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ABSTRACT

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We use elementary game-theoretical concepts to compare domestic equilibria with and without marriage. In particular, we examine the effects of marriage legislation, matrimonial property regime, and divorce court sentencing practice, on the decision to marry, and on the choice of game conditional on marriage. We find that, in the absence of social stigma or legal discrimination against unmarried couples, a couple will marry only if marriage serves as a commitment device which facilitates cooperation.

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1 Introduction

Until only a few decades ago, the answer to the title question was straightforward: people marry because cohabitation without marriage attracts social stigma and legal discrimination. In the light of evidence that stigma and legal discrimination have disappeared in developed countries, however, the question should rather be: why do couples still marry? In what follows, we use elementary game-theoretical concepts to compare domestic equilibria in the presence and in the absence of the marriage institution. In particular, we examine the effects of divorce legislation and sentencing practice, and of the matrimonial property regime, on the choice of game conditional on marriage, and on the decision to marry.

In much of the game-theoretical literature on the family, the nature of the game is taken as given. In the wake of Manser and Brown (1980), and McElroy and Horney (1981), most of the contributions assume that it will be cooperative. A notable exception is Lundberg and Pollak (1994), where the assumption is that the partners will behave non-cooperatively. The choice of game is endogenous in Del Boca and Flinn (2005), but is taken to depend on the exogenously given transactions-cost of cooperation. We investigate whether, or in which circumstances, marriage can be seen as a cooperation-inducing commitment device.

The idea that legislation may affect marital equilibrium is not new. Mnookin and Kornhauser (1979), and Cigno (1991), address the issue from a theoretical point view. The effects of divorce and property legislation on marriage, divorce and married women's labour supply have been investigated empirically by a number of authors, but the theoretical analysis does not appear to have gone very far. Section 2 of the present paper sets out the assumptions. Section 3 characterizes an efficient allocation of domestic resources. Section 4 characterizes the domestic equilibrium in the absence of the marriage institution. Section 5 does the same in the presence of the marriage institution under different property regimes, and with different divorce legislations and court practices. Section 6 discusses the results in the light of the evidence.

2 Assumptions

We focus on the union formed by a particular woman, f, and a particular man, m. The purpose of the union is to produce local public goods, in particular children, and to reap the efficiency gains that may result from domestic division of labour. We assume that the parties are perfectly informed about each other's characteristics, and about the characteristics of all alternative partners. This overlooks some important features

of reality, but allows us to focus on efficiency and distributional issues. We also assume that the parties are free to lend at the going interest rate, but allow for the possibility that borrowing may be subject to a ceiling.

There are two decision dates, 1 and 2. At date 1, f and m decide how much to work and consume, how many children to have, and how much time and money to spend on each child. These decisions are irreversible. At date 2, the children are independent adults, and the parents decide how much to work and consume. This location of the decision dates on the time line is not the only possible one, but is the most appropriate for our purposes. Had we been concerned with the effects of custodial arrangements on the amount of support provided by the non-custodial parent for example, we would have placed date 2 somewhat earlier, when the children are still dependent on their parents (but this, as we will argue, would imply imperfect information). Had we been concerned with the matching process, and with the way this is influenced by previous investments in human capital and conventional assets, we would have placed date 1 before, and date 2 at, the moment of the match. All decisions may be taken either cooperatively or non cooperatively. In the absence of cooperation, the number of children will be decided by the woman. Cooperation may result in explicit or implicit transfers between the parties.

Each party has the option of withdrawing from the union or, if the couple is legally married, seeking a divorce. In real life, many unions break down when the children are still dependent on their parents, or even before the children are born. The cause of these early separations is imperfect information about the present partner, or about the availability of alternative ones. In our perfect information framework, however, separation at date 1 makes no sense. Had either party had a better alternative, he or she would have taken it in the first instance. Separation may then make sense only at date 2, when the children are out of the way, and there are then no more efficiency gains to be had.

As in Cigno (1991), we assume that a child requires at least t_0 units of specifically maternal time (but nothing of great substance is lost if we set this minimum equal to zero). Together with the fact that men cannot have children, this is the only "natural" gender asymmetry to which we will admit – any other will be man-made. Above t_0, the father's time is a substitute for the mother's. In most of the analysis, we will further assume that it is a perfect substitute. That is a convenient simplification, which will permit us to derive analytical results in a fairly straightforward manner, but we will argue in the next section that nothing of substance changes if we assume that substitution takes place at a

diminishing marginal rate.

Let c denote the amount of money or goods, and t the amount of time ("attention") over and above t_0, that a child receives from his or her parents at date 1. For the perfect-substitutability assumption,

$$t = t_f + t_m, \tag{1}$$

where t_i is the amount of attention a child receives from i, $i = f, m$. Plausibly assuming that the length of time for which the mother is indispensable is relatively short,[1]

$$t_0 < t.$$

The child's lifetime utility maximized conditionally on c and t is denoted by $v(c, t)$, where $v(.)$ is an indirect utility function, increasing and concave. Since c may include the services of professional child minders, concavity implies that bought-in child care is an imperfect substitute for parental attention.

Assuming that the partners are altruistic towards their children, the utility of partner i may be written as

$$U_i = u(a_{i1}) + u(a_{i2}) + \beta n v(c, t), \ 0 < \beta < 1, \tag{2}$$

where (a_i^1, a_i^2) is i's own consumption stream, and $u(.)$ the instantaneous utility function, increasing and concave. Following Becker (1981), we will refer to n as the quantity, and $v(c, t)$ as the quality of children. Since the $nv(c, t)$ term is common to f's and m's utility, quantity and quality are local public goods. As children are not differentiated by sex, and β is the same for both partners, we are in effect saying that parents love daughters as much as sons, and that fathers love children as much as mothers do. As leisure does not figure in (2), i will throw any time that is left over from child care inelastically on to the labour market.

The last of these assumptions allows us to focus on the allocation of total work time between market and domestic (identified, here, with child care) activities.[2] Normalizing to unity a person's total work time at each date, f's and m's date-1 labour supplies will be, respectively,

$$L_f = 1 - (t_0 + t_f) n \tag{3}$$

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[1]How short depends on legislation and school of pediatric thought (from as little as three months, to as much as three years).

[2]The assumption that a person's total – market plus domestic – work time is a constant has some empirical justification. Burda et al. (2006) find that this total varies across countries (notably, between Europe and the US), but not across households belonging to the same country. What varies, within a country, is only the allocation of total work time between the two types of work.

and

$$L_m = 1 - nt_m. \tag{4}$$

Therefore,

$$\frac{\partial L_f}{\partial n} = -(t_0 + t_f) < 0, \ \frac{\partial L_f}{\partial t_f} = -n \le 0 \tag{5}$$

and

$$\frac{\partial L_m}{\partial n} = -t_m \le 0, \ \frac{\partial L_m}{\partial t_m} = -n \le 0. \tag{6}$$

Since L_i cannot be negative, (n, t_f, t_m) must be such that

$$(t_0 + t_f)\, n \le 1$$

and

$$nt_m \le 1.$$

We assume that neither of these restrictions will be binding (i.e., that the opportunity-cost of looking after children is sufficiently high for neither parent to want to spend more than the whole of his or her total work time in this activity). At date-2, when the children no longer demand attention, the labour supply will be equal to unity for both partners.

When the union is formed, i is endowed with b_i units of a tradeable asset ("money"), and h_i units of human capital. The latter may be partly a reflection of natural talent, and partly the result of previous educational investments or labour experience. From the moment the union is formed, however, human capital increases only with labour experience. We will assume that it accumulates at the rate αh_i, where α is a positive constant, per unit of labour. This formulation implies that more talented, or better educated, workers learn from experience more, or more quickly, than less talented, or less well educated ones. Nothing of substance changes if we allow f and m to differ also in their ability to raise children, or assume that this ability also increases with experience.

In the light of these assumptions, i's wage rate will be

$$w^1\left(h_i, L_i\right) = \left(1 + \alpha h_i L_i\right) h_i$$

at date 1, and

$$w^2\left(h_i, L_i\right) = \left(1 + \alpha\right)\left(1 + \alpha h_i L_i\right) h_i$$

at date 2. The assumption that the wage rate increases with market work implies increasing returns to this activity. The assumption that a unit of female human capital attracts the same rent (normalized to unity) as a unit of male human capital, and that the wage rate of two equally

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endowed persons grows at the same rate per unit of labour irrespective of sex, implies absence of gender discrimination in the labour market.

Partner i earns

$$y^1(h_i, L_i) \equiv w^1(h_i, L_i) L_i \tag{7}$$

at date 1, and

$$y^2(h_i, L_i) \equiv w^2(h_i, L_i) \tag{8}$$

at date 2. Notice that not only date-1, but also date-2 earnings are completely determined by the time allocation chosen at date 1, and that both $y^1(h_i, L_i)$ and $y^2(h_i, L_i)$ are increasing in L_i. The consequences of relaxing some of the assumptions made in this section will be examined at the end of the next one.

3 Efficiency

A Pareto-optimal $(a_{i1}, a_{i2}, t_i, c, n, s)$ maximizes

$$\Lambda = \lambda U_f + (1 - \lambda) U_m, \ 0 \le \lambda \le 1, \tag{9}$$

for some λ, subject to $(1) - (8)$, and to the resource constraints,

$$\sum_{i=f,m} \left[a_i^1 - b_i - y^1(h_i, L_i) \right] + nc + s = 0, \tag{10}$$

$$\sum_{i=f,m} \left[a_i^2 - y^2(h_i, L_i) \right] - sr = 0 \tag{11}$$

and

$$-2\sigma \le s, \ i = f, m, \tag{12}$$

where s denotes the couple's joint savings, r the interest factor, and σ the most that an individual is allowed to borrow. The parameter λ may be interpreted as f's domestic welfare weight.

As U_i is independent of t_i, we can carry out the optimization in two steps. First, we find the (t_f, t_m) which minimizes the opportunity-cost of a child for each possible (n, t). Second, we look for the $(a_{i1}, a_{i2}, t, c, n, s)$ which maximizes Λ for each possible λ. The first step is equivalent to maximizing the couple's joint wealth,

$$W = \sum_i \left[b_i + y^1(h_i, L_i) + \frac{y^2(h_i, L_i)}{r} \right],$$

subject to $(1) - (8)$, for a given (n, t). The solution is illustrated in Figure 1. The straight line with absolute slope equal to unity is an isoquant. The convex-to-the-origin curves with absolute slope

$$-\frac{dt_m}{dt_f} = \frac{(1 + 2\alpha [1 - (t_0 + t_f) n]) r + \alpha (1 + \alpha)}{[1 + 2\alpha (1 - nt_m)] r + \alpha (1 + \alpha)} \frac{h_f}{h_m}, \tag{13}$$
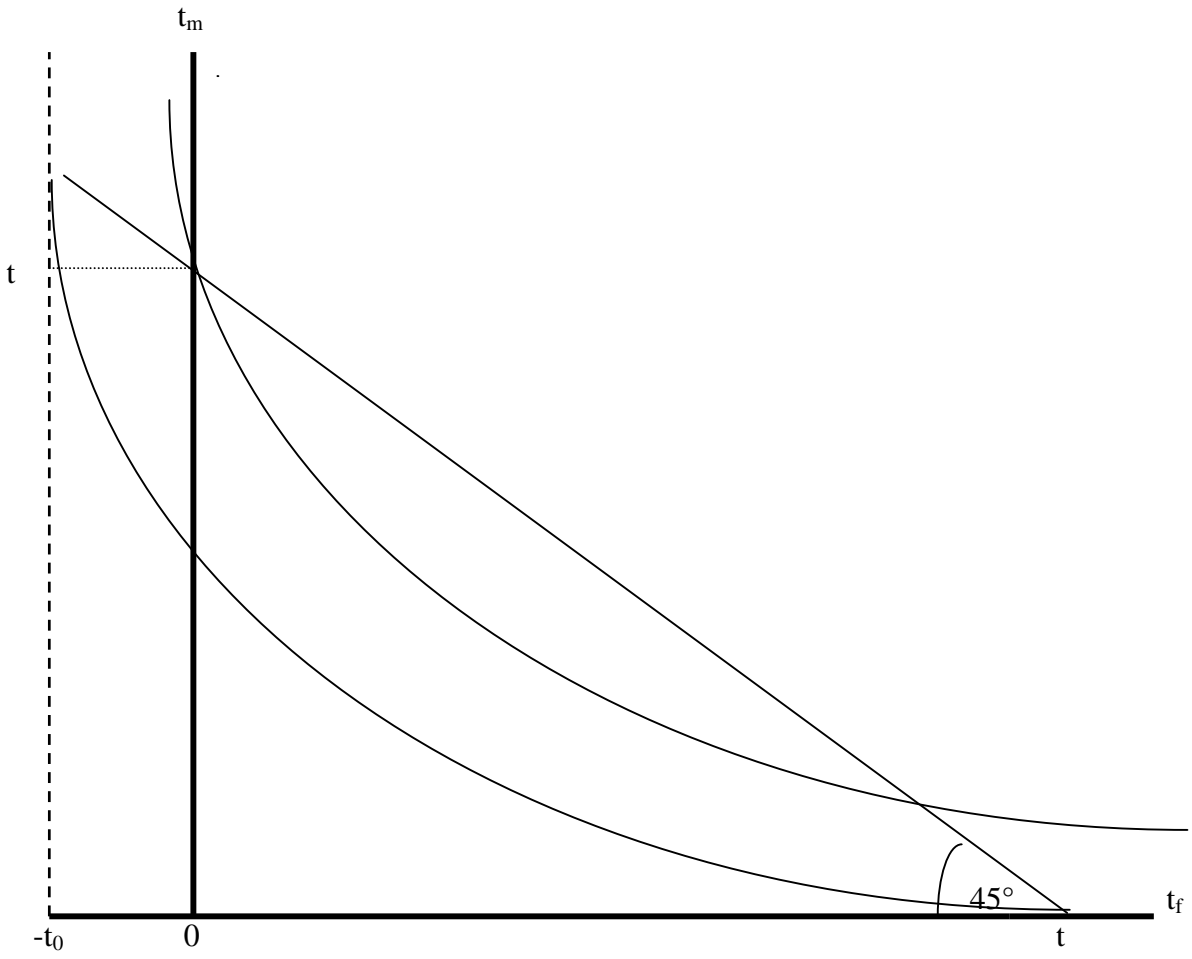
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Figure 1. Efficient division of labour

diminishing as t_m is substituted for t_f, are isocosts. Convexity implies that the cost-minimizing time allocation will be at a corner. For any (h_f, h_m) satisfying

$$\frac{h_f}{h_m} \leq \frac{(1 + 2\alpha) r + \alpha (1 + \alpha)}{(1 + 2\alpha [1 - (t_0 + t) n]) r + \alpha (1 + \alpha)}, \tag{14}$$

the opportunity-cost of a child will be minimized by the traditional division of labour,

$$t_f = t, \; t_m = 0. \tag{15}$$

Otherwise, it will be minimized by the liberated division of labour,

$$t_f = 0, \; t_m = t \tag{16}$$

(but remember that a mother cannot specialize in market work as far as a father, because she must spend at least t_0 units of her time with each child). Given a random distribution of human capital endowments, the cost-minimizing division of labour is more likely to be the traditional than the liberated one, because (14) is less stringent than its negation.

Condition (14) tells us that, unless h_f is sufficiently larger than h_m, wealth is maximized if f takes on the role of main childcarer, and m that of main earner. Conversely, if h_f is sufficiently larger than h_m to satisfy (14), f should be in the role the main earner, and m in that of main childcarer. In view of $(7) - (8)$, i's date-1 and date-2 earnings will be higher if i is the main earner, than if i is the main childcarer.

We now go on to maximizing (9) subject to $(10) - (12)$. The first-order conditions yield

$$\frac{u'(a_{i1})}{u'(a_{i2})} = \frac{\mu r + \rho}{\mu}, \tag{17}$$

$$\frac{v_t(c,t)}{v_c(c,t)} = - \left(y^1_{L_f}(h_f, L_f) + \frac{\mu}{\mu r + \rho} y^2_{L_f}(h_f, L_f) \right) \frac{\partial L_f}{\partial t} \tag{18}$$

$$- \left(y^1_{L_m}(h_m, L_m) + \frac{\mu}{\mu r + \rho} y^2_{L_m}(h_m, L_m) \right) \frac{\partial L_m}{\partial t} \tag{19}$$

and

$$\frac{v(c,t)}{v_c(c,t)} = c - \left(y^1_{L_f}(h_f, L_f) + \frac{\mu}{\mu r + \rho} y^2_{L_f}(h_f, L_f) \right) \frac{\partial L_f}{\partial n} \tag{20}$$

$$- \left(y^1_{L_m}(h_m, L_m) + \frac{\mu}{\mu r + \rho} y^2_{L_m}(h_m, L_m) \right) \frac{\partial L_m}{\partial n}, \tag{21}$$

where μ is the Lagrange-multiplier of (11), necessarily positive at an optimum, and ρ that of (12), positive or zero according to whether the constraint is or is not binding.

In view of $(3) - (4)$,

$$\frac{\partial L_f}{\partial t} < 0, \ \frac{\partial L_f}{\partial n} < 0 \text{ and } \frac{\partial L_m}{\partial t} = \frac{\partial L_m}{\partial n} = 0 \qquad (22)$$

if (h_f, h_m) satisfies (14),

$$\frac{\partial L_f}{\partial t} = 0, \ \frac{\partial L_f}{\partial n} < 0, \ \frac{\partial L_m}{\partial t} < 0 \text{ and } \frac{\partial L_m}{\partial n} < 0 \qquad (23)$$

otherwise. Since λ does not figure in either (14) or $(17) - (20)$, it is clear that, at a Pareto optimum, (U_f, U_m) is separable from (s, n, c, t_f, t_m).

At an optimum, the parents will then equalize their MRS of present for future consumption, and equated their MRS of quantity for quality of children to the full cost of having an extra child. Similarly, they will equate their children's MRS of c for t to the opportunity-cost of giving each child an extra unit of attention. If the couple is credit rationed, however, the common value of the two MRSs of present for future consumption will be higher than the interest factor, and the full marginal costs of n and c will be lower than they would if future costs were discounted at the interest factor. The solution will then be only a "local" Pareto optimum (in the sense that the economy formed by f and m will be a Pareto optimum conditional on what happens in the wider economy in which it is immersed, but the latter is not a Pareto optimum).[3]

> *Proposition 1. Efficiency requires division of labour. If the woman's human capital endowment is sufficiently larger than the man's, the efficient allocation will be characterized by the liberated division of labour. Otherwise, it will be characterized by the traditional division of labour. Either party will earn more if it specializes in market, than if it specializes in domestic work.*

Given a random distribution of endowments, this implies the following.

> *Corollary 1. The traditional division of labour is more likely to be efficient than the liberated one.*

Let us now look at the effects of relaxing some of our assumptions. If we replace the one that t_f and t_m are perfect substitutes with the one that t_m substitutes for t_f at a diminishing marginal rate, the isoquants

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[3]That is the sense in which the expression "Pareto efficiency" is generally used in game theory.

become convex to the origin, and the cost-minimizing time-mix may then be at an interior point.[4] If that were the case, there would be less specialization than with perfect substitutability, but there would still be some. Allowing for the possibility that not only the ability to make money, but also the ability to bring up children increases with experience will only make it more likely that the efficient time allocation is at a corner. We have remarked that the cost-minimizing allocation is more likely to be characterized by the traditional, than by the liberated division of labour. Dropping the (realistic) assumption that t_0 is positive (i.e., that the father cannot substitute for the mother at least over the peri-natal period) would do away with this proposition, but would not affect any of the other efficiency properties. Allowing for the possibility that the labour market discriminates against women, either in the sense that h_f is remunerated at a lower rate than h_m (less pay for same work and ability), or in the sense that w_f grows with labour experience at a rate lower than α (restricted career opportunities for women), would make it likely that the cost-minimizing allocation is the traditional one even if t_0 is zero, and even more if t_0 is positive.[5] Realistically allowing for mutual affection between the parties makes no qualitative difference to the results so long as each party loves itself at least a little more than the other.

4 Equilibrium without marriage

Developing an idea in Becker (1981), Lam (1988) demonstrates the existence and stability of matching equilibria characterized by either positive or negative assortative mating on wage rates and conventional assets. In the more recent literature, the assumption is generally that partners are matched by wealth. Indeed, Peters and Siow (2002) demonstrate the existence and stability of wealth-matching equilibria. In our context, however, i's realized wealth,

$$W_i \equiv b_i + y^1 \left(h_i, L_i \right) + \frac{y^2 \left(h_i, L_i \right)}{r},$$

is endogenous because it depends on time allocation. What is exogenous is i's potential or "full" wealth,

$$W_i^F \equiv b_i + y^1 \left(h_i, 1 \right) + \frac{y^2 \left(h_i, 1 \right)}{r}.$$

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[4]But not necessarily. If the elasticity of substitution of t_m for t_f is finite but greater than unity, the isoquants will still cut the axes, and the cost-minimizing division of labour may still be at a corner.

[5]In the presence of discrimination, the allocation could only be a local Pareto optimum even if the couple were not effectively rationed in the credit market.

As our analysis starts where the matching process ends, we assume

$$W_i^F = W^F, \ i = f, m. \tag{24}$$

That leaves room for either positive or negative assortment over money and human capital endowments, but rules out the possibility that a party is superior to the other on all scores (therefore, positive assortment implies same endowments). It carries also the implication that, had they remained single, f and m would have had the same utility level,

$$\max_{s_i} u \left(b_i + (1 + \alpha) h_i - s_i \right) + u \left(s_i r + (1 + \alpha)^2 h_i \right) = U^S, \ i = f, m.$$

We take the couple's initial endowments as given. A number of authors, including Konrad and Lommerud (2000), Peters and Siow (2002), and Cigno (2007), endogenize these endowments by modelling education and other forms of investment *before* the union is formed. As the focus of the present paper is on what happens after the union is formed, however, we will avoid complicating the model with restrictions other than (24).

4.1   Non-cooperation

Suppose that f and m play Cournot-Nash. Let s_i denote i's saving. Let c_i denote the amount of money, and t_i the amount of time that i spends on each child, so that

$$c = c_f + c_m$$

and

$$t = t_f + t_m.$$

The woman chooses (c_f, s_f, t_f, n) to maximize

$$U_f = u \left(a_{f1} \right) + u \left(a_{f2} \right) + \beta n v \left(c_f + c_m, \ t_f + t_m \right),$$

subject to the individual budget constraints

$$a_{f1} + nc_f + s_f = b_f + y^1 \left(h_f, L_f \right) \tag{25}$$

and

$$a_{f2} = rs_f + y^2 \left(h_f, L_f \right), \tag{26}$$

and to the individual borrowing constraint

$$-\sigma \le s_f, \tag{27}$$

taking (c_m, t_m) as given.

The first-order conditions yield

$$u'(a_{f1}) = \beta v_c (c_f + c_m, \ t_f + t_m), \tag{28}$$

$$\frac{u'(a_{f1})}{u'(a_{f2})} = \frac{\mu_f r + \rho_f}{\mu_f}, \tag{29}$$

$$\frac{v_t (c_f + c_m, \ t_f + t_m)}{v_c (c_f + c_m, \ t_f + t_m)} = - \left(y^1_{L_f} (h_f, L_f) + \frac{\mu_f}{\mu_f r + \rho_f} y^2_{L_f} (h_f, L_f) \right) \frac{\partial L_f}{\partial t_f} \tag{30}$$

and

$$\frac{v (c_f + c_m, \ t_f + t_m)}{v_c (c_f + c_m, \ t_f + t_m)} = c_f - \left(y^1_{L_f} (h_f, L_f) + \frac{\mu_f}{\mu_f r + \rho_f} y^2_{L_f} (h_f, L_f) \right) \frac{\partial L_f}{\partial n}, \tag{31}$$

where the derivatives of L_f are given by (5), μ_f is the Lagrange-multiplier of (26), and ρ_f that of (27).

The man chooses (c_m, s_m, t_m) to maximize

$$U_m = u(a_{m1}) + u(a_{m2}) + \beta n v (c_f + c_m, \ t_f + t_m),$$

subject to

$$a_{m1} + n c_m + s_m = (1 - n t_m) [1 + \alpha (1 - n t_m)] h_m, \tag{32}$$

$$a_{m2} = r s_m + [1 + \alpha (1 - n t_m)] h_m \tag{33}$$

and

$$-\sigma \leq s_m, \tag{34}$$

taking (c_f, t_f, n) as given.

The first-order conditions yield

$$u'(a_{m1}) = \beta v_c (c_f + c_m, \ t_f + t_m), \tag{35}$$

$$\frac{u'(a_{m1})}{u'(a_{m2})} = \frac{r \mu_m + \rho_m}{\mu_m} \tag{36}$$

and

$$\frac{v_t (c_f + c_m, \ t_f + t_m)}{v_c (c_f + c_m, \ t_f + t_m)} = - \left(y^1_{L_m} (h_m, L_m) + \frac{\mu_m}{\mu_m r + \rho_m} y^2_{L_m} (h_m, L_m) \right) \frac{\partial L_m}{\partial t_m}, \tag{37}$$

where the derivatives of L_m are given by (6), μ_m is the Lagrange-multiplier of (33), and ρ_m that of (34).

Let a C superscript denote the value of a variable at the Cournot-Nash equilibrium. Then, using $(28) - (30)$ and $(35) - (37)$, we can write

$$a_{i1} = a_1^C, \ a_{i2} = a_2^C, \ c_i = c^C, \ \mu_i = \mu^C \text{ and } \rho_i = \rho^C.$$

Therefore, the partners will have the same utility level, U^C. As the couple has always the choice of having no children,

$$U^S \leq U^C. \tag{38}$$

In view of $(3) - (4)$ and $(7) - (8)$, and using (31),

$$\left(1 + 2\alpha \left[1 - \left(t_0 + t_f^C\right) n^C\right] + \frac{\mu^C}{r\mu^C + \rho^C} \alpha \left(1 + \alpha\right)\right) h_f$$
$$= \left(1 + 2\alpha \left(1 - n^C t_m^C\right) + \frac{\mu^C}{r\mu^C + \rho^C} \alpha \left(1 + \alpha\right)\right) h_m.$$

If h_f is equal to h_m (positive assortment), f and m will then split child care, labour, and the monetary cost of children equally between them,

$$t_f = \frac{t^C - t_0}{2},$$

$$t_m = \frac{t^C + t_0}{2},$$

$$L_i = L^C$$

and

$$c_i = \frac{c^C}{2}.$$

If h_f is different from h_m (negative assortment), the monetary cost of children will still be split equally between the parties, but the parent with the larger human capital endowment will supply more child care, and less market work, than the parent with the larger money endowment. In other words, the two will specialize *against* their comparative advantages in order to equalize their incomes. The opportunity-cost of parental attention will not be minimized in either case, because the parents will not specialize in accordance with their comparative advantages.[6]

If credit is not rationed at equilibrium, saving will not be distorted. As (30) and (37) have the same LHS, the RHSs will be equal too. Given that time is inefficiently allocated, however, the sum of the RHSs of (30) and (37) will be larger than the RHS of (18) for any positive n. In equilibrium, therefore, each child will receive less attention, and relatively more money, than would be efficient. Inspecting (31), we also notice that the RHS of this equation is not the marginal cost of n to the couple, but only f's share of it. As the marginal cost to the couple is

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[6]Remember that, if the parents have the same human capital endowments, the mother a comparative advantage in child care, and the father in market work, for any positive value of t_0.

inefficiently large, f's share of it need not, but is likely to, be smaller than the efficient total. Therefore, n is likely to be inefficiently large. If the mother is credit rationed (ρ_f positive), that will reduce the RHS of (31), and thus make it even more likely that n will be inefficiently large.

> *Proposition 2. A Cournot-Nash equilibrium equalizes the income and utility levels of the parties to a non-marital union, but is not a Pareto optimum, not even a local one, because the parties do not exploit their comparative advantages, and the mother free-rides on the father over the choice of the number of children. If the parents have the same endowments, they will take equal shares in both market and domestic work; otherwise, they will specialize against their comparative advantages. Child quality will be inefficiently low, because the couple spends too little time, and relatively too much money, on each child. Child quantity is likely to be inefficiently large, especially if the mother is credit rationed.*

We have already remarked that it would make no sense for the couple to separate at date 1. If the couple plays Cournot-Nash, it will make no sense for two to separate at date 2 either, because that would make no difference to their utility.

4.2   Cooperation

Alternatively, suppose that f and m play a Nash-bargaining game. The two have a common interest in minimizing the opportunity-cost of children, and coordinating their decisions regarding the quality and quantity of the same. As cost minimization requires specialization, however, the candidate for the main childcarer role will agree to cooperate only if the candidate for the main earner role makes the former an adequate transfer at date 1, or credibly promises to make one at date 2. The problem with the latter is that, when date 2 comes, there will be no more efficiency gains to be reaped by cooperation, and it will then be in the main earner's interest to renege on the promise. Therefore, the promise will be credible if and only if it is the object a contract enforceable through a civil court. If the associated transactions-cost is prohibitively high however, the promise will not be credible, and any transfer will have to be made, in full, at date 1.

If the state of the world at date 2 were uncertain, the equilibrium would have to be found by backward induction. In our framework, however, there is no uncertainty, and an unmarried couple will play Nash-bargaining if and only if the main earner can buy the main childcarer's cooperation either with a payment at date 1, or with a legally binding

promise to make a one at date 2. If a Nash-bargaining equilibrium exists, it is then found in one shot by maximizing

$$N = (U_f - R_f)(U_m - R_m), \tag{39}$$

where R_i denotes i's reserve utility, subject to the utility-possibility frontier (UPF),

$$F(U_f, U_m) \leq 0. \tag{40}$$

In many household economics applications of game theory, R_i is identified with i's utility if he or she remained single. In Lundberg and Pollak (1996) and many other papers in its wake, R_i is identified with i's equilibrium utility in the Cournot-Nash game that the couple could have plaid instead of Nash-bargaining. In our context, both these alternatives cease to be available the moment the children are born, and resources are allocated to them, because that will irrevocably modify the initial endowments. As the couple will play Nash-bargaining if and only if the prospective main earner can either compensate the main childcarer at date 1, or commit to do so at date 2 by signing a legally binding contract, it still makes sense to think of either (U^S, U^S) or (U^C, U^C) as the threat-point of that game. As U^S cannot be larger than U^C for the assumption that f and m have formed a union, we can then simply write

$$R_i = U^C, \ i = f, m.$$

The utility-possibility frontier is traced maximizing (9), for each possible value of λ, subject to $(2) - (8)$, $(27),(34)$,

$$a_{f1} + cn + s_f = b_f + y^1(h_f, L_f) + z_1, \tag{41}$$

$$a_{m1} + z_1 + s_m = b_m + y^1(h_m, L_m) \tag{42}$$

$$a_{f2} = s_f r + y^2(h_f, L_f) + z_2, \tag{43}$$

and

$$a_{m2} + z_2 = s_m r + y^2(h_m, L_m), \tag{44}$$

where z_d is a voluntary transfer from m to f at date $d = 1, 2$, nonnegative if m is the main earner, non-positive if f is. We have conventionally assigned the monetary cost of the children, cn, entirely to the mother. If z_1 is positive, however, part of this cost will be effectively borne by the father. As already explained, z_2 can be different from zero only if the main earner can commit to making this transfer.

At each point of the UPF,

$$\frac{u'(a_{i1})}{u'(a_{i2})} = \frac{\mu_i r + \rho_i}{\mu_i}, \ i = f, m, \tag{45}$$

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$$\frac{v_t(c,t)}{v_c(c,t)} = -\left(y_{L_f}^1(h_f, L_f) + \frac{\mu_f}{\mu_f r + \rho_f} y_{L_f}^2(h_f, L_f)\right)\frac{\partial L_f}{\partial t} \qquad (46)$$

$$-\left(y_{L_m}^1(h_m, L_m) + \frac{\mu_m}{\mu_m r + \rho_m} y_{L_m}^2(h_m, L_m)\right)\frac{\partial L_m}{\partial t} \quad (47)$$

and

$$\frac{v(c,t)}{v_c(c,t)} = c - \left(y_{L_f}^1(h_f, L_f) + \frac{\mu_f}{\mu_f r + \rho_f} y_{L_f}^2(h_f, L_f)\right)\frac{\partial L_f}{\partial n} \qquad (48)$$

$$-\left(y_{L_m}^1(h_m, L_m) + \frac{\mu_m}{\mu_m r + \rho_m} y_{L_m}^2(h_m, L_m)\right)\frac{\partial L_m}{\partial n}, \quad (49)$$

where μ_i and ρ_i have the same interpretation as in the last subsection. If z_2 is different from zero, μ_f is equal to μ_m, and ρ_f to ρ_m. At the cost-minimizing division of labour, the first derivatives of L_i are given by (22) if (14) is satisfied, by (23) if it is not.

If neither of the borrowing constraints is binding, ρ_f and ρ_m are equal to zero, and $(45)-(48)$ is then equivalent to $(17)-(20)$. If that is true everywhere, the UPF coincides with the efficiency locus. A Nash-bargaining equilibrium then exists, and is efficient. Furthermore, as the efficiency locus is symmetrical around the 45° line, the equilibrium the will give the same utility level to each partner. This case is illustrated in Figure 2, where j stands for main childcarer, and k for main earner, $j, k = f, m$. The continuous concave-to-the-origin curve is the graph of the efficiency locus. The convex-to-the-origin ones are contours of (9). The Cournot-Nash equilibrium is represented by point **C**, and the Nash-bargaining equilibrium by point **B**. Both these points lie on the 45° line, but **C** is inside, and **B** actually on, the efficiency locus.

Alternatively, suppose that, everywhere except at $U_j = 0$,

$$0 = \rho_j < \rho_k,$$

so that

$$\frac{u'(a_{j1})}{u'(a_{j2})} = r < \frac{u'(a_{k1})}{u'(a_{k2})}.$$

The UPF then looks like the dashed concave-to-the-origin curve of Figure 2. As this curve is steeper than the continuous one representing the efficiency locus because k's credit ration gets tighter as z_1 gets larger (more positive for $k = m$, or more negative for $k = f$), a Nash-bargaining equilibrium may not exist. In the illustrative example, it does and is represented by the point B', inside the efficiency locus, and above the 45° line. Therefore, the equilibrium gives the main childcarer less utility than the main earner.
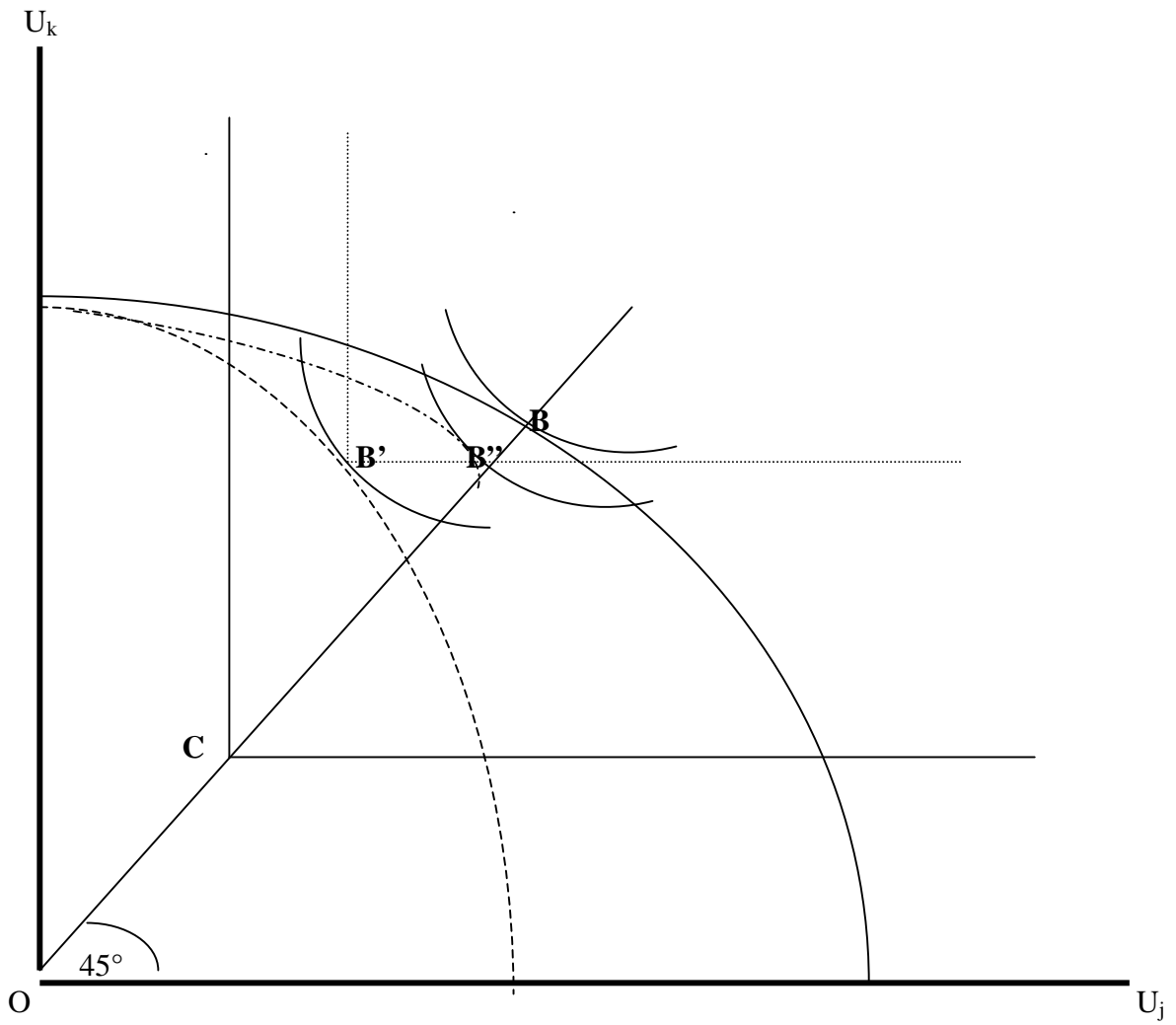
k

Figure 2. Cournot-Nash equilibrium, and Nash-bargaining equilibrium with and without separate-property marriage.

In view of Proposition 1, ρ_j will always be smaller than ρ_k if the cost-minimizing division of labour is the liberated one, because f can qualify for the main earner's role only if $(h_f - h_m)$ is positive, and $(b_f - b_m)$ consequently negative. That may not be the case, however, if the division of labour is the traditional one, because $(h_f - h_m)$ does not need to be negative. Furthermore, if the cost-minimizing division of labour is the traditional one, $\frac{\partial L_m}{\partial t}$ and $\frac{\partial L_m}{\partial n}$ will be zero in view of (22), and the quality and quantity of children will not be distorted. If the division of labour is the liberated one, by contrast, $\frac{\partial L_m}{\partial t}$ and $\frac{\partial L_m}{\partial n}$ will be negative in view of (23), and the quality and quantity of children will then be distorted. Therefore, if the main earner is the woman, the UPF will look like the dashed curve in Figure 2. If the main earner is the man, the UPF will lie inside the efficiency locus at all values of U_j, but will not be necessarily steeper than it.

> *Proposition 3. In the absence of credit rationing, an unmarried couple will play Nash-bargaining. The resulting equilibrium will be efficient, and will equalize the utility levels of the two parties. In the presence of credit rationing, a Nash-bargaining equilibrium may not exist. If it does, it will be inefficient, and may (will if the division of labour is the liberated one) give higher utility to the main earner than to the main childcarer.*

5   Marriage

Let us now introduce the marriage institution. A marital union differs from a non-marital one in that (i) it cannot be dissolved without court permission, and (ii) a court may order one party to make the other a transfer in the event of dissolution ("divorce"). Having argued that neither party can have an interest in separating at date 1, divorce can take place only at date 2, when the children are out of the way. Therefore, a mandatory transfer cannot be construed as child maintenance.[7]   In our perfect-information framework, there is also no room for divorce on grounds of adultery, mental or physical cruelty, and the like. Therefore, a mandatory transfer cannot be construed as compensation for the offended party. If an award is made, it can only be on distributional grounds.

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[7]As already pointed out, our perfect-information model cannot explain separation while the children are still dependent on their parents. For an economic analysis of the effects of child-support orders in an imperfect information setting, see Del Boca and Flinn (1995).

A couple will marry if neither party would be better-off cohabiting. If a party is indifferent between marrying and cohabiting, it will spin a coin. In the present section, we show how the decision to marry, and the properties of the domestic equilibrium conditional on marriage, are affected by divorce policy, and by the matrimonial property regime, under the assumption that cohabitation without marriage attracts neither social stigma, nor legal discrimination.

5.1 Separate property

In a separate-property[8] jurisdiction, any income or assets a spouse generates or acquires in the course of marriage are that spouse's individual property. As in the last section, the budget constraints are $(25) - (26)$ and $(32) - (33)$ if the couple plays Cournot-Nash, $(41) - (44)$ if it plays Nash-bargaining. In the second case, however, it may now be in the main earner's interest to make the other a transfer at date 2. If it is, the main earner's promise to do so may will be credible even without a legally binding contract. The borrowing constraints remain (27) and (34).

Let γ be the exogenously given cost (necessarily nonnegative) of obtaining a divorce, and θ the alimony (positive, negative or zero) awarded to f in that event.[9] Each spouse's date-2 consumption must now be at least as large staying married as divorcing,

$$s_f r + y^2 (h_f, L_f) + \theta - \gamma \leq a_{f2} \tag{50}$$

and

$$s_m r + y^2 (h_m, L_m) - \theta - \gamma \leq a_{m2}. \tag{51}$$

We will refer to (50) as f's, and (51) as m's, divorce-threat constraint. At most one of these restrictions will be binding. If f's is, z_2 will be positive and equal to $(\theta - \gamma)$. If m's is, z_2 will be negative and equal to $(\theta + \gamma)$. Notice that γ relaxes both these constraints, and thus makes it less likely that either of them will be binding.

We consider only two possibilities. In the first, the divorce courts have an egalitarian stance, θ takes the sign of $(U_m - U_f)$. In the other, the courts have a neutral stance, and θ is identically zero. The possibility that the courts will deliberately set out to increase inequality between the former spouses seems too perverse to merit attention, and is ruled

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[8]Common-law in the US.

[9]Alimony may be paid at regular intervals, or all at once. In our simplified time-frame, however, there is no way of distinguishing between a lump-sum payment at date 2, and a stream of periodical payments with present value equal to that sum from date 2 onwards.

out by law in some legal systems. If the couple plays Cournot-Nash, the partners will have the same equilibrium utility, and θ will then be equal to zero whatever the court's stance. We will consequently restrict our attention to the case, the only one in which marriage can make a difference, where the couple plays Nash-bargaining, *and* the courts have an egalitarian stance.

The utility-possibility frontier of a married couple is traced maximizing (9), for all possible values of λ, subject to $(2) - (8)$, (27), (34), $(41) - (42)$, $(43) - (44)$ and $(50) - (51)$. At each point of the frontier, therefore,

$$\frac{u'(a_{i1})}{u'(a_{i2})} = \frac{\mu_i r + \rho_i}{\mu_i - \xi_i}, \ \ i = f, m, \tag{52}$$

$$\frac{v_t(c,t)}{v_c(c,t)} = -\left(y_{L_f}^1(h_f, L_f) + \frac{\mu_f - \xi_f}{\mu_f r + \rho_f} y_{L_f}^2(h_f, L_f)\right) \frac{\partial L_f}{\partial t} \tag{53}$$

$$-\left(y_{L_m}^1(h_m, L_m) + \frac{\mu_m - \xi_m}{\mu_m r + \rho_m} y_{L_m}^2(h_m, L_m)\right) \frac{\partial L_m}{\partial t} \tag{54}$$

and

$$\frac{v(c,t)}{v_c(c,t)} = c - \left(y_{L_f}^1(h_f, L_f) + \frac{\mu_f - \xi_f}{\mu_f r + \rho_f} y_{L_f}^2(h_f, L_f)\right) \frac{\partial L_f}{\partial n} \tag{55}$$

$$-\left(y_{L_m}^1(h_m, L_m) + \frac{\mu_m - \xi_m}{\mu_m r + \rho_m} y_{L_m}^2(h_m, L_m)\right) \frac{\partial L_m}{\partial n}, \tag{56}$$

where ξ_i is the Lagrange-multiplier of i's divorce-threat constraint, and the other variables are defined as in the last section. The higher is γ, the less likely it is that i's divorce-threat constraint will be binding, and the lower the value of ξ_i if it is binding. The threat-point is again (R_f, R_m), but R_i is now the larger of i's utility in the Nash-bargaining equilibrium without marriage, and i's utility in the Cournot-Nash equilibrium. As the latter is independent of the couple's marital status, the way marriage and court policy can then affect the Nash-bargaining equilibrium conditional on marriage, and the decision to marry, is not through the threat-point, but by deforming the utility-possibility frontier.

If neither (50) nor (51) is binding, ξ_f and ξ_m will be zero, and $(52) - (55)$ will reduce to $(45) - (48)$. As the UPF will then coincide with the efficiency locus, a Nash-bargaining equilibrium will exist, and will be the same as if the couple were not married. If that is the case, the couple will decide whether to marry or cohabit by spinning a coin. By contrast, if either (50) or (51) is binding, ξ_f or ξ_m will be positive, z_2 will be different from zero even without a legally binding contract, and μ_f will be equal to μ_m. How will that affect the couple's choices?

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As only the main childcarer's divorce-threat constraint can be binding, we may re-write (52) as

$$\frac{u'(a_{j1})}{u'(a_{j2})} = \frac{\mu r + \rho_j}{\mu - \xi_j} \text{ and } \frac{u'(a_{k1})}{u'(a_{k2})} = \frac{\mu r + \rho_k}{\mu}, \tag{57}$$

where μ is the common value of μ_j and μ_k. With or without an operative threat, if

$$0 = \rho_j < \rho_k,$$

j's intertemporal trade-off will be lower than k's. With the threat, however, the difference between the two will be smaller (it cannot change sign, because θ and, consequently, ξ_j go to zero the moment the two trade-offs are equated) than without the threat. In Figure 2, the UPF associated with a positive ξ_j is represented by the dot-and-dash curve. This is steeper than the continuous one representing the efficiency locus, but not as steep as the dashed one representing the UPF with ξ_j equal to zero. An operative divorce threat then makes it more likely that a Nash-bargaining equilibrium will exist. If such an equilibrium would exist anyway, it will be less unfavorable to j with than without the threat (i.e., with than without marriage). In the illustrative example, the equilibrium with the operative threat exists, and is represented by the point B", closer to the efficiency locus, and to the 45° line, than the point B' representing the equilibrium without the threat.

> *Proposition 4. In a separate-property jurisdiction, marriage can make a difference to the domestic equilibrium only if credit is rationed, and the divorce courts use alimony to reduce utility inequality between the former spouses. If that is the case, marriage makes it more likely that a Nash-bargaining equilibrium will exist. If the equilibrium would have existed anyway, it will be less inefficient, and less unfavorable to the main childcarer, with than without marriage. The lower is the cost of obtaining a divorce, the larger is the effect of marriage.*

5.2 Community property

In a community-property jurisdiction, any income produced or assets acquired in the course of marriage are the couple's joint property. As a result, the couple faces the joint date-1 and date-2 budget constraints (10) and (11), instead of the individual ones associated with cohabitation, or separate-property marriage. For the same reason, the couple faces the joint borrowing constraint (12) instead of the more individual

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ones. In such a legal framework, there is no possibility of a monetary transfer between the spouses. By ruling out the possibility of a Cournot-Nash game, this makes sure that the spouses will play Nash-bargaining. By preventing k from buying j's cooperation (either with a payment at date 1, or with a legally binding promise to make one at date 2) once the wedding has taken place, however, it rules out also the possibility of a Nash-bargaining equilibrium without an operative divorce threat.

In the event of divorce, a court will be called upon to share the community property,

$$p \equiv (s - b_f - b_m) \, r,$$

between the former spouses in some way. Some legislations prescribe equal shares, others give the courts some leeway over the matter (which the courts typically use to compensate the main childcarer).[10] We can then write f's divorce-threat constraint as

$$b_f r + y^2 (h_f, L_f) + \theta - \gamma \le a_{f2}, \tag{58}$$

and m's as

$$b_m r + y^2 (h_m, L_m) + p - \theta - \gamma \le a_{m2}. \tag{59}$$

As in a separate-property regime, γ relaxes both these constraints. If we define θ to include not only the share of the community property assigned to f, but also a transfer from m to f out of the former's own pre-marital assets and post-divorce earnings, and assume that θ is set larger or smaller than $\frac{p}{2}$ according to whether U_m is larger or smaller than U_f, only the main childcarer's can be binding. In every other case, we cannot rule out the possibility that the main earner's divorce-threat constraint will be binding instead.

The utility-possibility frontier is now traced by maximizing (9), for each possible λ, subject to $(10) - (12)$ and $(58) - (59)$. Therefore, at each point of the frontier,

$$\frac{u'(a_{i1})}{u'(a_{i2})} = \frac{\mu r + \rho}{\mu - \xi_i}, \quad i = f, m, \tag{60}$$

$$\frac{v_t(c,t)}{v_c(c,t)} = - \left(y_{L_f}^1 (h_f, L_f) + \frac{\mu - \xi_f}{\mu + \rho} y_{L_f}^2 (h_f, L_f) \right) \frac{\partial L_f}{\partial t} \tag{61}$$

$$- \left(y_{L_m}^1 (h_m, L_m) + \frac{\mu - \xi_m}{\mu + \rho} y_{L_m}^2 (h_m, L_m) \right) \frac{\partial L_m}{\partial t} \tag{62}$$

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[10] In the US, a state prescribing equal shares is labelled community-property, and one allowing or prescribing compensation for the economically weaker party equitable-property-division.

and

$$\frac{v\left(c,t\right)}{v_c\left(c,t\right)} = c - \left(y^1_{L_f}\left(h_f, L_f\right) + \frac{\mu - \xi_f}{\mu + \rho}y^3_{L_f}\left(h_f, L_f\right)\right)\frac{\partial L_f}{\partial n} \tag{63}$$

$$- \left(y^1_{Lm}\left(h_m, L_m\right) + \frac{\mu - \xi_m}{\mu + \rho}y^2_{Lm}\left(h_m, L_m\right)\right)\frac{\partial L_m}{\partial n}, \tag{64}$$

where μ is the Lagrange-multiplier of the couple's joint date-2 budget constraint, ρ that of their joint borrowing constraint, and ξ_i that of i's divorce-threat constraint. The threat-point is the same as in a separate-property regime.

As a married couple has no alternative but to play Nash-bargaining, f and m will marry only if the prospective main childcarer's divorce-threat constraint can be binding, and (60) may then be re-written as

$$\frac{u'\left(a_{j1}\right)}{u'\left(a_{j2}\right)} = \frac{\mu r + \rho}{\mu - \xi_j} \text{ and } \frac{\mu r + \rho}{\mu} = \frac{u'\left(a_{k1}\right)}{u'\left(a_{k2}\right)}.$$

Figure 3 illustrates the case where ξ_j is positive for all U_j lower than U_k. As the UPF then looks like the dot-and-dash curve, the equilibrium is at point **B**.

> *Proposition 5. In a community-property jurisdiction, a married couple can only play Nash-bargaining. If divorce legislation and sentencing practice are such that only the prospective main childcarer can credibly threaten divorce, the couple will marry. The equilibrium will then be efficient, and give the same utility level to both spouses. Otherwise, a Nash-bargaining equilibrium conditional on marriage may not exist. The lower is the cost of obtaining a divorce, the more likely it is that the couple will marry.*

6   Discussion

Given increasing returns to market work experience, domestic division of labour according to the couple's comparative advantages minimizes the cost of bringing up children. That remains true if there are also increasing returns to domestic (child care) work. The cost-minimizing division of labour may be either traditional (father specializes in market work, mother looks after the children), or liberated (mother goes back to her job as soon as possible after the children are born, leaving father to look after them). If, at least over the peri-natal period, the mother cannot be replaced by the father, a man can qualify for the main earner's role even if, when the union is formed, his human capital endowment is
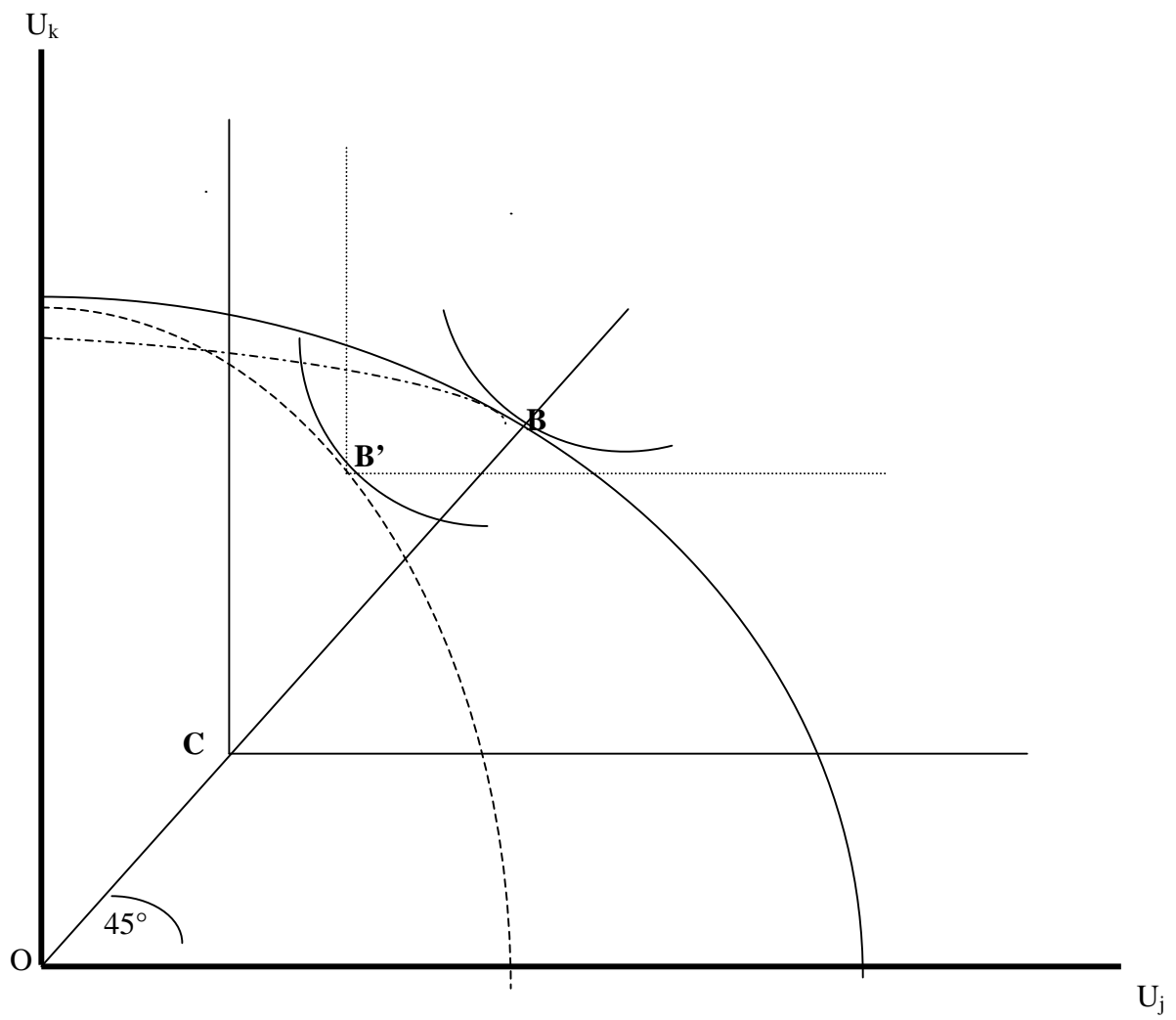
Figure 3. Cournot-Nash equilibrium, and Nash-bargaining equilibrium with and without community-property marriage.

no higher than the woman's. This makes it more likely that the cost-minimizing division of labour will be the traditional one – and even more so if the labour market discriminates against women in some way.

If the parties to a union play Cournot-Nash, they will either not specialize at all, or specialize against their comparative advantages so as to equalize earnings. Furthermore, the mother (assumed to have ultimate control over her fertility) will free-ride on the father over the choice of number of children. At equilibrium, each child will be raised with relatively too much money, and too little parental attention, and the quality/quantity of children mix will be wrong too. Therefore, a Cournot-Nash equilibrium is always inefficient, but gives the same utility level to each party. Division of labour in accordance with comparative advantages will be forthcoming if the parties play Nash-bargaining. But the equilibrium may be inefficient all the same, because the couple's intertemporal consumption plans may be distorted by credit rationing or, if the couple is married under a separate-property regime, by the threat of divorce. If the equilibrium is inefficient, it may be also unfair to the main childcarer. The finding that the domestic allocation of resources may be inefficient even if the couple cooperates casts doubt on the empirical literature inspired by the collective model of household decisions,[11] which seeks to recover the domestic sharing rule from the observation of activities or items of consumption unambiguously attributable to either one or the other partner, under the assumption that the domestic allocation of resources will always be efficient.

As the main childcarer earns less than the main earner, neither party to a union will agree to be the former unless it is guaranteed adequate compensation by the latter. Such compensation may be delivered contextually with fertility and time-allocation decisions, or at a later date when the children are grown-up and out of the way. At that date, however, there will be no more efficiency gains to be had by division of labour. As the birth of children and the allocation of parental time to their upbringing irreversibly modifies the couple's human capital endowments, any promise to deliver compensation to the main childcarer at that later date will not be credible unless it is in the main earner's interest to honour it. The decision whether to marry or cohabit, the choice of game conditional on marital status, and the division of labour if the game is cooperative, are endogenous. If marriage legislation and divorce court practice are such that the main childcarer can credibly threaten divorce, marriage may serve as commitment device which will make it less costly for the prospective main earner to secure the prospective main childcarer's cooperation. In a separate-property jurisdiction, a

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[11]See Bourguignon and Chiappori (1994) for an overview.

married couple may play either Cournot-Nash or Nash-Bargaining. Marriage can affect the choice of game, and the ensuing equilibrium in the case of Nash-bargaining, only if credit is rationed. If a Nash-bargaining equilibrium would exist whatever the couple's marital status, it will be less inefficient, and treat the main childcarer less unfavorably, with than without marriage. In a community-property jurisdiction, by contrast, a married couple can play only Nash-bargaining. The equilibrium will be efficient, and assign the same utility level to both spouses. In either marriage property regime, the lower is the cost of obtaining a divorce, the more likely it is that a couple will marry.

Although a perfect-information model like the present one cannot explain the real world, it is nonetheless interesting to compare the model's theoretical predictions with the empirical evidence. Bureau of Labor (2004), Drago et al. (2004), and Stancanelli (2007) report that, while the majority of women do not earn more than their male partners, a substantial minority of them (up to one in five) in the US, Australia and France does. In the light of substantial equality of opportunity for men and women in the labour markets of these countries, this finding is consistent with the model's prediction that the liberated division of labour is less likely than the traditional one, but still a possibility – especially if the labour market does not discriminate against women.

In the developed part of the world, cohabitation without marriage is socially acceptable at least since the 1960s, and the legislative trend is towards giving unmarried couples the same rights as married ones in matters such as tax treatment, inheritance, adoption, housing tenure, recognition of the partner as next of kin (e.g., if the other is hospitalized), and so on. Any residual form of legal discrimination has disappeared, in several European countries, with the introduction of legislation enabling de-facto couples to acquire the same legal rights as married ones by simply recording their union in a public register.[12] Evidence, in Stevenson and Wolfers (2007) and elsewhere, that marriage is losing ground to cohabitation in developed countries may thus be interpreted as showing that, more and more, a couple marries only if that makes it easier reaching a cooperative agreement.

Since the 1970s, many developed countries have introduced unilateral divorce legislation which effectively entitles either spouse to end a

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[12]The name given to these partnerships varies from country to country (civil partnership in the UK, *pact civil de solidarité et du concubinage* in France, *Eingetragene Lebenspartnerschaft* in Germany, etc.), but the substance is the same. A couple can costlessly record its union, and either party can costlessly and unilaterally rescind it at any moment. This possibility is open to both homosexual and heterosexual couples, but is not to be confused with homosexual, which is no different from heterosexual marriage where the cost of obtaining a divorce is concerned.

marriage by simply saying so before a court. This reduces the cost of obtaining a divorce, because the petitioner does not need to expend resources gathering or fabricating evidence of cruelty or adultery on the respondent's part. The evidence regarding the effects of these legislative changes is controversial. Zelder (1993) and Friedberg (1997) estimate that the introduction of divorce on demand by several US states encouraged divorce, but Smith (1997) finds that it had none in the UK. The two US studies do not control for matrimonial property legislation, and the UK one refers to variations over time in a single country where this legislation was the same throughout the sample period. Controlling for property legislation, Gray (1998) finds that the introduction of unilateral divorce in the US did not encourage divorce, but encouraged married women to supply more labour in separate-property states. Stevenson (2008) disputes the dependence of the labour effects of divorce legislation on the property regime, and attributes Gray's finding to an omitted-variable problem. In our model, the cost of obtaining a divorce cannot affect the likelihood of divorce because, in equilibrium, there is no divorce. By strengthening the role of marriage as a commitment device, however, a reduction in this cost makes it more likely that a couple will play Nash-bargaining rather than Cournot-Nash. These theoretical predictions are consistent with the empirical finding that the introduction of unilateral divorce did not cause the divorce rate to increase as some feared. They are consistent also with estimates of a positive effect of unilateral divorce on married women's labour supply if, for a sufficiently large proportion of the couples switching from Cournot-Nash to Nash-bargaining as a result of this legislative innovation, the cost-minimizing division of labour was the liberated one.

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