

Missing Contracts:
On the Rationality of not Signing a
Prenuptial Agreement¹

Antonio Nicolò[#] and Piero Tedeschi[§]

[#] Dipartimento di Scienze Economiche,
Università degli Studi di Padova

[§] Dipartimento di Statistica,
Università di Milano Bicocca

March 22, 2006

¹We thank for helpful comments on an earlier draft, the participants to the 2003 Workshop on Social choice and Welfare Economics in Malaga, EALE Congress 2003 in Nancy and SET 2003 International Conference in Milan. We are particularly grateful to Alberto Bisin, Sandro Brusco, Ottorino Chillemi, James Malcomson, Erik Maskin, Fausto Panunzi, David Perez-Castrillo and Kathryn Spier.

Abstract

Many couples do not sign prenuptial agreements, even though this often leads to costly and inefficient litigation in case of divorce. In this paper we show that strategic reasons may prevent agents from signing prenuptial agreements. Partners who value more the benefit of the marriage wish to signal their type by running the risk of a costly divorce. Hence this contract incompleteness arises as a screening device. Moreover, the threat of costly divorce is credible since the lack of an ex-ante agreement leads to a moral hazard problem within the couple, which induces partners to reject any ex-post amicable agreement.

Keywords: asymmetric information, incomplete contracts, prenuptial agreement.

JEL Classification: D82, K12, D10.

1 Introduction

Prenuptial agreements usually include clauses on how partners should behave during marriage and on how they should divide the common assets in case of divorce. Even though it is quite clear that prenuptial agreements allow savings in litigation costs, they are uncommon. Legal commentators and practitioners estimate that only 5-10% of the (USA) population enters into prenuptial agreements, and one study suggests that only 1.5% of marriage licence applicants would consider entering into such agreement” (H. Mahar, 2003). The usual justifications for this phenomenon are the lack of enforceability of premarital contracts, the presence of transaction costs and, finally, agents’ excessively optimistic expectations on their marriage.

After a closer scrutiny, all these explanations are not completely satisfactory. For instance, many States in USA have nowadays adopted the Uniform Premarital Agreement Act (UPAA).¹ This Act provides that courts must enforce premarital agreements, whenever they satisfy some simple formalities.² Similar reforms have been adopted in other countries, e.g., Australia. Therefore it is difficult to assume that in these countries (or states) prenuptial agreements are difficult to enforce.

As far as it regards the cost of writing prenuptial agreements, it might be very high if the involved agents have complex activities, but for more common people many Internet sites offer kits which help to stipulate premarital agreements at a very low cost, without the help of any legal advisors. The costs of contracting might also be a consequence of forecasting problems. Also this explanation is not satisfactory, since many marriages end within the early years of the union (one fifth of first marriages ends within 5 years, and one third ends within 10, see Bramlett and Moshler (2001)). Therefore the rate of divorce is high in the first years of marriage, making less difficult to write ex-ante a satisfactory agreement on how to divorce.

Nevertheless, couples could have too optimistic estimates of the probability of divorce. For instance they could have a wrong perception of the overall divorce rate. However, from Baker and Emery (1993) it appears that people correctly estimates the divorce rates, but that most people assume a much lower probability that they will personally divorce than the overall

¹Drafted by the National Conference of Commissioners On Uniform State Law in 1983. This Act is now adopted in some form in many States.

²“A premarital agreement must be in writing and signed by both parties. It is enforceable without consideration.” (UPAA, Section 2). Section 6 establishes substantive requirements for enforceability. Basically the agreements should be executed voluntary and each party must have (before execution) an adequate knowledge of the property or financial obligations of the other party.

rate. Thus, there is some evidence of excessively optimistic expectations, but wrong expectations can never explain why most people do not even sign postnuptial agreements when marriage comes into a crisis, or why a significant number of couples choose an adversarial divorce and not an amicable one.

If none of the previous explanations seems convincing, we still have to find one. The already quoted contribution by H. Mahar (2003) suggests an interesting one. In the interviews there reported, 60% of the respondents considers receiving a proposal of a prenuptial agreement a bad signal. The signaling content of the contract will be our starting point. Partners who do not write a prenuptial agreement, expose themselves to the risk of a costly litigation in case of divorce. In this way they credibly signal to highly evaluate marriage and that they want to devote time, effort and endowments to the success of the relationship. Partners who draw up a prenuptial agreement, by lowering the cost of divorce, signals a low evaluation of marriage and therefore that they have less incentive to exert effort in order to make the relationship successful.

Partners who do not sign a prenuptial agreement, sign a literally incomplete contract which in case of divorce, will be completed by means of a litigation in front of a court. Courts verify partners' behaviors during the relationship and divide the assets according to the marital law. Courts' activity, then, makes the divorce (even more) costly for the partners. The absence of a prenuptial contract is a credible signal only if partners cannot complete their marital contract by themselves when they decide to divorce. In our model couples who did not sign a premarital agreement do not sign postnuptial agreements. Intuitively, mutual distrust prevents real world couples when they start fighting. In order to model this "mutual distrust" spouses can take different actions during marriage. Therefore there is scope for a moral hazard problem which is worsened by the absence of prenuptial agreements, since it leaves undefined what has to be considered an appropriate behavior during marriage. In this setup the lack of a prenuptial agreement is renegotiation proof, since the proposal of a post-nuptial one is taken as a signal of unmonitored misbehavior of the proposer.

In summary, the absence of some clauses in a contract is a literal incompleteness, which is a sort of precommitment (credible or not) to let a third party complete the contract, verifying the relevant contingencies. The cost of verification is used as a signaling device. If the parties can perfectly anticipate what the third party will observe (verify) the commitment is not credible and the parties will renegotiate the previous agreements completing the contract. However, if the parties cannot predict the outcome of the verification activity, then the precommitment might become credible.

There are two streams of literature related to our contribution. The first, which stems from the Becker's seminal works on marriages (Becker 1973, 1974), studies the effect of different marriage laws on the marital institution: Friedberg (1998), Fella, Manzini and Mariotti (2004), Rasul (2006) study how unilateral versus consensual divorces legislation affect the divorce rate. *The main difference of our with this approach is that we are not interested in the effects on the divorce rate, but rather in finding cases where not signing a prenuptial agreement is rational. Our analysis has implications for different policy issues. Namely, it allows provisional answers to the two following questions: 1) should prenuptial agreements be enforceable and 2) should they be mandatory (Becker, 1998)? In our model we prove that prenuptial enforceability can save relevant litigation costs. When individuals may attach very different values to marriage, there are cases in which all agents prefer a separating equilibrium in which only partners who attach less value to the marriage sign prenuptial agreements, to a pooling equilibrium in which all divorcing couples separate in front of a court, since prenuptial agreements are not enforceable. This result seems to us robust, even if one could prove that enforceable premarital agreements increase the probability of divorce, and this increase is socially inefficient (questa frase non so se metterla). Mandatory prenuptial agreements, at the opposite, would force agents who evaluate more the benefit of marriage to separate from the others by signing prenuptial agreements which would make separation costly (for instance by using private arbitrators). Thus, mandatory agreements in our model would be at best irrelevant.*

Considering more in details each single contribution, Fella et al. is the paper more theoretically oriented and for this reason more closely connected with ours. Fella et al. study the possibile effects of different divorce laws on the divorce rate. In this endeavour they model with particular attention all those aspects of marriage which are not verifiable by a court. We are interested in analyzing the role of prenuptial agreements as a way to avoid the use of courts. In our setup it is therefore natural to model primarily the complementary aspects of marital life, that is, those which are verifiable.

The other papers have a similar focus, but a more applied nature. The closest to our contribution is that by Matouschek and Rasul (2004) in which the authors analyze the different motivations to marry instead of simply cohabiting. They model marriage as an exclusive relation which increases the cost of separation with respect to cohabiting. Their main (empirical) result is that marriage has an incentive effect, rather than a signaling one.

In our paper, we make a similar comparison between marriages with or without prenuptial agreements, since the former (like cohabitation), induce lower cost of exiting the relationship. Nevertheless, we focus on the signaling

effects of the prenuptial agreement rather than the incentive ones. However, we show that marriage without prenuptial agreement can have incentive effects with respect to marriage with prenups, which reasonably has incentive effects with respect to cohabiting. Therefore Matouschek and Rasul (2004) findings are not inconsistent with ours, even though marriage without prenuptial has a signaling effect with respect to marriage with it. A more precise assessment of the issue could be done in a model where agents can choose among cohabiting, marriage without prenuptial agreement and marriage with prenup, which is not available as yet.

The second stream of literature takes into consideration the strategic contents of the contracting activity. Non-contingent contracts as a signaling/screening device are analyzed in Aghion-Bolton (1987), Diamond (1993) Hermalin (2001), Bordignon and Brusco (2001), and especially Spier's (1992). Incomplete contracts may help in establishing the appropriate incentive in presence of imperfect verifiability (Bernheim and Whinston (1998)). The last two contributions are concerned with the endogenization of incomplete contracts and in this respect they are closely related with ours.

Even though our paper does not deal with incomplete contract theory, we think that it can provide two side contributions to that literature. In order to explain these contributions, recall that, loosely speaking, there are two kinds of incomplete contracts: flat contracts, i.e., those specifying the same action in different contingencies, and those not specifying what to do in some contingency. Our model suggests that the two forms of incompleteness might have different explanations. Current literature neglects this point, because it tries to derive both forms of contract incompleteness by cost of complexity. The second contribution to the general theory of incomplete contract is that literal incompleteness might matter. Also this point is neglected because it is often assumed that literal incompleteness has no effect when renegotiation is allowed.³

The paper proceeds as follows. In Section 2 we describe the bench mark model and we present how courts rule on divorce when agents have not drawn up divorce clauses in their marriage contracts. In Section 3 we state our main result and in the following Section 4 generalizes this result discussing the optimal separating contract. Section 5 concludes.

2 The Agents' Model

Population is constituted by many agents, N , who live two periods and in period 0 have a private endowment equal to 1. Each agent i can use the

³See Hermalin and Katz (1993).

private endowment as an input factor, denoted by e , to produce a durable, public (within the couple) good G . We assume that for production purposes the public good is “indivisible”, that is, either it is produced or it is not. In the consumption activity we assume that $G \in [0, 1]$, i.e., the good is perfectly divisible. This assumption captures the idea that in real world spouses may have children or not, but they can enjoy their company for fractions of time. Moreover, couples can buy a house, but courts can impose to sell it and share the proceeds. This assumption allows to avoid dealing with these fine details of divorce decision which we do not feel as relevant for this paper.

Agent i can enjoy the endowment as leisure, denoted by l , instead of devoting the time for the production of the public good. Hence: $e_i + l_i \leq 1$ for each agent $i \in N$, that is, effort and leisure cannot exceed total endowment. For simplicity, let assume that $e_i, l_i \in \{0, 1\}$. We refer to the activities l_i and e_i respectively as agent i 's leisure and effort, but we may think at them as money, time, etc., spent respectively for private consumption or for the production of the durable public good. Production of the public good G is a risky activity which depends on the effort devoted by agent i . When agents i and j are married, we will denote the probability that the public good is produced as: $\Pr \{G = 1; e_i, e_j\} = \rho(e_i, e_j)$. We will build a symmetric model and therefore $\rho(1, 0) = \rho(0, 1)$. This allows to simplify notation and define: $\rho_2 = \rho(1, 1)$, $\rho_1 = \rho(1, 0) = \rho(0, 1)$ and $\rho_0 = \rho(0, 0)$, which denote respectively the probability that the durable good is produced when both spouses exert effort, only one does and nobody does. We assume that: $\rho_2 > \rho_1 > \rho_0 > 0$, that is, leisure contribute less to the production activity of the public good than effort. There are two types of agents, who differ for the value that they assign to the public good G : let v_h denote the value assigned by the high type agents to the public good and v_l the value assigned by the low-types with $v_h > v_l \geq 0$. For instance, partners can spend their time either in activities which benefit more who performs them (think for instance to a professional occupation whose benefits are not only monetary but also intangible and can be measured in terms of status, personal fulfilment, social recognition, etc.), or in activities like home care, children education, etc. which have a (more) symmetric effect on the welfare of the partners and can be considered public goods within the couple. People differ on the value they assign to children education or to home life, but still all individuals usually prefer to have well educated children or a cosy house.

Agents are matched in pairs; θ is the degree of fit of the partners and we assume that it is a random variable with $\theta \in \{\theta_b, \theta_g\}$, with $\theta_b < -v_h$, $\theta_g > 0$, $E(\theta) \geq 0$. The assumption that $\theta_b \leq -v_h$ implies that the psychological aspects of marriages, summarized by the degree of fit, are more relevant than the productive ones. More to the point, the psychological as-

pects can drive couples to divorce even when successful from a productive point of view. We deserve this as a reasonable assumption for relationships like marriages, *and even more so since we are not interested in studying the effects of prenuptial agreement laws on the divorce rate.* Let $p = \Pr\{\theta = \theta_b\}$. Agents (and couples) live two periods. A married couple can divorce only in the second period. We assume that the degree of fit, θ , and the production of the durable good, G , are uncorrelated. Agents' expected utility function is linear and separable in all components with no discounting. Given our assumptions, all agents prefer to be matched with a partner who provides effort rather than with one who chooses leisure. If type $k = \{h, l\}$ agent decides to marry, her ex-post utility function is:

$$u_i = \theta + v_k + l_i + \xi[\theta + v_k] \\ + (1 - \xi)[\alpha_i v_k - \Phi_i]$$

where ξ is an indicator functions such that $\xi = 1$ if agent i has a partner at time $t = 1$ and $\xi = 0$ otherwise; α_i is the portion of good G that agent i receives according to the divorce rule and Φ_i is the sum of the litigation costs and monetary transfers (eventually negative) from i to j .

The information structure of the game is as follows. The agents cannot observe the degree of fit θ until they marry. This assumption is obviously restrictive, and could literally be justified if agents cannot live together before marriage. Here, the assumption can also capture the fact that agents can change in that critical part of life just after marriage. During the relations, agents can observe the amount eventually produced but not the level of effort. Courts can verify both the amount of public good produced and the level of effort, but going to a court costs F to each partner, where F is the cost, not necessarily monetary, of a divorce suit in front of a court.

The timing of the game is the following. In the first stage nature selects high types with probability q and low ones with complementary probability. Then each agent proposes a contract. Writing (and reading) a contract costs ε , where ε is a fixed and arbitrarily small amount. Then a matching phase starts. Agents are drawn in pairs from a ballot box containing the entire population. If both agents propose the same contract, then the contract is signed (and no contract is signed whenever both agents do not want to sign any ex-ante contract). If agents propose different contracts, they are put again in the ballot. Pairs are sequentially drawn. Matching is in logic time and ends when all the remaining agents were already matched with all the others left in the ballot. For sake of simplicity, we assume that the number of agents of each type, $|k|$, with $k = \{h, l\}$ is even.

After matching, marriage begins and each agent decides whether to devote effort in producing the durable (public within the couple) good or to

enjoy leisure. Nature determines the degree of fit of the married partners, who afterwards observe the outcome and the level of production. Spouses simultaneously decide whether to continue the marriage or to end it. Divorce occurs if at least one of the partners wishes to end the marriage. In case of divorce spouses may negotiate an ex-post agreement. We simply assume that Nature draws up one of the two partners who is entitled to propose an ex-post agreement, while the other can accept or refuse it. Proposing (and accepting) an ex-post agreement has the same cost as an ex-ante agreement, ε . If the proposal is accepted the ex-post agreement is enforced. On the contrary, if the proposal is rejected, spouses go to court.

The Set of Contracts The contract must be flat, if agents are not willing to pay the verification costs, $2F$. In the opposite, a marital contract specifies all transactions between partners in case of divorce: to whom the public good G is assigned and the amount of monetary transfer from one spouse to the other. Hence, if partners verify the levels of effort, the contract is a function

$$f : \{0, 1\} \times \{0, 1\} \rightarrow [0, 1] \times (-\infty, \infty)$$

where the domain is the level of effort provided by agent 1 and 2 respectively, and the range is the amount of the public good eventually produced assigned to agent 1, and a monetary transfer (that can be negative) from agent 2 to agent 1. We consider here deterministic premarital contracts, that is contracts where either the effort is always verified or never. In Section 4 we consider a larger set of premarital contracts which allows for random verification. Finally, we assume that both ex-ante and ex-post marriage contracts are enforceable.

The Court's Rules Divorce rules adopted by courts vary among different countries and States. There are basically two regimes: (i) a “community property” regime, which essentially means that marital property belongs equally to the partners and in case of (no-fault) divorce it is equally shared; (ii) an “equitable division” regime according to which the “division of jointly owned marital property and the amount of any monetary transfer between the partners is determined by a court in order to reach “a fair and equitable solution”.⁴ In this second case the marital property is not always divided equally, and many factors, such as the contribution of each party to the well-being of the family and to the acquisition of the marital property, the

⁴The Code of Virginia § 20-107.3. In US a community property regime is adopted, for instance in Arizona, California, and Texas, but the majority of States provide for equitable rather than equal distribution.

circumstances and factors which contributed to the dissolution of the marriage, the personal characteristics (age, mental condition) of each partner, etc., are usually taken into account by the court. In our model agents may differ for their type and the effort they exerted, but the courts may only observe this second characteristic and then equitable divorce rules should only depend upon the levels of effort. We restrict a divorce rule to select an equal division of the property (without any monetary transfer) in all cases where parties behaved identically, either exerting effort or not exerting it. In case, the parties exerted a different level of effort and an agent used his/her own endowment for personal well-being, we require that court adopts the rule which (i) awards the other party with a monetary compensation in order to offset the agent who has exerted effort for the well-being of the couple; (ii) assigns the marital asset to the agent who exerted more effort. Our model is consistent with the equitable division regime.⁵ Since the court replaces decisions which parties could autonomously take, we will denote the court decision with the same function $f(\cdot)$ as the prenuptial contract, with some abuse of notation. Hence,

$$\begin{aligned} f(0,0) &= f(1,1) = \left(\frac{1}{2}, 0\right) \\ f(1,0) &= (1, m) \\ f(0,1) &= (0, -m) \end{aligned}$$

In this paper we assume that $1 \geq m > 2F$, where the first inequality says that the maximal penalty provided for by law is not greater than the initial endowment. The last inequality implies that partners will always prefer to divorce in case of bad match even if they have to go to a court. $m > 2F$ states that the total litigation cost (psychological included) should not exceed the possible gains of litigation. We think that these are realistic assumptions in most cases.

2.1 The Flat Premarital Contract

Since the verification activity is costly, going to court implies a loss of efficiency. In our model spouses can avoid the cost of litigation by signing a premarital contract such that f is a constant function and therefore there is no need to verify the level of individual efforts. The flat contract is a function $f(e_i, e_j) = (\beta, 0)$ where $\beta \in [0, 1]$, for all $e_i, e_j \in \{0, 1\}$. Clearly, if this

⁵Our model would be consistent also with the community property regime, if the lack of effort could be considered sufficient for a fault-divorce. However, in our model the lack of effort is never the cause of the divorce which can therefore be considered a no-fault one.

contract is signed and is enforceable, then there is no reason to go to a court in case of divorce. In all cases the public good eventually produced will be split between the partners according to the contract and no monetary compensation is due to the partner by the shirking agent. In the next subsection we will deal with the fair flat premarital contract where the good is splitted evenly, that is, where $\beta = \frac{1}{2}$.

2.2 Preliminary Results when Types are Observable

In this paper we want to show that the absence of a premarital contract is a credible signalling device. Therefore, we focus on the case in which, this is the *only* reason not to sign such a contract.

Suppose that types were observable. Moreover assume that high ones would like to separate and when separated both (the high and the low) make the efficient choice of effort when they sign a flat premarital contract. Finally, suppose that the low type does not provide effort in equilibrium, while the high does (and these choices are consistent with efficiency). Under these assumptions, partners choose not to sign a premarital contract, only due to signalling problems, whenever types are not observable.

Analytically, it is efficient to shirk for the low-type if:

$$\begin{aligned} E(\theta) + 1 + \rho_0 v_l + p(\theta_g + \rho_0 v_l) + (1-p)\frac{1}{2}\rho_0 v_l &\geq \\ E(\theta) + \rho_2 v_l + p(\theta_g + \rho_2 v_l) + (1-p)\frac{1}{2}\rho_2 v_l & \end{aligned}$$

which implies

$$v_l \leq \frac{2}{(3+p)(\rho_2 - \rho_0)}. \quad (1)$$

It is efficient to exert effort for high-type if:

$$v_h \geq \frac{2}{(3+p)(\rho_2 - \rho_0)}. \quad (2)$$

Moreover, suppose that in case of divorce the public good is equally split between the parties. A high-type prefers to exert effort in the production even if the partner does not, if the following holds:

$$\begin{aligned} E(\theta) + \rho_1 v_h + p(\theta_g + \rho_1 v_h) + (1-p)\rho_1 \frac{v_h}{2} &\geq \\ E(\theta) + 1 + \rho_0 v_h + p(\theta_g + \rho_0 v_h) + (1-p)\rho_0 \frac{v_h}{2} & \end{aligned}$$

that is,

$$v_h \geq \frac{2}{(3+p)(\rho_1 - \rho_0)} \quad (3)$$

Condition (3) implies condition (2) and therefore it is also sufficient to ensure that a high-type prefers to exert effort in the production when also the partner does. The above discussion is summarized in the following proposition.

Proposition 1 *If couples are formed by agents of the same type, and conditions (1) and (3) hold, then the flat premarital contract $f(e_i, e_j) = (\frac{1}{2}, 0)$ for all $e_i, e_j \in \{0, 1\}$ is efficient and incentive compatible.*

If agents are able to observe partner's type, then each high-type agent chooses a high-type partner and both exert effort and achieves full separation. When agents do not observe partner's type and effort the flat premarital contract does not induce the separation of types. In fact, a low-type prefers to marry a high-type and still to put no effort in the production of the public good, since all agents prefer to be married with one who provides effort, than the opposite.

The previous result suggests that in homogeneous groups or societies which share the same religious values or cultural traditions, we expect to observe the community property regime as a durable and widespread institution. In fact, the community of cultural or religious values typically increases the information on the potential partner's type. In more heterogeneous societies in which screening and signalling problems between the potential partners may emerge, we expect to observe a variety of different marital institutions and contracts.

3 Main Results

In this section we prove that there exists a Bayesian perfect separating equilibrium where all partnerships are formed by agents of the same type, provided that some conditions are satisfied. In this section we focus on the case where a spouse can only propose to her counterpart to sign a premarital contract in the set Φ or to not sign any premarital contract. As mentioned above, in the next Section we consider more sophisticated premarital contracts where the probability of effort verification is not always either zero or one.

High-type agents propose to the selected partner to sign "no contract", low-type agents propose to sign the flat contract of proposition 1. Hence, in equilibrium the adverse selection problem is solved and all agents exert their

efficient level of effort. Moreover, high-type agents choose to go to Court and not to sign a post marital contract just before divorcing. Inefficient litigation is the result of a signaling game. Players who receive a proposal for an ex-post agreement assign probability 1 that the proposer of an ex-post agreement is an agent who exerted zero effort. Given this belief it is optimal for the receiver to refuse the renegotiation proposal, because the court will force the partner to compensate for the misconduct. Therefore nobody will ever propose a post nuptial agreement. Here we will summarize the main proposition, while leaving a more precise statement and the proof in the Appendix.

Proposition 2 *If the parameters satisfy (1) and (3) if:*

$$v_h \geq 2 \frac{1 + F(1-p)}{(3+p)(\rho_2 - \rho_0)}$$

$$v_l \leq \min \left\{ \frac{1 - (1-p)m}{\frac{1}{2}\rho_2(3+p) - \rho_1(1+p)}, \frac{2(1-p)(m+F)}{2(1+p)\rho_1 - (3+p)\rho_0} \right\},$$

then there exists a separating perfect Bayesian equilibrium such that:

- 1) *all marriages are formed by agents of the same type;*
- 2) $e_i^h = 1$ and $e_i^l = 0$;
- 3) *high-type agents do not propose any contract;*
- 4) *low-type agents sign a flat premarital contract and therefore never incur in litigation costs;*
- 5) *all couples divorce when $\theta = \theta_b$ (the degree of fit is negative);*
- 7) *high-type partners always face costly litigation in case of divorce;*
- 8) *Agents who receive an ex-post agreement proposal will believe with probability one that the partner shirked; therefore, nobody in equilibrium will propose an ex-post agreement.*

Proof. See the Appendix. ■

The separating equilibrium does exist since for high-type agents the gain of joining with a high-productivity partner is greater than the expected cost of facing a contentious divorce, while the opposite holds true for low-type agents. This occurs since agents differ in their private evaluation over the public good: low-type agents assign a low value to the public good and therefore the expected cost due to the positive probability of a contentious divorce does not compensate the increase in the ex-ante probability of producing the public good when the partner is a high type. The assumption that $m > 2F$ implies that no agent who exerted effort wants to make an ex-post agreement proposal. In fact the only proposals that are going to be accepted provide a

payoff of $-m$ to the proposer, which is always lower than the payoff she can obtain by going to the court.

The choice to not sign any contract is an effective device to sustain the separating equilibrium, because partners who have to go in front of a court decide to not complete their contracts, even if to go to a court is ex-post not efficient. This decision is sustained by specific out-of-equilibrium beliefs. That is, if a partner receives an ex-post negotiation proposal, he assigns probability one that the proposer shirked. This belief implies that a renegotiation proposal is refused. This, in turn, implies that in equilibrium a proposal is never made. The next goal of this section is to show that this belief is the only one satisfying the weakest of the divinity criteria: the D1 criterion.

We will not define the D1 criterion formally. Its intuition is as follows. Suppose that one player is observed deviating from the equilibrium and that there are two different types of that player, types 1 and 0. Moreover, suppose that any belief that the deviating player might held, induces 0 to deviate whenever it induces 1 to do so, but not the opposite. That is, there are beliefs that induce 0 to deviate, but not 1. Then, according to D1, we must assign probability zero that the deviating player is of type 1.

Proposition 3 *For any positive, arbitrarily small, cost of proposing an ex-post agreement, ε , if $m > 0$, then only the equilibrium beliefs of Proposition 2 satisfy the D1 criterion, that is, the counterpart who receives a renegotiation proposal infers that the proposer shirked with probability 1.*

Proof. See the Appendix ■

The intuition of this proposition is the following. Agents who have not exerted effort are more prone to renegotiate since in case of litigation in front of a court they incur in the penalty that the court inflicts to shirking agent. For this reason an agent infers that the partner shirked in case she receives an agreement proposal.

Remark 1 *We assumed that both agents simultaneously choose to divorce, if $\theta = \theta_b$, before negotiating the divorce. Our argument still holds if we assumed that the proposer may also propose to continue the marriage. In this case, the equilibrium beliefs should assign probability 1 that the partner who proposes to continue the marriage is a shirker.*

Remark 2 *Notice that a proposal of an ex post agreement could be done both by a deviating high-type who did not exert effort, or by a deviating low type who find it optimal to shirk if married with an high type. Given assumption (3) the former case is excluded. However in the Appendix we prove that the*

equilibrium holds also for parameter values which do not satisfy (1) and (3). Under those more general conditions it is possible to conceive a deviating high type for whom shirking is not a dominated strategy.

Remark 3 *The main implication of previous Remark 2 is that the absence of a contract can also have incentive effects on partners, inducing them to behave correctly, besides having important sorting ones.*

4 The Optimal Separating Contract

As we pointed out above, going to court is a (credible) device to sustain a separating equilibrium, but it is ex post inefficient. Therefore, a contract inducing partners to litigate with probability one in case of divorce may not be an optimal separating contract. In fact, high-type partners might achieve separation going to court with some positive probability (less than one) in case of divorce. This strategy allows to reduce the ex-post inefficiency by reducing the probability of a divorce suit.

In this section we want to study the best contract (in term of high-type agents payoff) which sustains a separating equilibrium. To this aim, we consider here a larger set of premarital contracts, where they specify not only to whom the public good eventually produced is assigned and a monetary transfer between partners, but also the probability to go a court. Let P^{\max} be the maximal feasible penalty for misconduct, that we assume finite either for the presence of liquidity constraint or because contracts with higher fees are not enforceable by law. Since a high-type agent never incurs in the punishment, it is clearly optimal to fix it at its maximum level.

We focus here on the case that the probability of going to court (i.e. to verify the effort exerted by the partners) does not depend upon the amount of public good produced. In a previous version we generalize the analysis to the case when the probability of litigation may change whether the public good were produced or not. The analysis of the general case is analytically less simple but not much more informative from an economic point of view.

Let γ be the probability of going to court in case of divorce. Let consider any pair (v_h, v_l) such that conditions (1) and (3) are satisfied. Recall that the flat contract is efficient and high-type agents do provide effort even if the partner does not, and therefore the only relevant constraint is the self-selection one for the low-types. The optimal separating contract is the contract which sustains the separating equilibrium described in Proposition 2 providing the highest expected utility to the high-type agents. Hence the optimal separating contract is the contract which minimizes the probability γ

of ex-post verification subject to the self-selection constraint for the low-type being satisfied.

Proposition 4 *If the parameters satisfy (1) and (3) then the contract which provides for effort verification with probability*

$$\gamma^* \equiv \frac{v_l(\rho_1 - \rho_0)(3 + p)}{(1 - p)(\rho_1 v_l + 2(P + F))}$$

in case of divorce, maximizes the high-type agents' expected utility, among all contracts which sustain a separating equilibrium. The above optimal separating contract is renegotiation-proof: if an agent proposes to renegotiate this contract, the partner assigns probability 1 to the fact that the proposer has not exerted effort, by the D1 criterion

Proof. See the Appendix ■

This analysis deserves some comments. We prove that the optimal separating contract induces costly litigation with a positive probability. This result is consistent with the observation that couples who enter in a divorce process sometimes end their relationship with an adversarial divorce, but sometimes reach an amicable agreement before entering into a litigation in front of a court. In our model to sign the optimal prenuptial agreement with random verification is equivalent to not sign any prenuptial agreement and accept to sign a postnuptial agreement with probability γ^* , in case of divorce. Note in fact that the same reasons which prevent partners from renegotiating their contract (as we showed in Remark (??)), prevent them to accept postnuptial agreement with a probability higher than γ^* .

Finally, the divorce legislation determines which couples do write premarital agreements. If divorce legislation always oblige to equally divide the marital asset, we expect that high-type couples do write premarital contracts with random verification, for instance using private arbitrators, while low-type couples do not write any premarital contract, because the regime replicates their equilibrium contract described in section 3.

4.1 Robustness of the Equilibrium to the Matching Process

In our model we restrict the agent to announce a single contract in the matching stage. Hence a problem of multiple equilibria immediately arises. Any contract which provides to agents a utility higher than the utility of remaining alone, is an equilibrium of the game when all agents announce this contract since no agent can deviate making a different proposal. Hence, in

order to refine our equilibria we could generalize the matching stage allowing each agent to propose not only a single contract, but a set of contracts that he agrees to sign. We take here a different approach, which is analogous to that taken in the matching literature and more specifically in the network formation literature. In that literature it is used the concept of pairwise-stable allocation for cooperative equilibria, first introduced by Jackson and Wolinsky (1996) and more recently the notion of pairwise-Nash equilibrium for non-cooperative equilibria (see Calvó-Armengol and İlkiliç (2005)). We simply extend those notions to our setup of incomplete information. Namely, a pairwise stable perfect Bayesian Nash equilibrium satisfying the D1 criterion is a perfect Bayesian Nash equilibrium such that there exists no pair of agents that proposing a different contract can gain a higher expected utility under the constraint that their beliefs have to satisfy the D1 criterion.

For instance, by condition (1), low-type agents prefer to not exert effort if they sign a flat contract. It follows that there is no pairwise perfect Bayesian Nash equilibrium where all agents propose the same contract in the matching stage and then exert effort during the relationship. Suppose in fact that (i) there exists a contract where ex-post verification occurs with some positive probability such that the expected punishment for shirking agents is so large to induce low-type agents to exert effort; (ii) all agents propose such a contract in the matching stage. Consider then any pair of low-type agents: they can sign a flat contract, do not exert effort, and obtain a strictly larger payoff.

Proposition 5 *Consider any pair (v_h, v_l) which satisfies conditions 1 and 3. If $P^{\max} \geq \frac{v_l(\rho_1 - \rho_0)F}{v_h(\rho_2 - \rho_{med})} - (F + \rho_1 \frac{v_l}{2})$, then the unique pairwise stable perfect Bayesian Nash equilibrium is the separating equilibrium where low-type couples sign a flat contract and high-type couples sign the contract that in case of divorce provide for effort verification with random probability γ^* .*

Proof. See the Appendix. ■

5 Discussion and Interpretation

Our paper offers an explanation for the scarce diffusion of the prenuptial agreements, based not on the presence of large transaction costs, bounded rationality or psychological qualms, but on rational behavior in a matching market characterized by asymmetric information on the partners' types. Namely, we show that under some conditions agents can rationally choose to not draw up these contracts. Moreover we prove that the enforceability

of prenuptial agreement can also be efficient, since prenuptial agreements allow to save litigation costs for those couples which attach less value to this institution. It is important to stress that we do not show that under any condition is efficient that agents can (but not have to) draw such contracts. Nevertheless we believe that to defend the principle of freedom contracting (and of no mandatory contracting) is sufficient to prove that there are at least some conditions under which this freedom is consistent with a rational and efficient behavior.

In the following lines we discuss some assumptions of our model.

Matching. We restricted ourselves to matching rules which prevent agents from remaining unmatched. In fact, we were interested in analyzing how partners contract over their divorce and how different contracts affect the ex-post probability of divorce, while we were not concerned about how the divorcing decision affects the ex-ante probability to marry. However, we conjecture that generalizing the model would not change the qualitative results.

Renegotiation. In the model agents may complete their contracts after having observed the outcome, and therefore when they already exerted the effort. High-type agents reject any proposal in the renegotiation stage since they believe that the partner who makes a proposal did not exert effort. What does it happen if we allow agents to complete the contract at time 0, before effort is exerted? Let us consider a game where at time zero an agent can ask to complete the contract to the partner, but, consistently with this assumption, the partner may accept or reject the proposal. If she rejects, she can then decide whether to continue the marriage or to divorce in order to marry with a different partner. It is possible to check that our main argument still holds. There exists a separating equilibrium where high-type agents reject the proposal to complete the contract since they believe with probability one that the partner who makes the proposal is a low-type who is going to not exert effort. Moreover, (after rejection) they divorce in order to find a new partner. One can also check that these beliefs are the only one satisfying the D1 criterion. In fact, a deviating low-type prefers to not exert effort. Therefore he is more prone to renegotiate the incomplete contract which is costly in case of divorce at time one after the effort has been exerted.

The Role of the Court. We assume that courts may verify how a spouse uses her initial endowment (effort) (even if the partner cannot) at the same cost at which the partner observes it. This seems to us a reasonable assumption, since courts (even if have not direct information) have coercive and mandatory power and they can inspect bank accounts, call a third party as a witness, etc.. Moreover by letting the law (and consequently the courts) determine which is a misconduct and which is a proof of such a behavior,

partners (who, in general are not lawyers) implicitly increase the cost of observing a violation of the (incomplete) contract and decrease the cost for a third party to verify it.

On the contrary, we do not assume that courts may verify the production technology, that is a “black box” for courts, which can only observe the individual inputs and the total output. In this model, we speak about courts, but agents can also use private arbitrators, and our arguments still hold. However, there might be other reasons to prefer courts to private arbitrators. For instance, the verification technology (which in our setting determines the litigations costs) may present increasing return to scale, so that a centralized institution (a court) is more efficient than private arbitrators⁶; another justification is that private arbitrators may be more prone to collusive agreements with one of the party than a court. Such consideration is even more relevant if we introduce some form of asymmetry between the parties, which seems an important issue, since it is reasonable to assume that a court protects the weakest party more efficiently than a private arbitrator.

⁶It worths noticing that in our framework courts have to be efficient, as far as it regards the cost of verification, but not too much. In fact if courts are “too efficient” and are able to verify agents’ effort without no costs, high-type agents will prefer to draw up contracts which provide for private costly arbitration, in order to maintain positive costs of divorce.

References

- [1] Aghion, P., and P. Bolton (1987): “Contract as Barrier to Entry”, *American Economic Review*, 77, 388-401.
- [2] Baker, L. and R. Emery (1993): “When Every Relationship is Above Average: Perceptions and Expectations of Divorce at the Time of Marriage”, *Law and Human Behavior*, 17, 439-464.
- [3] Becker G. S. (1973) “A Theory of Marriage: Part I”, *Journal of Political Economy*, 81, 813-46.
- [4] Becker G. S. (1974) “A Theory of Marriage: Part II”, *Journal of Political Economy*, 82, S11-S26.
- [5] Becker, G. S. (1998) “Do You Swear to Love, Honor and Cherish? Then Sign Here”, *Hoover Digest*.
- [6] Bernheim D. B. and M. D. Whinston (1998): “Incomplete Contracts and Strategic Ambiguity”, *American Economic Review*, 88, 902-932.
- [7] Bordignon M., and S. Brusco (2001): “Optimal Secession Rules”, *European Economic Review*, 45, 1811-34.
- [8] Bramlett, M.D., and W. D. Mosher (2001): “First Marriage Dissolution, Divorce and Remarriage: United States.”, *Advanced Data No.323 NCHS*.
- [9] Calvó-Armengol A. and R. İlkiliç (2005), “Pairwise-Stability and Nash Equilibria in Network Formation”, FEEM n. 34.2005.
- [10] Diamond, D. (1993): “Seniority and Maturity of Debt Contracts”, *Journal of Financial Economics*, 33, 341-368.
- [11] Fella G., P. Manzini and M. Mariotti: “Does Divorce Law Matter?”, *Journal of the European Economic Association*, 2 (4), 607-633.
- [12] Friedberg., L. (1998): “Did Unilateral Divorce Raise Divorce Rates? Evidence from Panel Data,” *American Economic Review*, 88 (3), 608-627.
- [13] Hermalin, B. (2001): “Adverse Selection, Short-term Contracting, and the Under-provision of On-the-job Training,” mimeo: University of California.

- [14] Hermalin, B. and M. Katz (1993): “Judicial Modification of Contracts between Sophisticated Parties: A More Complete View of Incomplete Contracts and Their Breach” *Journal of Law, Economics, and Organization*, 9, 230-55.
- [15] Jackson M. and A. Wolinsky (1996): “A Strategic Model of Social and Economic Networks”, *Journal of Economic Theory*, 71, 44-74.
- [16] Mahar, H. (2003): “Why Are there so Few Prenuptial Agreements”, John M. Olin Center for Law, Economics, and Business Discussion Paper n 436.
- [17] Rasul, I. (2006): “Marriage Markets and Divorce Laws” *Journal of Law, Economics, and Organization*, 22, 30-69.
- [18] Rasul, I. , N. Matouschek (2004): “The Economics of the Marriage Contract: Theories and Evidence”, mimeo Northwestern University.
- [19] Spier, K. (1993): “Incomplete Contracts and Signaling”, *Rand Journal of Economics*, 23, 432-443.

6 Appendix

In order to prove Proposition 2, we first prove that our equilibrium holds also for a more general set of parameter values and then prove that the proposition is an implication of the more general one.

Proposition 6 *If $v_l \leq \bar{v}_l$, $v_h \geq \bar{v}^h$, where:*

$$\frac{\bar{v}_h}{2} = \max \left\{ \frac{1 - m(1-p)}{(1-p)\rho_2 + 2(1+p)(\rho_2 - \rho_1)}, \frac{2(1-p)F}{(3+p)(\rho_2 - \rho_1)}, \frac{1 + (1-p)F}{(3+p)(\rho_2 - \rho_0)} \right\}$$

and:

$$\frac{\bar{v}_l}{2} = \min \left\{ \frac{1}{(3+p)(\rho_1 - \rho_0)}, \frac{(1-p)(m+F)}{2(1+p)\rho_1 - (3+p)\rho_0}, \frac{(1-p)F+1}{(3+p)(\rho_2 - \rho_0)} \right\}$$

then the following perfect Bayesian equilibrium exists:

High-type agents:

- 1) announce to sign no contract. They reject any contract proposal;
- 2) exert the efficient level of effort: $e_i = 1$;
- 3) exert effort when married to a low type if $F \geq \frac{\rho_2 - \rho_1}{(1-p)(\rho_1 - \rho_0)}$, otherwise they shirk;
- 4) choose to divorce if $\theta = \theta_b$;
- 5) in case of divorce and the partner is the proposer of the ex-post agreement:
 - 5.1) if they exerted effort they accept only proposals such that they receive the public good eventually produced and monetary transfer from the partner at least equal to $m - F$.
 - 5.2) if they shirked they accept any proposal such that they pay at most $m + F$ to the partner and do not receive any amount of the public good eventually produced;
- 6) in case of divorce and if they are the proposers of the ex-post agreement:
 - 6.1) if they exerted effort they do not make any proposal;
 - 6.2) if they shirked they offer to give to the partner the public good and to pay a total transfer of $m - F$ to her.

Low-type agents:

- 1) announce to sign the flat contract, $f(e_i, e_j) = (\frac{1}{2}, 0)$ for all $e_i, e_j \in \{0, 1\}$. They reject any proposal to sign a prenuptial agreement with effort verification;
- 2) do not exert any effort in the equilibrium path, $e_i = 0$;
- 3) shirk if married with an high type;
- 4) behave as high type agents (who exert the same level of effort) both in the

decision about divorcing and in the renegotiation stage, whenever no complete contract was drawn.

If an agent proposes a premarital contract, the partner assumes with probability 1 that the proposer is a low-type. In case of divorce, if partner j proposes an ex-post agreement, then agent i has beliefs which assign probability 1 that agent j exerted zero effort.

Proof. High-type agents. The high types prefer to exert effort than not exerting it, when they marry a high-type partner and do not sign any premarital contract if:

$$\begin{aligned} E(\theta) + \rho_2 v_h + p(\theta_g + \rho_2 v_h) + (1-p)(\rho_2 \frac{v_h}{2} - F) &\geq \\ E(\theta) + 1 + \rho_1 v_h + p(\theta_g + \rho_1 v_h) - (1-p)(m + F) & \end{aligned}$$

that is

$$v_h \geq \frac{1 - m(1-p)}{\frac{1}{2}(1-p)\rho_2 + (1+p)(\rho_2 - \rho_1)}. \quad (4)$$

If the high type who marries a low one will exert effort, the self-selection constraint for the high type is satisfied if:

$$\begin{aligned} E(\theta) + \rho_2 v_h + p(\theta_g + \rho_2 v_h) + (1-p)(\rho_2 \frac{v_h}{2} - F) &\geq \\ E(\theta) + \rho_1 v_h + p(\theta_g + \rho_1 v_h) + (1-p)\rho_1 \frac{v_h}{2} & \end{aligned}$$

which is equivalent to:

$$v_h \geq \frac{2(1-p)F}{(3+p)(\rho_2 - \rho_1)}. \quad (5)$$

If the high type who marries a low one will shirk, the self-selection constraint for the high type is satisfied if:

$$\begin{aligned} E(\theta) + \rho_2 v_h + p(\theta_g + \rho_2 v_h) + (1-p)(\rho_2 \frac{v_h}{2} - F) &\geq \\ E(\theta) + 1 + \rho_0 v_h + p(\theta_g + \rho_0 v_h) + (1-p)\rho_0 \frac{v_h}{2} & \end{aligned}$$

or:

$$v_h \geq 2 \frac{1 + F(1-p)}{(3+p)(\rho_2 - \rho_0)} \quad (6)$$

It is obvious that either (5) or (6) is binding. If (5) is binding then the deviating high type will exert effort when married to a low one. Otherwise, he will shirk. (5) will be binding if:

$$\frac{2(1-p)F}{(3+p)(\rho_2 - \rho_1)} \geq 2 \frac{1 + F(1-p)}{(3+p)(\rho_2 - \rho_0)}$$

or:

$$F \geq \frac{\rho_2 - \rho_1}{(1-p)(\rho_1 - \rho_0)}$$

Low-type agents. A low type agent who marries a low-type partner and signs a flat premarital contract, prefers to shirk (conditioned to the fact the partner does not exert effort) if:

$$\begin{aligned} E(\theta) + 1 + \rho_0 v_l + p(\theta_g + \rho_0 v_l) + (1-p)\rho_0 \frac{v_l}{2} &\geq \\ E(\theta) + \rho_1 v_l + p(\theta_g + \rho_1 v_l) + (1-p)\rho_1 \frac{v_l}{2} & \end{aligned}$$

which after easy calculation becomes:

$$v_l \leq \frac{2}{(3+p)(\rho_1 - \rho_0)} \quad (7)$$

A deviating low type who marries a high type, prefers to not exert effort if

$$\begin{aligned} E(\theta) + 1 + \rho_1 v_l + p(\theta_g + \rho_1 v_l) - (1-p)(m + F) &\geq \\ E(\theta) + \rho_2(1+p)v_l + p\theta_g + (1-p)\left(\rho_2 \frac{v_l}{2} - F\right) & \end{aligned}$$

that is:

$$v_l \leq \frac{1 - (1-p)m}{\frac{1}{2}\rho_2(3+p) - \rho_1(1+p)}, \quad (8)$$

and it is easy to check that both numerator and denominator of the right side are positive for $p < 1$. When a deviating low type shirks if married to an high one, the self selection constraint for the low type is satisfied if:

$$\begin{aligned} E(\theta) + 1 + \rho_0 v_l + p(\theta_g + \rho_0 v_l) + (1-p)\rho_0 \frac{v_l}{2} &\geq \\ E(\theta) + 1 + \rho_1 v_l + p(\theta_g + \rho_1 v_l) - (1-p)(m + F) & \end{aligned}$$

that is

$$v_l \leq \frac{2(1-p)(m + F)}{2(1+p)\rho_1 - (3+p)\rho_0} \quad (9)$$

provided that the denominator is positive, otherwise it is always satisfied. Finally, the unique ex-post proposal that is going to be accepted is such that the proposer pays $m - F$ to her partner and leaves her the property of the public good. In not making any proposal a high-type agent who exerted effort obtains $-F$, in case no public good has been produced and $\frac{v_h}{2} - F$ in case it has been produced. It follows that no proposal is going to be made

by a high-type (who exerted effort) if $-m + F < -F$ or $m > 2F$, as we assumed. ■

Proof of Proposition 2. Notice that (3) implies (4). In fact:

$$\frac{2}{(3+p)(\rho_2 - \rho_1)} - \frac{1 - m(1-p)}{\frac{1}{2}(1-p)\rho_2 + (1+p)(\rho_2 - \rho_1)} = \frac{2(3 - 2p - p^2)(\rho_2 - \rho_1)m + (1-p)\rho_1}{(3+p)(\rho_2 - \rho_1)((3+p)\rho_2 - 2(1+p)\rho_1)} \geq 0$$

Moreover, (3) implies (5). In fact:

$$\frac{2}{(3+p)(\rho_2 - \rho_1)} \geq \frac{2(1-p)F}{(3+p)(\rho_2 - \rho_1)}$$

iff: $1 \geq (1-p)F$, which is satisfied by assumption. Therefore only (6) imposes new restrictions on the set of parameter values where the model holds with respect to (3).

Finally notice that (1) implies (7), but not (8) and (9). ■

Proof of Proposition 3: Consider agent i who values $v_i = \{v_h, v_l\}$ the public good and who does provide effort in the public good production, $e_i = 1$. Let $(\gamma v_i, \chi)$ be an ex-post agreement where $\gamma \in [0, 1]$ is the portion of good G to be assigned to agent i and χ is a monetary transfer from i to her partner (which can be negative). Denoted with μ_1 the probability that the partner will accept the proposal, agent i will propose the ex post agreement $(\gamma v_i, \chi)$ if the following holds:

$$\mu_1(\lambda \gamma v_i - \chi) + (1 - \mu_1) \left(\lambda \frac{v_i}{2} - F \right) - \varepsilon \geq \lambda \frac{v_i}{2} - F$$

where $\lambda = 1$ if the public good has been produced, $\lambda = 0$ otherwise. Notice that the inequality can be satisfied only if:

$$\lambda \gamma v_i - \chi - \lambda \frac{v_i}{2} + F \geq \varepsilon$$

Therefore the inequality can be expressed as:

$$\mu_1 \geq \frac{\varepsilon}{\lambda \gamma v_i - \chi - \lambda \frac{v_i}{2} + F} \equiv \underline{\mu}_1$$

Agent i who does not provide effort in the public good production, $e_i = 0$, will propose an ex-post agreement, denoted with μ_0 the probability that the partner will accept the proposal, if

$$\mu_0(\lambda \gamma v_i - \chi) + (1 - \mu_0)(-m - F) - \varepsilon \geq -m - F$$

Again notice that the inequality is satisfied only if:

$$\lambda\gamma v_i - \chi + m + F \geq \varepsilon$$

that is,

$$\mu_0 \geq \frac{\varepsilon}{\lambda\gamma v_i - \chi + m + F} \equiv \underline{\mu}_0$$

Noticing that $m > 0$, it is easy to check that $\underline{\mu}_0 < \underline{\mu}_1$ for any value of $\varepsilon > 0$. Hence there exists a larger set of conjectures that i might hold that induces i to deviate when $e_i = 0$ with respect to when $e_i = 1$. Hence for the D1 criterion the partner should assign probability 1 to the fact that $e_i = 0$. ■

Proof of Remark 2. Suppose that a postnuptial agreement is always signed in case of divorce. A high-type agent prefers to shirk than to exert effort if

$$E(\theta) + \rho_2 v_h + p(\theta_g + \rho_2 v_h) + (1-p)U_c \leq E(\theta) + 1 + \rho_1 v_h + p(\theta_g + \rho_1 v_h) + (1-p)U_c$$

where U_c is the expected utility gained in case of divorce if the proposal of an agreement is accepted. The above condition is equivalent to:

$$v_h \leq \frac{1}{(1+p)(\rho_2 - \rho_1)} \quad (10)$$

Hence if condition 10 holds, to shirk is not a dominated strategy. Comparing the above condition with those of Proposition 6, we must prove that:

$$\bar{v}_h \leq v_h \leq \frac{1}{(1+p)(\rho_2 - \rho_1)}$$

whose necessary condition is

$$\bar{v}_h \leq \frac{1}{(1+p)(\rho_2 - \rho_1)}$$

that is:

$$\max \left\{ 2 \frac{1 - m(1-p)}{(1-p)\rho_2 + 2(1+p)(\rho_2 - \rho_1)}, \frac{2(1-p)F}{(3+p)(\rho_2 - \rho_1)}, 2 \frac{1 + F(1-p)}{(3+p)(\rho_2 - \rho_0)} \right\} \leq \frac{1}{(1+p)(\rho_2 - \rho_1)}$$

We will prove that the inequality holds for each member. Let us start with the first one which would be satisfied if:

$$2 \frac{1 - m(1-p)}{(1-p)\rho_2 + 2(1+p)(\rho_2 - \rho_1)} \leq \frac{2}{(1-p)\rho_2 + 2(1+p)(\rho_2 - \rho_1)} \leq \frac{1}{(1+p)(\rho_2 - \rho_1)}$$

However the first inequality is trivially true, while the last inequality is satisfied since:

$$\frac{1}{(1+p)(\rho_2 - \rho_1)} - \frac{2}{((1-p)\rho_2 + 2(1+p)(\rho_2 - \rho_1))} = \frac{\rho_2(1-p)}{(1+p)(\rho_2 - \rho_1)((1-p)\rho_2 + 2(1+p)(\rho_2 - \rho_1))} \geq 0$$

As for the second element notice that it would be implied by:

$$\frac{2(1-p)F}{(3+p)(\rho_2 - \rho_1)} \leq \frac{(1-p)}{(3+p)(\rho_2 - \rho_1)} \leq \frac{1}{(1+p)(\rho_2 - \rho_1)}$$

The first inequality is satisfied and the last inequality is equivalent to:

$$\frac{1}{(1+p)(\rho_2 - \rho_1)} - \frac{(1-p)}{(3+p)(\rho_2 - \rho_1)} = \frac{2+p+p^2}{(3+p)(1+p)(\rho_2 - \rho_1)} \geq 0$$

which is satisfied. For the last we apply a similar argument. It is satisfied if:

$$2 \frac{1 + F(1-p)}{(3+p)(\rho_2 - \rho_0)} \leq 2 \frac{1 + (1-p)\frac{1}{2}}{(3+p)(\rho_2 - \rho_0)} = \frac{2 + (1-p)}{(3+p)(\rho_2 - \rho_0)} \leq \frac{1}{(1+p)(\rho_2 - \rho_1)}$$

where the first inequality is satisfied, the equality is simple manipulation, while the last holds since:

$$\frac{1}{(1+p)(\rho_2 - \rho_1)} - \frac{2 + (1-p)}{(3+p)(\rho_2 - \rho_0)} = \frac{3(2\rho_2 + \rho_1 - 3\rho_0) + p(\rho_2 + 2\rho_1 - 3\rho_0) + p^2(\rho_2 - \rho_1)}{(3+p)(1+p)(\rho_2 - \rho_0)(\rho_2 - \rho_1)} \geq 0$$

■

Proof of Proposition 4: In order to write the self selection constraint for the low-type we have to consider if a low-type who deviates and marry a high-type partner exerts effort or not.

The low-type expected payoff given a flat contract is

$$E(\theta) + 1 + \rho_0 v_l + p(\theta_g + \rho_0 v_l) + (1-p)\rho_0 \frac{v_l}{2}, \quad (11)$$

if he deviates, marry a high-type and does exert effort, then his expected payoff is:

$$E(\theta) + \rho_2 v_l + p(\theta_g + \rho_2 v_l) + (1-p)\left(-\gamma F + \rho_2 \frac{v_l}{2}\right), \quad (12)$$

while if he deviates, marry a high-type and does not exert effort his expected payoff is

$$E(\theta) + 1 + \rho_1 v_l + p(\theta_g + \rho_1 v_l) + (1-p)(-\gamma(P^{\max} + F)) + (1-\gamma)\rho_1 \frac{v_l}{2} \quad (13)$$

By condition (1), (11) \geq (12) for all $\gamma \geq 0$. Moreover, (13) $>$ (12) for $\gamma = 0$, and (13) is monotonically decreasing in γ . It follows that if it exists a $\gamma \in [0, 1]$ for which ((11)) = (13) ($>$ (12)), then it is unique and characterizes the optimal separating contract, being the minimal γ for which the self-selection constraint is satisfied.

Summing up, the probability γ^* which characterizes the optimal separating contract is obtained by the following condition

$$E(\theta) + 1 + \rho_0 v_l + p(\theta_g + \rho_0 v_l) + (1-p)\rho_0 \frac{v_l}{2} = E(\theta) + 1 + \rho_1 v_l + p(\theta_g + \rho_1 v_l) + (1-p)(-\gamma^*(P^{\max} + F)) + (1-\gamma^*)\rho_1 \frac{v_l}{2},$$

that is,

$$\gamma^* \equiv \frac{v_l(\rho_1 - \rho_0)(3+p)}{(1-p)(\rho_1 v_l + 2(P^{\max} + F))} \quad (14)$$

Noting that $\frac{\partial \gamma}{\partial v_i} > 0$ and that $\gamma^* = 0$ for $v_l = 0$, we can calculate the minimal cost of litigation for a shirking agent, $(P^{\max} + F)$, which guarantees the existence of a separating equilibrium for all pair (v_l, v_h) which satisfies conditions (1) and (3). In fact substituting into (14) $v_l = \frac{2}{(3+p)(\rho_2 - \rho_0)}$, we obtain

$$\gamma^* \equiv \frac{\frac{(\rho_1 - \rho_0)}{(\rho_2 - \rho_0)}}{(1-p)(P^{\max} + F + \rho_1 \frac{1}{(3+p)(\rho_2 - \rho_0)})},$$

and therefore,

$$(P^{\max} + F) \geq \frac{2\rho_1(1+p) - \rho_0(3+p)}{(1-p)(3+p)(\rho_2 - \rho_0)}.$$

We still have to check whether the optimal separating contract is renegotiation proof. Namely, we have to check that if an agent proposes to renegotiate this contract, the partner assigns probability 1 to the fact that the proposer has not exerted effort, by the *D1* criterion. Let $\gamma < \gamma^*$ be the probability to go to court in the renegotiation proposal (we only look at proposals where the penalty is still the largest possible one, P^{\max} , since, our argument immediately applies to the case in which an agent proposes a lower penalty for misconduct). Let λ be an indicator function such that $\lambda = 1$ if the public good has been produced, $\lambda = 0$ otherwise. Agent i will propose an ex-post agreement when providing effort in the public good production, $e_i = 1$, if:

$$\begin{aligned} \mu_1(\gamma(\lambda \frac{v_i}{2} - F) + (1-\gamma)\lambda \frac{v_i}{2}) + (1-\mu_1) \left(\gamma^*(\lambda \frac{v_i}{2} - F) + (1-\gamma^*)\lambda \frac{v_i}{2} \right) - \varepsilon \geq \\ \gamma^*(\lambda \frac{v_i}{2} - F) + (1-\gamma^*)\lambda \frac{v_i}{2}, \end{aligned}$$

where μ_1 is the probability that the partner will accept the proposal and $v_i = \{v_h, v_l\}$ is the value of the public good for agent i . Hence:

$$\mu_1 \geq \frac{\varepsilon}{(\gamma^* - \gamma) (F + \lambda \frac{v_i}{2})} \equiv \underline{\mu}_1$$

If instead agent i who does not provide effort in the public good production, $e_i = 0$, he will propose an ex-post agreement when:

$$\begin{aligned} \mu_0(-\gamma(P^{\max} + F) + (1-\gamma)\lambda \frac{v_i}{2}) + (1-\mu_0) \left(-\gamma^*(P^{\max} + F) + (1-\gamma^*)\lambda \frac{v_i}{2} \right) - \varepsilon \geq \\ -\gamma^*(P^{\max} + F) + (1-\gamma^*)\lambda \frac{v_i}{2} \end{aligned}$$

where μ_0 is the probability that the partner will accept the proposal. Therefore

$$\mu_0 \geq \frac{\varepsilon}{(\gamma^* - \gamma')(F + P^{\max} + \lambda \frac{v_l}{2})} \equiv \underline{\mu}_0$$

and it is straightforward to note that $\underline{\mu}_0 < \underline{\mu}_1$. ■

Proof of Proposition 5:

We have to consider two types of equilibria: (i) “separating” equilibria where high-type agent announce a certain type of contract and low-type agents announce a different contract, and therefore all couples are formed by the same type of agents; (ii) “pooling” equilibria where all agents announce the same contract (but then different types can exert different level of effort). It turns out immediately that the unique potentially pairwise-stable equilibrium among the former type is the equilibrium where high-type agents sign a contract with γ^* random probability of ex-post verification in case of divorce. In fact if low-type agents sign a different contract than the high-type agents, then they sign a flat contract. Hence, high-type agents sign the signalling contract which guarantee to them the largest payoff.

Consider now any equilibrium where all agents propose the same contract. We have already argued in the main text that there is no pairwise stable equilibrium where low-type agents sign contracts with ex-post verification. Then a “pooling” equilibrium where all agents propose the same contract is pairwise stable only if low-type agents do not exert effort. It follows that the contract has no incentive effect, and then the unique proposal that can be part of a pairwise stable equilibrium is the flat contract. Let $\rho_{ave} = q\rho_2 + (1-q)\rho_1$. A high-type agent obtains a higher payoff in the optimal separating equilibrium than in the “semi-pooling” equilibrium where all couples sign the flat contract (and low-type agents do not exert effort) if:

$$E(\theta) + \rho_2 v_h + p(\theta_g + \rho_2 v_h) + (1-p) \left(-\gamma^* F + \rho_2 \frac{v_h}{2} \right) \geq$$

$$E(\theta) + \rho_{ave} v_h + p(\theta_g + \rho_{ave} v_h) + (1-p) \rho_{ave} \frac{v_h}{2}$$

that is if

$$P^{\max} \geq \frac{v_l(\rho_1 - \rho_0)F}{v_h(\rho_2 - \rho_{ave})} - \left(F + \rho_1 \frac{v_l}{2} \right).$$
■