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Marriage and Consumption Insurance: What's Love Got To Do With It?

by Gregory D. Hess

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This paper explores the role of marriage when markets are incomplete so that individuals cannot diversify their idiosyncratic labor income risk. *Ceteris paribus,* an individual would prefer to marry a "hedge" (i.e. a spouse whose income is negatively correlated with her own) as it raises her expected utility. However, the existence of love complicates the picture: while marrying a hedge is important, an individual may not do so if she finds someone with whom she shares a great deal of love. Is love more important to a lasting marriage than economic compatibility? To answer this question, I develop a simple model where rational individuals meet, enjoy the economic and non-pecuniary benefits of marriage (i.e. love), and then must decide whether to remain married or divorce.

The model predicts that if love is persistent and the resolution of uncertainty to agents' income is early, then those who in fact married hedges (and for good reason) are the ones most likely to be caught short with too little love in order to save a marriage in the event of an adverse shock. Consequently, under these conditions individuals who are good hedges for one another are more likely to marry one another, although once married, they will be **more likely** to divorce.

In contrast, if love is temporary (in the sense of reverting to a common mean) and the resolution of uncertainty to agents' income is predominantly later, then those who in fact marry hedges will in fact be **less likely** to subsequently divorce. Evidence is provided to distinguish which of these alternative scenarios is in support of these aspects of the decision to stay married. Additional hypotheses regarding the effect of differences in the expected means and volatilities of partners' incomes are also derived from the theory and tested.

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Love's not Time's fool, though rosy lips and cheeks.
Within his bending sickle's compass come,
Love alters not with his brief hours and weeks,
But bears it out even to the edge of doom:
... W. Shakespeare, Sonnet 116

1 Introduction

In his seminal work on the economics of marriage, Gary Becker [1975] argued that the fundamental reason for marriage is the creation of one's own children, as "Sexual gratification, cleaning, feeding and other services can be purchased," but one's *own* children cannot be. Importantly, he introduced broad economic concepts into the analysis and existence of marital institutions. He also emphasized the role the marriage market plays in sorting individuals based on their traits: positive assortive mating would rely on these traits being complements, whereas negative assortive mating would require these traits to be substitutes.

In contrast, several economists have also considered the pure risk-sharing elements of marriage.[1] For instance, Kotlikoff and Spivak (1981) analyze the gains from marriage from risk sharing when expected lifetimes are uncertain. Rosenzweig and Stark (1989) explore the marriage market from the perspective of how families in different Indian villages arranged marriages in order to offset weather-related risk. Recently, Ogaki and Zhang (2001) find further evidence that women migrate to distant villages to marry as a means of family risk-sharing.[2]

The broader risk-sharing literature, however, contains a vast amount of evidence against complete risk sharing and complete markets. At the macro-level, Backus, Kehoe and Kyd-

[1] Indeed, some would argue that in societies where the means of intertemporal consumption smoothing are limited, children themselves would provide a type of income insurance for old age or disability. This paper does not consider the use of children for this role.

[2] See Bergstrom (1996) and Weiss (1997) for a broader survey of the literature on the economics of family creation and destruction.

land (1992) demonstrate incomplete cross-country risk sharing, while, among others, Hess and Shin (1998, 2000) find evidence of limited across-region risk sharing within the United States. At the micro-level, Cochrane (1991), Mace (1991) and Hess and Shin (1999) provide evidence against complete markets / aggregate risk-sharing across households within a country, while Hayashi, Altonji and Kotlikoff (1996) demonstrate incomplete risk sharing across generations even within a given family.

The objective of this paper is to analyze the role economic factors such as risk sharing play in the decision to get married and stay married, and how the presence of love interacts with these economic motives. In the simple model presented here, individuals are faced with randomly fluctuating labor incomes which they can smooth intertemporally by borrowing or saving at a risk-free rate, exactly as in the permanent income hypothesis. However, there is assumed to be no formal market to diversify idiosyncratic risk to income.[3] Marriage, whereby two individuals consume out of common resources, does provide an opportunity to partly offset the idiosyncratic shocks to their income.[4] Partly simply refers to the fact that an ideal mate would be a complete hedge, whereby the partner's income would be perfectly negatively correlated with one's own income. Still, *ceteris paribus*, an individual will have higher expected utility by sharing resources with a partner whose shocks to income are less than perfectly correlated.

While the desire to offset idiosyncratic labor risk could be a powerful inducement to marry, it is also the case that other issues also matter when it comes to marrying and staying

[3] A good reason for why labor income risk is not fully insurable is moral hazard, for if labor income risk were to be completely insurable this would provide a strong disincentive to work. See Chami and Fisher (1996) for a more general treatment of how incomplete markets can give rise to non-market arrangements for co-insurance.

[4] Of course, polygamy would do an even better job of providing this insurance. As we do not observe many societies where this is operable or legal, one can only suppose that "love" faces adverse technological issues when there are more than two individuals in a marriage. For instance, Becker (1975) argues that a reason why we do not observe several men married to the same woman is that it would be hard to identify the father, although he admits that this would not explain why one man would not marry several women. Recent advances in DNA testing would also lessen this reason. Becker explains the lack of polygamy rather by diminishing returns from adding additional members to a marriage, and hence, *ceteris paribus*, additional members would rather form their own two-person union rather than be the third member of an existing one.

married. I simply term this factor “love”. In the model, love is an additively separable, exogenous non-pecuniary endowment good, which two individuals mutually share. It is, for good or bad, subject to fluctuations (both again shared). As will be shown, how long initial love can be expected to last, crucially effects the way in which observed economic characteristics can be used to predict whether a marriage will succeed or end in divorce.

A number of strong predictions about the relationship between mates who are good economic hedges and their ability to get married, as well as stay married, are implied by the model. First, two individuals are more likely to marry each other the better hedges they are. Second, if love is persistent and the resolution of uncertainty about shocks to income is primarily early in life, the model predicts that married couples who are better hedges for one another are more likely to divorce. The reason lies in the trade-off between consumption insurance and love in the model. Operationally, while both consumption insurance and love will cause a couple to marry, if love is long-lasting and future income uncertainty is low, only love will keep them together in the long run. In contrast, if love is a short-lived phenomenon and the resolution of uncertainty to agents’ income is primarily in the future, then married couples who are better hedges actually stay married longer. Because couples will find less love on average (since love is mean reverting), the costs of being married to a poor hedge will rise in the future. Importantly, the impact of a couple’s predicted income correlation on marital duration allows one to infer the persistence characteristics of love and the importance of future income uncertainty.

The cases in which potential marriage partners have different expected levels of incomes and income uncertainties are also considered. Additional theoretical predictions are derived and tested. The remainder of the paper is organized as follows: the model is presented in Section 2, and four propositions are derived that link marital-income characteristics to the decision to get married and stay married. Section 3 provides a test of the propositions concerning the effects of these marital income characteristics on marital duration. I conclude in Section 4.

2 The Model

The model has three time periods: 0, 1 and 2. In period 0, two individuals, i and j, randomly meet and decide whether or not to get married. They learn the expected correlation of their incomes, ρ_{ij}, and observe how much they initially love each other in period 1, α_1, where ρ_{ij} and α_1 are assumed to be independent.[5] Unfortunately, initial love, α_1, is only a noisy, though unbiased, signal of how much they will love each other in period 2, α_2.

Each individual also learns in period 0 the present value of their expected lifetime earnings, i.e. their permanent income, $\overline{y_i}$.[6] A fraction θ of this income is earned in period 1, while the remaining $(1-\theta)$ fraction is earned in period 2. Each k^{th} individual $(k = i, j)$ has a random income error in each period (t), ϵ_{tk}, so that actual income in each period is $y_k = \overline{y_k} + \epsilon_{tk}$, where $E_0(\epsilon_{1k}) = 0$, $E_1(\epsilon_{2k}) = 0$ and $var(\epsilon_{ti}) = \sigma_k^2$. To keep the expected present discounted value of income fixed at $\overline{y}_k$ as of period 1, regardless of when it was earned, I assume that each agent receives θy_k in period 1 and $(1-\theta)(1+r)y_k$ in period 2 where $(1+r)$ is the gross rate of return. Individuals receive labor income in periods 1 and 2, yet decide whether or not to marry in period 0. Further, to keep the model simple, I assume that agents have only one opportunity to marry. Of course, if the couple decide to marry then they will continue to share resources evenly. I discuss the terms of marriage adopted in the paper below.

In period 1, all individuals observe the realized shocks to their incomes, ϵ_{1k}, and each consumes c_{1k}^{M} if married, and c_{1k}^{NM} if unmarried, $k = i, j$. Depending on the timing of income, θ, each agent will borrow or save at the gross rate of return $(1+r)$. In period 2, if the agents are married, they learn how much they will love each other in period 2. Love is

[5] In cases where it is clear the notation applies to both individuals, I drop the i and j subscriptions.

[6] All variables are per-person.

assumed to follow the exogenous process:

$$\alpha_2 = \delta\alpha_1 + (1 - \delta)\overline{\alpha} + \nu \tag{1}$$

where ν is a random disturbance unknown to either agent in period 1, but learned by both in period 2. Namely, $E_t(\nu) = 0$, for $t = 0, 1$, and where ν has the cumulative density function $F(\nu)$.[7] The parameter δ controls for the extent to which love is temporary ($\delta \to 0$), i.e. it is mean reverting to $\overline{\alpha}$, or permanent ($\delta \to 1$).[8] After learning ν, but before observing their second-period income shocks, ϵ_{2i} and ϵ_{2j}, couples decide whether to divorce or stay married. After this decision, each consumes c_{2k}^D and c_{2k}^M, respectively. If they have never married, each simply consumes c_{2k}^{NM} in period 2. The timing of events in the model is listed in Table 1.

The model's marital institutions are as follows: First, if i and j are married, they consume out of their joint resources, including both income and savings, and maximize their joint welfare for as long as they are married. Within marriage, each individual's utility is weighted equally. Second, if i and j marry in period 1, they each receive α_1. If they do not marry, they receive $\alpha_1 = 0$. If the couple marries in period 1 and subsequently divorces in period 2, the individuals receive no love ($\alpha_2 = 0$) in period 2 and they must pay the utility cost ϕ to divorce. Third, divorce agreements are assumed to split marital savings evenly, as well as all expected future labor earnings evenly.[9] If the couple stay married they then receive α_2.

[7] Love and all income characteristics are assumed to be independent.

[8] For the case of $\delta = 1$, Katarina Juselius provided an alternative explanation for this assumption: namely, that individuals' love for one another is a random walk, and what is important for staying married is that their love be "cointegrated"– see Johansen and Juselius (1992).

[9] This latter assumption is helpful in two regards. First, it equates the marginal utility of consumption across partners in the first period. Second, it makes the probability of divorce, conditional on marriage, independent of the expected level of individual resources.

2.1 The Two-Period Problem

If i and j do not marry, they individually choose the path of consumption and savings that maximizes their individual sum of discounted utilities:

$$\max_{\{c_{tk}\}} E_0 \left\{ \sum_{t=1}^{2} \beta^{t-1} U(c_{tk}) \right\} \qquad \text{for } k = i, j \quad \text{and} \quad 0 < \beta \leq 1, \tag{2}$$

subject to their budget constraints:

$$c_{1k} + s_k = \theta y_k \qquad \text{and} \qquad c_{2k} = (1+r)(s_k + (1-\theta) y_k) \qquad \text{for } k = i, j \tag{3}$$

If i and j marry, they choose the path of consumption and the decision to remain married or divorce later to maximize their welfare. As long as they remain married, they maximize their joint welfare out of joint resources. Otherwise, as stated above, they evenly split their resources (current savings and expected future income) and maximize their individual utility. Let D refer to the decision in period 2 whether to divorce, and P be the probability that they divorce (having been married), so that $(1-P)$ is the probability that they do not divorce and thus remain married. [10] The probability of divorce, P, the decision to marry and the subsequent decision to stay married or divorce are endogenously determined below.

The consumption decision for i, given that she is married to j is (j solves the similar problem):

$$\begin{aligned} \max_{\{c_{tk}, D\}} \quad & E_0 \Big\{ \alpha_1 + (1/2) \cdot \textstyle\sum_{k=i,j} U(c_{1k}) \; + \\ & E_1 \beta \Big([P \cdot (-\phi + U(c_{2i}))] + (1-P) \cdot \Big[\alpha_2 + (1/2) \textstyle\sum_{k=i,j} U(c_{2k}) \Big] \Big) \Big\} \end{aligned} \tag{4}$$

[10] Given this setup, since P is endogenous but does not depend on a consumption-choice variable - see expressions (12)to(14) - the expected marginal utility of consumption is the same whether one remains married or divorces. Furthermore, given the certainty equivalent specification of the utility function assumed, the results are unaffected if expression (4) is changed so that in period one, individuals i and j jointly maximize their expected welfare even when they are divorced in period 2.

subject to their budget constraints in periods 1 and 2:

$$\sum_{k=i,j} c_{1k} + \sum_{k=i,j} s_k = \sum_{k=i,j} \theta y_k \tag{5}$$

$$c_{2i} = \begin{cases} \beta^{-1}((1/2)\sum_{k=i,j} s_k + (1-\theta)(\ \overline{y}_{ij} + \epsilon_i)) & \text{if } i \text{ and } j \text{ Divorce} \\ \beta^{-1}(\sum_{k=i,j}(s_k + (1-\theta)(\overline{y}_{ij} + \sum_{k=i,j} \epsilon_k)) - c_{2j} & \text{if } i \text{ and } j \text{ Remain Married} \end{cases}$$

where $\overline{y}_{ij}$ is their average joint expected income, $\overline{y}_{ij} = (1/2)\sum_{k=i,j} \overline{y}_k$.

2.2 The Second-Period Consumption Problem and the Divorce Decision

The model is solved recursively. In period 2, after i and j learn the degree of their new love for one another, α_2, and then make the decision to stay married or not. To simplify the calculation, I assume that the utility function is quadratic, $U(c) = c - (b/2)\ c^2$, which provides certainty equivalence. In addition, I assume that the discount factor is the reciprocal of the interest rate factor, $\beta^{-1} = (1+r)$.

If an individual $k = i, j$ has never married (NM), then consumption in period 2 is:

$$c_{2k}^{NM} = \beta^{-1}\left[s^{NM} + (1-\theta)y_k\right] \quad k = i, j. \tag{6}$$

If a couple was married in period 1, yet, having learned ν, decides to divorce and pay the utility cost ϕ, the period 2 consumption level for individual $k = i, j$ is:

$$c_{2k}^{D} = \beta^{-1}\left[s^{D} + (1-\theta)(\ \overline{y}_{ij} + \epsilon_k)\right] \tag{7}$$

where $s^D = (1/2) \cdot \sum_{k=i,j} s_k^M$. Recall that if divorced, i and j equally divide total savings, $\sum_{k=i,j} s_k^M$, and fully share their expected future labor incomes.

If i and j are married and choose not to get divorced (denoted in period 2 by 'M') they maximize their equally weighted, joint welfare:

$$\max_{\{c_{2k}\}} \quad \alpha_2 \; + \; (1/2) \cdot \sum_{k=i,j} U(c_{2k}), \tag{8}$$

subject to:

$$\sum_{k=i,j} c_{2k} = \beta^{-1} \sum_{k=i,j} (s_k^M + (1-\theta) y_k). \tag{9}$$

The first-order condition is for the married individuals to equate their marginal utilities, $U'(c_{2i}^M) = U'(c_{2j}^M)$, so that the consumption and utility levels are:

$$c_{2i}^M = c_{2j}^M = (1/2) \cdot \beta^{-1} \sum_{k=i,j} \left(s_k^M + (1-\theta) y_k \right). \tag{10}$$

Notice from (7) and (10) that $E(c_{2k}^M) = E(c_{2k}^D)$ for $k = i, j$. This result is a property of the sharing rules for divorce and marriage and the fact that divorce is assumed to have only a utility cost but not a financial cost.

The decision to divorce hinges on whether $U(c_{2k}^M) < U(c_{2k}^D)$ for either $k = i, j$. It can be written in terms of the second-period common shock to the level of love that will result in divorce:

$$\begin{array}{llcl} \text{Divorce if:} & \nu & < & -\left(\delta\alpha_1 + (1-\delta)\overline{\alpha} + \phi + (1-\theta)^2\beta^{-1}\zeta\sigma_i^2(1-\Omega)\right) \\ & \text{or} & & \\ & \nu & < & -\left(\delta\alpha_1 + (1-\delta)\overline{\alpha} + \phi + (1-\theta)^2\beta^{-1}\zeta\Phi^2\sigma_i^2(1-\Omega)\right) \\ \text{Remain Married:} & \text{Otherwise,} & & \end{array} \tag{11}$$

where $\zeta = \beta^{-1}(b/2)$, $\Omega = ((1 + 2\rho_{ij}\Phi + \Phi^2)/4)$, ρ_{ij} is the correlation of their income shocks, and Φ is the ratio of their standard deviations, $\Phi = \sigma_j/\sigma_i$. Four important aspects of the model are worth noting. First, Ω provides a measure of the hedging benefit since as ρ rises, married individuals become worse hedges for one another and Ω rises. For example, if $\Phi = 1$

so that both agents have the same expected income volatility, then $\Omega = 1$ when incomes are perfectly positively correlated, $\rho_{ij} = +1$, and $\Omega = 0$ when incomes are perfectly negatively correlated, $\rho_{ij} = -1$. Second, if $\theta = 1$ so that all income is earned in period 1, then economic factors play no direct role in the period-2 decision to divorce or stay married.[11] Third, if $\delta = 0$ so that all fluctuations in love are temporary, a couple's initial level of love (α_1) has no effect on its decision whether or not to divorce. Finally, due to the assumption that couples share lifetime expected labor resources even if they divorce, consumption-utility levels will be the same regardless of whether the couple divorces or stays married. Hence, the decision to stay married will not depend directly on labor income differentials.

Given the couples' parameters (α_1, ρ_{ij}, $\overline{y}_k$, σ_k, for k $= i, j$) and the technology and institutional parameters (δ, θ, and ϕ), $\hat{\nu}$ is defined as the worst shock to their love that i and j can receive and still remain married. Since, in general, individuals will have different expected income volatilities, $\Phi \neq 1$, each individual within a marriage will have a different threshold point. Thus, we must consider the highest threshold (i.e. the greatest lower bound for love) between the two partners, namely, $\hat{\nu} = max(\hat{\nu}_i, \hat{\nu}_j)$. The probability of divorce is then:

$$P = \int_{-\infty}^{\hat{\nu}} dF(\nu) \; = \; F(\hat{\nu}), \tag{12}$$

where:

$$\hat{\nu}_i \;\; = \;\; -\left(\delta\alpha_1 + (1-\delta)\overline{\alpha} + \phi + (1-\theta)^2\beta^{-1}\zeta\sigma_i^2(1-\Omega)\right) \tag{13}$$

$$\hat{\nu}_j \;\; = \;\; -(\delta\alpha_1 + (1-\delta)\overline{\alpha} + \phi + (1-\theta)^2\beta^{-1}\zeta\sigma_i^2\Phi^2(1-\Omega)). \tag{14}$$

Notice that for $\delta > 0$ as α_1 increases, $\hat{\nu}$ falls, and the probability of divorce falls. In other words, couples that love each other more in period 1 are more likely to remain married.

[11] However, economic factors will have an effect, indirectly, as love may be substituted for economic factors in period 1.

Similarly, as agents become better hedges for one another, ρ falls and Ω falls, which causes $\hat{\nu}$ to fall. This results in an decreased probability of divorce. These are only partial equilibrium results since in period 1 agents may trade off "love" for "better" hedges.

2.3 The First-Period Consumption Problem and the Decision to Marry

Having solved the period-2 consumption problem and the decision to stay married or divorced, I now solve the period-1 consumption problem. In period 1, both i and j know each others economic characteristics and initial level of love they have for each other, α_1. Below, I examine their consumption and welfare levels over periods 1 and 2 under both marriage and non-marriage conditions to solve their decision to get married.

If i and j do not marry, they individually maximize (2), subject to (3). As I have assumed that the discount factor equals the inverse of the interest rate factor, the optimality condition is that $U'(c_{1i}^{NM}) = E_1 U'(c_{2i}^{NM})$. Once the period-1 income shock is observed, the consumption and savings solutions are, respectively:

$$c_{1i}^{NM} = E_1(c_{2i}^{NM}) = \left[\frac{1}{1+\beta}\right](\overline{y_i} + \theta\epsilon_{1i}) \tag{15}$$

$$s_i^{NM} = \left[\frac{\theta(1+\beta)-1}{1+\beta}\right]\overline{y_i} + \left[\frac{\beta\theta}{1+\beta}\right]\epsilon_{1i}. \tag{16}$$

Hence, prior to learning their period-1 income shocks, the expected welfare levels for individuals i and j if they do not marry are, respectively:

$$E(W_i^{NM}) = \overline{y}_i(1-\psi\overline{y}_i) - \sigma_i^2(\psi\theta^2 + (1-\theta)^2\zeta) \tag{17}$$

$$E(W_j^{NM}) = \overline{y}_j(1-\psi\overline{y}_j) - \sigma_i^2\Phi^2(\psi\theta^2 + (1-\theta)^2\zeta), \tag{18}$$

where $\psi = (b/2)/(1+\beta)$.

If they do marry, they maximize (4), subject to (5). The solution for the consumption path c_{1k}^M and c_{2k}^M, $k = i, j$, is to equate the marginal utility across partners at period 1 and to equate the marginal utility of consumption at period 1 with the expected marginal utility of consumption at period 2:

$$c_{1i}^M = E_1(c_{2i}) = \left[\frac{1}{1+\beta}\right](\overline{y_{ij}} + (\theta/2)\sum_{k=i,j}\epsilon_{1k}) \tag{19}$$

$$c_{1j}^M = E_1(c_{2j}) = \left[\frac{1}{1+\beta}\right](\overline{y_{ij}} + (\theta/2)\sum_{k=i,j}\epsilon_{1k}) \tag{20}$$

$$(1/2)\cdot\sum_{k=i,j} s_k^M = \left[\frac{\theta(1+\beta)-1}{1+\beta}\right]\overline{y}_{ij} \;+\; \left[\frac{\beta\theta}{2(1+\beta)}\right]\sum_{k=i,j}\epsilon_{1k}. \tag{21}$$

According to equations (19) and (20), each individual in a marriage smoothes his or her consumption across time, knowing that all labor resources earned in period 1, all marital savings, and all expected future labor income is shared if they divorce. Notice that complete risk sharing is obtained within marriages.

The expected utility from marrying, conditional on learning α_1, $\overline{y}_k$, and σ_k for $k = i, j$, and ρ_{ij} is:

$$\begin{aligned} E(W_i^M) \;&=\; \alpha_1 + \beta\left[-\phi\cdot P + (1-P)\cdot\Big(\delta\alpha_1 + (1-\delta)\overline{\alpha} + [1-F(\hat{\nu})]^{-1}\textstyle\int_{\hat{\nu}}^{\infty}\nu dF(\nu)\Big)\right] \\ &\quad +\overline{y}_{ij}(1-\psi\overline{y}_{ij}) - \sigma_i^2\left[\theta^2\Omega\psi + (1-\theta)\zeta(P + (1-P)\cdot\Omega)\right] \end{aligned} \tag{22}$$

$$\begin{aligned} E(W_j^M) \;&=\; \alpha_1 + \beta\left[-\phi\cdot P + (1-P)\cdot\Big(\delta\alpha_1 + (1-\delta)\overline{\alpha} + [1-F(\hat{\nu})]^{-1}\textstyle\int_{\hat{\nu}}^{\infty}\nu dF(\nu)\Big)\right] \\ &\quad +\overline{y}_{ij}(1-\psi\overline{y}_{ij}) - \Phi^2\sigma_i^2\left[\theta^2\Omega\psi + (1-\theta)\zeta(P + (1-P)\Omega)\right], \end{aligned} \tag{23}$$

where P is defined in expression (12). The decision to get married is therefore:

$$\text{Marriage Decision:} \quad \begin{cases} \text{Marry if:} & E(W_k^M) \geq E(W_k^{NM}) \quad \text{for both k=i,j.} \\ \text{Do not marry if:} & \text{Otherwise.} \end{cases}$$

We now have the model's main prediction for the factors which affect the likelihood of marriage.

Proposition 1 *Ceteris paribus, two individuals are less likely to marry:*

- *The more correlated their earnings are.*
- *The greater the difference in their expected earnings is.*
- *The greater the difference in the uncertainty about their individual earnings is.*

Proof: From expressions (22) and (23), the expected welfare from marriage decreases as ρ_{ij} increases, while the welfare from not marrying does not depend on ρ_{ij}. Also, since marriages must be mutually agreed to, the binding decision to marry is on the individual with higher expected income and lower variance. Without loss of generality, denote individual i such that $\hat{\nu}_i > \hat{\nu}_j$. As her potential partner's ($j's$) income uncertainty rises ($\Phi > 1$) and expected income falls relative to hers ($\overline{y}_j < \overline{y}_{ij}$), from expression (22) we see this lowers the expected welfare from individual i marrying individual j. *Ceteris paribus*, they are less likely to receive a love shock that compensates them for their loss, which makes the probability of their getting married decrease.

Based on the decision to marry and the welfare from not marrying, which are derived from expressions (17), (18), (22), and (23), Proposition 1 follows directly. First, the more positively correlated individuals' incomes are, the poorer the individuals are at providing income insurance for one another, which reduces the expected welfare from marriage. Second, if individuals i and j are identical in all respects, except mean income, one must wonder why the individual with a higher income would ever agree to marriage.[12] The answer is that without a great deal of mutual love, she will not, and the likelihood of such a high level of mutual love becomes less and less likely the bigger the gap in expected incomes.

[12] One can think of this as: 'Why would a multi-millionaire want to marry you?'

As a result, they will be less likely to marry. Finally, the implication that a greater difference in earnings-uncertainty lowers the likelihood of marriage follows exactly as in the case of greater expected-earnings differentials: the individual with lower uncertainty must be compensated with higher levels of love in order to engage in the marriage, which makes marriage a less likely outcome.

Interestingly, one can see from Proposition 1 that the introduction of love allows individuals to marry spouses who may not improve their economic outlook. For example, it allows one to marry someone who is a poor hedge, who has a lower or more volatile income, and who may have fewer resources.[13] Of course, whether or not this results in longer-lasting marriages depends on the willingness for individuals to substitute economic characteristics for initial love. It will also depend upon how long the love between the couple is expected to last, δ, and the fraction of labor income that is earned in the future, θ.

2.4 The Divorce Decision

Now that the properties governing whether two individuals will get married have been established, I examine the properties that govern whether they will stay married or divorce. The result depends critically on the persistence of love (δ) and the fraction of risk to income that is resolved in the future (Φ). In order to keep the results as transparent as possible, I proceed through this analysis by inspecting one mechanism at a time.

2.4.1 The Impact of Income Correlation on the Probability of Divorce

In this subsection I analyze the impact of more correlated incomes on the decision to stay married or divorce. To isolate this feature, I assume that individuals have the same mean

[13]For example, the existence of love will tend to make the correlation of income across spouses more positive, which is consistent with Becker and Murphy's (1998) view that love induces additional positive assortive mating. Their reasoning is that love waters down the economic incentives for marriage, producing segregation and limiting the extent to which "low quality" mates can bribe "high quality" mates to marry them. The model does suggest, however, that the existence of love will lead to more negative assortive mating based on income volatility and mean income characteristics.

incomes ($\overline{y}_i = \overline{y}_j$) and variances ($\Phi = 1$). In this case, individuals i and j will have the same threshold-love levels, referred to as $\hat{\nu}$. As of period 1, an increase in ρ affects the probability of divorce as follows:

$$\frac{dF(\hat{\nu})}{d\rho_{ij}} = F'(\hat{\nu}) \cdot \left[\frac{\partial\hat{\nu}}{\partial\rho_{ij}} + \left(\frac{\partial\hat{\nu}}{\partial\alpha_1} \cdot \frac{\partial\alpha_1}{\partial\rho_{ij}}\right)\right] \tag{24}$$

This total effect takes into account that individuals must still find it incentive compatible to get married in the first place, $E(W_k^M) \geq E(W_k^{NM})$ for $k = i, j$. The term in square brackets is the total effect of a change in ρ on the threshold love shock $\hat{\nu}$. The are two effects. The first term is the direct effect that a change in ρ_{ij} has on the threshold love shock. The second term is the effect of an increase in ρ_{ij} inducing a substitution towards more initial love, which will indirectly affect the threshold level of love in period 2. However, having arrived at period 2, love and hedging have the following effects on the shock level that love can withstand, $\hat{\nu}$:

$$\partial\hat{\nu}/\partial\alpha_1 = -\delta < 0 \tag{25}$$

$$\partial\hat{\nu}/\partial\rho_{ij} = (1-\theta)^2\zeta\beta^{-1}\sigma_i^2/2 > 0 \tag{26}$$

Using expressions (26) and (25) and solving for the "love-correlation" trade-off, $\partial\alpha_1/\partial\rho$, by differentiating expression (22) given the constraint that $E(W^M) \geq E(W^{NM})$, the solution to (24) is:

$$\frac{dF(\hat{\nu})}{d\rho_{ij}} = F'(\hat{\nu})(\sigma_i^2/2)\Phi\left[\beta^{-1}(1-\theta)^2\zeta - \delta\left(\frac{\theta^2\psi + (1-\theta)^2\zeta(1-P(\hat{\nu}))}{1+\beta\delta(1-P(\hat{\nu}))}\right)\right] \gtrless 0. \tag{27}$$

The first term inside the square brackets is positive and reflects the costs of having a partner who is a poorer hedge (i.e., higher ρ) in period 2. This term goes to 0 as θ approaches 1, since the role of a hedge is no longer needed in the future if all permanent income uncertainty has been resolved in period 1. The second term inside the square brackets is negative and reflects the fact that having a partner who is a poorer hedge makes an individual require more love in period 1 to get married. The fact that being a poorer hedge "crowds-in" initial love will be more important for keeping marriages together as initial love becomes more persistent (δ rises) and there is less uncertainty to future income (θ is low).

Proposition 2

- *Case A: An increase in the correlation of couples' individual incomes, ρ_{ij}, will raise the probability of divorce if the persistence of love, δ, is sufficiently low and the fraction of income that is earned early in life, θ, is sufficiently low.*
- *Case B: An increase in the correlation of couples' individual incomes (ρ_{ij}) will lower the probability of divorce if the persistence of love, δ, is sufficiently high and the fraction of income that is earned early in life, θ, is sufficiently high.*

Proof: The sign of (27) depends on the term in square brackets. Denote this expression in square brackets ω. At the extreme values of θ and δ, if $\delta = 0$ then $\omega > 0$, if $\theta = 0$ then $\omega > 0$, while if $\theta = 1$, then $\omega \leq 0$. ω is decreasing in both θ and δ, namely,

$$\partial\omega/\partial\theta = -\beta^{-1} - \delta\left(2\theta\psi + 2(1-\theta)\zeta(1-P(\hat{\nu}))\right) < 0$$

$$\partial\omega/\partial\delta = \left\{-1 + \left(\frac{\beta(1-P(\hat{\nu}))}{(1+\beta\delta(1-P(\hat{\nu}))}\right)\right\} \cdot \left(\frac{\theta^2\psi + (1-\theta)^2\zeta(1-P(\hat{\nu}))}{1+\beta\delta(1-P(\hat{\nu}))}\right) < 0,$$

so that the probability of divorce falls as either δ or θ rise.

In Case A, since initial love is temporary and there is still a demand for income insurance in period 2, couples may marry in period 1, despite having highly correlated incomes, only if they start out with a very high initial amount of love. However, because this love is not likely to last and couples still prefer good income insurance, they will be more likely to divorce than couples that started out as good hedges for one another. In contrast, in Case B all that matters in the decision to divorce or stay married is how much love existed initially, since most income uncertainty has been resolved by period 2. Those who are better hedges tend to have less love initially and hence are more susceptible to a love shortfall in period 2 as long as love is sufficiently persistent.

2.4.2 The Impact of Income Uncertainty on the Probability of Divorce

While the discussion so far has focused on the correlation of the partners' incomes, one can repeat the exercise considering individuals who are the same in all respects except income volatility. The intuition is as follows: if a couple differs greatly in the volatility of its partners' incomes, one must consider why the individual with stable income married the individual with the volatile one. Similar to the case of two individuals who marry despite not being good hedges for one another, the answer lies in the fact that the low-volatility individual must have been compensated with a large initial level of mutual love. If, as in Case A, initial love is transitory and a large fraction of permanent income is still to be earned, then this couple is more likely to divorce because there will not be enough love in the future to compensate the individual with lower income risk (i.e., the individual with a lower volatile income will fall short first). In contrast, in Case B, if initial love is persistent and little income is left to be earned in the future, then the couple will be less likely to run short of love and divorce.

Proposition 3

- *Case A: An increase in the gap between a couple's individual income uncertainties, Φ, will raise the probability of divorce if the persistence of love, δ, is sufficiently low and the fraction of income that is earned early in life, θ, is sufficiently low.*
- *Case B: An increase in the gap between a couple's individual income uncertainties, Φ, will lower the probability of divorce if the persistence of love, δ, is sufficiently high and the fraction of income that is earned early in life, θ, is sufficiently high.*

Proof: Without loss of generality, consider the case where $\Phi \geq 1$. Here, we must consider i's expected willingness to remain married to j as j's income uncertainty rises relative to that of i's. In this case, agent i has the binding reservation level of love. The effect of a change in Φ on the probability of divorce, conditional on the fact that they get married $W_k^M \geq W_k^{NM}$ for $k = i, j$, is:

$$\frac{dF(\hat{\nu_i})}{d\Phi} = F'(\hat{\nu_i})(\sigma_i^2/2)(\Phi + \rho_{ij}) \left[\beta^{-1}(1-\theta)^2\zeta - \delta \left(\frac{\theta^2\psi + (1-\theta)^2\zeta(1-P(\hat{\nu_i}))}{1+\beta\delta(1-P(\hat{\nu_i}))} \right) \right] \gtrless 0,$$

where $\Phi + \rho_{ij} > 0$. The remainder of the proof follows that of Proposition 2, as the sign of the effect depends on the sign of the term in square brackets.

2.4.3 Spousal Mean-Income Differences and the Probability of Divorce

The discussion so far has not focused on income differences across spouses. Indeed, the conditions which affect the impact of mean-income differences on the probability of divorce depend critically on the way in which divorce agreements split marital income. Since all expected future labor income is shared once married in the model presented here, there is no direct effect of expected income differences on the probability of divorce and on the threshold levels for the love shock, $\hat{\nu}$ – see equations (13) and (14). However, differences in mean income do have an indirect effect on the probability of divorce since they will induce a substitution effect towards a higher initial level of love. If this love is permanent (δ is high), then we should expect marriages with larger mean-income differences between partners to have lower probabilities of divorce. This holds regardless of θ. If love is truly temporary ($\delta = 0$), however, then spousal mean-income differences will not help in predicting the duration of marriages.

Proposition 4

- *Case A: An increase in the gap between a couple's individual mean incomes will have no effect on the probability of divorce if the persistence of love, δ, is sufficiently low.*
- *Case B: An increase in the gap between a couple's individual mean incomes will lower the probability of divorce if the persistence of love, δ, is sufficiently high.*

Proof: Without loss of generality, consider the case where $\overline{y}_i \geq \overline{y}_j$, so that $\overline{y}_i \geq \overline{y}_{ij}$. Individual i will be the binding individual with regards to whether or not to divorce. The total effect of an increase in i's expected income relative to j's is, conditional on the fact that they marry so that $W_k^M \geq W_k^{NM}$ for $k = i, j$, is:

$$\left.\frac{dF(\hat{\nu}_i)}{d\overline{y}_i}\right|_{\overline{y}_i = \overline{y}_{ij}} = F'(\hat{\nu}) \left(\frac{-(\delta/2)(1 - 2\psi\overline{y}_{ij})}{1 + \beta\delta(1 - P(\hat{\nu}))} \right) \leq 0. \tag{28}$$

The sign depends on $(1 - 2\psi\overline{y}_{ij})$, which is assumed to always be positive. This is a direct consequence of obtaining a solution with quadratic utility.

2.4.4 The Imperfect Sharing of Expected Future Resources in the Case of Divorce

An important simplification assumption for the theory is that all remaining expected permanent income is shared if a married couple divorces in period 2. As a direct consequence, Proposition 4 indicates that even when love is very temporary, a big difference in spouses' expected future incomes (which suggests a great deal of initial love) is not a harbinger of future divorce, unlike couples that are poor hedges for one another (Proposition 2), or those with large income volatility differences (Proposition 2). This feature of Proposition (4), however, would not be the case if couples did not fully share their expected future incomes in the case of divorce. Such a case is now discussed in this sub-section.

To focus on this issue alone, assume that couples only differ in their mean incomes, and that there is no income uncertainty. This simplification is justified by the fact that Propositions 2 $-$ 5 already do not allow for any sharing of unexpected income changes in the case of divorce, and the issue at hand is how the probability of divorce responds if they do not share the expected part as well. While I maintain the assumption that marital assets are shared at the time of divorce - namely, in the case of divorce, each spouse receives shared marital savings from period one, $\sum_{k=i,j} s_k^M$ - let χ be the fraction of future remaining permanent income remaining that an individual does not share with his / her partner in the case of divorce; namely, the expected labor resources for individual i are $(1 - \theta)(\overline{y}_{ij} + \chi(\overline{y}_i - \overline{y}_{ij}))$, while for individual j they are $(1 - \theta)(\overline{y}_{ij} + \chi(\overline{y}_j - \overline{y}_{ij}))$, which simplifies to $(1-\theta)(\overline{y}_{ij}-\chi(\overline{y}_i-\overline{y}_{ij}))$. Continue to let individual i be the spouse that is expected to be richer so that $\overline{y}_i > \overline{y}_{ij}$, and hence i will have the binding reservation love level in period 2:

$$\hat{\nu} = z(1-b(x+z)) - \phi - \alpha_1\delta - \overline{\alpha}(1-\delta) \tag{29}$$

where $z = \beta^{-1}(1-\theta)\chi(\overline{y}_i - \overline{y}_{ij})$ and $x = \beta^{-1}((1-\theta)\overline{y}_i - (1/2)\sum_{k=1}^{2} s_k^M)$. Of course, if $\chi = 0$, then $z = 0$ and we are back to the full sharing of expected permanent income as above. Following the earlier presentation, the probability of divorce is simply the probability that the shock to mutual love falls below the threshold $\hat{\nu}$, namely $P = F(\hat{\nu})$. A key complication introduced by relaxing the assumption of complete expected permanent income sharing even in the case of divorce is that now the probability of divorce depends critically on agent's i's and j's consumption-savings decisions in period 1 through x.

As the consumption welfare levels are unchanged if the couple never marries, to uncover how unshared resources affect our earlier results, we must only reconsider the case when i and j marry in period and then must optimally choose to remain so or not in period 2. To keep the algebra simple, assume that the shocks to love are uniformly distributed over the interval $[-\Delta, \Delta]$. Repeating the maximization steps outlined earlier in the paper, average savings at the end of period one is $(1/2)\sum_{k=i,j} s_k^M = A \cdot \overline{y}_{ij}$, where $B = 1 + bz^2/2\Delta$, and $A = (\theta - \beta^{-1}(1-\theta)B)/(1+\beta^{-1}B)$. Moreover, marital consumption in the first period is no longer equated across spouses as they have differing expected resources in the second period as long as the probability of divorce is greater than zero. The period one consumption levels are:

$$c_{1i}^M = Pz + \beta^{-1}((1-\theta) + A)\overline{y}_{ij}$$

$$c_{1j}^M = -Pz - z^2/2 + \beta^{-1}((1-\theta) + A) \cdot (1+B)\overline{y}_{ij}$$

where $P = (1 + (\hat{\nu}/\Delta))/2$ and $\hat{\nu}$ is defined in (29).[14] The effect of the lack of expected

[14]Note that the effects of z are not symmetric with respect to z for $z > 0$. While j will consume less to

income sharing in period two is smoothed through into consumption behavior in period 1. To more clearly see, consider the effect of a small change in $\overline{y}_i$ evaluated at $\overline{y}_i = \overline{y}_{ij}$ (i.e. $z = 0$). Then $(\partial c^M_{1i}/\partial \overline{y}_i)\Big|_{\overline{y}_i = \overline{y}_{ij}} = -\ (\partial c^M_{1j}/\partial \overline{y}_i)\Big|_{\overline{y}_i = \overline{y}_{ij}} = (1/2)\beta^{-1}P(1-\theta)\chi$. As long as some income is to be earned in period 2, the probability of divorce is not zero, and there is incomplete sharing of resources in period 2 in the case of divorce, spouse i consumes more in period 1 than spouse j, as he/she has greater expected resources in period 2. Optimal consumption in period 2 for the case that i and j remain married is:

$$c^M_{2i} = c^M_{2j} = \beta^{-1}(A + (1-\theta))\overline{y}_{ij}$$

In the case of divorce, the optimal consumption levels for i and j are, respectively:

$$c^D_{2i} = \beta^{-1}(A + (1-\theta))\overline{y}_{ij} + z$$

$$c^D_{2j} = \beta^{-1}(A + (1-\theta))\overline{y}_{ij} - z$$

Plugging these consumption values into the welfare functions for marriage and no marriage as of period 1, expressions (2) and (4), respectively, an increase in $\overline{y}_i$ affects the probability of divorce as follows:

$$\frac{dF(\hat{\nu})}{d\overline{y}_i}\Big|_{\overline{y}_i = \overline{y}_{ij}} = F'(\hat{\nu})\cdot(1-2\psi\overline{y}_{ij})\cdot\left\{\beta^{-1}\chi(1-\theta) + \left[\frac{-(\delta/2) + \delta P(\hat{\nu})\chi(1-\theta)}{1+\beta(1-\delta P(\hat{\nu}))}\right]\right\} \gtrless 0. \quad (30)$$

As expected remaining income is shared even in the case of divorce, $\chi \to 0$ and expression (30) collapses to the earlier result in expression (28). The first term inside the braces is the period 2 direct effect of how a change in individual i's expected income affects the probability of staying married: namely, $(\partial\hat{\nu}/\partial\overline{y}_i)$. With incomplete sharing of expected

smooth out the expected fewer resources he / she will have in period 2, due to the curvature in utility and the fact that the reservation love shock is determined by individual i, the impacts of z on spouse i and j will differ.

resources in the case of divorce, a rise in i's expected resources will raise the net economic benefits to divorce in period 2 and hence should raise the probability of divorce.

The second term of expression (30) - in square brackets - is the effect of a rise in i's expected resources on the probability of divorce that works indirectly through the decision to get married. It is composed of two terms. The first term within square brackets, as was pointed out above for the case where $\chi = 0$, indicates that as long as initial love has some persistence, then we should expect marriages with larger mean-income differences between partners to have more love and hence should be less likely to end in divorce. The second term within square brackets captures the effect that the incomplete sharing of expected resources in the case of divorce raises the economic returns to marriage for the better off individual - recall that it's their reservation level of love that is binding. Hence, *ceteris paribus*, they can settle for a smaller amount of initial love as they still retain the option of divorce. This raises the probability of divorce if initial love is persistent.

Of course, which effect dominates, cannot be determined *a priori*. However, the fraction of expected income to be earned in the future, $(1 - \theta)$, and the fraction of expected income that is not shared in the case of divorce, χ, enter expression (30) together. Hence, both the persistence of divorce, δ, and the expected amount of unshared lifetime resources in case of a divorce, $\chi(1 - \theta)$, factor prominently in the effect of an increase in a couple's mean income differences on the probability of divorce.

Proposition 5

- *Case A: An increase in the gap between a couple's individual mean incomes will have no effect on the probability of divorce if the persistence of love, δ, is sufficiently low and the expected amount of unshared lifetime resources, $\chi(1 - \theta)$, is sufficiently low.*
- *Case A*: An increase in the gap between a couple's individual mean incomes will raise the probability of divorce if the persistence of love, δ, is sufficiently low and the expected amount of unshared lifetime resources, $\chi(1 - \theta)$, is sufficiently high.*
- *Case B: An increase in the gap between a couple's individual mean incomes will lower*

the probability of divorce if the persistence of love, δ, is sufficiently high and the expected amount of unshared lifetime resources, $\chi(1-\theta)$, is sufficiently low.

Proof: See expression (30).

Allowing for the possibility that divorced couples do not fully shared expected future labor income allows for a slightly richer set of possibilities for how the persistence of love can alter the impact of joint economic characteristics on the probability of divorce. Nevertheless, the basic proposition relating differences in expected income and its effect on divorce are little changed. One can obtain a zero (positive) impact in Case A (Case A^*) from larger expected income differences on the probability of divorce if initial love is temporary and expected future resources are relatively similar (dissimilar) whether one stays married or divorces. One can also obtain a negative impact of larger expected income differences on the probability of divorce if love is permanent and expected future resources are relatively similar whether one stays married or divorces (Case B).

3 Empirical Results

In this section I test the broad implications of the theory. Since potential pairings of individuals are not observed in the data set, I am restricted to testing only the model's implications for couples that do get married. In particular, I investigate the impact of spousal income correlations, their volatility, and mean differences on the duration of marriages and hence on the probability of divorce. If partners with higher correlated incomes and greater differences in the volatilities of their incomes are less **(more)** likely to divorce, then we can infer that love is primarily permanent **(temporary)**, and the fraction of lifetime income uncertainty that is to be resolved in the future is relatively small **(large)**. Also, if partners with larger differences in their mean incomes are less likely **(no less likely)** to divorce, then we can infer that love is primarily permanent **(temporary)**. This interpretation of the empirical findings below is based on Propositions 2 - 4, subject to the qualification in Proposition 5;

namely, that larger differences in mean incomes can lead to an increase in the likelihood of divorce if love is temporary and couples incompletely share expected future labor income in the case that they divorce.

It is essential to note that the model's predictions concerning the likelihood of divorce depend on the fact that these income terms are substituted for love at the time of marriage. Accordingly, these expected income characteristics for each marriage will be based on information assumed to be known at the beginning of each marriage.

3.1 The Data

The theory is tested using data on first marriages from the National Longitudinal Survey of Youth (NLSY) for the years 1978-1994. Unlike earlier surveys in this collection, both men and women were chosen as respondents. I can only consider married couples, as data for a respondent's spouse are collected only once he or she becomes married and no retrospective income data for the spouse are collected. The data set contains demographic, income, and marital information for the respondents. It also contains a much smaller sub-set of this information for their spouses if applicable. The NLSY data set has over twelve thousand respondents; however, after removing missing data, incomplete responses, respondents who became widowed or were never married, and making other data refinements discussed below, I have just over twelve hundred observations (first marriages) left in the sample. Also, since respondents can get married more than once, though the theory outlined above does not incorporate this, I only consider data for first marriages.[15]

The unit of observation for this model is a marriage. The key data for the dependent variable in this empirical study is whether a marriage ends in divorce (DIV=1) or not (DIV=0). For general demographic variables used as explanatory variables, I include a

[15]Interestingly, a common finding in the literature is that individuals who have been divorced are more likely to do so again if they remarry. I briefly explore some empirical aspects of second marriages below at the end of section 3.4 and the results in column (VIII) of Table 5.

number of variables used in prior studies: namely, whether the spouses attended a two- or four-year college at the beginning of the marriage (EDUCM=1 for the male and EDUCW=1 for the female), whether there were no dependents in the household at the beginning of the marriage (NOKIDS=1),[16] the ages of each spouse when first married (AGEM for the male and AGEF for the female), the race of the respondent (WHITE=1), whether the respondent was raised Catholic (CATH=1), and whether the respondent's parents are divorced from one another at the beginning of the marriage (PARDIV=1). I also calculated the maximum duration observed of a given couples marriage (MAXDUR), which is equal to the duration of their marriage if the marriage ends in divorce (DIV=1) and is otherwise equal to the duration of their marriage in 1994 when the sample ends (DIV=0).

3.2 Construction of Economic Characteristics at the Start of a Marriage

As there are data for labor income by both respondents and spouses for a subset of the years 1978-1994 once they are married, we can calculate for each marriage the mean, variance, and correlation of the partner's incomes.[17] However, the theory presented above suggests that information about these marital-income characteristics should be based on available information at the time of the beginning of the marriage. Hence, the predicted income characteristics for the marriage will be projected from those observed at the beginning of a couple's marriage. Unfortunately, the NLSY data set does not contain a full set of information for **both** the respondent and his or her spouse. Exceptions are each partner's sex, age at first marriage, education at marriage and reported occupation at the time of the marriage, which are included as observed characteristics at the beginning of the marriage.[18]

[16] The results are similar if we use the number of children at the beginning of marriage as opposed to a dummy variable to distinguish between zero and the presence of children.

[17] The data was converted to real by dividing by the 1994 based GDP deflator.

[18] The NLSY reports each partner's current occupation which are then classified into 10 groupings. The listed occupations on the NLSY are (001-195) professional,technical and kindred, (201-245) managers,officials and proprietors, (260-285) sales workers, (301-395) clerical and kindred, (401-575) craftsmen, foremen and kindred, (601-715) operatives and kindred, (740-785) laborers, except farm, (801-802) farmers and farm managers, (821-824) farm laborers and foreman, (901-965) service workers, except private household, and

To incorporate cross-spouse information pertinent to determining their expected income characteristics, I constructed two vectors, 10×1 each, of dummy variables for the marital occupation of each husband and wife in a marriage: MMAROCC is the vector of dummy variables for the male's marital occupation, and FMAROCC is the vector of dummy variables for the female's marital occupation. These two 10×1 vectors of beginning of marriage occupation dummy variables are then multiplied to get a 10×10 vector of cross marital occupation characteristics. In addition, I also include interactions between an individual's marital age and education status, as well as interactions of these with his/her spouse, and demographic information that is based only on the respondent's characteristics, such as their race, whether their parents were divorced or they were raised Catholic. While this may be an incomplete list of initial marital characteristics, it would be extremely unlikely that this would bias these predicted measures in any way that would affect the analysis.

I consider first the case of the constructed measure of the predicted income correlation for each i^{th} marriage. I calculated the partner's actual income correlation (CORR) and then created the predicted correlation variable (PCORR) from the fitted value of the following regression:

$$\begin{aligned} CORR_i \;=\; & \textstyle\sum_{z=1}^{10} \sum_{z'=1}^{10} a_{zz'} \cdot MMAROCC_{zi} \;\cdot\; FMAROCC_{z'i} \;+\; c_1 \cdot WHITE_i \\ & + c_2 \cdot AGEM_i \;+\; c_3 \cdot AGEW_i \;+\; c_4 \cdot (AGEM_i \cdot AGEW_i) \\ & + c_5 \cdot EDM_i \;+\; c_6 \cdot EDW_i \;+\; c_7 \cdot (EDW_i \cdot EDM_i) \\ & + c_8 \cdot (AGEM_i \cdot EDM_i) \;+\; c_9 \cdot (AGEW_i \cdot EDUCW_i) \\ & + c_{10}(\cdot AGEM_i \cdot EDM_i \cdot AGEW_i \cdot EDUCW_i) \\ & + c_{11} \cdot NOKIDS \;+\; c_{12} \cdot CATH_i \;+\; c_{13} \cdot PARDIV_i \;+\; u_i \end{aligned} \tag{31}$$

where z and z' indicate the combination (10×10) of male and female marital occupations,

(980-984) private household, where the occupational classification codes are reported in the parentheses. In a few instances, the respondent's occupation for the year of the marriage was not reported, so the occupation for the prior year was used.

respectively. To reiterate, the right-hand side variables are all known at the beginning of the marriage. The fitted values from this regression, PCORR, are therefore the predicted correlation of the partners' incomes based on information at the beginning of the marriage. Similarly, differences in the partners' actual mean incomes (MGAP) and actual variances of their incomes (VGAP) were regressed on the identical right-hand side variables that appear in equation (31). From these regressions, the predicted gap in mean incomes (PMGAP) and variances (PVGAP) were constructed. The mean income gap (MGAP) is measured as the absolute value of the difference of the means as suggested by the definition of z in sub-section 2.4.4. The income variance gap (VGAP) was measured by calculating the ratio of the higher value in a marriage to the lower value in the marriage, as suggested by the definition of Φ. Therefore, larger values of MGAP and VGAP correspond to greater mean and variance inequality in a marriage, while the lowest value that MGAP and VGAP can take are 0 and 1, respectively.[19]

The estimates of equation (31) for the actual correlation (CORR) and similar ones for the actual mean gap in incomes (MGAP), and actual variance gap in incomes (VGAP) are presented in Table 2. The left-hand side column lists the explanatory variables, while columns (I) through (III) present the results for the three dependent variables. To conserve space, the individual estimates and standard errors are not reported for the one-hundred (10×10) joint marital occupational dummies in each regression. Rather, I report the p-value for the F-test (*p-value occupation*), that the marital occupation dummy variables MMAROCC and WMAROCC are all jointly equal to 0. I also report the p-values from two other F-tests: *p-value occupation cross*, for the null hypothesis that the interactions between the marital occupations dummies are jointly zero when individual dummies for each spouses

[19] Explicitly, MGAP $= |\overline{y}_i - \overline{y}_j|$ and VGAP $= max(\sigma_i^2/\sigma_j^2, \sigma_j^2/\sigma_i^2)$. Other approaches to empirically defining the disparity of means and variances across partners were used, such as the absolute value of the difference or the absolute value of the differ scaled by the sum of the two partners' variables. The findings of this paper **do not** depend on the method chosen to measure these disparities, but rather the measures presented are those that most closely fit their counterparts from the theory.

marital occupation are included in the regression; and *p-value AGE & ED cross*, for the null hypothesis that the cross interactions between spouses ages and education values are jointly zero, $c_4 = c_7 = c_{10} = 0$. These latter two p-value statistics are important as the cross spouse variables will be useful for identifying the independent role of the predicted income characteristics on the duration of marriage.

Column (I) of Table 2 presents the regression results when the couple's actual labor income correlation (CORR) is the dependent variable. Typically, couples in which the respondent is white, who are older when married and whose male partner has more education at the start of the marriage typically have more negatively correlated labor incomes. The estimated cross effect on spouse age at marriage suggests that the age effect is diminishing across spouses, while the cross effect on education at marriage suggests, however, that the education effects are amplified across spouses. The p-value results from the F-statistic also reveal that one can reject the hypothesis that the marital occupational dummy variables are jointly equal to zero at or below the .001 level of statistical significance. As well, the p-values for the cross occupation and age and education variables are also below conventional levels of significance.

Column (II) of Table 2 reports the empirical results for equation (31) when MGAP is the dependent variable. Marriages in which the respondent is white, Catholic, and with divorced parents, and in which the spouses are young upon first marriage are associated with larger mean income gaps. These effects all have levels of statistical significance well below .05. In addition, the reported p-value reveals that one can reject the hypothesis that the marital occupational dummy variables are jointly equal to zero at or below the .001 level of statistical significance. Again, the p-values for the cross occupation and age and education variables are also below conventional levels of statistical significance. Finally, column (III) presents the results for the case in which the partners' gap in the variances of their individual incomes is the dependent variable. Here, only the dummy variables for the occupation dummies are significantly different from zero at or below the .001 level, and the cross occupation dummy variables are also significantly different from zero at or below the .001 level. The R-squared is .258, which is two times higher than for the CORR equation (I) and about one-quarter higher than for the MGAP equation (II).[20]

3.3 Empirical Regularities

Tables 3 and 4 present statistics and correlations for the data for the marriages and marital economic characteristics used in this study. Table 3 demonstrates that over thirty percent of first marriages failed by 1994, while only about fifteen percent of the respondents' parents divorced. The sample is sixty-five percent white, over thirty-five percent Catholic, and quite young when first married. These latter two features are likely driven by data necessity: since the survey is of young people, and I consider only those who get married during this sample, this sample criteria biases the population towards those who married young, a characteristic that could in fact be correlated with being raised Catholic.[21] Finally, approximately one-third of the male and female spouses have attended a two- or four-year college at some point by the time of their marriage, and approximately eighty percent of these first marriages begin without dependents. The average predicted correlation (based on data at the initial year of their marriage) is around .2, the average mean income gap is approximately twelve thousand dollars, while the average ratio of the highest-to-the-lowest income variances is approximately 19.[22,23]

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[20]Fortunately, the regression results for MGAP are no weaker than that for CORR, as one potential finding is that PMGAP is insignificant in determining marital durations. Of course, a poorly measured PMGAP is one way to obtain this finding. However, since the R-squared for the PMGAP regression is no worse than that for PCORR, it is unlikely that a finding of the insignificance of PMGAP on the duration of marriages (and the significance of PCORR on the duration of marriages) would be due to its poor measurement. I return to this point again below.

[21]While this may bias the sample, it is unlikely that this biases the tests of the hypotheses.

[22]Note that the lowest value for VGAP is 1, although the predicted value can take a value lower as the regression specification (31) is unrestricted. The results reported in Table 5 are robust to setting these predicted values below one equal to one.

[23]While the predicted correlation is low, this is consistent with the finding of Dynarski and Gruber (1997). Using the PSID and CEX data sets, they find that a wife's labor income does not appreciably affect the

Table 4 presents a simple cross correlation of the data. The correlations reveal that subsequent divorce is negatively correlated with age at marriage , the absence of dependents at the beginning of marriage, more education, and parents who did not divorce. In general, the unconditional correlations between divorce and the predicted income characteristics for correlation and volatility are positive and relatively large, while the predicted mean gap has a much smaller and negative correlation with divorce. In addition, there are two other sets of correlations that are of interest: first, marriages that begin when either the male or female spouse is older are associated with the respondent being more educated, though for women it is associated with having fewer beginning of marriage dependents. Finally, the predicted income characteristics display the following correlation patterns: first, spouses with larger gaps in their mean incomes tend to have more negatively correlated incomes and smaller gaps in their income variances. Second, spouses with higher predicted income correlations also have larger predicted volatility differences. The remaining correlations between the income variables and the other characteristics are directly related to the empirical results in Table 2, from which these predicted income characteristics were constructed.

3.4 Empirical Estimates

In this subsection I present a test of the predictions in Propositions $2-5$. The empirical analysis of marriages and divorces in this data set is complicated by the fact that the data are censored: the data set ends with some marriages having failed after surviving for some duration of time and other marriages having survived until the end of the recorded data set. Fortunately, duration models are able to test the predictions from the theory while overcoming this problem of censoring. Duration models specify a hazard function, $\lambda(t_i, X_i)$ and a survival function $S(t_i, X_i)$: the former is the instantaneous probability that the i^{th} marriage of duration of t periods will fail. The X_i are exogenous and time-invariant

smoothness of the head's labor income. However, as long as the correlation between the head's and wife's incomes is less than one, marriage will still provide a consumption-insurance benefit.

variables that impact the hazard of the i^{th} marriage ending in a divorce. Clearly, $\lambda(t_i, X_i)$ and $S(t_i, X_i)$ are related.[24]

The estimation results presented below were obtained from a Cox (1972) proportional hazard model.[25] For the proportional hazard model, the hazard function is related to the hazard rate according to $\lambda(t_i, X_i) = \lambda(t_i, 0)e^{\gamma'(X_i)}$, where the vector γ contains the parameters to be estimated. The benefit to estimating the proportional hazards model is that one can use a partial likelihood function approach to estimate the parameters γ, without estimating the baseline hazard $\lambda(t_i, 0)$ which contains the individual heterogeneity.

To test the predictions of the theory, $\gamma' X_i$ is specified as follows:

$$\begin{aligned} \gamma' X_i \;=\; & \gamma_1 \cdot PCORR_i + \gamma_2 \cdot PMGAP_i \\ & + \gamma_3 \cdot PVGAP_i + \gamma_4 \cdot X_i \end{aligned} \tag{32}$$

According to the theory, the estimates of γ_1, γ_2 and γ_3 should be negative if love is permanent and future income (both shared and unshared) is relatively unimportant in income considerations. In contrast, if love is temporary and future income is important in permanent income considerations, then γ_1 and γ_3 should be positive. In addition, if love is temporary then γ_2 should be zero (positive) if expected future income differentials in the case of divorce are small (large).

The vector of control variables for the i^{th} marriage, X_i, includes AGEM, AGEW, EDUCM, EDUCW, $(EDUCM \cdot AGEM)$, $(EDUCW \cdot AGEW)$, NOKIDS, WHITE, CATH, PARDIV and the twenty individual marital occupation dummy variables for both spouses, FMAROCC and MMAROCC. To conserve space, rather than report the estimated coefficients on the individual marital occupation dummy variables, I simply report at the

[24] See Kiefer (1988) for an introductory discussion of duration models.

[25] Also see Keifer (1988) for the specifics of the partial likelihood function approach to estimating these models with censoring. Note that this assumption for the hazard function does not affect the results presented below. Similar findings were also obtained from exponential, Weibull and log-logistic specifications of the hazard function.

bottom of the table the p-value from the χ^2 test of the null hypothesis that they are jointly equal to zero. Moreover, I experimented with allowing for time dependent covariates for each of these individual characteristics (not shown) in the hazard model, and found that only PARDIV demonstrated time dependent effects that were significantly different from zero at below the .1 level, so that $PARDIV \cdot DUR$ is also included in (32) as a time dependent covariate.[26] Importantly, expression (32) excludes the cross spouse variables $AGEM \cdot AGEW$, $EDUCM \cdot EDUCW$, $(AGEM \cdot EDUCM \cdot AGEW \cdot EDUCW)$ and the cross spouse marital occupation dummy variables (but not the individual ones) that were included in the prediction equations for PCORR, MGAP and VGAP.[27] The model is estimated by maximizing the partial log-likelihood function with respect to the parameters γ, accounting for censored data - see Kiefer (1988).

Table 5 presents estimation results of equation (32) for the full sample. In general, the results support the view that love is temporary, that the fraction of income risk in the future is relatively large, and that incomplete sharing of expected future income is not large. Typically, we can reject the null hypothesis that the estimates of γ_1 and γ_3 are 0 in favor of the alternative that they are greater than 0. Furthermore, the estimates of γ_2 are always statistically indistinguishable from 0. Column (I) of Table 5 provides estimates of the baseline specification (32) when just PCORR is included in the regression. Strikingly,

[26] That is, DUR is a function of time as observed duration of the marriage changes. This is opposed to the dependent variable, maximum duration ($MAXDUR$), which is fixed for each i^{th} marriage. None of the other variables had time dependent effects that were statistically significant from zero at or below the .1 level. One can reject the null that all the time dependent effects, excluding those for PARDIV, are jointly different from zero at the .9 level of statistical significance.

[27] This two-step estimation procedure identifies the effect of predicted marital economic factors (PCORR, PMGAP, and PVGAP) in the duration equation by retaining individual spouse characteristics in the hazard equation but excluding interaction affects between the spouses. A possible exception is the inclusion of NOKIDS in both the prediction and duration equations. I included NOKIDS in the hazard equation as it is likely to have an independent effect on marital duration apart from its effect on predicting joint economic characteristics. Though not shown, it is significant and negative when the economic characteristics are excluded or insignificant – e.g., see column (II) of Table 5 where γ_2 is estimated to be near zero and γ_1 and γ_2 are set equal to zero. The results presented in Table 5 are **unchanged** if one the excludes NOKIDS variable from the hazard model, one includes age and education cross terms in the hazard model, or one excludes the time dependent effect of PARDIV in the hazard model.

the more positively related the spouses' incomes are, the more likely that the marriage will end in divorce as the hazard rate rises. The coefficient on γ_1 is positive and statistically different from 0 at below the .01 level of significance. Columns (II) and (III) provide estimates of the baseline specification (32) when just PMGAP and PVGAP, respectively, are included as covariates in the hazard function. While the coefficient on PMGAP is not statistically different from 0, the coefficient on PVGAP is statistically significant at or below the .01 level, and the sign of the coefficient is once again positive. This suggests that partners with greater differences in income volatility will have an increased chance of divorce, while those with greater mean differences will not. The estimates in columns (I) through (III) also suggest that marriages when the woman is older when first married, have a decreased chance of getting divorced, while those respondents whose parents have divorced have a higher chance of divorce themselves, although this effect tends to diminish with time. Moreover, as indicated by the row labeled 'p-values', one can reject that the individual marital occupation dummy variables for both spouses are jointly equal to zero at conventional significance levels.

In column (IV) of Table 5, estimates are provided when all three economic variables are included simultaneously. Again, the coefficients on PCORR and PVGAP are positive and statistically different from 0 at or below the .05 levels of statistical significance. Moreover, the coefficient on PMGAP remains statistically indistinguishable from 0 at conventional levels. Interestingly, the results in Table 2 provide evidence that the predicted level of mean incomes has a much better fitting regression than does the predicted income correlation as measured by its R-squared. It is likely, therefore, the finding that γ_2 is insignificantly different from 0 is not due to PMGAP's poor measurement, but rather to PMGAP's inability to contribute to the explanation of a marriage's duration.

The final results, reported in columns (V) - (VIII) of Table 5, provide additional empirical results which demonstrate the robustness of the findings. Columns' (V) through (VII) results are to ensure that our baseline sample and specification are not unduly influenced by households that may display reverse causality with respect to economic characteristics and marital success.[28] For example, suppose that households have some private information that they will be successful and hence one partner specializes in home production (where economic services are unreported) for the purposes of having children. We would expect that couples like this would display a larger gap in mean observed incomes, and more negatively correlated observed incomes.[29]

In column (V), the specification is re-estimated over the full sample, except that the dummy variable NOKIDSEVER is included as an explanatory variable, despite its potential endogeneity with the duration of marriage.[30] The variable NOKIDSEVER takes the value of 1 if the couple has no children at any time during their marriage, and is zero otherwise. While the effect of NOKIDSEVER on the hazard rate is positive and statistically significant at or below the .01 level, the estimated coefficients on the income characteristics, PCORR, PMGAP, and PVGAP, are largely unaffected. These income terms are, therefore, not just proxies for the tendency to have more children.[31] The results in column (VI) remove marriages whose partners have the top 25 percent of observed mean income gaps, MGAP, in the sample.[32] Removing these households should remove some marriages in which one member specializes in home production and provides unobserved economic benefits (i.e., thereby raising the mean income gaps), which could affect the results. The results for γ_1, γ_2, and γ_3 reported in column (VI), however, are unaffected by the removal of these

[28] Of course, this is the exacty reason why the predicted values of CORR, MGAP, and VGAP, rather than their actual values, are included in the specification of the hazard rate, equation (32).

[29] The scenario for the latter would be that a successfully married couple would have one partner with improving income prospects while the other partner would have declining market participation in order to raise children. In turn, this would make their actual income correlations (CORR) appear negative.

[30] There are too few observations to estimate the duration model separately for those who do not have children. See Table 3.

[31] It is interesting to point out that survey evidence in the sociology literature actually suggests that marital happiness and the presence of children are negatively correlated – see White, Booth and Edwards (1986). Somewhat paradoxically, however, children are associated with longer-duration marriages.

[32] To note, the findings are also identical if I remove the top 25 percent of actual income variance differentials, VGAP, in the samples, or impose a minimum average earnings restriction for each partner.

households. Finally, in (VII), households with the lowest 25 percent of observed income correlations (CORR) are removed from the sample. Again, the results on the key variables are largely unaffected.

As a final investigation, I included second marriages into the data set and re-estimating the projection equations (not shown) and proportional hazard model equation, and included a dummy variable for second marriages (SECOND) as an additional explanatory variable in both equations. Note that these 125 second marriages come from the 353 out of 1207 first marriages that ended in divorce, though any dependence is not modeled in the econometrics. The results from estimated hazard model are reported in column (VIII) of Table 5. One would think, however, that second marriages for the respondent might involve some learning, which would lead them to make better matches during second marriages. The evidence in column (VIII) indicates, however, the inclusion of these additional marriages leaves the baseline estimation results relatively unchanged, though there is a statistically significant increased hazard for second marriages as compared to first ones.[33] While puzzling, the myopia or addictive behavior towards temporary initial love suggested by these results for second marriages is outside the scope of the paper.[34]

To summarize, Table 5 present comprehensive evidence that income characteristics projected from data available only at the beginning of a marriage are significant explanatory factors in a marriage's probability of survival. The evidence uncovered is that more positively correlated incomes between partners and a bigger gap in their income volatilities are

[33] I also tried interacting second marriages with the economic characteristics, though the coefficients were individually and jointly insignificant as conventional levels.

[34] Interestingly, second marriages have, on average, lower predicted income correlations than first marriages that end in divorce. This is important, since these second marriages are a sub-sample of first marriages that end in divorce. Hence, there seems to be some learning going on here. As well, second marriages have, on average, lower predicted differences in income volatility than do first marriages that end in divorce. Again, there seems to be some learning going on here. Nevertheless, consistent with the literature on divorce, second marriages are more likely to fail than first marriages. Of the 1207 first marriages, 29 % (353/1207) fail in divorce, whereas of the 125 second marriages from these 353 failed marriages, 35 % (44/125) fail in divorce, **ceteris paribus**. Given the shorter observed time horizon in the data for second marriages, this higher frequency of divorce in second marriages in the table is likely to be biased downwards.

associated with marriages of decreased duration. Moreover, bigger mean income gaps do not affect a marriage's duration. This pattern of results is consistent with the marriage model presented in the first part of the paper in which love is temporary, the fraction of income uncertainty that lies in the future is large, while the fraction of expected unshared income in the case of divorce is small.[35]

4 Conclusion

This paper has explored a model in which individuals can borrow or lend through time but can only diversify their labor income risk via marriage. Furthermore, the model allows for an exogenous, fluctuating factor that is a substitute for the utility from consumption: i.e., love. The model predicts that if love is permanent and income risk diminishes through time, then couples who substitute away from the hedging role of marriage when finding a partner will in fact be less likely to subsequently divorce. Alternatively, if love is quite temporary and income risk looms large in the future, then these same couples who substitute away from the hedging role of marriage when finding a partner will in fact be more likely to subsequently divorce. The evidence provided in this paper points to the likelihood that love is temporary and that future income uncertainty is important in determining marital duration. Further testable implications based on the mean and variance differences between spouses and the way in which the persistence properties of love determine how these predict marital duration also confirm the finding that love is temporary.

A potential shortcoming of this model is that love is purely determined by exogenous factors.[36] Rather, if partners could invest in love (perhaps with home production) to raise its future stock, then they may find that better economic characteristics would lead to a

[35] The result on income uncertainty might be quite large given that the data set, the National Longitudinal Survey of Youth, focuses on young respondents. That is why the evidence for PMGAP is important for establishing the case of love's temporary nature.

[36] See Mulligan (1997) and Becker and Murhpy (1998), among others, for a more general treatment of the economic and welfare effects of endogenizing love.

higher return on the investment in love. In turn, this would lead to partners with better economic characteristics accumulating a greater stock of love, which would make these marriages last longer. An extension along these lines, however, does not alter the basic finding that beneficial economic characteristics (e.g., marrying a better hedge) lead to an increase in the survival of marriages and that initial love cannot simply be substituted in its place.

REFERENCES

Backus, D.K., P.J. Kehoe, and F.E. Kydland, 1992, International Real Business Cycles, Journal of Political Economy 100, 84-103.

Becker, G. S., A Theory of Marriage, in Economics of the Family: Marriage, Children and Human Capital, Theodore W. Schultz, ed., 1975, University of Chicago Press for the National Bureau for Economic Research. Reprinted in Gary S. Becker, The Economic Approach to Human Behavior, 1976, University of Chicago Press.

Becker, G. S. and K. M. Murphy, September 21, 1998, Chapter V: Sorting by Marriage, *mimeo*.

Bergstrom, T., 1996, Economics in a Family Way, Journal of Economic Literature 34, 1903-1934.

Chami, R. and J. Fisher, 1996, Altruism, Matching and Non-Market Insurance, Economic Inquiry 34, 630-647.

Cochrane, J.H., 1991, A Simple Test of Consumption Insurance, Journal of Political Economy 99, 957-976.

Cornwell, C. and P. Rupert, 1997, Unobservable Individual Effects, Marriage and the Earnings of Young Men, Economic Inquiry, 35, 285-294.

Cox, D.R., 1972, Regression Models and Life-Tables (with discussion), Journal of the Royal Statistical Society B 34, 187-220.

Dynarski, S. and J. Gruber, 1997, Can Families Smooth Variable Earnings?, Brookings Papers on Economic Activity, 229-284.

Hess, G.D. and K. Shin, 1998, Intranational Business Cycles in the United States, Journal of International Economics 44, 289-314.

Hess, G.D. and K. Shin, 1999, Risk Sharing of Dis-Aggregate Macroeconomic and Idiosyncratic Shocks, Federal Reserve Bank of Cleveland, working paper 99-15.

Hess, G.D. and K. Shin, 2000, Risk Sharing Within and Across Regions and Industries, Journal of Monetary Economics 45, 533-560.

Johansen, S. and K. Jesulius, 1990, Maximum Likelihood Estimation and Inference on Cointegration - with Applications to the Demand for Money, Oxford Bulletin of Economics and Statistics 52, 169-210.

Kiefer, N., 1988, Economic Duration Data and Hazard Functions, Journal of Economic Literature 106, 646-679.

Kotlikoff, L. and A. Spivak, 1981, The Family as an Incomplete Annuity Market, Journal of Political Economy 89, 372-391.

Mace, B.J., 1991, Full Insurance in the Presence of Aggregate Uncertainty, Journal of Political Economy 99, 928-56.

Ogaki, M. and Q. Zhang, 2001, Decreasing Relative Risk Aversion and Tests of Risk Sharing, Econometrica 69, 515-534.

Rosenzweig, M. and O. Stark, 1989, Consumption Smoothing, Migration, and Marriage: Evidence from Rural India, Journal of Political Economy 97, 905-926.

Weiss, Y. 1997, The Formation and Dissolution of Families, in M. Rosenzweig and O. Stark, eds., Handbook of Population and Family Economics, Elsevier Science B.V.

White, L.K., A. Booth, and J.N. Edwards 1986, Children and marital happiness - why the negative correlation?, Journal of Family Issues 7, 131-147.

Table 1. Timing of Events

1. Period 0
   (a) Individuals i and j meet.
   (b) They learn how much they initially love each other, α_1, the expected correlation of their period-1 incomes, ρ_{ij}, and the variance of their incomes, σ_i^2 and σ_j^2.
   (c) They decide whether or not to marry.
2. Period 1
   (a) Each individual $k = i, j$ receives his or her first-period income, $\theta(\overline{y}_k + \epsilon_{1k})$.
   (b) Individuals consume c_{1k}^M (save s^M) if married and c_{1k}^{NM} (save s^{NM}) if never married.
3. Period 2
   (a) Married individuals learn how much they still love each other, $\alpha_2 = (1-\delta)\overline{\alpha} + \delta\alpha_1 + \nu$.
   (b) Individuals who were married in period 0 decide to divorce or remain married.
   (c) Each individual $k = i, j$ receives his or her second-period income, which has a present value as of time period 1 equal to $\beta^{-1}(1-\theta)(\overline{y}_k + \epsilon_{2k})$. If couples divorce, they pay the utility cost ϕ.
   (d) Divorced individuals consume c_{2k}^D. Married individuals consume c_{2k}^M . Never married individuals consume c_{2k}^{NM}.

Table 2: Economic Variables Projected on Initial Marital Characteristics

	Dependent Variable		
	(I)	(II)	(III)
Explanatory Variables	CORR	MGAP	VGAP
WHITE	−0.1235[a]	3.0965[a]	9.5980
	(0.0331)	(0.6745)	(6.8669)
AGEM	−0.0567[b]	−2.3129[a]	11.0681
	(0.0236)	(0.7561)	(8.8718)
AGEF	−0.0525[c]	−3.0019[a]	14.5099
	(0.0273)	(0.8501)	(13.1158)
$AGEM \cdot AGEF$	0.0020[c]	0.1190[a]	−0.5540
	(0.0011)	(0.0371)	(0.4570)
EDM	−0.4796[b]	−8.1200	−8.9033
	(0.2250)	(7.1723)	(41.2800)
EDF	0.3669	8.8597	77.5720
	(0.3021)	(6.0955)	(122.6985)
$EDM \cdot EDF$	−0.6248[b]	−10.3656	−52.8784
	(0.2713)	(12.4780)	(46.0003)
$AGEM \cdot EDM$	0.0205[b]	0.4365	−0.0025
	(0.0092)	(0.3032)	(1.5861)
$AGEF \cdot EDF$	−0.0166	−0.4873[c]	−4.2340
	(0.0137)	(0.2754)	(6.1434)
$AGEM \cdot EDM \cdot AGEF \cdot EDF$	0.0011[b]	0.0186	0.1235
	(0.0005)	(0.0232)	(0.1038)
NOKIDS	−0.0938[a]	0.4938	−20.4056
	(0.0364)	(0.7768)	(19.3434)
CATH	−0.0026	1.7973[a]	3.9630
	(0.0319)	(0.7008)	(4.5578)
PARDIV	0.0040	1.7278[b]	−5.3651
	(0.0415)	(0.8675)	(4.5233)
NOBS	1207	1207	1207
R^2	0.119	0.194	0.258
p-value occupation	0.001	0.001	0.001
p-value occupation Cross	0.001	0.001	0.001
p-value AGE & ED Cross	0.013	0.009	0.663

Notes: Columns (I)-(III) report the estimation results for the full sample, 1207 observations, where partner's income correlations (CORR), income mean gaps (MGAP) and income variance gaps (VGAP) are the dependent variables, respectively. NOBS is the number of observations (marriages). Standard errors, robust to possible heteroskedasticity of unknown form, are reported in parentheses. [a], [b] and [c] refer to statistical significance (two-tailed) at or below the .01, 05 and .10 levels, respectively. Each regression also includes interactions between the two sets of 10×1 for each partner's occupation at the time of marriage, MMOCC and WMOCC. *p-value occupation* reports the level of statistical significance at which one can reject the hypothesis that all the marital occupation dummy variables are jointly equal to zero. *p-value occupation cross* is for the test that the interactions between the marital occupations dummies are jointly zero when the individual dummies for each spouses marital occupation continue to be included in the regression. *p-value AGE & ED cross* is for the null hypothesis that the cross interactions between spouses age and education are jointly zero The key variables from the NLSY are whether the respondent was white (WHITE), the respondent's age when married (AGEF for the female and AGEM for the male), did the respondent attend a 2 or 4 year college (EDF for the female and EDM for the male), were the respondent's parents divorced (PARDIV), and was the respondent raised Catholic (CATH).

Table 3: Statistics

			Percentile				
Series	Mean	Std. Error	10^{th}	25^{th}	50^{th}	75^{th}	90^{th}
DIV	0.292	0.455	0.000	0.000	0.000	1.000	1.000
MAXDUR	9.815	4.157	3.000	9.000	10.000	13.000	15.000
WHITE	0.671	0.470	0.000	0.000	1.000	1.000	1.000
AGEM	23.42	3.702	20.00	21.00	23.000	25.000	27.000
AGEF	21.46	3.030	18.000	19.000	21.000	23.000	25.000
EDM	0.276	0.448	0.000	0.000	0.000	1.000	1.000
EDF	0.259	0.437	0.000	0.000	0.000	1.000	1.000
NOKIDS	0.760	0.426	0.000	1.000	1.000	1.000	1.000
CATH	0.380	0.486	0.000	0.000	0.000	1.000	1.000
PARDIV	0.150	0.357	0.000	0.000	0.000	0.000	1.000
PCORR	0.216	0.181	0.003	0.103	0.218	0.322	0.410
PMGAP	12.692	6.903	9.626	12.244	14.950	18.587	3.963
PVGAP	19.447	0.579	−6.846	0.481	8.166	17.843	27.885

Notes: See Table 2. Number of observations is 1207. Variables that are new to the tables are whether the marriage ended in an observed divorce (DIV) and the whether the respondent had children at the end of the marriage or sample (KIDS). PCORR, PMGAP and PVGAP are the fitted values from the estimates reported in columns (I) through (III), respectively, of Table 2.

Table 4: Correlation Matrix

	DIV	MAXDUR	WHITE	AGEM	AGEF	EDM	EDF	NOKIDS	CATH	PARDIV	PCORR	PMGAP
MAXDUR	−.768											
WHITE	−.069	.053										
AGEM	−.066	−.095	.038									
AGEF	−.145	−.115	.037	.363								
EDM	−.080	.007	−.012	.266	.121							
EDF	−.098	.037	.044	.018	.222	.019						
NOKIDS	−.100	.046	.248	.033	.101	.143	.146					
CATH	−.023	−.012	−.207	.015	.031	.050	.043	−.028				
PARDIV	.072	−.047	−.071	.011	−.003	−.037	−.053	−.042	−.009			
PCORR	.122	−.085	−.372	−.187	−.207	−.025	−.103	−.274	.092	.010		
PMGAP	−.055	−.012	.314	.391	.027	.384	−.074	.184	.101	.078	−.120	
PVGAP	.113	−.134	.050	.004	.041	−.053	−.050	−.094	−.015	−.034	.255	−.055

Notes: See Tables 2 and 3.

Table 5: Estimation Results for the Divorce Hazard Rate (λ)

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	$(VIII)$
PCORR	1.336^{a}			1.039^{b}	1.106^{a}	1.052^{b}	0.801^{c}	0.737^{c}
	(0.404)			(0.435)	(0.424)	(0.502)	(0.478)	(0.391)
PMGAP		−0.008		0.002	0.004	0.018	−0.002	0.000
		(0.017)		(0.018)	(0.018)	(0.021)	(0.022)	(0.016)
PVGAP			0.106^{a}	0.073^{b}	0.079^{b}	0.075^{b}	0.083^{b}	0.101^{a}
×100			(0.031)	(0.033)	(0.033)	(0.035)	(0.036)	(0.033)
SECOND								0.367^{b}
								(0.186)
AGEM	0.036^{c}	0.015	0.013	0.030	0.030	0.005	0.035	0.016
	(0.020)	(0.019)	(0.019)	(0.020)	(0.020)	(0.024)	(0.024)	(0.020)
AGEF	-0.050^{b}	-0.061^{b}	-0.059^{b}	-0.052^{b}	-0.056^{b}	−0.034	-0.046^{c}	-0.063^{a}
	(0.025)	(0.025)	(0.025)	(0.026)	(0.026)	(0.030)	(0.028)	(0.024)
EDM	1.456^{c}	0.549	0.556	1.213	1.297	1.302	1.798	0.620
	(0.879)	(0.836)	(0.827)	(0.918)	(0.923)	(1.106)	(1.127)	(0.830)
EDF	−0.277	−0.043	−0.151	−0.293	−0.254	−1.190	−0.751	−1.124
	(1.147)	(1.151)	(1.153)	(1.149)	(1.156)	(1.389)	(1.335)	(1.016)
WHITE	−0.023	−0.156	-0.216^{c}	−0.090	−0.109	−0.092	−0.108	−0.157
	(0.127)	(0.129)	(0.119)	(0.139)	(0.137)	(0.154)	(0.155)	(0.130)
CATH	−0.109	−0.079	−0.080	−0.097	−0.098	−0.006	−0.024	−0.035
	(0.115)	(0.119)	(0.115)	(0.119)	(0.120)	(0.134)	(0.137)	(0.112)
$AGEM \cdot EDM$	-0.072^{b}	−0.033	−0.033	−0.061	-0.065^{c}	−0.069	-0.085^{c}	−0.035
	(0.036)	(0.035)	(0.034)	(0.038)	(0.038)	(0.047)	(0.048)	(0.034)
$AGEF \cdot EDF$	0.002	−0.010	−0.003	0.003	0.002	0.037	0.015	0.044
	(0.052)	(0.053)	(0.053)	(0.053)	(0.053)	(0.064)	(0.061)	(0.046)
NOKIDS	−0.111	-0.229^{c}	−0.166	−0.088		−0.154	−0.048	−0.103
	(0.132)	(0.127)	(0.129)	(0.133)		(0.147)	(0.146)	(0.124)
NOKIDSEVER					0.402^{b}			
					(0.164)			
PARDIV	1.058^{a}	1.037^{b}	1.032^{b}	1.051^{a}	1.068^{a}	0.891^{b}	0.722^{b}	0.916^{b}
	(0.408)	(0.408)	(0.407)	(0.408)	(0.408)	(0.411)	(0.365)	(0.379)
$PARDIV \cdot DUR$	-0.105^{c}	-0.105^{c}	-0.104^{c}	-0.105^{c}	-0.107^{b}	-0.104^{c}	−0.072	-0.086^{b}
	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)	(0.059)	(0.054)	(0.050)
Nobs	1207	1207	1207	1207	1207	905	905	1332
llk	−2382.2	−2387.5	−2383.0	−2380.1	−2377.6	−1785.6	−1835.5	−2722.8
p-value	0.003	0.003	0.037	0.022	0.035	0.066	0.021	0.116

Notes: See Tables 2 and 3. Estimates are obtained from a proportional hazard model. Columns (I)-(IV) report the estimation results for the full sample. The results in column (V) are for the base case where NOKIDSEVER is included in the specification of the hazard function. The results in column (VI) are for the sub-sample where the top 25 percent of mean income gaps (MGAPs) are removed from the sample. The results in column (VII) are for the sub-sample where the bottom 25 percent of actual income correlations are removed from the sample. The results in column (VIII) are for the expanded sample that includes second marriages. llk is the value of the log-likelihood function, and p-value is from the χ^2 test of the null hypothesis that the individual marital occupation variables are all equal to zero.

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