5), and denoting i's contribution to c by c_i, we can write f's budget constraint as

$$a_f + c - c_m = (1 - t_0 - t + t_m)\left[1 + \alpha\left(1 - t_0 - t + t_m\right)\right] h\omega, \tag{18}$$

and m's as

$$a_m + c_m = (1 - t_m)\left[1 + \alpha\left(1 - t_m\right)\right] h\omega. \tag{19}$$

The woman now chooses (c, t) to maximize her own utility, subject to (18), taking (c_m, t_m) as parameters. Her choice will satisfy the first-order conditions

$$u'(a_f) = \beta U_c^*(c, t) \tag{20}$$

and

$$\frac{U_t^*(c, t)}{U_c^*(c, t)} = \left[1 + 2\alpha\left(1 - t_0 - t + t_m\right)\right] h\omega. \tag{21}$$

The man chooses (c_m, t_m) to maximize his own utility, subject to (19), taking (c, t) as parameters. His choice will satisfy

$$u'(a_m) = \beta U_c^*(c, t) \tag{22}$$

and

$$\frac{U_t^*(c, t)}{U_c^*(c, t)} = \left[1 + 2\alpha\left(1 - t_m\right)\right] h\omega. \tag{23}$$

Equations (20) − (23) imply that, in equilibrium, f and m consume the same amount of the private good,

$$a_f = a_m, \tag{24}$$

and thus enjoy the same utility level,

$$U_f = U_m. \tag{25}$$

[1] Each of them would then consume $(1 + \alpha) h\omega$ of the private good, and zero of the public one. Utility would be $u((1 + \alpha) h\omega)$ for both of them.

They also supply the same amount of care time,

$$t_0 + t_f = t_m. \tag{26}$$

and thus of labour. If we then compare (21) and (23) with (15), we can see that f and m equate their child's MRS of money for care time to their own share (rather than to the whole) of the marginal opportunity-cost of the latter. There are thus two reasons why a non-cooperative marriage is inefficient. One is that the spouses do not exploit their comparative advantages in the allocation of time. The other is that they spend relatively too little for their child.

Let a superscript C identify the value of a variable in the Cournot-Nash equilibrium, and a superscript B' that of a variable in the ex-post bargaining equilibrium. The marriage will be cooperative if and only if

$$U_i^{B'} \geq U_i^C, \ i = f, m. \tag{27}$$

In both Figure 2 and Figure 3, the non-cooperative equilibrium is represented by point **C**, with coordinates $\left(U^C, U^C\right)$. As the equilibrium is inefficient, **C** lies inside the utility-possibility frontier. The difference between the two figures lies in the position of **B'** relative to **C**. In Figure 2, **B'** lies outside the segment of the utility-possibility frontier that satisfies (27). The couple will then play the Cournot-Nash game, and end up at **C**. In Figure 3, by contrast, **R'** lies close enough to **R** for **B'** to fall inside the segment that satisfies (27). The couple will then play the Nash-bargaining game, and the equilibrium will be at **B'**. In general, therefore, a woman *may* be better-off submitting to her husband's opportunistic bargaining, than refusing to cooperate.

Lundberg and Pollak (1996) assume post-marital bargaining, and take the non-cooperative equilibrium to be the threat point. In the present context, however, the non-cooperative equilibrium ceases to be available the moment f and m marry, because her human capital potential is then irreversibly curtailed. The comparison between **B'** and **C** serves only to determine which kind of game will be plaid after the marriage.

2 The model with money endowments

Does it make any difference if individual endowments include money or other conventional assets instead of, or as well as, human capital? In many legal systems, spouses can opt for either a joint or a separate property regime, but this applies only to assets acquired after marriage. Assets acquired before marriage are individually owned anyway. Additionally, the disposal of any assets that the woman might have received

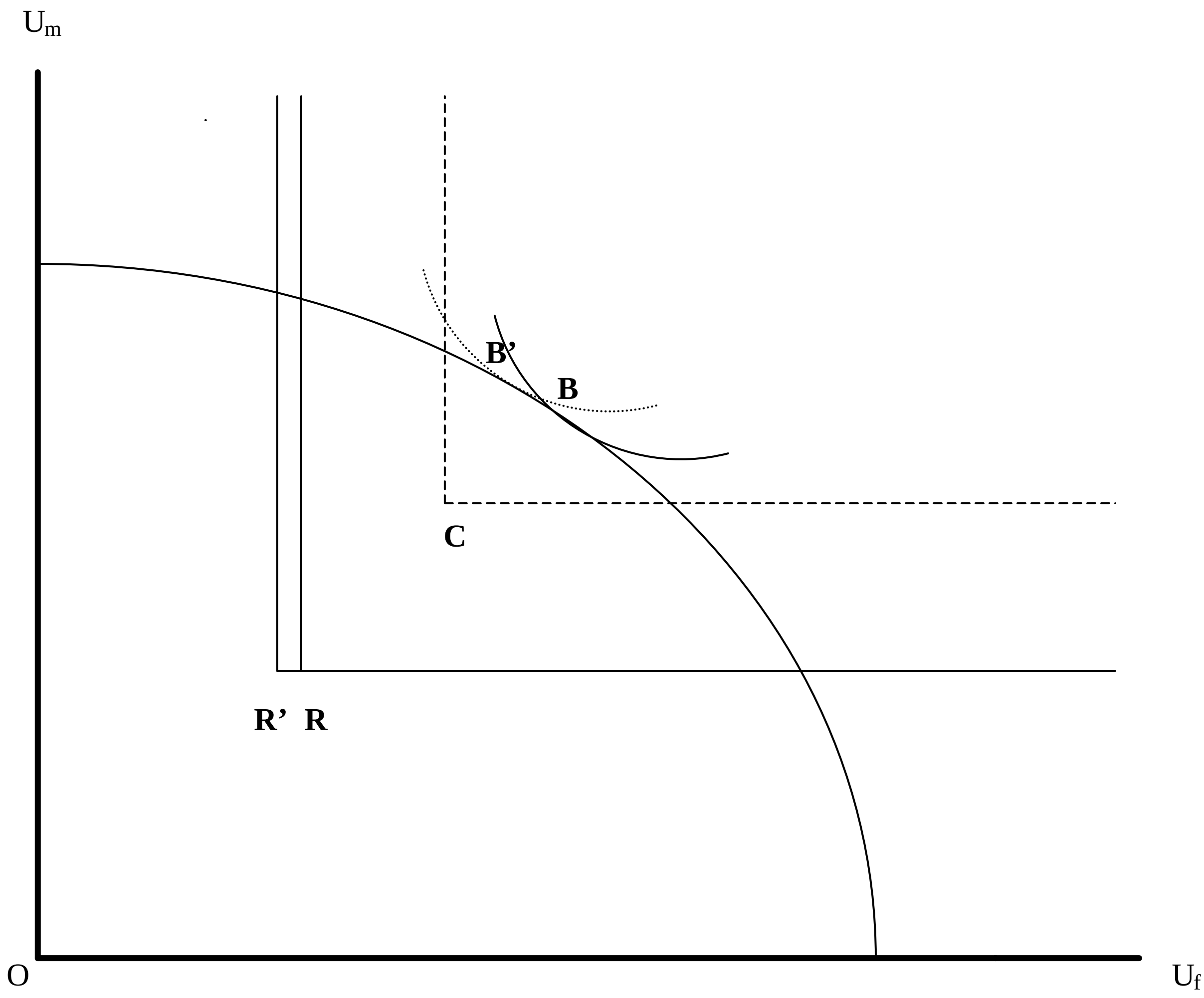

Figure 3. Ex-ante bargaining, ex-post bargaining and non-cooperative equilibrium with money and human capital endowments.

from her own parents at the time of marriage ("dowry") are typically subject to legal restrictions that put them beyond the reach of rapacious (or imprudent) husbands. I shall thus assume that property rights are vested in the individual, rather than in the couple. To maintain symmetry, I shall also assume that the spouses start out with the same endowment of money, as well as of human capital.

Let b denote the common value of f's and m's initial money endowment. Ex ante, f and m have again the same reserve utility,

$$R_i = u\left(b + (1+\alpha)\,h\omega\right) \equiv R.$$

Their pre-marital bargaining power is thus unaffected by the presence of money endowments.

Ex post, however, f's reserve utility is now given by

$$R'_f = u\left(b + (1-t_0-t)\left[1+\alpha\,(1-t_0-t)\right]h\omega\right),$$

and m's by

$$R'_m = u\left(b + (1+\alpha)\,h\omega\right).$$

For any positive h, it thus remains true that R'_f is smaller than R'_m, and that the cooperative equilibrium with post-marital bargaining is more favourable to m than to f. But it is clear that, the larger b relative to h, the smaller the difference between R'_f and R, and thus between R'_f and R'_m. If h were equal to zero, R'_f would be actually equal to R'_m.[2] If human capital at marriage were entirely the result of education, and f and m were totally uneducated ($h = 0$), point **B'** would coincide with point **B**, and the woman would then have nothing to fear from ex-post bargaining.

Let us now look at non-cooperative marriages. With money and human capital endowments, the woman's budget constraint is

$$a_f + c - c_m = b + (1-t_0+t_m)\left[1+\alpha\,(1-t_0-t+t_m)\right]h\omega, \qquad (28)$$

but the first-order conditions on her choice of (c,t) are still (20) – (21).

The man's budget constraint is

$$a_m + c_m = b + (1-t_m)\left[1+\alpha\,(1-t_m)\right]h\omega, \qquad (29)$$

and the first-order conditions on his choice of (c_m, t_m) are again (22) – (23).

In the non-cooperative equilibrium, it is then again true that the spouses consume the same amount of the private consumption good,

[2]In that limiting case, however, there would be nothing to gain from domestic division of labour.

supply the same amount of child care time, and give their child the wrong mix of money and care time. As in the basic model, the equilibrium is thus inefficient.

Continuing to assume that pre-marital contracts are unenforceable, which of the two available alternatives will prevail? Once again, it all depends on the position of the post-marital bargaining equilibrium, **B'**, relative to the non-cooperative one, **C**. Now, however, the probability of a post-marital bargaining equilibrium is an increasing function of the relative weight of conventional assets. This provides a rationale for the institution of the dowry, and for the special protection that legislations afford to dotal goods.

3 Discussion

We have seen that the traditional domestic division of labour, where men go out to work, and women stay at home to look after the children, can emerge even if husband and wife have exactly the same preferences and endowments. That is sufficient to explain a bias against women in the division of the benefits of marriage, and in the amount of education that they receive from their family of origin. It also provides a rationale for giving a daughter a dowry, and for the existence of legal restrictions on the disposal of dotal goods.

All that is needed to produce these results is some recognition that (i) the mother cannot be entirely replaced by the father in the care of a child, (ii) work experience has a permanent effect on earning ability, and (iii) a man and a woman cannot credibly commit to any particular division of consumption after marriage. In relation to (i), I postulate that a child requires at least a certain amount of specifically maternal time. Beyond that, the father's and the mother's time are perfectly substitutable for each other in the care of the child. In relation to (ii), I postulate that human capital accumulates with work experience, and that the accumulation rate increases with education. Taken together with (i), this implies that it is efficient for the father to specialize completely in market work, and for the mother to take complete responsibility for the care of the child. In view of (iii), if the woman accepts to withdraw from the labour market to look after a child single-handed, she exposes herself to the risk of opportunistic bargaining on her husband's part once the child care season is over, and her human capital potential compromised.

A woman can avoid being exploited by her husband by refusing to specialize in child care, and retaining control over her own earnings (*e.g.*, by keeping a separate bank account). This may not be socially acceptable in certain contexts. If it is, however, it will have efficiency costs. One arises from the fact that the domestic division of labour will not exploit comparative advantages. The other arises from the local public good nature of the child's well-being. Non-cooperative parents spend too little time with their children. The analysis assumes that spouses, while altruistic towards their children, are not altruistic to each other. Allowing for reciprocal altruism would moderate the extent to which a spouse will exploit a domestic bargaining advantage. So long as each spouse cares a little more about his or her own consumption than about the spouse's, however, the results will remain qualitatively the same.

The rationale for the institution of the dowry comes from the fact that, while the marginal benefit of education depends on how much the educated person will work in subsequent life, and thus on the domestic division of labour, the marginal benefit of money and other conventional assets is independent of it. Parents may then rationally decide to save with a view to providing a daughter with a dowry, in addition or as an alternative to buying her an education. This explains why girls traditionally got less education than equally gifted boys. The reason was not necessarily that parents liked sons better than daughters. It may have been that a girl's interest was better served by giving her money, rather than an education she would not be able to use to the full. By limiting parental freedom to choose the mix of money and education to give a child, compulsory education makes it less likely that a girl will have a cooperative marriage, and thus that the marriage will be efficient.

All of this assumes that education gives utility only indirectly, by raising the recipient's earning capacity. If education gives also direct utility, or has a direct effect on a person's domestic bargaining power, the rationale for giving a daughter money rather than education becomes doubtful.

4 References

Basu, K. (2006), "Gender and Say: A Model of Household Behaviour with Endogenously Determined Balance of Power", *Economic Journal* 116, 558-580

Bergstrom, T. C. (1996), "Economics in a Family Way", *Journal of Economic Literature* 24, 1903-1934

Cigno, A. (1991), *Economics of the Family*, Oxford and New York: Clarendon Press and Oxford University Press

——— (2006), "A Constitutional Theory of the Family", *Journal of Population Economics* 19 (Special Issue on Political Economy and Population Economics), 259-283

——— and F. C. Rosati (2005), *The Economics of Child Labour*, Oxford and New York: Oxford University Press

Lundberg, S. and R. A. Pollak (1996), "Bargaining and Distribution in Marriage", *Journal of Economic Perspectives* 10, 139-158

——————————— (2003), "Efficiency in Marriage", *Review of Economics of the Household* 1, 153-167

Manser, M. and M. Brown (1980), "Marriage and Household Decision Making: a Bargaining Analysis", *International Economic Review* 21, 31-44

McElroy, M. B. and M. J. Horney (1981), "Nash-Bargained Household Decisions", *International Economic Review* 22, 333-349