Review of Economics of the Household 2, 325–340, 2004

Cohabitation and Marriage in a Risky World

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Received December 27, 2002; Accepted April 16, 2004

Abstract. Different couples are analyzed in presence of income uncertainty and precautionary saving. Married couples have legal restrictions on their relationship that force them to act cooperatively, while cohabitants with limited commitment act non-cooperatively. This makes risk sharing different for different couples; married couples share risk completely, while cohabitants share risk to a lesser extent due to their lack of commitment and cooperation. This makes precautionary savings greater for cohabitants than for married couples. However, cohabitants also tend to undersave to possibly increase assistance from their partner. However, mutual altruism mitigates the inefficiencies and enforces time consistent risk sharing among cohabitants.

Keywords: risk sharing, altruism, precautionary saving, samaritan's dilemma, limited commitment

JEL Classification: D64, D81, J12

Risk averse people save not only to smooth consumption, but also to keep a buffer stock if future outcomes are unfavorable. If the insurance market is incomplete intra-family insurance may provide a substitute. There are many examples of this, especially from developing countries.[1] Furthermore, even in industrialized countries with well developed social security people may use the family as a means of insurance. It has been shown that couples can arrange informal risk sharing between each other.[2] In the present paper such intra-household risk sharing is studied. The focus is on the potential differences in behavior between cohabiting and formally married couples.

In the old days, almost every couple who shared everyday life were married with many legal restrictions on their relationship. Today, couples in most Western countries make an active choice whereas to legally marry or just to cohabit, a choice which has both legal and economic consequences. Often cohabitation is only a prelude to marriage (see e.g., Michael Bracher and Gigi Santow, 1998; John Ermish and Marco Francesconi, 2000), but to an increasing extent cohabitation has become a substitute to marriage. This is especially prevalent in the Scandinavian countries,

I am thankful to Jonas Agell, Sophia Grahn-Voorneveld, Peter Kooreman and to Mats Persson for valuable comments on an earlier version. I have also received useful comments from the editor and from two anonymous referees. Generous financial support from the Jan Wallander and Tom Hedelius Foundation and from Knut and Alice Wallenbergs Foundation is gratefully acknowledged.

but is also becoming more common in other Western countries.[3] Referring to the British Omnibus study Jane Lewis (2001) finds that 10% of interviewed cohabitants would not consider marriage, and for another 23% marriage was not important. In the 1998 wave of the Swedish survey HUS, more than 20% of the cohabitants had lived together with the same partner for ten years or more.[4] These figures indicate that permanent cohabitation is not negligible, and should therefore be considered and analyzed.

One important difference between marriage and cohabitation is marital dependence. Married spouses are often legally obliged to care for each other. (In Sweden e.g., family legislation stipulates that spouses have the right to the same standard of living and Canada, several states in the U.S., and a number of European countries apply a common property law.) Even if some argue that an equal split of resources between spouses is unrealistic, at a minimum it acts as a threat point in areas with a common-law regime. Traditionally, this has meant that women have especially depended on their husbands in order to maintain their standard of living. Nowadays, many couples consist of two equal and independent individuals, who want to stand on their own two feet and not to be dependent on a spouse. For many, especially women, who want to be independent, a formal marriage may therefore be viewed as an obstacle to independence (see e.g., Lewis, 2001), and informal cohabitation is preferred. Lewis also argues that cohabitants are more egalitarian and Scott South and Glenna Spitze (1994) show that cohabitants share housework more equally than do married couples. Also, in discussing possible reasons why couples choose informal cohabitation instead of marriage, Bracher and Santow (1998) focus on gender equality and mutual independence. Hence, there are probably substantial differences between married and cohabiting couples.

In this paper I do not focus on the reasons for cohabitation or marriage, but rather on the consequences of a choice already made. I show that the outcomes for cohabiting couples may be very different from those for married couples in a risky environment where people save for precautionary reasons mainly due to their difference in decision making.

There are various possible modes of family decision making. Harold Alderman et al. (1995) give an overview of the unitary model and arguments for alternatives to that model. The unitary model (see e.g., Paul Samuelson, 1956; Gary Becker, 1991) was developed for, and could suit married couples fairly well in the way it treats the family as one unit optimizing one common objective. The outcome is efficient and is enforced by full altruism, social norms or legislation. However, several authors have pointed out that the unitary model is probably too restrictive in many cases even for formally married couples, and it is not fully supported by empirical studies (see Alderman et al., 1995; Shelly Lundberg, Robert Pollak, and Terence Wales, 1997; Martin Browning and Pierre-André Chiappori, 1998; Martin Browning and Velérie Lechene, 2001; Maurizio Maurizio Mazzocco, 2003).

An alternative to the unitary model may therefore be some kind of cooperative model, where the household is treated not as one single unit, but as a formation of individuals (see e.g., Kai Konrad and Kjell Erik Lommerud, 2000; Dan Anderberg, 2001, 2003). A cooperative model also gives rise to an efficient solution. In this paper the solution is the same, whether we use the unitary or the cooperative model.

For a cohabiting couple, however, faced with fewer legal restrictions and weaker social norms, cooperative models are likely to be time inconsistent, as solutions are not self-enforcing. Instead, it is likely that cohabitant decisions are made in a non-cooperative way. Cohabiting couples do not act as one unit (that is why they have actively chosen not to marry), but instead as two independent decision makers. Both partners maximize their own utility, taking the other's actions as given (see e.g., Peter Kooreman and Arie Kapteyn, 1990; Assar Lindbeck and Jörgen Weibull, 1998; Franz Wirl and Gustav Feichtinger, 2002). In contrast to cooperative solutions, non-cooperative solutions typically tend to be inefficient.[5]

Wirl and Feichtinger (2002) assign the cooperative model to what they call "traditional" marriages, and the non-cooperative to "modern" marriages, which they say are characterized by love, rather than rules and norms. They study the effect on wealth accumulation in a dynamic model with perfect foresight, and conclude that love or altruism mitigates the non-cooperative model's inefficiency, but that "altruism (unless perfect) is an insufficient substitute for lacking cooperation". In the present paper I carry out a similar exercise, but I assign the non-cooperative model to informal cohabitants.

Furthermore, I introduce uncertainty about future income and study the savings behavior for couples who also have a precautionary motive for saving. In this sense this paper is also related to the literature on informal risk sharing. Recent studies that address the problem of risk sharing with different degrees of commitment include Ethan Ligon, Thomas P. Jonathan, and Worrall Tim (2002), who explain incomplete risk sharing by limited commitment, and both Marcel Fafchamps (1999) and Andrew D. Foster and Rosenzweig R. Mark (2001), who also disregard savings, but find that altruism and/or reciprocity can mitigate inefficiency from lack of commitment. Ethan Ligon, Thomas D. Jonathan, and Worrall Tim (2000) introduce savings in non-cooperative mutual insurance and Saku Aura (2002) and Dan Anderberg (2001, 2003) specifically study risk sharing between spouses.

In this paper I compare risk-sharing behavior between formally married and cohabiting couples. A unitary or cooperative model for decision making is assigned to married couples, whereas I assume that cohabitants care for each other (otherwise they would not live together), but act non-cooperatively. Individuals are risk averse and have uncertain income, which makes them save for precautionary reasons. Because of their altruistic feelings cohabitants choose to share risk voluntarily, in contrast to married spouses who have legal restrictions forcing them to share risk efficiently. The resulting cohabitant risk sharing is time consistent, but inefficient. The inefficiency is twofold. The less the partners love each other, the less they are willing to share risk; and a less altruistic couple is also more prone to free-ride on each other by saving less (in order to receive larger assistance in case of income loss), which gives rise to a kind of Samaritan's dilemma. The Samaritan's dilemma was first noticed by James Buchanan (1975) in the context of public welfare, but has also been applied to two-person relations (see e.g., Lindbeck and Weibull, 1988; Neil Bruce and Michael Waldman, 1990; Berthold Wigger, 1996). Because of this Samaritan's dilemma the cohabiting couple would gain in own expected utility if the partners would agree on always splitting total income, i.e., the solution which is valid for a married mutually providing couple.

The rest of the paper is organized as follows. In section 1 a simple model of precautionary saving is presented. Then follows section 2, where the effects of marriage are considered. In section 3, precautionary savings by a cohabiting couple is studied. The cohabitant inefficiency is analyzed and the solutions for the two different couples are compared. Section 4 concludes.

1. A precautionary savings model

Let us start by considering a single individual, who lives for two periods, receiving a certain income in the first period, and an uncertain in the second. He gets utility from consumption in the two periods according to the utility function

$$U = u(c_1) + u(c_2), \tag{1}$$

where c_t is consumption in period t and $u' > 0$, $u'' < 0$ and $u''' > 0$, implying that that the individual is prudent and saves for precautionary reasons. The interest and discount rates are, for simplicity, equal to zero. First-period income is y_1. Period-two income may be high or low, indicating, for example, employment or unemployment, an interpretation adopted throughout this paper. $y_2 = y_\mathrm{l}$ with probability p_1 and $y_2 = y_\mathrm{h}$ with probability p_2, where subscripts l and h represent low and high income, respectively.

$p_1 + p_2 = 1$ and the part of y_1 saved to period two is denoted S, and the first-order condition for utility maximization is

$$u'(y_1 - S) = p_1 u'(y_\mathrm{l} + S) + p_2 u'(y_\mathrm{h} + S). \tag{2}$$

Due to the convexity of u' (i.e., savings also for precautionary reasons) savings S are larger than they would have been with consumption smoothing as the only reason for saving.[6]

1.1. Couples

Consider an altruistic couple, consisting of individuals A and B, each with utility functions as described above i.e., there are no public goods, but only private consumption.[7] They are concerned with the other's wellbeing. Besides utility from own consumption, each utility function also includes the private utility of the other, weighted by the altruism parameter, γ_i.

$$E[U_i] = E[u_i] + \gamma_i E[u_j], \tag{3}$$

where u_i is utility from own consumption, henceforth called private utility and defined as in equation (1) for $i = A, B,\ j \neq i$.[8]

The altruism parameter $\gamma_i \in [0, 1]$ may well differ between the two. The one extreme is that one does not care at all about the other, and the other is that both have the same weight in the expected utility function.

Union dissolution is impossible in the model. This fact is crucial to the results, but a divorce probability would be an additional source of uncertainty in the model, which would make the effects from income uncertainty less clear.

I assume that both partners participate in the labor force[9] and face the same risk of becoming unemployed, but their probabilities need not be independent. We then get the following outcome structure for all possible events:

with probability p_{11} both A and B become unemployed and both receive y_l;
with probability p_{12} A becomes unemployed and receives y_l, while B stays employed and receives y_h;
with the same probability p_{12} B becomes unemployed and receives y_l, while A receives y_h;
with probability p_{22} both A and B stay employed and both receive y_h.

By forming a couple individuals can share risk with less need for precautionary savings. Couples choose between formal marriage and cohabitation. I disregard any direct economic factors, like e.g., different tax treatment of different couples that have been studied by James Alm and Whittington A Leslie (2003) and just conclude that some couples have chosen marriage and others have chosen cohabitation. In the following sections we will see the results of this choice.

2. Married couples

Let us first regard a formally married couple and analyze the spouses' behavior. I assume a common-law regime for married couples where spouses are legally obliged to provide for each other so that both have the same standard of living, even if one of them suffers a great loss in the labor market.[10] For a married couple there are thus legal restrictions that force the partners to have the same level of consumption, i.e., $c_{1A} = c_{1B}$ and $c_{2A} = c_{2B}$. These constraints make the married couple maximize utility in a cooperative way, which in this model makes the outcome equal to that of the unitary model and independent of altruism.[11,12] According to the unitary model total income is pooled and it is of no importance which spouse earns the income. This makes the need for precautionary saving smaller because marriage can be viewed as a kind of insurance. If both spouses have expected utility function (3) and must have the same level of consumption, we get the following first-order condition with respect to savings for any of the spouses:

$$u'(y_{\mathrm{l}} - S_{\mathrm{m}}) = p_{11}u'(y_{\mathrm{l}} + S_{\mathrm{m}}) + 2p_{12}u'\left(\frac{y_{\mathrm{l}} + y_{\mathrm{h}}}{2} + S_{\mathrm{m}}\right) + p_{22}u'(y_{\mathrm{h}} + S_{\mathrm{m}}), \tag{4}$$

where S_{m} indicates savings for a married individual. Assume the probabilities above $p_1 = p_{11} + p_{12}$ and $p_2 = p_{12} + p_{22}$ for both spouses. Due to the convexity of marginal utilities we can then state the following proposition, which is intuitive according to insurance theory.

Proposition 1. *A married individual saves less for precautionary reasons than does a single one if period-two incomes are not perfectly correlated between the spouses.*[12,13]

Proof. Available on request. □

Because $S > S_{\mathrm{m}}$ equations (2) and (4) imply that marginal utility of consumption is greater for the single than for the married individual, implying that when there is precautionary saving in presence of income uncertainty expected utility is higher for the married than for the single individual.

3. Cohabiting couples

Hence, a married couple completely shares the risk and creates a kind of family insurance, which decreases the need for precautionary saving. What about a cohabiting couple in which two people love each other, but do not have legal restrictions on their behavior, will they also engage in some kind of risk sharing?

Let us therefore study a cohabiting couple in detail. The altruistic couple is still denoted A and B, and both have earnings and utility functions as described above. However, unlike the married couple they act as two independent, non-cooperative individuals.

A and B unilaterally maximize their own full utility according to equation (3), but due to altruism they both consider the other's private utility while doing so. They also take the other's actions as given. In period two, when the states of employment and unemployment are revealed, it is possible for the cohabitants to give non-negative transfers to each other in order to smooth incomes and thereby increase utility (a transfer from A to B is labelled T_A and a transfer from B to A is labelled T_B). Negative transfers are ruled out, because one cannot take resources from the other. These transfers are completely voluntary and due to altruism. The whole sequence can be seen as a two-stage game with a resulting Cournot-Nash equilibrium. In the first period both partners unilaterally decide how much to save, and in the second period when they are either employed or unemployed, they decide whether or not to transfer some amount to their partner. To achieve the subgame perfect equilibrium, the game is solved by backwards induction.

In period two the four possible outcomes are the same as for the married couple above. In each case they have to decide if a transfer should be made to the other, and how large such a transfer should be. In the cases where the outcome is the same for both we make the (not very strong) assumption that no transfers are made.[14]

In the case where A receives y_l, while B gets y_h there will be a strictly positive transfer T_B from B to A in period two if altruism is strong enough.[15] $T_B > 0$ is set so that

$$u'_B(y_h + S_B - T_B) = \gamma_B u'_A(y_l + S_A + T_B). \tag{5}$$

The more B loves A, the larger the possible transfer will be. Also, the larger the earnings and savings of B compared to A, the larger the transfer will be. The case in which A stays employed and B is unemployed is entirely symmetric. Henceforth it is implicitly assumed that the couple is effectively altruistic, i.e., that the constraint of a non-negative transfer is not binding. Sufficiently strong altruism also makes the important assumption of no possible dissolution a realistic assumption.

It is the presence of altruism that makes the couple willing to share risk in spite of imperfect commitment. However, because the transfer depends on the savings difference, there is also a possibility that they act strategically so as to increase the possible transfer from the other. If one of the two saves less in period one, he or she could possibly get a larger transfer in period two. This implies a mutual Samaritan's dilemma, in which both save less than optimal in the first period in order to possibly benefit from the other's altruism in the second.[16]

In period one, A (and B) maximizes own expected utility $E[U_A]$ (and $E[U_B]$) and thereby decides how much to save. This is done given the possible transfers in period two and the behavior of the partner. The optimization problem can be written as follows and the optimization for B is entirely symmetric.

$$\begin{aligned}
\max_{S_A} E[U_A] = {} & u_A(y_1 - S_A) + \gamma_A u_B(y_1 - S_B) \\
& + p_{11}[u_A(y_l + S_A) + \gamma_A u_B(y_l + S_B)] \\
& + p_{12}[u_A(y_h + S_A - T_A) + \gamma_A u_B(y_l + S_B + T_A)] \\
& + p_{12}[u_A(y_l + S_A + T_B) + \gamma_A u_B(y_h + S_B - T_B)] \\
& + p_{22}[u_A(y_h + S_A) + \gamma_A u_B(y_h + S_B)].
\end{aligned} \tag{6}$$

The optimization results in the following first order condition:

$$\begin{aligned}
u'_A(y_1 - S_A) = {} & p_{11} u'_A(y_l + S_A) + p_{22} u'_A(y_h + S_A) \\
& + p_{12}\left[u'_A(y_h + S_A - T_A)\left(1 - \frac{\partial T_A}{\partial S_A}\right)\right. \\
& \left. + \gamma_A u'_B(y_l + S_B + T_A)\frac{\partial T_A}{\partial S_A}\right] \\
& + p_{12}\left[u'_A(y_l + S_A + T_B)\left(1 + \frac{\partial T_B}{\partial S_A}\right)\right. \\
& \left. - \gamma_A u'_B(y_h + S_B - T_B)\frac{\partial T_B}{\partial S_A}\right],
\end{aligned} \tag{7}$$

where $\partial T_A/\partial S_A = u''_A/(u''_A + \gamma_A u''_B) > 0$ and $\partial T_B/\partial S_A = -(\gamma_B u''_A/(u''_B + \gamma_B u''_A)) < 0$ are obtained from implicit differentiation of (5). Using (5) we can simplify the expression to

$$u'_A(y_1 - S_A) = p_{11}u'_A(y_1 + S_A) + p_{22}u'_A(y_h + S_A) + p_{12}\Big[u'_A(y_h + S_A - T_A). + u'_A(y_1 + S_A + T_B)\Big(1 + (1 - \gamma_A\gamma_B)\frac{\partial T_B}{\partial S_A}\Big)\Big] \tag{8}$$

Because of the effect of own savings on the potential transfers not only consumption smoothing and precautionary saving are decisive for the savings decision, but also strategic "undersaving", which gives rise to a Samaritan's dilemma. By saving less in period one A (and B) can count on a larger transfer in period two. However, the extent of this undersaving depends on the degrees of altruism, γ_A and γ_B. Implicit differentiation of (11) shows the different effects of altruism on savings.

$$\frac{\partial S_A}{\partial \gamma_A} = \left[\frac{(\gamma_B)^2 u'_{AR}u''_{AR}}{u''_{BD} + \gamma_B u''_{AR}}\right] \Big/ \Psi > 0, \tag{9}$$

where subscript D denotes donor of a period-two transfer, and subscript R a recipient of such a transfer, and where

$$\Psi = -u''_{1A} - p_{11}u''_{11A} - p_{22}u''_{22A} - p_{12}u''_{AD} - p_{12}\left[\frac{u''_{AR}(u''_{BD})^2 + \gamma_B u''_{BD}\big[(\gamma_A\gamma_B - 1)u'_{AR}u'''_{AR} + (\gamma_A\gamma_B + 1)(u''_{AR})^2\big]}{(u''_{AD} + \gamma_A u''_{BR})^2}\right].$$

A sufficient condition for Ψ to be positive is decreasing absolute risk aversion, i.e., $(u''_{AR})^2 - u'_{AR}u'''_{AR} > 0$, which seems fairly reasonable.

Savings thus increase unambiguously in own altruism, both for precautionary and for strategic reasons. With a higher γ_A A saves more to be able to increase the support for B in case of his unemployment. A high γ_A also makes A less willing to "cheat" on B, i.e., the strategic undersaving decreases.

With respect to the partners' altruism the two effects counteract each other:

$$\frac{\partial S_A}{\partial \gamma_B} = \frac{u'_{AR}u''_{AR}\big(u''_{BD}(2\gamma_A\gamma_B - 1) + \gamma_A\gamma_B^2 u''_{AR}\big)}{(u''_{AD} + \gamma_A u''_{BR})^2\Psi}. \tag{10}$$

A higher γ_B implies that A can count on a higher transfer from B, which reduces the marginal utility of undersaving. This causes S_A to decrease when γ_B increases. By how much depends on A's own degree of altruism. When Lindbelk and Weibull (1988) find that undersaving increases in the other's altruism they do not consider mutual altruism, but assume that only the potential donor is altruistic (in this case this would imply $\gamma_A = 0$). The other effect is on precautionary saving. When γ_B increases the need for precautionary saving by A decreases. Taken together we cannot tell whether the total effect is positive or negative.

In order to be able to compare the behavior of the uncommitted cohabiting couple with those of singles and married couples, I assume that both partners have identical utility functions and the same altruistic concern for each other, i.e., $\gamma_A = \gamma_B = \gamma$: This implies that the transfers and savings are the same for A and B, so that $T_A = T_B = T$ and $S_A = S_B = S_{\mathrm{coh}}$. Looking back at (5) and rewriting it, it is obvious that if $\gamma = 1$, then both cohabitants have the same marginal utility in period two, and hence the same consumption level, which in turn implies that total income is split equal, i.e., $T = (y_{\mathrm{h}} - y_{\mathrm{l}})/2$. Whenever $\gamma < 1$, the transfer will be less, and the employed cohabitant will have a higher consumption level than the unemployed,

$$u'_D(y_{\mathrm{h}} + S_{\mathrm{coh}} - T) = \gamma u'_{\mathrm{R}}(y_{\mathrm{l}} + S_{\mathrm{coh}} + T). \tag{11}$$

For identical cohabitants, the level of savings is determined by the first-order condition

$$\begin{aligned} u'(y_1 - S_{\mathrm{coh}}) = {} & p_{11}u'(y_{\mathrm{l}} + S_{\mathrm{coh}}) + p_{22}u'(y_{\mathrm{h}} + S_{\mathrm{coh}}) \\ & + p_{12}\left[u'_{\mathrm{R}}\left(1 + \frac{\partial T}{\partial S_{\mathrm{R}}}\right) - \gamma u'_{\mathrm{D}}\frac{\partial T}{\partial S_{\mathrm{R}}}\right. \\ & \left. + u'_{\mathrm{D}}\left(1 - \frac{\partial T}{\partial S_{\mathrm{D}}}\right) + \gamma u'_{\mathrm{R}}\frac{\partial T}{\partial S_{\mathrm{D}}}\right], \end{aligned} \tag{12}$$

where both take into account that their own savings affect the possible transfers whether they become donors or recipients, but where they do not consider identical savings; that $S_A = S_B = S_{\mathrm{coh}}$ is a result, not an assumption. This is what creates the strategic undersaving. Taking (18) into account, (19) can be simplified to

$$\begin{aligned} u'(y_1 - S_{coh}) = {} & p_{11}u'(y_{\mathrm{l}} + S_{\mathrm{coh}}) + p_{22}u'(y_{\mathrm{h}} + S_{\mathrm{coh}}) \\ & + p_{12}\left[u'_{\mathrm{R}}\left(1 + \frac{\partial T}{\partial S_{\mathrm{R}}}\right) + u'_{\mathrm{D}}\left(1 - \gamma\frac{\partial T}{\partial S_{\mathrm{R}}}\right)\right] \end{aligned}$$

Proposition 2. *Cohabitants save less than singles i.e.,* $S_{\mathrm{coh}} < S$.

Proof. Due to incomplete commitment, this proposition is less self-evident than Proposition 1 and a proof is found in the Appendix. □

The reason for cohabitants to save less than singles are twofold. They save less because the mutual risk sharing decreases the need for precautionary saving, but they also strategically undersave in order to free ride on the partner's altruism. This means that cohabitants also get a family insurance. However, we cannot generally say if a cohabiting individual saves more or less than a married one. A cohabiting couple share risk to a lesser extent and save more for precautionary reasons than a married couple, but they also engage in strategic undersaving.

Propositions 3 and 4. *When* $\gamma < 1$ *the non-cooperative solution for the cohabiting couple is inefficient. However, it is time consistent.*

Proof. Unlike in Bruce and Waldman (1990)and Lindbeck and Weibull (1998), the agents in the present model do not know in advance who will be the donor and who will be the recipient (or if any transfer will be made at all). This makes the Samaritan's dilemma mutual, where both undersave for strategic reasons at the same time as they save as precaution. As in a classical Samaritan's dilemma, agreeing in advance on a certain transfer would imply a Pareto improvement. If both partners agreed in advance on the same transfer T^* they would both achieve a higher level of expected utility. Maximizing expected utility for either A or B given that $T_A = T_B = T$ and that the saved amount S^*_{coh} is the same for both partners (i.e., $i = A, B$) gives the following:

$$\max_{T,S_{\text{coh}}} E[U_i] = (1+\gamma)[u(y_1 - S_{\text{coh}}) + p_{11}u(y_1 + S_{\text{coh}}) + p_{22}u(y_{\text{h}} + S_{\text{coh}}) + p_{12}[u(y_1 + S_{\text{coh}} + T) + u(y_{\text{h}} + S_{\text{coh}} - T)]]. \tag{14}$$

The two first-order conditions are then

$$\frac{\partial E[U_i]}{\partial S_{\text{coh}}} = (1+\gamma)[-u'(y_1 - S_{\text{coh}}) + p_{11}u'(y_1 + S_{\text{coh}}) + p_{22}u'(y_{\text{h}} + S_{\text{coh}}) + p_{12}[u(y_1 + S_{\text{coh}} + T) + u(y_{\text{h}} + S_{\text{coh}} - T)]] = 0, \tag{15}$$

$$\frac{\partial E[U_i]}{\partial T} = (1+\gamma)p_{12}[u'(y_1 + S_{\text{coh}} + T) - u'(y_{\text{h}} + S_{\text{coh}} - T)] = 0. \tag{16}$$

This maximization implies that, irrespective of the degree of altruism, expected utility would be maximized if the couple could agree on a transfer, which equalizes their marginal utilities in period two, i.e., $T^* = (y_h - y_l)/2$, so that the couple splits total income equally.[17] Comparing this with the result in (11) we see that an employed cohabitant transfers too little to the unemployed whenever $\gamma < 1$. Iff $\gamma = 1$ the non-cooperative solution coincides with the efficient solution, but whenever $\gamma < 1$ a contract guaranteeing the transfer T^* would actually be a Pareto improvement, as both partners would be better off ex ante.[18] However, such a contract would not be time consistent because the employed partner has an incentive to deviate from the agreement and instead transfer the optimal amount determined in (11). Because there are only two periods, there is no effective punishment in case of deviation, and the time consistent solution cannot be anything but the one determined in (12) and (19). □

The above result could possibly change in a multi-period framework. However, if there is a known last period (e.g., at the age of retirement) the employed partner will transfer T instead of T^*. This last event is common knowledge to the couple, and induces inefficient equilibrium transfers in all periods. [1000] get a result similar to mine in their infinite-horizon model. They show that with a known flow of income the non-cooperative solution, driven by altruism, is time-consistent but inefficient.

What about savings? The savings resulting from the first-best situation is identical to the savings for the married couple. Inserting $T^* = (y_h - y_l)/2$ into (19) gives

$$u'(y_1 - S^*_{\mathrm{coh}}) = p_{11}u'(y_1 + S^*_{\mathrm{coh}}) + 2p_{12}u'\left(\frac{y_h + y_1}{2} + S^*_{\mathrm{coh}}\right) + p_{22}u'(y_h + S^*_{\mathrm{coh}}). \tag{17}$$

However, we cannot say generally whether the non-cooperative cohabitants save too little or too much compared with this first-best. On the one hand, they share risk to a lesser extent than optimal, which increases their precautionary savings above the optimal level. On the other hand, cohabitants act strategically, which makes them save less than optimal. These two effects counteract and the level of altruism is decisive for the importance of the two effects. Precautionary saving decreases with altruism, because mutual risk sharing increases, while strategic undersaving implies increased saving with more altruism. Figure 1 shows how S_{coh} changes with γ and compares it with the constant optimal savings level (equal to the savings level for the married couple) if we, for simplicity assume that utility functions are CARA. The upper curve shows the part of the couple's savings that consists of precautionary savings only, and no strategic undersaving. We can directly see that the less altruistic the couple is, the more important is the strategic motive compared with the precautionary savings motive. With full altruism ($\gamma = 1$) strategic undersaving vanishes and precautionary saving is the same for the cohabiting couple as for the married.

Proposition 5. *Marriage enforces the first-best risk sharing, which is unattainable for cohabitants.*

Proof. The first-best, but unattainable solution for the cohabiting couple in (16) and (17) is exactly the solution for the married couple. The cohabitants have a Samaritan's dilemma, in the way that they cannot enforce a contract yielding optimal savings, and there is no effective punishment in case of a deviation. A way to obtain optimal transfers and savings would be to put legal restrictions on the

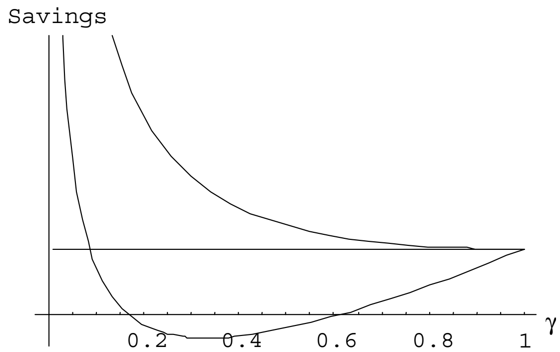

Figure 1. Cohabitation savings with and without undersaving compared with savings by the married.

relationship, which induces such enforcement. A married couple gets that kind of legal restrictions, enforcing the optimal solution. A formal marriage forces the couple into the efficient solution, which is impossible to achieve on a voluntary basis if $\gamma < 1$. □

4. Conclusion

In this paper I have theoretically studied risk sharing in married and cohabiting couples, that are assumed to differ in the way they make decisions. I assume that legally married couples make decisions according to the unitary or, at least according to a cooperative model, whereas altruistic cohabitants act non-cooperatively (cf. Wirl and Feichtinger (2002) and their discussion on "traditional" and "modern" marriages). Like Wirl and Feichtinger (2002) I compare the two different couples and their behavior. The additional contribution in this paper is that I introduce income uncertainty and a precautionary savings motive. It turns out that when future income is uncertain, a union, either a formal marriage or informal cohabitation, offers a kind of insurance through mutual risk sharing. There is, however, an important difference between these unions. In a formal marriage with a common-law regime there are legal restrictions forcing the couple to always share total income equally, which induces efficient savings. For a cohabiting couple, on the other hand, there is not that kind of legislation, but risk sharing is totally voluntary and due to the altruistic feelings between the two. Their voluntary risk sharing is time consistent, but inefficient. If altruism is less than complete a high-income cohabitant is not prepared to share his/her income totally equally with a less fortunate partner.

What distorts the result even more is strategic undersaving. Both cohabitants know that if they save less they can count on a larger transfer in the next period, hence they both save less than optimal in order to possibly free ride on the other's altruism. This causes a kind of mutual Samaritan's dilemma, which is impossible to eliminate for the cohabiting couple. The inefficiency in the cohabitant solution depends on the partners' degrees of altruism. The more altruistic the couple, the less inefficient their risk sharing. The efficient solution for the cohabiting couple is only attainable if both partners are completely altruistic and implies complete risk sharing and exactly the same savings as for the married couple.

What we see here is something of a paradox. Cohabitants are often supposed to value equality higher than do married people (see e.g., South and Spitze, 1994; Bracher and Santow, 1998; Lewis, 2001), but they are not able to be as egalitarian and equal as married couples.

The analysis in this paper, of course, has limitations. What is not considered is union dissolution, which probably would have an effect on the results. If there is a risk that there is no one to share income uncertainty with next period this certainly affects precautionary savings. Many studies suggest that cohabitation dissolutions are far more prevalent than dissolutions of formal marriages (see e.g., Ermisch and Francesconi, 2000; Lewis, 2001), which makes it interesting for future research to incorporate the risk of union dissolution into this kind of analysis. Since permanent cohabitation seems to be increasingly frequent it is especially important to focus on the certain aspects of cohabitation, and not only to equalize it with formal marriage.

Another extention would be to endogenize labor force participation. Due to different legal structures and decision-making processes the probability for a traditional specialization with only one partner participating in the labor force is likely to be higher among married couples than among cohabitants.

Appendix. Proof of Proposition 2

Assume that $S_{\rm coh} = S$. This implies, according to the first-order conditions (12) and (19) that

$$p_{12}[u'(y_{\rm l} + S) + u'(y_{\rm h} + S) - u'(y_{\rm l} + S + T) - u'(y_{\rm h} + S - T)] = 0. \tag{18}$$

However, this can only be true if $p_{12} = 0$ or if $T = 0$. For an effectively altruistic couple we, however, know that due to altruism $T > 0$. Hence, (18) must be false and $S_{\rm coh} \neq S$ iff $p_{12} > 0$.

Assume instead that $S_{\rm coh} > S$. This implies that

$$u'(y_{\rm l} - S_{\rm coh}) > u'(y_{\rm l} - S), \tag{19}$$

which in turn implies that

$$\begin{aligned} &p_{11}[u'(y_{\rm l} + S_{\rm coh}) - u'(y_{\rm l} + S)] \\ &\quad + p_{12}[u'(y_{\rm l} + S_{\rm coh} + T) + u'(y_{\rm h} + S_{\rm coh} - T) - u'(y_{\rm l} + S) - u'(y_{\rm h} + S)] \\ &\quad + p_{22}[u'(y_{\rm h} + S_{\rm coh}) - u'(y_{\rm h} + S)] > 0. \end{aligned} \tag{20}$$

However, if $S < S_{\rm coh}$, we know that the terms on the first and third lines are negative. When it comes to the second line, due to the convexity of u' we have that the sum of the two first marginal utilities is decreasing in T, implying that it takes its greatest value for the lowest possible T. i.e., $T = 0$. However, if $T = 0$ the second-line expression is also negative. Hence, the assumption that $S_{\rm coh} > S$ must be false. This leads us to the conclusion that if $p_{12} > 0$, then $S_{\rm coh} < S$ and if $p_{12} = 0$ then $S_{\rm coh} = S$. □

Notes

1 See e.g. Andrew Foster and Mark Rosenzweig (2001), Mark Rosenzweig (1988), Mark Rosenzweig and Oded Stark (1989), and Ethan et al. 2000 and 2002.

2 See e.g., Lawrence Kotlikoff and Avia Spivak (1981), Aura (2002) and Anderberg (2003) for theoretical analyses of risk-sharing arrangements within the household.

3 See e.g., Lewis (2001) Oysten Kravdal (1999), Michael Murphy (2000), Larry Bumpass and Hsien-Hen Lu (2000), and Alm and Wittington (2003).

4 The Omnibus survey is presented at. http://www.statistics.gov.uk/services/surveyomnibus.asp and the HUS survey at http://www.handels.gu.se/econ/econometrics/hus/husin.htm
5 An exception is Brouning (2001) who shows that an efficient savings outcome is reachable for a couple in a non-coopreative framework.
6 The right-hand side of (2) would equal $u'(p_1y_l + p_2y_2 + S)$ for a utility function with $u''' = 0$. However, when $u''' > 0$, $p_1u'(y_l + S) + p_2u'(y_h + S) > u'(p_1y_l + p_2y_h + S)$. Hence, the left-hand side is also greater than it would have been for a risk neutral saver, implying that S is larger when the individual saves also for precaution.
7 This means that forming a union does not imply any economies of scale, but that the only "benefit" from being a couple is the possibility to share risk.
8 It is really a philosophic issue whether this is the correct utility form, or whether it rather should be $EU_i = Eu_i + \gamma_i EU_j$, but for $\gamma = 1$ the latter form would yield infinite utility for both if an amount was transferred from one partner to another. If $\gamma < 1$ the two formulations are behaviourally equivalent. Linden and Weibull (1938) discuss this matter.
9 To endogenize labor force participation is beyond the scope of this article.
10 Aura (2002) study differences in savings between common-law and community property regimes.
11 Due to income risk the only ex ante Pareto efficient solution is the one reached in the unitary model.
12 Shelly Lundberg and Robert Pollak (2003) argue that strict distributions between spouses are unlikely yo be acheivable when it comes to bargaining over public goods (like place of residence), implying that the outcome may very well be inefficient also for a married couple. However, I disregard any public goods and only regard the division of income.
13 The correlation between period-two income of A and B is $\rho = (p_{11}\varepsilon_1^2 + p_{22}\varepsilon_2^2 + 2p_{12}\varepsilon_1\varepsilon_2)/\varepsilon_1^2(p_{11} + p_{12}) + \varepsilon_2^2(p_{12} + p_{22})$.
14 If the difference in altruism is small enough, the difference in savings will not generate any transfers when both earn the same income.
15 If altruism is so weak that $u'_B > \gamma_B u'_A$ for $T_B = 0$ there will be no transfer from employed B to unemployed A. For the same reason as above we discard the possibility of a transfer from the unemployed to the employed partner.
16 This problem is similar to those studied by Bruce and Waldman (1990) and Lindbeck and Weilbull (1988) who also find that potential recipients save too little when their own savings are decisive for a potential transfer, although in the present paper the problem is mutual.
17 This is the standard result of first-best risk sharing also pointed out by e.g., Foster and Rosenzweig (2001) and Ligon et al. (2000).
18 This is similar to the result found by Lundberg and Pollak (2003) that with binding agreements inefficiency would disappear.

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