How to Carve a Medical Degree: Human Capital Assets in Divorce Settlements

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This paper examines effects of the legal rules for property division at divorce on investment in human capital during marriage. We show that current rules generally lead to suboptimal levels of investment and spousal support or to inequitable distribution of the returns from such investment, or both. We propose a new rule that performs better than the existing rules on both efficiency and equity criteria and that requires no more information than the existing rules.

More than half the states in the United States now have "no-fault" divorce laws that allow either party to end a marriage without obtaining agreement from his or her spouse.[1] Along with the increased ease of divorce have come changes in the practices governing alimony payments and the division of marital property at divorce. Alimony awards are rare in no-fault divorces. At the same time, spouses who support their mates in acquiring a professional degree are now attempting to claim some remuneration for that support when divorce occurs. In this paper, we review the approaches that courts have recently taken in dividing human capital assets and we propose an alternative rule for such division. We show that our proposed rule should be no more difficult to apply than those currently used, that it is likely to increase the efficiency of financing graduate education, and that it provides for more equitable division of the returns to education than do the approaches currently in use.

The pure no-fault states are our primary focus for a number of reasons. First, it appears that nearly all states will have some form of no-fault divorce in the near future. Second, Lenore Weitzman (1985) and others have argued that no-fault laws have led to greater declines in the economic status of women upon divorce than obtained under the old adversary rules.[2] Finally, no-fault divorce laws can make particularly attractive the practice that we call "strategic divorce," in which one spouse uses divorce in order to increase his or her lifetime wealth. The "standard" case is that of the husband who is supported through medical school by his wife, and who leaves her the day he is board-certified in his lucrative specialty.[3]

The case law on the treatment of human capital as marital property is decidedly

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[1] See Weitzman (1985), Doris Freed and Timothy Walker (1985, 1986), and *Uniform Marital Property Act* (1986). Many other states have hybrid rules, in which no-fault rules apply after a period of separation.

[2] In states that do not have no-fault rules, a partner who resists divorce can exert considerable leverage in the property, alimony, and child-support negotations. See Robert Mnookin and Lewis Kornhauser (1979) and Elisabeth Landes (1978). H. Elizabeth Peters (1986) provides empirical evidence that alimony and child support are lower in no-fault states.

[3] We use the case of a male medical student/doctor and his female spouse because virtually all of the case law involves women supporting their husbands' educations. To pose this problem as being sex-neutral in practice is to mispose it.

mixed. Some courts have held that a professional degree is not marital property, because the degree is not transferable.[4] Where the courts have found a degree to be marital property, division of the property has ranged from awarding the wife her actual cash contribution, and in some cases adding a return based on the passbook savings rate, to awarding the wife something less than 40 percent of the estimated present value of the portion of the husband's earnings attributable to the degree.[5] Courts are unlikely to award alimony (now usually called maintenance) in these cases, because no-fault statutes typically allow for maintenance only in cases where one spouse is unable to support himself or herself. In cases resembling the medical student example, the women have just been supporting themselves *and* their husbands.

Though we study the efficiency aspects of various rules, efficiency is not, and probably should not be, the primary focus of property settlement laws. Fortunately, the rule that we propose also has very attractive equity properties; in most cases, it meets the strong Pareto criterion that all parties be at least as well off, having engaged in a transaction as they would have been had they not done so. Thus, the rule that we propose will generally yield a level of investment in human capital that is closer to the optimum than will any current law or precedent. Further, in the event of divorce, whether strategic or otherwise, both husband and wife are better off economically than they would have been had the marriage occurred, but the joint investsupport relationship not been undertaken.

Some might argue that there are no efficiency issues in laws that address the division of marital property, because the parties may write efficient contracts that supersede the court's standard rules. There are a number of answers to this argument. The simplest is that if the state provides "default" rules that lead to efficient investment, then agents need only be aware that such is the nature of the rules, and they can avoid the costs of contracting. Contracting costs may be quite high, including legal fees of between $1,000 and $10,000 and potential emotional strife brought on by negotiations that contemplate divorce.[6]

Efficiency issues will also arise if some marriage partners have systematically biased views of the probability of eventual divorce or of the altruism of their spouses if divorce occurs. As we show later, asymmetric beliefs about the probability of divorce (in the extreme, strategic divorce) can lead one spouse to elicit behavior from the other that is jointly inefficient, but privately profitable. Given that *some* rules will exist, consistency with efficient behavior on the part of well-informed marital partners seems as good a criterion as any for picking them. Finally, the typical divorce involves bargaining over many issues. Property settlements, maintenance payments, and custody arrangements may be traded-off against one another in the process and the law will greatly influence the strength or weakness with which each party comes to the settlement negotiations.

In order to focus on the relationships between property rules and human capital acquisition, we do not consider the presence of other "lumpy" assets, such as the family house, or the process by which settlements are enforced.[7] We also confine our formal analysis to couples without children.

[4]Joan Krauskopf (1980), Marvin Moore (1982), Allan King (1982), and J. Patrick Gunning (1984) analyze the treatment of professional degrees as marital property. Lloyd Cohen (1987) considers the treatment of less tangible marriage-specific assets in divorce settlements.

[5]*Inman v. Inman* is a good example of the first type of award; *Lynn v. Lynn* and *O'Brien v. O'Brien* are good examples of the second. In *O'Brien*, the court stated that it would award 40 percent of the estimated present value of the professional license to practice medicine. It then spread payments over a 10-year period, thus substantially reducing the value of the award.

[6]See *Wall Street Journal*, July 23, 1986. The legal fees are for cases involving tangible assets. Including future human capital in pre-nuptial agreement would surely complicate the contract.

[7]The very high default rates on support payments, however, indicate that this is likely to be an important issue if remuneration is to be made over an extended period of time.

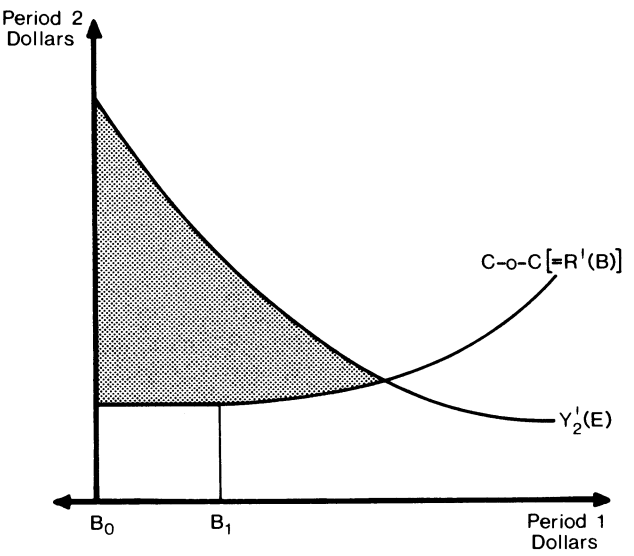

FIGURE 1

I. Financing Investment in Education

In this section, we amend Gary Becker's (1967) model of individual investment in human capital in order to analyze a couple's decision to acquire additional education for one spouse. We examine the investment calculation in a two-period model. In period one, one member of the couple "invests" in education, while the other member "supports" the education both directly (for example, paying tuition) and indirectly (for example, through providing or paying for household operations).[8] In the second period, no education occurs. The return to period-one education is the increase in income that the investing spouse will receive when working in period two.

A. *The Financial Returns to Education*

The financial benefit from education is increased income in period two, ΔY_2. We assume that Y_2 increases with education, E, but at a decreasing rate, $Y_2'(E) > 0, Y_2''(E) < 0$.[9] We express the benefits in terms of period-two net income, although we recognize explicitly below that some of that income may be transferred to period one.[10] These benefits are illustrated in Figure 1 as

[8]Both the costs and returns to education include pecuniary and non-pecuniary factors. To start with, we look only at the monetary costs and benefits. The extension to non-pecuniary support is straightforward in principle although accurate measurement of such support may be complicated in practice. If support involves delaying the opportunity for the supporting spouse also to acquire education, the analysis must be altered. We discuss the complication in Section III.

[9]We recognize that for a given course of study, for example, medical school, $Y_2'(E)$ will not be everywhere downward sloping—there will be a "spike" at graduation. However, a new college graduate will face a continuum of potential human capital acquisitions from a one-day computer-programming course through medical school and an arduous and prestigious residency. Looking at all of these possibilities the potential human capital investor will see a declining marginal return schedule.

[10]Throughout the paper, we assume that the return to education is completely predictable. Technically, our analysis requires only that the return to education does not affect the probability of divorce and that market interest rates on educational loans incorporate the possibility of default. The latter assumption is innocuous; the former is justified by the assumption of "efficient divorce" discussed in Section II.

the downward-sloping marginal return to education function. This is the marginal increase in Y_2 for each dollar's worth of resources invested in education in period one.

B. *The Financial Costs of Education*

The financial cost of education includes tuition and the foregone income from a decrease in the investing spouse's period-one labor supply. The resulting budget constraint is met by increasing one's net indebtedness, that is, decreasing second-period consumption, and by decreasing period-one consumption. To the extent that the return on the supporting spouse's savings is less than the interest rate at which the investing spouse can borrow, it is efficient for the spouse to provide support before the investor goes to external sources. If the couple faces the same borrowing and saving rates, then they will be indifferent between internal and external financing.

There are many reasons that the borrowing and savings interest rates might differ. The difference pays for transaction costs and the risk of default on loans. It is on the transaction costs that a couple can economize by using internal support. In particular, the supporting spouse will be able to obtain, at little or no expense, the loan-qualification information that a bank must do some amount of investigation to acquire. Not only does the spouse have lower costs of acquiring relevant information about the investor, she also has lower costs of monitoring the investor's effort once the education is begun. While the couple is married, the supporting spouse probably also has a greater ability to persuade the investing spouse to supply the optimal level of his own effort.[11] Moreover, the technology of household production will generally make the supporting spouse a low-cost provider of non-pecuniary support.

On the other hand, while a supporting spouse may be at an advantage in minimizing the transaction costs, she is likely to be at a disadvantage in regard to the costs of default risk. Unlike a bank, she cannot diversify away this risk with low transaction costs. Sharing the risk with others will also diminish the advantages of spousal support. Still, the evidence is clear that spouses do provide support, so we infer that the transaction cost and home production savings outweigh the risk-bearing cost over some range.[12]

If spousal financing is substituted for external support for some portion of the marginal education costs, education will be less costly on the margin. As a result, it will be efficient for the investing spouse to acquire more education than he would if he had to borrow all funds externally.[13] Both the lower cost of financing and the additional education that it induces will generate rents for the couple when they finance the education jointly in comparison to what the investor could obtain if the supporting spouse were not present.

C. *The Individuals' Financing Cost Function*

We look first at the cost of financing an investment for an individual. In the standard single-interest-rate analysis, maximization of the intertemporal utility function, $U = U(C_1, C_2)$ with an investment opportunity yields $U_1/U_2 = 1 + r = f'(E)$, where U_i is the marginal utility of consumption in period i, r is the interest rate, and $f(E)$ is the period-two payoff to investment of an amount E in the available project during period one.

In general, the borrowing rate that an individual faces on the margin is a weakly increasing function of the person's borrow-

[11] Due to the investor's limited liability, he may otherwise have less incentive than is optimal to contribute his own work effort to the investment.

[12] It may also be the case that the banking industry is not perfectly competitive. Thus, intra-household financing allows the investing spouse to avoid paying monopoly rents. Self-financing may not be socially efficient in this case, but it is a welfare improvement for the couple.

[13] This is true unless the marginal return to further education drops discontinuously at the level of education that is optimal in the absence of spousal support.

ing.[14] We assume a continuous cost of credit function that is constant when a person is a net saver and weakly increasing in the amount borrowed when he becomes a net borrower. This roughly reflects the actual opportunities available to most students, who can obtain some government-guaranteed student loans and, perhaps some loans from parents, but who must then turn to more expensive sources of credit, from unsecured student loans through bank cards and loan sharks.[15]

Figure 1 illustrates the marginal cost of credit function that we assume. On the horizontal axis is funding drawn from the credit market either through decreases in savings or increases in borrowing. (The case we have shown is that of an investor with initial savings of $B_1 - B_0$). On the vertical axis is the marginal decrease in period-2 consumption due to the marginal decline in savings or increase in debt during period 1. If the investor paid all education expenses (tuition plus foregone income) through changes in his credit position, and if he took all gains as increases in second-period consumption, then there would be no effect on C_1. In that case, the education could be viewed as a pure arbitrage opportunity, yielding second-period rents equal to the shaded area in Figure 1. Since this option is always available to the investor, the shaded area represents a lower bound on the rents that could be generated by the education opportunity.

In general, however, an investor in education would want to change his net credit position by more or less than the cost of his education (in tuition plus foregone income). Opposing forces from a wealth effect and a substitution effect make the net change ambiguous. As the marginal cost of credit increases, the price of consumption in period one increases relative to the price of second-period consumption. The resulting substitution effect encourages the investor to finance part of the investment by foregoing some period-1 consumption in lieu of some borrowing.

On the other hand, the additional income that will be obtained in period 2 as a payoff to the education relaxes the lifetime budget constraint, and, provided that consumption in each period is a normal good, will tend to increase consumption in both periods. This wealth effect from the returns to education will encourage the investor to borrow more than the cost of education.[16] That is, he will want to transfer some of the expected increase in period-2 income to period 1.

If the wealth effect were small, for example, if the investment were just barely profitable, the substitution effect would dominate, resulting in a decrease in C_1 and an increase in C_2 relative to the levels without the investment. If the investor faced a constant marginal interest rate, the substitution effect would disappear. In that case, the wealth effect would ensure that the investor lives better as a student (higher C_1) than he would have during period 1 if he had not engaged in the education. Our strong impression is to the contrary—graduate students are poorer while in school than they would have been had they instead been in the work force. The obvious explanation would be the dominance of the substitution effect, which implies an increasing cost-of-credit schedule.[17]

[14] Likewise, beyond some level of savings, the marginal interest received on savings is an increasing function of the amount saved. The increasing interest rate on savings, however, would complicate the analysis quite a bit and is probably not relevant to the level of savings held by most young couples trying to finance graduate school.

[15] Becker (1967) observes that subsidized loans may be at rates below the rate on savings. Were this the case, the order in which sources of finance are used would be different from that suggested here, and the lowest rate would be lower. The cost function would still be upward sloping and continuous, however, which is what we need for the analysis that follows.

[16] We term this a "wealth effect," rather than an "income effect" in order to distinguish it from the conventional analysis of an exogenous increase in the interest rate. The relevant interest rate does indeed increase here, but the increase is a result of optimizing behavior, not an exogenous shock.

[17] See Alan Gustman and Frank Stafford (1972) for evidence that our impression is correct. An alternate explanation for this observation is that being in graduate school lowers one's marginal rate of substitution (MRS) of period-one consumption for period-two consumption. This might be true to the extent that social

As the cost of market financing increases with increased borrowing, so does the cost of period-one consumption relative to period-two consumption, and thus, so does the *MRS* between consumption in period one and period two. Substitution toward the relatively cheaper commodity (period-two consumption) will be used to "self-finance" part of the investment.

Formally, in the absence of spousal support, and assuming that the nonnegativity constraints on education and consumption are not binding at the optimum, the investor solves

$$(1) \qquad \max_{C_1, C_2, E, B} U(C_1, C_2),$$

s.t.

$$(1a) \qquad C_1 = Y_1 + B - E,$$

$$(1b) \qquad C_2 = Y_2(E) - R(B),$$

where B is the net credit position of the individual and $R(B)$ is the second-period repayment as a function of first-period credit position. Both B and $R(B)$ are positive when he is a net borrower and negative when he is a net saver. We assume that $R'(B) > 0$ and $R''(B) \geq 0$, $R''(B) = 0$ when $B < 0$. An optimum for this problem will always exist.[18]

The first-order conditions then imply that

$$(2) \qquad Y_2'(E) = R'(B) = U_1/U_2.$$

The marginal return to education must equal the marginal repayment per dollar borrowed (i.e., the marginal interest rate plus one), and both must equal the marginal rate of substitution between first- and second-period consumption.

D. *The Increased Returns to Education with Spousal Support*

When one member of a couple invests in additional education, his spouse may contribute financial support by using her savings and by reducing her period-1 consumption.[19] If the couple is maximizing the rents from the investment opportunity, then the supporting spouse will contribute to the investing spouse's education so long as her marginal opportunity cost of the funds is less than his.[20] The supply of "credit" from the supporting spouse is an increasing function of the rate of return offered.

Let E, the total value of period-one resources devoted to the investment, be divided into the part provided by the investing spouse, denoted H, and the part provided by the supporting spouse, denoted W. The supporting spouse's supply of (i.e., marginal cost of) support function is shown as $S'(W)$ in Figure 2. It is added (horizontally) to the investor's marginal financing cost function, defined implicitly in (2), which we denote $I'(H)$, to give C-o-F, the cost of financing including spousal support. The addition of spousal support results in greater rents from a given level of education and increases the optimal level of education.[21]

norms do not require that a graduate student dress as well or display other material wealth to the same extent that people of the same age must in the business world. Still, if professional education is highly profitable, as it is generally thought to be for medical and business school, the wealth effect that is dominated is quite large, indicating that the offsetting effect must also be quite large.

[18] A sufficient condition for uniqueness is that $Y_2(E)$, $R(B)$, and $U(C_1, C_2)$ are all continuous in all derivatives up to third order, that $Y_2'(E) > 0$, $Y_2''(E) < 0$, $R'(\cdot)$, $R''(\cdot) > 0$, and $U_i > 0, U_{ii} < 0$ for $i = 1,2$. We assume that these conditions hold.

[19] We assume for simplicity that work hours, at home or outside the home, cannot be adjusted. If one ignores the effect of leisure time on the marginal utility of consumption, then changes in work hours can be considered as changes in consumption of leisure.

[20] Joint maximization of rents from the education follows immediately if we assume that the spouses always bargain to a Pareto optimum.

[21] Wealth effects make the illustration in Figure 2 imprecise. In Figure 2, $I'(H)$ is the marginal cost of investment function facing the husband without spousal support. When the supporting spouse contributes according to $S'(W)$, the total supply of financing shifts to the right by less than would occur by simply adding horizontally $S'(W)$ and $I'(H)$. This is because the investing spouse's anticipation of additional rents, assuming that he receives a positive share of these new rents, lead him to demand more consumption in each period (including period 1). This wealth effect will thus

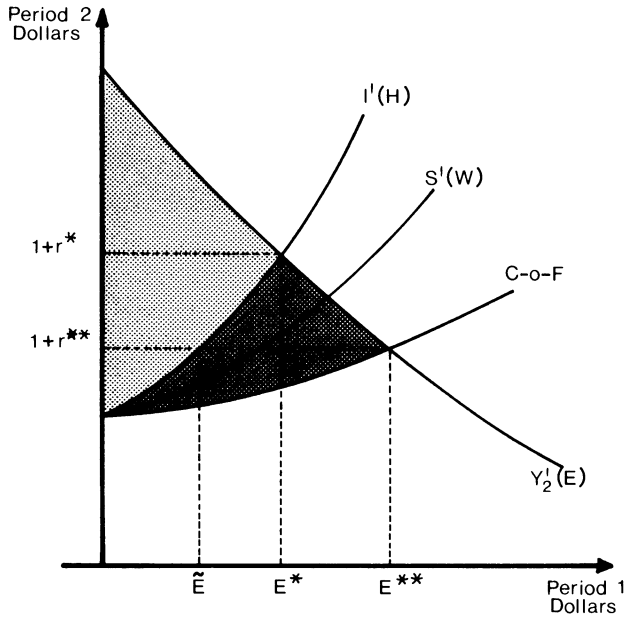

FIGURE 2

If consumption in each period is a normal good for the supporting spouse and she faces a (weakly) increasing cost of credit, then the opportunity cost of her financing will be (weakly) positively sloped. Solving the optimization problem as in (1) with an explicit spousal credit function of this sort yields first-order conditions

$$(3)\quad Y_2'(E) = R'(B) = S'(W) = U_1/U_2.$$

The extra condition indicates that the spouse's support will be used to the point that her opportunity cost of supplying credit is equal to the marginal return on the education.[22]

The investing spouse is using self-financing, spousal financing, and credit market financing to support his education. At the optimum, the marginal opportunity cost of each source is equal to the marginal return to education. In addition, the cost of each source of funding is increasing in the amount of funding provided. Thus, the total cost of each source of funds is bounded above by the quantity of funding provided multiplied by the marginal interest rate. This result will prove very useful in analyzing property division rules in the following section.

In the presence of spousal support, the investor in education will choose the optimal amount of such education if either (a) both parties perceive the probability of divorce to be zero *or* (b) they agree in advance that repayment for spousal support will be along her opportunity cost of support function plus some predetermined share of the rents generated by her participation. Such an agreement —a Pareto-improving trade—would lead to efficient acquisition of human capital and would assure that neither side would be worse off than if he or she had refused to participate in the invest-support relationship. The rents due to spousal support are the rents from education with spousal support minus the rents without spousal support. Graphically, these are illustrated approximately as the dark-shaded area in

shift $I'(H)$ to the left, reducing his supply of self-financing at all levels of period-two return.

[22] By the definition of $I'(H)$—the period-one marginal cost to the husband of providing resources for the investment --it is always the case that at an optimum $I'(H) = R'(B) = U_1/U_2$. Thus, (3) can be written as $Y_2'(E) = I'(H) = S'(W)$.

Figure 2. The result of the spouse's participation is more education and a lower marginal interest rate. Looking at the spouse's opportunity cost of funding function, we can calculate what quantity of funding she provides. This is approximately equal to $(E^{**} - \tilde{E})$.[23]

II. Rules for Division of the Education Asset

In most marriages, the costs attributable to the spouse's support and the additional rents resulting from her participation would be very difficult to calculate. Neither the opportunity cost of the spouse's support nor the level of education that would have occurred in the absence of her support are likely to be readily observable. Moreover, in the context of a divorce proceeding there would be no incentive for the parties to provide honest estimates of these parameters. Yet, for a division rule to be effective in practice, it must be based on data that the court could obtain.

In recent cases, courts have asserted their ability to estimate the costs of the education, the amount financed by each source, the cost of external credit, and the increase in expected earnings that resulted from the education. Using a subset of these data, we suggest a rule that has many of the equity and efficiency properties that would result from the Pareto-improving contract discussed in Section I, Part D. We then compare this rule with the rule implicit in *O'Brien*, in which the supporting spouse receives a fraction t of the estimated value of the human capital acquired by the investing spouse, where t is an increasing function of the amount of support given. We also briefly discuss two other rules: *Inman*, in which the supporting spouse is repaid her contribution compounded at the passbook savings rate, and *Graham*, in which the supporting spouse receives nothing at all.

Throughout the remainder of the paper we take the decision to divorce to be unaffected by the property division rules or the resulting wealth of each party. Elizabeth Peters has shown that if both parties have symmetric information regarding each spouse's opportunities in the event of divorce, divorce will occur if and only if it is efficient in the sense of Becker, Elisabeth Landes, and Robert Michael (1977).[24] That is, divorce occurs only if new information leads to the net rents available from marriage becoming negative. Thus, the rules governing property division, alimony, and child support will not affect the probability of divorce, although they will affect the terms of divorce settlements if divorce occurs. The rules for divorce settlements may also affect the division of resources within a continuing marriage; the division that would occur in the event of divorce is a natural starting point when marital partners bargain over the rents to the marriage.[25] With no-fault divorce, each party must do at least as well in the continuing marriage as he or she would do exercising the no-fault option.[26] This provides an additional reason for being concerned with the equity effects of the "default" rules for divorce settlements.

To start, we consider the behavior of the four rules for dividing human capital under each of two regimes. The first we term "naive

[23] This is only an approximation due to the wealth effects explained in fn. 21.

[24] Peters' empirical work supports the assumption of symmetric information.

[25] We assume, following Peters, that renegotiation of the marital contract occurs only if, under the current contract, rents to the continuing marriage become negative for one of the parties. Left out of this analysis is the real possibility that when one party attempts to use the settlement rules to increase his or her share of rents to the marriage, the obvious lack of altruism and "love" involved may make some of the rents vanish. Indeed, enough of them could vanish to turn an efficient marriage into an efficient divorce. If such psychic costs of renegotiation are large relative to the rents from the marriage, then divorce may be the only alternative to the status quo. In this case, the property settlement rules will affect the likelihood of divorce. Borenstein and Courant (1987) model these alternatives and discuss complications when divorce is endogenous to the settlement rules.

[26] There are two important caveats to this analysis. First, divorce settlements, and hence the relevant reservation positions within marriage, are subject to uncertain enforcement and potentially costly enforcement. Second, the rents available from the marriage may themselves be altered by the realized return to human capital investment. For instance, the successful acquisition of education may change the investing spouse's tastes.

marriage," in which neither member of the couple contemplates the possibility of divorce during the investment period, but some exogenous event or news causes divorce to occur at the end of the first period. There are no efficiency costs here—couples will obtain optimal levels of education, given their prior beliefs. Our concern in naive marriage is with equity and regret—do the various rules divide the human capital asset such that both parties are better off for having engaged in the invest-support relationship? The second regime is strategic divorce, in which one party receives bad news about the rents from the marriage during period one, but keeps the other spouse in blissful ignorance until the investment is completed. Here the various rules have both efficiency and equity implications.

In both of these regimes, we keep the model very simple. In particular, we assume that divorce and the accompanying settlement do not affect the marginal rate of substitution schedule between period-1 and period-2 consumption. That is, there are no wealth effects due to the possibility of divorce and utility functions are not state-dependent. In the third part of the section and in the Appendix we briefly consider a number of cases that incorporate such wealth effects and state-dependent utility. We also consider richer classes of prior beliefs than those implicit in naive and strategic divorce.

Before turning to the analysis, we formally state our proposed rule, which we call the "Marginal Interest Rate," or MIR rule.

The Marginal Interest Rate Rule. When divorce occurs at the beginning of period two, the "investing" spouse will reimburse the "supporting" spouse in the amount of the latter's period-one support compounded at the investing spouse's period-one *marginal* interest rate.

A. *Naive Marriage and Divorce*

The naive marriage that we consider would appear to be very naive indeed—we assume that both spouses act under the assumption that the probability of divorce is zero. While such behavior may be naive, neither the behavior nor our modeling of it is silly. It may be costly to the marriage itself for the marital partners to investigate their subjective probabilities of divorce. Moreover, in a very real sense the parties to a marriage would usually prefer to act naively in the sense of this section, and will be reinforced in such action if they know that property settlement rules will not penalize them for having behaved in this way.

The assumption of naive marriage also permits us to abstract from efficiency considerations, as under naive marriage, equation (3) will always holds. When such a marriage ends in divorce, or when one party threatens divorce in order to change the division of rents to the continuing marriage, it is readily apparent that there are potential equity effects arising from the various rules. The direction and magnitude of these effects are intimately bound up with the division of rents from the invest-support relationship. As long as a rule for property division divides only these rents, neither party will regret having engaged in the invest-support behavior.

The MIR Rule. The MIR rule always divides rents to the invest-support transaction. The supporting spouse would always receive more than her opportunity cost of support. She would be compensated at her marginal opportunity cost (from (3), $S'(W) = R'(B)$) multiplied by her total investment. The investing spouse would also be earning some rents, because under our assumptions $Y_2'(E)$ is strictly downward sloping, and therefore inframarginally always greater than $R'(B)$, the marginal repayment rate that the supporting spouse receives.

Another advantage of the MIR rule is that it is in line with our reading of the legal definition of marital property, that is, property that was acquired during the marriage and that therefore is to be divided upon divorce. In most states, real or intellectual property that is brought into a marriage by one party is not considered marital property. If, for instance, a doctor has a medical degree before marriage, the degree would not be considered in the context of a property settlement. It could well be argued that the investing spouse brings certain ability or other resources (for example, a high grade

point average or the ability to bear tedious memorization of the names of bones) into the marriage that would produce rents even without spousal support. These rents are illustrated in Figure 2 as the light-shaded area. The MIR rule would not assign any of these rents to the supporting spouse.

Likewise, the supporting spouse brings certain resources into the marriage, including her savings and her credit rating. She might claim (and in general the court would support her) that these are not marital property and that therefore they should not be divided up at divorce. Full reimbursement of the opportunity cost of her financial support, which this rule more than accomplishes, would satisfy such a claim.

What the MIR rule does divide up is the rents from the joint invest-support activity in which the couple engages. Neither party brought the ability to earn these rents into the marriage. They are marital property, a product of the invest-support relationship. We do not claim that the MIR rule will lead to equal division of these rents, but the information necessary for equal division is not available—all of the functions illustrated in Figure 2 would have to be observed directly.

The O'Brien Rule. In *O'Brien v. O'Brien*, the trial court used an unstated formula that resulted in the supporting spouse receiving 40 percent of the expected value of the education acquired by the investing spouse.[27] In a similar New York State case, a different court argued that application of *O'Brien* would lead to assigning only 10 percent of the value of the degree that was acquired, because the supporting spouse contributed much less.[28] In modeling the "*O'Brien* Rule," we assume that the court's award is based on a formula of the form:

$$(4) \qquad A(W, E, \Delta Y) = t(W/E)\cdot\Delta Y,$$

where $A(\cdot)$ denotes the amount of the award, ΔY is defined as the increase in expected period-two earnings that is attributable to the investment (i.e., $Y_2(E)-Y_2(0)$), and t, which in this context acts like a tax rate, is an increasing function of W/E, the share of the investment that is supported by the wife.

To simplify the analysis further, we assume that $t(W/E)$ may be written as $\alpha\cdot(W/E)$. We restrict α to the zero-one interval on the grounds that the Court will not give the supporting spouse a larger share of proceeds from the investment than her share of the total cost. For any $S'(W)$ and $Y_2'(E)$ functions there will be *some* values of α that will be consistent with a Pareto-optimal contract, but the acceptable range will vary from couple to couple. Obviously, when α is zero, the supporting spouse will regret having supported in the event of divorce or a threat of divorce. Less obvious is the result that if α is equal to one, the investing spouse will always regret having accepted support. To see this, note that if $\alpha=1$, the investing spouse, upon divorce, receives a net return on his investment of $[(E-W)/E]\Delta Y$. From Section I, E will be an increasing function of the W offered at a given repayment rate, with dE/dW strictly less than unity. Now consider the effect of an increase in W on the husband's net return, $Y_2(E)-A(W, E, \Delta Y)$:

$$(5) \qquad \frac{d\ \text{Net Return}}{dW}$$

$$= \{E\cdot[(E'(W)-1)\Delta + (E(W)-W)\, Y_2'(E)E'(W)]$$

$$-(E(W)-W)\Delta Y(E)E'(W)\}E^{-2}.$$

A little manipulation reveals that the sign of

[27] The court based its award on a finding that the supporting spouse contributed 71 percent of the total costs incurred by the couple during the period of the investment. If the court concluded that 50 percent of the family costs were attributable to her, then the other 21 percent of the total costs that she contributed is 42 percent of the costs attributable to the investing spouse. This may have been the basis for the 40 percent figure.

[28] This case, *Eisenstadt v. Eisenstadt*, is also interesting because the court's logic is much like that of the proposed MIR rule. Although the court provided an award under the theory of rehabilitative maintenance, the amount of the award was determined by estimating a market return to the supporting spouse's support.

(5) is the same as the sign of

$$(6)\quad \Delta Y(E'(W)-1) + [(E(W)-W)E'(W)]\,[Y_2'(E)-\Delta Y/E].$$

The expression in (6) is unambiguously negative: the first group of terms is negative because $E'(W)<1$, and the second group is the product of a positive expression and the difference between the marginal and average products of education. Thus if $\alpha=1$, an increase in W (at any initial level of W) leads to both an increase in E and a reduction on the investing spouse's net return. The supporting spouse receives a payment in excess of the marginal rents generated by her support. Integrating over W, it must then be true that her total repayments exceed total rents from the invest-support relationship. Thus, a rule that assigns the supporting spouse the same share of the returns from education equal to her share of the investment costs will always make the investing spouse regret having accepted her support.

The fundamental problem with the *O'Brien* rule is that ΔY is conceptually the wrong property to divide. At least some of ΔY is rents to the investing spouse's abilities, which is not marital property. Because ΔY does not measure rents, there is no general $t(W/E)$ schedule that will divide rents.[29] By chance, in some cases, the *O'Brien* rule with the "right" parameters could perform as well as the MIR rule and divide rents. In some such cases, the distribution of rents might be preferable (under some equity criteria) to that arising from the MIR rule. But in many cases, the *O'Brien* does not divide rents at all. The MIR rule always does.

The Graham and Inman Rules. The *Graham* rule never divides rents from the invest-support relationship while the *Inman* rule does only if $R'(B)=S'(0)$, which generally equals one plus the passbook rate on savings. The *Graham* rule provides no compensation for the supporting spouse, so she will always have lost money on her support, which will have been directly transferred to the investing spouse. Given that $S''(W)>0$, the *Inman* rule will undercompensate the supporting spouse if borrowing is undertaken at an interest rate above the passbook rate.

B. *Strategic Divorce*

Many of the concerns over the rules for division of human capital assets, as well as a primary motivation for this paper, arise from the possibility of strategic divorce. In this case, one party receives bad news for the marriage during period one and withholds it, intending to divorce or to alter the rent distribution within the marriage once the investment is completed. If the property division rule divides wealth that is not a rent from the invest-support relationship, strategic divorce may transfer wealth from the supporting to the investing spouse or *vice versa*. If the potential "victim" of such transfers recognizes these possibilities, the spousal support, and thus the transfer, may not occur. Instead, the rule for dividing human capital may lead to a refusal to offer or to accept support, resulting in adverse efficiency effects.

We simplify the exposition by assuming that one party (the strategic divorcer) intends to divorce or threaten divorce (i.e., use the property division rule to enhance his or her share of rents from a marriage that continues in period two) with probability one. The other party (the victim) believes, or acts as if (s)he believes, that the probability of divorce is zero. In essence, the victim is still in naive marriage. These simplifying assumptions abstract from the game of incomplete information that would probably be played between spouses, each of whom realizes that there is some probability that he or she will become a victim of the other's strategic divorce. Still, this simple approach allows us to illustrate many of the transfers and inefficiencies that could obtain in the full game-theoretic model, and thus permits

[29] The $t(W/E)$ function could at best reflect the opportunity costs of support for supporting spouses on average, but could not be based on individuals' costs.

some comparisons of these effects under alternative rules.

Strategic Divorce Under the MIR Rule. Consider the "standard" strategic divorce in which the husband acquires education with the wife's support and then, to her complete surprise, divorces her.[30] Under the MIR rule, the investing spouse would want to solve the following utility maximization problem:

$$(7)\quad \max_{E,B,W} U(Y_1 - E + B + W, Y_2(E) - R(B) - W \cdot R'(B)),$$

s.t.

$$(7a)\quad S'(W) \le R'(B).$$

The constraint would be imposed by the supporting spouse. It says that, even under her naive assumption that divorce is impossible, she will not provide support for which her opportunity cost is higher than the rate at which the household can borrow, $R'(B)$. Without this constraint, the investing spouse would set B at zero to minimize $R'(B)$ and would do all financing through the supporting spouse, regardless of her opportunity cost. Thus, the constraint would always be binding.

The maximization problem in (7) yields first-order conditions that together imply:

$$(8)\quad S'(W) = R'(B) = U_1/U_2 - W \cdot \frac{R''(B) \cdot S''(W)}{R''(B) + S''(W)} < U_1/U_2 = Y_2'(E).$$

Here the MIR rule does not yield completely efficient investment because it creates a monopsonylike incentive to which the investing spouse may respond. Whenever he borrows on the margin from the credit market and from the supporting spouse, he raises the rate at which he will have to pay back the supporting spouse for all inframarginal support. Thus, the investing spouse would borrow less from the external credit market and from his spouse, do more self-financing, and obtain less education than is efficient.

The precise result in (8) depends on the simple assumptions of this model, but the effect identified is more general. Regardless of the exact information and bargaining positions of the "strategic divorcer" and the "victim," the link established by the MIR rule between the amount of support provided and the rate at which repayment must be made will alter the investor's incentive to accept support and the supporter's incentive to provide it. Thus, a similar *monopoly*like effect results if the supporter, rather than the investor, is the one who anticipates divorce. In that case, the supporter takes into account that increases in her support may lessen the amount that the investor will borrow externally and thus lower $R'(B)$, the rate at which repayment will occur.[31]

Whether the investor or the supporter engages in strategic behavior, the MIR rule retains the attractive property that some spousal support, $W > 0$, will take place if a positive level of support would be efficient. Strategic use of the MIR rule causes incentives for suboptimal levels of spousal support only to the extent that marginal borrowing changes the repayment rate on all inframarginal support. Thus, these effects diminish when the level of spousal support is near zero, that is, when there is no inframarginal support. Furthermore, the spousal support that does occur will still always result in a Pareto improvement under the MIR rule, regardless of the strategic motivations of either spouse. The naive spouse will never be made worse off than if no support had occurred.

Strategic Divorce Under Current Rules. As shown above, only by coincidence does the

[30] The analysis, of course, extends to the case of renegotiation within a continuing marriage.

[31] The maximands for the general model are derived in the Appendix. The results of this simplified model are spelled out in greater detail in Borenstein and Courant (1987).

O'Brien rule divide rents from the invest-support behavior. For this reason, it can permit a great deal of abuse through strategic divorce. If the tax rate is high, α near 1, the supporting spouse may be able to use strategic divorce to appropriate a large portion of the returns to the investor's "innate ability." Indeed, when α equals one, it is always the case that the supporting spouse could appropriate some of these rents.[32] If the tax rate is low, α near zero, the strategically divorcing investor may convince the supporting spouse to contribute large sums on which she will then receive a significantly negative return.

Just as inequitable redistribution is likely if the tax rate favors the individual planning to threaten divorce, large inefficiencies are likely if the tax rate favors the naive spouse who does not anticipate divorce. If α is near one, the investor who plans for divorce will permit no support from his spouse, even though Pareto-improving transactions are available. If α is close to zero, the potentially supporting spouse will find alternative investments that may yield lower returns, but are not subject to large losses when divorce occurs or is threatened.

The *Inman* rule favors strategic divorce by the investing spouse. Under *Inman* the supporting spouse is compensated at the passbook rate. If she provides any support at all, she thus receives none of the rents from the invest-support relationship. In fact, on each dollar of support, she loses the difference between her opportunity cost of support and the passbook rate, a difference that is (weakly) positive. If the supporting spouse anticipates divorce under *Inman*, no such transfer occurs and there is no spousal support, a plainly inefficient outcome.[33]

Efficiency and Equity with Strategic Divorce. On balance, the MIR rule looks considerably better than the other rules on both efficiency and equity grounds. The MIR rule assures that rents to the invest-support relationship are divided. Most important, in the normal case of the investing spouse divorcing his supporter, MIR assures that the supporting spouse will have received a return of at least $S'(W)$ on her last dollar of support.

The *O'Brien* and *Inman* rules seem likely to have much more serious problems. Without going into explicit functional forms, "seem likely" is as strong a statement as we can make, but we make it strongly. The *O'Brien* rule with a high tax rate can induce the investing spouse to completely forego rents that could have been generated from an invest-support relationship and can provide strong incentives for the supporting spouse to engage in strategic divorce. Both *O'Brien* with a low tax rate and *Inman* will encourage the supporting spouse to restrict W or encourage the investing spouse to act strategically. Stronger statements yet can be made about the equity effects. *O'Brien*, *Inman*, and *Graham* all have enormous potential for abuse. Though the MIR rule is not completely efficient it does not encourage such abuses. By dividing the rents, it assures that neither party is worse off for having engaged in the transaction.

C. *Wealth Effects and Other Complications*

In general, both parties may recognize the possibility of divorce and the utility functions of each party will be state-dependent. The location of the marginal rate of substitution schedule between consumption in period one and period 2 will depend on whether divorce has occurred or not, or, more generally, on news about the rents to the marriage. Dealing with these phenomena formally involves expected $S'(W)$ and expected $I'(H)$ functions as analyzed in the Appendix.

The most important result from this analysis has to do with wealth effects. Consider a case in which bad news about the marriage leads either to divorce or to a reallocation of rents in period two that causes the supporting spouse to be worse off than her period-one expectations. If consumption is a normal good, the *ex post* realization of $S'(W)$ will be below the expected value of $S'(W)$ upon

[32] The proof of this follows the same lines as the discussion around (6).

[33] The same arguments as for *Inman* apply for analysis of the *Graham* rule. Under *Graham* the loss to the supporting spouse is even larger.

which the supporting spouse will have based her period-one decisions. This implies, under the MIR rule, that she will be glad to have engaged in the invest-support transaction and will wish that she had provided more support. Based on Weitzman's finding that wives' consumption typically falls after divorce, we are convinced that this is the most common case for supporting spouses. Similar analysis can be done for other cases and for the investing spouse, although we have no strong prior belief about the state-dependency of the marginal utility of period-two consumption schedule for divorced husbands.

In the general case, as in the case of strategic divorce, the MIR rule fails to achieve Pareto optimality because of the monopoly and monopsony effects. However, it always permits some support and investment if some is *ex ante* Pareto-superior to none, where the other rules may not. Finally, and in our view most important, the MIR rule behaves especially well under both low *ex ante* probabilities of divorce, which we take to be and hope is the norm, and under strategic divorce.

III. Sequential Investment, Measuring Support, and Other Loose Ends

In this section we expand the analysis to treat briefly a number of issues that bear on the application of the MIR rule in the "real world."

A. *Sequential Investment in Human Capital*

It is quite common for spouses to agree to take turns acquiring human capital. For example, the wife might first put the husband through medical school, and the husband would then support his wife's studies in law school. That such an arrangement could be efficient from the perspective of the household is clear. Given that marginal financing costs will generally be increasing in E during the investment period and that once one spouse has acquired a degree, his or her cost-of-financing function will generally fall, it should be straightforward (but we spare the reader and ourselves the details) to write down a three-period model in which a sequential investment strategy maximizes rents to what are now two invest-support transactions.[34] Indeed, courts often award "rehabilitative maintenance" to spouses who have not acquired human capital during the marriage. Such awards would appear to be consistent with a notion that the husband owes the wife "in-kind" support of the type that she provided to him.

Where such contracts exist, the MIR rule does not fully compensate the supporting spouse for her investment. The $S'(W)$ functions that she uses to determine her offer of support in period one will reflect her expectation of similar support for her planned period-two investment. With normal cross-period wealth effects, expectation of this support will shift $S'(W)$ out, leading to her having provided more support in period one than she would have had she not expected "in-kind" restitution in period 2. In principle, then, the MIR payment should be augmented by an additional lump-sum equivalent of just the size that would be required to make her $S'(W)$ function the correct one *ex post*.

In practice, this magnitude will be impossible to observe, and it will also be difficult to establish the nature of the (generally) implicit contract regarding period-two support. The discussion here makes the case for what courts term rehabilitative maintenance, even in the context of the MIR rule, but does not make it easy to calculate what the level of such payments should be.[35]

[34] The reason that the husband goes first in our example is that the absolute increment in mens' wages arising from human capital investment is generally higher than that for women. Thus, for a couple maximizing lifetime wealth, it will be efficient, all other things equal, to maximize the length of time during which benefits from the husband's investment can be realized.

[35] Actually, things are even more complicated, because the position of the $S'(W)$ curve will also depend on period-3 consumption and utility functions in both the married and the divorced state. Arguably, to be consistent with the approach taken in this paper, we would want to calculate an award in excess of the MIR rule using $\mathbf{E}[S'(W)]$, which we also cannot observe.

B. *Measuring the Supporting Spouse's Contribution*

Throughout this discussion we have acted as if measurement of W is straightforward. In practice, it may be quite difficult. Typically the court measures W as the supporting spouse's contribution less her estimated consumption. The latter is usually taken to be total household spending less tuition and other school-related spending, all divided by two. Typically, dollar costs of schooling, rather than opportunity costs, are measured, and typically, home production by the supporting spouse is not counted as part of her contribution.

It is straightforward to show that with nonzero probabilities of divorce any systematic errors in measuring W will bias consumption and investment choices made by both parties in period one, and will generally lead to non-optimal investment behavior. Analogously, errors in measuring W will have equity effects all their own. Having said that, we have no concrete proposal for measuring W. We note, however, that litigation over the value of household production, for instance, can eat up the rents from the invest-support transaction in a hurry, while using court-imposed rules on them will surely lead to inefficiency and inequity in individual cases. Moreover, the accuracy of the court's estimate that each party gets half of the period-one consumption will depend on marriage-specific arrangements.

Other rules for property division also require measurement of W and will thus also have biases and equity effects.[36] Given the relative neutrality of MIR when W is measured accurately, it should continue to do better than the other rules. We have not, however, formally compared the performance of different rules when W is measured with error.

C. *Children and Home Production*

Much of the analysis may change if we allow for children and for specialization in home production. We suspect that variants on the MIR rule will still work well at handling repayment for supporting human capital investment. But as human capital in the hands of the investing spouse becomes a smaller fraction of what is at stake in the household (as is the case under both topics in the title of this subsection) a richer model of the marriage is required to develop rules that compensate the child-rearing and home-production specializing spouse for the relatively household-specific nature of her human capital investment.

The presence of children also raises the issue of child support at divorce and the interaction between child-support rules and rules for dividing the human capital asset. Child support is almost invariably assessed as a fraction of income. As with any other income-producing family asset, division of the human capital asset should only affect child support through its effects on each party's annual income. The complication is that the human capital asset cannot be divided as such. Transfers must be made in the form of income from the asset.

Still, the accounting seems manageable. The investing spouse should be allowed to deduct the annual value of the human capital property settlement from his income, and the same amount should be added to the income of the supporting spouse. In practice, if child support is linear in income, the same effect (in present value terms) could be achieved by having the lump-sum (or structured) wealth transfer subtracted from the husband's income in the year(s) that it takes place. With nonlinear support schedules a more complicated procedure would be required, but the problem is one of calculation, rather than of measuring things that are hard to observe.

IV. Conclusion

The model presented in this paper leaves out a great deal about marriage that makes it institutionally different from a business partnership. In future work, we hope to incorporate explicitly what we feel are the most important aspects relevant to human capital acquisition, household production, and household economies. Though this will un-

[36] The exception is the *Graham* rule under which the supporting spouse get nothing.

doubtedly complicate the analysis, the same basic approach—finding a price at which the supporting behavior is a Pareto improvement— should be of great value.

Though the precise marginal interest rate will not always be obvious, a close estimate would probably be less difficult to make than many valuations that courts currently make regarding property, intangible goods, and even human life. If a couple had the opportunity to take out additional loans at 24 percent and chose not to, then this is above their marginal interest rate in financing. If they had exhausted all possibility for subsidized loans and even loans secured with real property, then the rates on such credit are below their marginal interest rate. Through this sort of investigation about financing choices that the couple made, the court could narrow down the range in which the reimbursement rate should lie.

The difference between a marginal interest rate of, say, 15 percent under MIR and the 5 percent rate that *Inman* might suggest can be quite substantial. For instance, consider again the recently board-certified specialist who files for divorce 6 years out of medical school. Suppose that the spouse provided $10,000 of support during each year of the 4 years of medical school, but that the doctor received no spousal support during his residency that followed. The *Inman* rule would award her about $61,000, while the MIR rule would award $133,000.

We offer the MIR rule as an alternative to the extremely crude guidelines that the courts currently use. There is no accepted method for calculating the proportion of the returns to education that should be awarded to the supporting spouse. At this point, much of the scholarly legal community agrees that the supporting spouse should receive some reimbursement. Some even argue that compounding her investment at the passbook savings rate yields a payment that is too low.[37] To the best of our knowledge, however, ours is the first attempt to produce a compensation formula that would result in an equitable distribution of the asset and would always give each party an incentive to participate in the joint invest-support behavior.

[37]See Joan Krauskopf, Marvin Moore, and Weitzman.

APPENDIX

This appendix presents a more general model of the effects that the possibility of divorce and the use of the MIR rule may have on the invest and support decisions of a couple.[38] We then outline further extensions of the model that would bring it still closer to reality.

In general, both parties may recognize the possibility of divorce and the utility function of each party will depend on the state of the marriage and wealth in each state. For the general case of nonzero probabilities of divorce, we can define expected utility functions for both parties, and use these to derive expected $S'(W)$ and $I'(H)$ functions. To do this in a general framework, we posit a probability distribution of "news" about the marriage that will be revealed to both partners at the end of period one. For simplicity, we assume now that all news is common knowledge within the marriage. The extension to strategic behavior is straightforward, but complicates the math quite a bit, because multiple-probability distributions must be included in the analysis, and to analyze efficiency, some distribution must be assumed to be the true or objective one.

The change in rents to the marriage that occurs at the end of period 1 is n, a random variable with cumulative distribution function $\Phi(n)$. If the news is worse than some critical value of n, n^*, then the rents to the marriage become negative and divorce occurs. If the news is better than n^*, then the marriage continues and some allocation of the family consumption—a function of n—results. The expected marginal rate of substitution function for the supporting spouse can then be written as

$$\text{(A1)} \qquad \mathbf{E}[S'(W)] = \frac{U_1'(C_1)}{\Phi(n^*)U_2^{d\prime}(C_2^d) + \Omega},$$

where

$$\Omega = \int_{n^*}^{\bar{n}} U_2^{m\prime}(C_2^m(n))\, d\Phi(n),$$

m and d refer to the married and divorced states, respectively, and $\bar{n}$ is the best news that has positive probability.[39]

[38]Analysis of *Inman* and *Graham* is obvious, and it is impossible to say anything general about *O'Brien*.

[39]One additional simplification implicit in this presentation is that the single variable n represents the change in joint rents from the marriage. In fact, this is the sum of the rents to each individual in the marriage and the distribution of this change will affect the allocation of the consumption within the marriage, if it continues. The complete model has two news variables, one for each spouse, and a mechanism that maps the news into a distribution of rents.

It is readily apparent that $\mathbf{E}[S'(W)]$ is between $S_d'(W) = U_1'(C_1)/U_2^{d\prime}(C_2^d)$ and $\mathbf{E}[S_m'(W)] = U_1'(C_1)/\Omega[1-\Phi]^{-1}$. The $\mathbf{E}[I'(H)]$ function can be derived in the same way and has analogous properties. Because the compensation rule used in the event of divorce will affect the supporting spouse's wealth in that state, and may affect the allocation of the marital rents if the marriage continues, the exact location of the $\mathbf{E}[S'(W)]$ function will be influenced by the rule.[40]

Behavior of the investing spouse can be modeled as maximization of his expected utility function subject to her imposition of the constraint that $\mathbf{E}[S'(W)] \leq$ **E**(marginal return), where **E**(marginal return) is the expected return on support under the various rules. Absent the monopoly and monopsony effects that we have discussed above, the MIR rule will lead to *ex ante* efficient behavior.[41]

The analysis of equity and regret depends on the relationship between the functions subscripted d and subscripted m. For example, in the "typical" case, where consumption in each period is a normal good and divorce leads to a reduction in period-two consumption for wives, $S_d'(W)$ will be below $S_m'(W, n)$ for all values of n that permit the marriage to continue. This would imply that in the event of investor-initiated divorce or threatened divorce the supporting spouse will wish that she had provided more support. Similar analysis can be done for other cases and for the investing spouse, although we have no strong priors on the normal relationship between $I_d'(H)$ and $I_m'(H, n)$.

The monopsony effect directly alters the investing spouse's incentives under divorce, and under marriage if rents are redistributed in period 2, and therefore changes his *ex ante* financing choices. The analysis of this effect follows that presented in the discussion of strategic divorce. The investing spouse chooses less than the optimal amount of spousal and external credit market financing, obtains too little education, and finances too much of it through foregone current consumption.[42]

The magnitude of these effects varies directly with the probability of bad news that is likely to cause renegotiation or divorce. Similarly, the monopoly effect, which leads to the supporting spouse providing an inefficiently low level of support, inducing the investing spouse to borrow more in order to raise the marginal interest rate, will be more important the larger is the probability of bad news.

The analysis can be further extended by allowing the parties to have different subjective distributions of n. Although we do not pursue the matter here, we note that the expected utility (and, hence, $I'(H)$ and $S'(W)$) functions remain well-defined. Again, the MIR rule fails to achieve Pareto optimality because of the monopoly and monopsony effects. Again, the MIR rule will always permit some support if such is Pareto superior to none, where the other rules may not.

[40] The analysis is further complicated somewhat by the fact that the $S_d'(W)$ and $S_m'(W, n)$ functions are not themselves independent of the *distribution* of n. Though the supporting spouse can plan optimally, for each state given the *ex ante* plan of the investing spouse, the investor's plan will itself depend on the probability of divorce. Still, if an equilibrium does exist between the two spouses, the $\mathbf{E}[S'(W]$ function will be well-defined for whatever equilibrium behavior is chosen by the investing spouse. These feedback effects will not alter the analysis of the equilibrium, but they will change the equilibrium values of each variable.

[41] Even where one party regrets having undertaken the invest-support relationship *ex post*, if both parties correctly perceived the objective distribution of n *ex ante*, the MIR rule divides the *ex ante* rents from the invest-support relationship.

[42] This latter effect is limited by his ability to forego current consumption without depriving the spouse of current consumption to the point that $\mathbf{E}(S'(W)) >$ **E**(marginal return).

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