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Grandma was Right: Why Cohabitation Undermines Relational Satisfaction, But is Increasing Anyway

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Summary: This paper uses a game theoretic model to explain empirical research which has revealed higher relational satisfaction among married couples than cohabiting couples, as well as among married couples who did not cohabit before marriage. Despite these findings, in recent decades cohabitation rates have dramatically increased in both Europe and the United States. Instrumental variables estimations on data from 28 industrialized countries and 50 U.S. states show cohabitation strongly correlated with increases in women's labor force participation, where a 10 percent increase in women's labor force participation results in a 6.4 to 14.6 percent increase in cohabitation.

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I. INTRODUCTION

Concern over the future of the traditional family has become the focus of a deeply divisive debate in many western countries. A major social change in recent decades has been the dramatic increase in the rate of cohabitation of heterosexual unmarried partners: According to U.S. Census estimates, the number of unmarried cohabiting couples in the United States has increased approximately ten-fold since 1970 to nearly 4.2 million in 2002. A recent study of women in their thirties found that the first residential union for 52 percent of American women and 70 percent of British women was cohabitation rather than marriage. In some Scandinavian countries the figure was found to be even higher; for example, in Sweden it has reached over 90 percent (Kiernan, 2003).

This paper uses game-theoretic and empirical methods common to economics to explore several interesting empirical phenomena related to cohabitation and marriage. The first is that while cohabitation is often viewed as an alternative to marriage in which greater flexibility is perceived to enhance relational satisfaction, empirical studies reveal a consistently and significantly *lower* level of relational satisfaction among cohabiting couples than among married couples (Nock, 1995; Brown and Booth, 1996; Stack and Eshleman, 1998; Treas and Giesen, 2000). Another common motivation for cohabitation is its use as a pre-marital screening device. Yet empirical studies consistently reveal higher rates of unhappiness and divorce among married couples who previously cohabited, a phenomenon referred to in the literature as the "cohabitation effect," which has remained a puzzle among social psychologists (Thompson and Colella,1992; Bumpas and Sweet, 1989; Bennett, Blanc, and Bloom, 1988; Booth and Johnson, 1988).

Using a game-theoretic framework, I develop a theory that seeks to explain these empirical phenomena. First, I demonstrate why we should expect marriage to result in a higher level of relational satisfaction than cohabitation. The essential idea is that for a broader range of individuals, marriage promotes self-control more effectively than cohabitation. The intuition is the following: Define s as the minimum T-period consequence that is required to check selfish behavior toward a partner. If the consequences of exiting a bad marriage are more severe than the consequences of exiting a bad cohabitation, an individual is more likely to accept s within marriage than in cohabitation in lieu of exiting the relationship. This makes s a more credible deterrent to selfish behavior within marriage than cohabitation. As a result, for a range of individuals full cooperation is possible in marriage, while in cohabitation only a "pseudo-cooperative" behavior is possible, a lower level of cooperation characterized by occasional defections. That it is more difficult for either party to walk away from marriage than cohabitation makes the cooperative outcome more likely within marriage.

Why might couples who cohabit before marriage be more likely to divorce? If there is imperfect information, the model predicts that some couples will choose to cohabit as a pre-marital screening device. These couples are a self-selected group for whom cooperation, even within marriage, is most uncertain. For these couples, the pseudo-cooperative behavior under the relative instability of cohabitation may establish expectations about partner behavior that are taken with the couple into marriage, fostering an outcome that is worse than what the couple could have achieved from a different set of expectations formed by entering into marriage directly. Thus the cohabitation effect can be explained by factors related to both self-selection and behavioral expectations.

If cohabitation is empirically associated with lower levels of happiness, then why is it on the rise in western society? The model generates hypotheses that are used to explain cohabitation trends in Europe and the United States, and account for cross-sectional differences between countries. Since increases in cohabitation rates appear to have started in most countries during the mid-1960s to early 1970s, possible candidates for an explanation would appear to be (a) a general liberalization of divorce laws that occurred in many western countries during this period; (b) the widespread introduction of the contraceptive pill in the mid-60s; (c) the widespread legalization of abortion in the early 1970s; and (d) the increase in women's wages and labor force participation.

Of these four factors, the model highlights the effects from the legalization of abortion and the increase in women's wages and labor force participation. The intuition is that factors (a) and (b) yield ambiguous effects on the marriage/cohabitation choice. However, children are more likely to be desired within than out of wedlock, so that the availability of abortion increases the reservation payoff within cohabitation more than marriage. Interestingly, women's labor force participation influences a couple toward cohabitation through two channels: It substitutes women's time away from household activity, lowering the gains from cooperation (through activity specialization) within the relationship while also increasing reservation payoffs outside a relationship.

Separate estimations on data from 28 industrialized countries and 50 U.S. states, each using instruments to control for the endogeneity of cohabitation, point to women's labor force participation as the unique factor among these significantly associated with higher levels of cohabitation. These findings are corroborated by a difference-in-differences estimation on the U.S. state data showing changes in cohabitation rates between 1990 and 2000. Results indicate that a 10 percent increase in women's labor force participation is associated with a 6.4 to 14.6 percent increase in the rate of cohabitation. The paper continues with a survey of recent trends and empirical studies on cohabitation and marriage relationships in Section II. The theoretical model is presented in Section III, empirical results in Section IV, and Section V offers some conclusions from the research.

II. COHABITATION AND MARRIAGE: EMPIRICAL FINDINGS

Though most research on marriage and relationships has been undertaken by sociologists and psychologists, marriage is an institution that has increasingly attracted the attention of economists since the seminal work of Becker (1973, 1974). Much research since then, such as Laine (1992), has focused on gaining a deeper understanding of mate selection, or "matching equilibria" in the marriage market. Other work has centered on the childbearing decision (Murphy, 2002), and intra-household bargaining between spouses (Carter and Katz, 1997). Kevane and Wydick (2001) and Seaton (2001) provide empirical tests of Nash bargaining models applied to marriage in developing and developed country contexts, respectively.

More recently Matouschek and Rasul (2006) attempt to empirically distinguish between three motives for marriage: as an institution that provides an exogenous payoff to partners, marriage as a commitment device, and finally as a screening device. The authors exploit the timing in the implementation of unilateral divorce laws in the United States their empirical study, concluding that the predominant reason people marry is that marriage serves as a commitment device.

While economics has made forays into understanding the nature of relationships, the most substantial studies of marriage and cohabitation have been undertaken in social psychology, where researchers have carried out a rich array of both theoretical and empirical work. Batlova and Cohen (2002) document differences in cohabitation across countries. Rates of unmarried cohabitation among adults for selected countries from their study are given in Table 1. Other research has revealed changes in attitudes toward cohabitation, which have become increasingly accepting in most western societies (Bumpass and Sweet, 1989; Booth and Crouter, 2002; Thornton and Young-de Marco, 2001). Taken from the latter, Table 2 illustrates the greater social tolerance of cohabitation in the United States. In Britain, Haskey (2001) finds that the percentage of those agreeing that "living together outside of marriage is always wrong" dropped from about 45 percent among those in the 1920 birth cohort to about 8 percent in the 1960 birth cohort.

Nevertheless, empirical studies by social psychologists have consistently found that married people report higher levels of personal happiness than unmarried people (Diener et. al., 2000; Stack and Eshleman, 1998), a result that seems to hold across countries, cultures, and time periods, although the difference in happiness between single and married people has narrowed in recent years (Frey and Stutzer, 2002). A key question is the extent to which the correlation between marriage and happiness is due to selection effects, or whether it is marriage itself that causes people to be happier. Some

studies such as Mastekaasa (1992), Stutzer and Frey (2005), and Frey and Stutzer (2006) have found significant selection effects of happy people into marriage.

Frey and Stutzer utilize data from the German Socio-Economic Panel Study, a data set spanning from 1984 to 2000 from which they are able to carry out estimations on up to 133,952 observations of 15,268 individuals, with some of these individuals moving from singleness to marriage during the 17-year sample period. First, they find marriage to be associated with significantly higher levels of happiness than singleness (with happiness of cohabitants ranking in the middle). The effect is sizeable, equivalent to the difference in a person having 2.5 times the mean household income instead of the mean household income. Second, their analysis using panel data allows them to uncover significant evidence of self-selection effects of happy people into marriage. Interestingly these self-selection effects are strongest among two groups of individuals, those who marry in their early 20s and those who marry after their early 30s. In both of these groups, Frey and Stutzer find that those in the relevant group who will later marry report significantly higher life satisfaction scores than those who will remain single.

Other research has focused on the similarities and differences in relational outcomes between marriage and cohabitation, *i.e.* is it *togetherness* that brings happiness, or is happiness in some way related to *commitment*? The empirical evidence suggests that while cohabiting couples report moderately greater levels of personal happiness than single people (Stack and Eshleman, 1998; Frey and Stutzer, 2002), there is a significant difference between marriage and cohabitation in reported happiness and relational functionality (Nock, 1995; Brown and Booth, 1996; Stack and Eshleman, 1998; Treas and Giesen, 2000). The empirical results of Brown and Booth are typical of the literature, and are carried out on a sample of 13,017 individuals using 1987-1988 U.S. National Survey of Family and Households data. Their results show that relative to marriage, cohabitation is significantly associated with greater levels of disagreement in relationships, a lower perception of relational fairness, relative unhappiness, and less frequent partner interaction.

Empirical research also suggests a higher level of sexual infidelity among cohabiting couples than married couples. On a sample of 3,432 Americans from the 1992 National Health and Social Life Survey, Treas and Giesen (2000) reveal a significantly higher likelihood of sexual infidelity among cohabiting couples than married couples. They conclude that even "controlling for sexual values…did not eliminate the significant association between infidelity and cohabitation, a result that pointed to commitment mechanisms as likely influences on sexual behavior" (p.58).

Recent research has furthermore tried to understand why married couples who cohabit prior to marriage appear to experience higher levels of dissatisfaction, separation, and divorce

than couples who did not previously cohabit, *i.e.* the causes of the "cohabitation effect". Self-selection based on demographic characteristics and relational attitudes appear to account for part of the phenomenon. But Cohan and Kleinbaum (2002) conclude from laboratory experiments with couples involved in problem solving exercises that the cohabitation effect is due principally to poor relationship-building skills and communication habits in marriage that are developed during cohabitation. In response to the question "Why are prior cohabiters more likely to get divorced?" they respond that "Pre-marital cohabitation experience appears to be a vulnerability spouses bring into marriage that puts them at risk for poor marital communication" (p.189).

III. THE MODEL

3.1. Basic Framework

Consider the "Relationship game" in Figure 1, involving two players, Candy and Bubba. Candy and Bubba play an infinitely repeated game in which each has a defecting and a cooperative strategy. Bubba's strategies are to Go Out Drinkin' or Stay Home/Fix Sink, while Candy's strategies are to Be Sweet or Nag Bubba, strategies intended to reflect the nitty-gritty of potential marital conflict. Let δ_i be the per-period discount factor, where for each representative player $\delta_i \in (0,1)$, and the distribution of individuals across (0,1) is uniform. The model incorporates the following three axioms:

The Human Frailty (HF) Axiom. Though purely altruistic motives can certainly influence behavior in relationships, I posit that the human tendency toward self-interested behavior influences decision-making. Payoffs in marriage are $y \succ x \succ 0 \succ -z$, indicative of a Prisoners' Dilemma, such that each player has a dominant strategy characterized by the more selfish behavior in the stage game.

The "Not-Just-A-Piece-Of-Paper" (NJPP) Axiom. After any stage of the repeated interaction, either player may choose to exit the game. However, if either spouse exits a marriage, both receive the divorce payoff, ν, which is lower than the reservation payoff for breakup of non-marital unions, α, which are both smaller than *x*. The second axiom merely says that marriage vows matter. Breaking such vows, and the legal agreement that lies behind them, is more painful than if vows were never made. (Temporarily we will normalize ν to zero.)

The "Codependence Invites Defection" (CID) Axiom. I will assume that a cooperative relationship must be characterized by a Nash equilibrium that is not only subgame-perfect, but "renegotiation-proof," providing no incentive for renegotiation between players at any stage of the game. When players threaten to retaliate against a defection, the response must be credible; otherwise such statements merely invite partner defections and codependent behavioral patterns. (For an excellent review on codependent behaviors, see Prest and Protinsky, (1993)).

Given the HF, NJPP, and CID axioms, each spouse will engage in the cooperative behavior if the consequences from short-term selfish behavior are sufficiently high. The following inequality gives the conditions under which the *T*-period consequence will deter a one-period episode of selfish behavior in the relationship:

$$y - \delta_i\, z - \delta_i^{\,2} z - \ldots - \delta_i^{T} z + \delta_i^{T+1} x + \ldots + \delta_i^{\infty} x < x + \delta_i x + \delta^2 \cdot x + \ldots + \delta_i^{\infty} x\,.$$

Algebraic manipulation of (1) shows that selfish behavior is deterred by the *T*-period consequences

when $\dfrac{y-x}{x+z} < \dfrac{\delta_i - \delta_i^{T+1}}{1-\delta_i}$. (1)

The rationale for the CID axiom is evident at this point, *i.e.* the *T*-period consequences necessary to deter selfish behavior must be credible, or we should rule out the strategy profile as a possible equilibrium. Suppose the defecting player can either play a strategy of "defiance" (further defection) or "contrition" (cooperation) in response to any punishment strategy by the other player after he or she defects. Because $x > 0$, notice that given a defiant strategy by a defector, the affected partner's best response to a one-period defection may be to let "bygones be bygones," to renegotiate in favor of a return to cooperation since defiance yields the Pareto-inferior (0,0) payoff for the *T*-period duration. Thus the possibility of renegotiation may encourage a codependent behavioral pattern that "enables" defections and thus inhibits Nash cooperation. But since (by the HF axiom) $y > x$, the *T*-period consequences are renegotiation-proof if the defector plays the contrite strategy in response to his defection, or "accepts the consequences of being selfish." Unlike the (0,0) payoff, there is no incentive for both players to renegotiate the $(y,-z)$ payoff since payoffs in the consequence phase are Pareto efficient (see Benoit and Krishna, 1993).

Within marriage, where the "out option" is $\nu = 0$, the condition must therefore be established under which the defecting partner will play the contrition strategy during the *T*-period consequences in order regain the value of the mutual cooperative outcome within the relationship. This condition is given by (2):

$$-z - \delta_i z - \delta_i^2 z - \ldots - \delta_i^{T-1} z + \delta_i^{T} x + \ldots + \delta_i^{\infty} x > 0\,,$$ or equivalently

$$\frac{\left(1-\delta_i^T\right)(-z)+\delta_i^T x}{1-\delta_i}>0 \quad \text{or} \quad \delta_i>\left(\frac{z}{x+z}\right)^{\frac{1}{T}}. \qquad (2)$$

Notice that by equation (1) the punishment period T must be sufficiently *large*, while (2) requires that the punishment period T must be sufficiently *small*. Both will hold given sufficiently high δ, and the range of individuals i for whom both (1) and (2) are satisfied thus determine those that are able to obtain a cooperative marriage outcome.

In contrast, consider cohabitation where the exit option from the relationship, α, is relatively less painful than divorce, *i.e.* $v<\alpha<x$. After any stage game, an unsatisfied partner can leave the relationship, resulting in a payoff of $\frac{\alpha}{1-\delta_i}$ to each player for the remainder of the game.

The conditions that will deter selfish behavior in cohabitation are the same as for marriage, and are given in (1). What changes with cohabitation is the willingness of the offending party to internalize the consequences of his or her own selfish behavior. This condition is necessary for the Nash equilibrium to be renegotiation-proof, and for cohabitation they are that

$$-z-\delta_i z-\delta_i^2 z-\ldots-\delta_i^{T-1} z+\delta_i^T x+\ldots+\delta_i^{\infty} x>\alpha+\delta_i\alpha+\delta_i^2\alpha+\ldots+\delta_i^{\infty}\alpha, \text{ or } \delta_i>\left(\frac{\alpha+z}{x+z}\right)^{\frac{1}{T}}. \quad (3)$$

By the Folk Theorem of repeated games, the minimum (α,α) payoff is guaranteed in cohabitation. However, it can be seen by examining the conditions in (2) and (3) that the consequence acceptance conditions on δ_i are more easily fulfilled under marriage than under cohabitation. In fact, there is a range of δ_i for which cooperation is possible in marriage, but only a lower payoff is obtainable in cohabitation, obtainable either by exiting the relationship or a in a "pseudo-cooperative" equilibrium in which each player plays just cooperatively just frequently enough to keep the other from exiting the relationship. This is demonstrated in the proof to PROPOSITION 1. (Formal proofs to all propositions in the paper are given in an appendix available on the author's website, but the basic intuition of the results will be provided here.)

PROPOSITION 1: *The cooperative equilibrium is feasible for more individuals in marriage than cohabitation.*

Figure 2 illustrates the ranges over $\delta_i \in (0,1)$ where selfish behavior is deterred. Notice from Figure 2 that the marriage contract functions as a discipline device for the middle-range types within the spectrum. Refer to (1) as the Defection Deterrence (DD) curve and (2) and (3) as the

Consequence Acceptance curves (CA and CA′). For equilibrium cooperation to be feasible in marriage (cohabitation), we must have δ_i such that the CA (CA') curve lies above the DD curve.

Intersection of the CA and CA′ curves with the DD curve in Figure 2 indicates the critical values, δ_M and δ_C, for which renegotiation-proof Nash cooperation is possible within marriage and cohabitation, respectively. For those with $\delta_i \in [\delta_C, 1)$ the equilibrium is possible in either cohabitation or in marriage, while for those with $\delta_i \in (0, \delta_M)$, it is never possible. For those with $\delta_i \in (\delta_M, \delta_C)$, the DD curve lies below the CA curve but above the CA' curve, meaning that marriage uniquely provides the credible check against selfish behavior.

3.2. Happiness in Marriage and Cohabitation

The introduction listed two common motives for cohabitation. Here I will focus on the first motivation, the desire for increased relational flexibility. Suppose that partners make a single choice of cohabitation or marriage and then view the relationship as plays of an infinitely repeated game within that arrangement.

In this "meta-game" let's introduce imperfect information into the model. This is not necessarily the standard problem of asymmetric information; those considering marriage often worry not only about their partner's ability to sustain a positive relationship, but also their *own* ability. Here any mistakes in entering into marriage must involve not just one misperception, but rather *two*: the misperception of Partner 1 believing his *own* δ_i to be greater than δ_M, when it is in fact lower, simultaneous with the same misperception by Partner 2 about δ_i of Partner 1, or vice versa.

To keep the analysis simple, assume now that both partners possess equal but imperfect information over $\tilde{\delta} \equiv min\{\delta_i, \delta_j\}$, or the true minimum δ of the couple, where we will assume $\tilde{\delta}$ is distributed uniformly over the interval $(0, \bar{\delta}]$. Let $\hat{g}(\tilde{\delta})$ be a uniform density function where the domain of $\hat{g}(\tilde{\delta}) \subset [0, \bar{\delta}]$ and $\hat{G}(\cdot)$ be its associated distribution function. The true $\tilde{\delta}$ lies within the interval c with mean $\hat{\delta}$ such that $\tilde{\delta} \in \left[\hat{\delta} - \frac{c}{2}, \hat{\delta} + \frac{c}{2}\right]$, where the parameter c constitutes a measure of imperfect information. A higher $\hat{\delta}$ thus implies a distribution function that is (first-order) stochastically dominant over the distribution function yielded by lower values of $\hat{\delta}$, or $\hat{G}^a(\cdot) < \hat{G}^b(\cdot)$ for all δ, where $\hat{\delta}^a > \hat{\delta}^b$.

Consider now the decision couples make between cohabitation and marriage. A couple chooses marriage if $\left(1-\hat{G}(\delta_M)\right)x+\hat{G}(\delta_M)\nu > \left(1-\hat{G}(\delta_C)\right)x+\hat{G}(\delta_C)\alpha$, which becomes

$$\frac{\hat{G}(\delta_C)-\hat{G}(\delta_M)}{\hat{G}(\delta_M)} > \frac{\alpha-\nu}{x-\alpha}. \tag{5}$$

Let δ^* be the lowest level of $\hat{\delta}$ for which $\hat{G}(\cdot)$ satisfies equation (5). Through substituting the uniform density function with information parameter c into (5), we find that every couple with $\hat{\delta} \geq \delta^*$ will choose marriage, and every couple with $\hat{\delta} < \delta^*$ will choose cohabitation where

$$\delta^* = \frac{1}{\alpha-\nu}\left[\left(\delta_C+\frac{c}{2}\right)\alpha-(\delta_C-\delta_M)x-\left(\delta_M+\frac{c}{2}\right)\nu\right]. \tag{6}$$

Since the distribution function of a higher $\hat{\delta}$ stochastically dominates that of a lower $\hat{\delta}$, marriage is increasingly appealing for a couple with higher $\hat{\delta}$. This leads to the following proposition that provides a rationale for what is found in the empirical literature:

PROPOSITION 2: *Married couples will be happier on average than cohabiting couples.*

The intuition to the result follows from a combination of selection and incentive effects: Every couple with $\hat{\delta} \geq \delta^*$ opts for marriage over cohabitation. This combined with the result that cooperation is easier within marriage than in cohabitation makes it straightforward to demonstrate that every couple choosing marriage has a higher level of expected happiness than every couple choosing cohabitation. The fact that married couples have a higher expected payoff *ex ante* to marriage implies that they are happier on average *ex post*.

3.3. Explaining the Cohabitation Effect

Hall and Zhao (1995) find that a primary motive for cohabitation is that individuals use it as a screening device for marriage. Cohan and Kleinbaum (2002) review three hypotheses that have sought to explain the cohabitation effect, the association between pre-marital cohabitation and marital failure. Some such as Kurdek (1999) attribute the greater rate of failure of these marriages to union duration, explaining that such findings are consistent with a normal decline in marital satisfaction after the first few years of marriage and that previously cohabiting couples are, in many respects, farther along this path. A second hypothesis is a self-selection effect: Cohabiting types may be more apt to possess negative characteristics that can lead to marital instability and divorce (Thornton, Axinn, and Hill, 1992). Lillard et. al. (1995) provide strong empirical support for this notion. A third explanation

is that poor relational habits that couples acquire in cohabitation have subsequent negative affects within marriage (Axinn and Thornton 1992; Schoen and Weinick, 1993).

The first hypothesis does not appear to be consistent with empirical work that finds lower levels of relational satisfaction among newly cohabiting couples than newly married couples who were not cohabiting previously (Brown and Booth, 1996). Hence the following extension of the model draws on the second of these hypotheses; subsequently I will explore the third hypothesis.

To provide some structure to the idea of pre-marital cohabitation, assume that after living together for *m* periods, a couple has (weakly) better information about true $\tilde{\delta}$, specifically that the level of imperfect information shrinks to c/ϕ, where $\phi \geq 1$. If $\phi > 1$, this implies a narrower density function over true $\tilde{\delta}$, *i.e.* a density function $\hat{h}(\cdot)$ where the mean of $\hat{h}(\cdot)$ is contained strictly within the domain of $\hat{g}(\cdot)$. Assume now that in the meta-game, couples either marry directly or cohabit for *m* periods after which they marry or continue in cohabitation. In this way cohabitation adds a certain "option-value" to the relationship. A couple cohabiting for *m* periods and deciding to marry receives an average payoff of

$$x^c \equiv \alpha + \delta\alpha + ... + \delta^m\alpha + \delta^{m+1}x + ... + \delta^\infty x \quad \text{if } \tilde{\delta} \geq \delta_M \text{, and}$$

$$v^c \equiv \alpha + \delta\alpha + ... + \delta^m\alpha + \delta^{m+1}v + ... + \delta^\infty v \quad \text{if } \tilde{\delta} < \delta_M .$$

For simplicity, assume cohabitation is considered only by those with $\hat{\delta} \leq \delta_C - 0.5c$. Letting $\hat{H}(\cdot)$ be the distribution function of $\hat{h}(\cdot)$, a couple chooses marriage directly over pre-marital cohabitation if

$$\left(1-\hat{G}(\delta_M)\right)x + \hat{G}(\delta_M)v > \left(1-\hat{G}(\delta^*)\right)\left(\left(1-\hat{H}(\delta_M)\right)x^c + \hat{H}(\delta_M)v^c\right) + \hat{G}(\delta^*)\alpha \qquad (7)$$

The explanation of equation (7) is the following: If a couple decides to cohabit rather than marry, the probability that they will choose to marry after *m* periods is $1-\hat{G}(\delta^*)$. If $\phi = 1$ and premarital cohabitation has no value in information gathering, then $\hat{H}(\cdot)$ equals $\hat{G}(\cdot)$ and living together before marriage only serves to delay the inevitable risk involved in the marriage decision. As premarital cohabitation yields better information, ϕ becomes larger and $\hat{H}(\cdot)$ tends toward zero, the right-hand-side of (7) converging to $\left(1-\hat{G}(\delta^*)\right)x^c + \hat{G}(\delta^*)\alpha$. Note that as the updated-information parameter ϕ approaches infinity, premarital cohabitants never get divorced.

PROPOSITION 3: *With $\phi < \phi^*$, couples who choose to cohabit prior to marriage are more likely to divorce.*

The proposition can be easily understood in light of equation (7). Let δ^{**} be the cutoff point for the decision in (7). Even with perfect information ($\phi = \infty$) available through premarital cohabitation, couples with $\hat{\delta} > \delta^{**}$ choose to marry. With $\hat{G}(\delta_M)$ zero or close to zero, any small risk of divorce is more than offset by $x > x^c$. With $\phi = \infty$, divorce is non-existent among premaritally cohabiting couples, but will occur with probability $\hat{G}(\delta_M)$ among directly marrying couples. When $\phi = 1$, divorce is higher for premaritally cohabiting couples since $\hat{H}(\delta_M)$ and $\hat{G}(\delta_M)$ are monotonically decreasing in $\hat{\delta}$, and $\hat{\delta}$ is higher for directly marrying couples than premaritally cohabiting couples. At some intermediate value $\phi^* \in (1, \infty)$, divorce rates are the same. Thus, one explanation for higher divorce rates among premaritally cohabiting couples is a pure selection effect: Unless information acquisition is high in cohabitation, the divorce rate among pre-marital cohabitants is higher because riskier couples choose it.

The third hypothesis of Cohan and Kleinbaum (2002) is that divorce is higher among premaritally cohabiting couples because premarital cohabitation fosters poor relational habits. A rather informal application of the model suggests how this may happen. In determining the prospects of different potential equilibria, the expectations of players matters. Expectations about behavior have long been recognized as important in equilibrium selection such as in models involving "fictitious play" (Robinson, 1951) or "focal points" (Schelling, 1960). Thus in exploring the most likely equilibrium outcomes in marriage, it would be a mistake to ignore the role of game play during premarital cohabitation in creating expectations about game play during marriage.

Marriage typically begins with public vows by the couple *against* defections, which may help to create an optimistic strategy that assumes the best about the other partner's behavior. But as the proof to PROPOSITION 1 demonstrates, the unique equilibrium in cohabitation for $\delta_i \in (0, \delta_C)$ is "pseudo-cooperation" in which cooperation occurs in each period with some probability $p_c^* < 1$. How might this equilibrium behavior in cohabitation affect the creditability of marital vows, and in turn influence behavior in marriage?

Call the expectation about the probability of cooperation, p_c, in each period "trust." Suppose a partner learns to expect a defection every $n = 1/p_c$ plays of the stage game where $n < T$. A lack of trust increases the incentives to defect from (1) to playing cooperatively if and only if

$$\frac{\left(1-\delta_i^{\,n}\right)x}{1-\delta_i}-\delta_i^{n}z+\frac{(n-1)\left(\delta_i^{\,n+1}-\delta_i^{\,n+T}\right)y}{n(1-\delta_i)}>y-\frac{\left(\delta_i-\delta_i^{\,T+1}\right)z}{1-\delta_i}. \qquad (8)$$

Observe that while the (defecting) right-hand side is the same as in (1) after cancellations, the rewards on the (cooperative) left-hand side are smaller given the assumption that nobody *prefers* to be defected on, or $\frac{\left(1-\delta_i^{\,T+1}\right)x}{1-\delta_i}>-z+\frac{\left(\delta_i-\delta_i^{\,T+1}\right)y}{\left(1-\delta_i\right)}$. A deficiency of trust causes a guarded behavior, shifting the DD curve upwards to DD′, and raising δ_M to δ'_M as in Figure 3. Here the threshold of T increases for any level of δ to yield the cooperative equilibrium.

In summary, the model provides two possible explanations of the cohabitation effect. First, it could be attributable to the second of Cohan and Kleinbaum's hypotheses, a selection effect in the context of imperfect screening. If screening during cohabitation is relatively effective, then it could be attributed to the third hypothesis, poor relational habits developed in cohabitation that create a self-fulfilling prophesy of reduced cooperation within marriage, with a combination of the two effects being possible and even likely.

IV. EXPLAINING INCREASES IN COHABITATION

4.1. Empirical Framework

What accounts for the rapid rise of cohabitation in many Western societies? One answer is that the increase in premarital cohabitation is a product of a general movement within western society away from traditional ideas about marriage, divorce, birth control, abortion, women's rights, and a host of other related issues. Another explanation is that increases in cohabitation are the product of a (more or less) exogenous historical change, for example, in the manner that Akerlof et. al. (1996) attribute the increase in illegitimate births to the advent of the birth control pill. The two most striking empirical facts about the prevalence of cohabitation are (1) the rate at which cohabitation has increased in United States, Britain, and most European countries over the last four decades; and (2) the considerable differences in cohabitation rates that remain between the industrialized nations of Europe, the U.S., and Japan (see Figure 1). These differences between industrialized countries, all with broad exposure to western popular culture for many generations, suggest that the cohabitation decision may be influenced by exogenous factors.

In the case of the United States, the fact that the dramatic increase in cohabitation occurs in during the late 1960s to early 1970s suggests one or more of the following phenomena as potential causes: (a) liberalization of divorce laws in many states in the mid-1970s; (b) development and

diffusion of oral contraception, *i.e.* "the pill" in the mid-1960s; (c) the 1973 Supreme Court legalization of abortion; and/or (d) increases in women's labor force participation and wages during this period.

What predictions would the model make regarding the influence of each of these phenomena on increases in cohabitation and the observed differences between countries? To find predictions on changes in cohabitation rates we return to the basic model where can re-write the expression for which a couple prefers marriage to cohabitation in (5) to obtain

$$\left(\delta_M - \left(\hat{\delta} - \frac{c}{2}\right)\right)\nu + \left(\hat{\delta} + \frac{c}{2} - \delta_M\right)x > \left(\delta_C - \left(\hat{\delta} - \frac{c}{2}\right)\right)\alpha + \left(\hat{\delta} + \frac{c}{2} - \delta_C\right)x. \qquad (9)$$

Noting that changes in cohabitation take place on the margin for those with $\hat{\delta}$ near δ^*, the second term on the right-hand-side of (9) goes to zero for sufficiently small c. Solving (9) for δ^* we obtain

$$\delta^* = \frac{1}{x-\nu}\left[\left(\delta_M - \frac{c}{2}\right)x - \left(\delta_M + \frac{c}{2}\right)\upsilon + c\alpha\right] \qquad (10)$$

Partial differentiation of (10) with respect to each of the parameters yields $\frac{\partial \delta^*}{\partial x} < 0$, $\frac{\partial \delta^*}{\partial \alpha} > 0$, and $\frac{\partial \delta^*}{\partial \upsilon} > \text{or} < 0$. The sign on the divorce payoff is theoretically ambiguous, negative when imperfect information and the risk of divorce is high, but positive as the imperfect information parameter c gets closer to zero and the "commitment effect" from marriage on relational cooperation dominates.

Each of these social changes during the mid-1960s to early 1970s can be interpreted in terms of parameter changes in the model. The legal changes in favor of no-fault divorce laws in the early and mid-1970s can be represented as an increase in ν as divorce became easier, less costly, and the stigma of divorce lessened. The development and widespread use of the pill in Europe and the United States the mid-1960s allowed for the postponement of childbearing early in the years of both cohabitation and marriage. The ability to plan families may make marriage more attractive, but the absence of children in a relationship makes it easier to dissolve; thus, it could theoretically increase all of x, ν and α. Abortion, on the other hand, occurs vastly more frequently outside of marriage than within marriage (approximately four times as frequently, according to U.S. Census data). Therefore the predominant influence of legalized abortion should be to increase α. Changes in women's labor force participation increase the reservation utility of women outside both marriage and cohabitation, raising both ν and α. If the value of the cooperative outcome x relies (or relied) in part from gains from exchange originating from women specializing in housework and child

raising (*time* contributed to the household), and men specializing in paid work (*money* contributed to the household), then the movement of women into formal labor markets should also lower *x*.

Based on the effect of these social changes on our parameters, the total effect on the cohabitation rate for any social change is $\Delta\delta^* = \frac{\partial\delta^*}{\partial x}\Delta x + \frac{\partial\delta^*}{\partial\alpha}\Delta\alpha + \frac{\partial\delta^*}{\partial\upsilon}\Delta\upsilon$. Given the expected effects on *x,* α, and ν from the respective societal changes and the sign of their respective derivatives on δ^*, Table 3 gives the predicted effect on cohabitation from these phenomena. Liberalization of divorce laws make commitment more difficult in marriage, but make the consequences of marital failure less harsh. The effect of the pill is ambiguous as it has similar positive impacts in marriage as in cohabitation. Legalized abortion should yield higher cohabitation rates because of its heavy use in preventing out of wedlock births. Women's labor force participation should raise cohabitation rates from three sources: lowering the gains from household specialization, increasing the payoff from non-cooperation in marriage, and increasing the reservation payoff in cohabitation. It's only influence towards marriage may be to make the outcome from a failed marriage better, but this effect vanishes as information about partners increases. Thus, the model points to legalized abortion and increased labor force participation by women as the most likely causes of increases in cohabitation.

4.2. Data and Methodology

There are at least two major challenges in estimating the effects of such factors on cohabitation rates. The first is data availability: One would ideally have panel data containing cohabitation rates back to the 1960s or at least early 1970s, when cohabitation rates began their sharp upward trend. Unfortunately, except for some retrospective studies, no such data set exists either for the United States or European countries. Thus we must be content to look for clues regarding the relationships between these variables and cohabitation rates from the time they became widely available, beginning for the most part in the early 1990s.

One set of data is from Batlova and Cohen (2002) who compile figures on 1994 cohabitation rates taken from the *International Social Survey Programme* in which independent institutions in 20 nations replicate survey questions in their own countries. The survey asks a large sample of adults in each country if they have ever cohabited with a partner outside of marriage. Included in three of the estimations are cohabitation rates from eight additional countries obtained by incorporating data from a separate study by Kiernan (2002), in which a slightly different question was asked of respondents; the estimated cohabitation rates are predicted values obtained from overlapping countries to yield a sample of 28 countries. The U.S. data on cohabitation were taken from the

Bureau of the Census, which began collecting state-level data on cohabiting partners in the 1990 and 2000 general censuses. Data descriptions and sources are given in Tables 4, 5, and 6, and scatter plots of the cohabitation with divorce and female labor force data (our two continuous variables) are given in Plots 1 through 4.

The second challenge involves establishing a relationship between cohabitation rates and variables that are likely to be endogenous to cohabitation. Like cohabitation, many variables we might suggest as being casual could themselves have been caused by generally liberalizing views, creating an omitted variable bias. However, potential explanatory variables differ in their degree of endogeneity to the cohabitation decision: Behavioral variables such as divorce rates, abortion rates, and labor force participation seem most likely to vary endogenously with cohabitation rates. Faith and values variables and political conservatism are more likely to exert direct influences on behavior rather than the other way around. Policy variables, such as the availability of abortion on demand, legalization of oral contraception, waiting periods for divorce would seem to operate in more of a middle ground.

Hausman (1978) tests for endogeneity confirmed these general presuppositions. The null hypothesis that women's labor force participation, abortion rates, and divorce rates are exogenous was rejected at the 10 percent level in the U.S. state data. While the availability of the pill is ubiquitous in the United States, mandated health insurance coverage of the pill is not; legislation was introduced in 10 states in the late 1990s that mandated health insurance coverage of the pill.[1] The Hausman test failed to reject the null hypothesis of exogeneity of contraceptive pill legislation. Unlike across the 50 states, the legal availability of first-trimester abortion-on-demand varies from country to country, as does the availability of no-fault divorce. There even exists some variation in the availability of the pill, which was illegal in Ireland and Japan in the mid-1990s when the cohabitation data was obtained. While the Hausman test rejected exogeneity of the female presence in the labor force at the 10 percent level, it failed to reject abortion availability, legality of the pill, no-fault divorce, or even divorce rates themselves across countries.

4.3. Empirical Results

To treat endogeneity problems in the behavioral variables, instrumental variables were used in the level estimations on cohabitation rates. In the cross-country estimations, the ratio of female tertiary school enrollment was used as an instrument for women's labor force participation. Only about two-thirds of the countries in the study have policies allowing first-trimester abortion-on-

[1] States mandating health insurance coverage of the pill during the 1990s are Maryland, California, Connecticut, Georgia, Hawaii, Maine, New Hampshire, Nevada, North Carolina, and Vermont. (Source: Planned Parenthood, 2002)

demand. Though the 1973 Roe vs. Wade decision had guaranteed this across U.S. states, an effective instrument for abortion rates was per capita state expenditure on health services. Though divorce rates would appear to be endogenous, the varying availability of "no-fault" divorce across the 28 countries exerts no direct effect on cohabitation, and was used in some of the estimations as an instrument for the divorce rate. Since in the 1990-2000 period, "no-fault" divorce was widely available in each of the 50 U.S. states, the varying waiting period for divorce settlement was found to be an effective instrument for the U.S. divorce rate. As shown in Tables 4, 5, and 6, all first-stage estimations of endogenous variables on exogenous variables and the set of instruments carried *F*-statistics significant at the 5% level or less, and *t*-statistics on direct instruments were significant at the 5% level in 18 out of 20 first-stage estimations, and close to significant in the other two.

Nearly all of the variables have the expected sign in the cross-country second-stage estimations in Table 4, though the coefficients on female labor force participation are uniquely significant. That the coefficient on abortion availability and measures of Catholicism were statistically insignificant was somewhat surprising, even given the small sample size. The abortion coefficient, however, approaches significance and is quite consistent across estimations; it would imply that the availability of abortion on demand increases the ever-cohabitated rate by about 4 percentage points around a base mean of 16.6%. However, the consistency and significance (and near significance) of women's labor force participation is most noteworthy, with an average coefficient of 0.554. Noting that the female labor force variable in the cross-country estimations is given as a ratio to labor force participation of men, if we assume a 0.75 participation rate by men, it holds that in the cross-country estimations that a 10% increase in labor force participation by women is associated with a 14.6% increase in cohabitation.

In the estimations in Table 5 on cohabitating partner households as a percent of all households from the 2000 U.S. Census, (predicted) abortion rates and contraceptive pill insurance coverage were highly insignificant (and even marginally carrying the opposite sign). By far the biggest (negative) predictor of cohabitation rates is the percentage of Christian adherents in a state, a measure of the church-going population. Its negative effect on cohabitation, however, is almost totally through mainline Protestants and evangelicals. Controlling for church attendance, the percentage of Catholic adherents was *positively* related to cohabitation. To capture measures of conservatism, I included the percentage of Republican votes received in each state in the 2000 Presidential election in specification (2), and dummy variables capturing the now infamous American "red state/blue state" distinction. Though there was little change between the 2000 and 2004 elections in this category, I used the results from the 2004 vote totals since that election has been regarded as one in which states lined up around

issues related to traditional values. The coefficients all had the expected sign (positive coefficient on being a "blue" state increases cohabitation rates), but with small magnitude and non-significance once religious values are controlled for. Female labor force participation emerged again as the uniquely significant variable of the four chief candidates, with consistent and strong coefficients across specifications. Most interesting is the similarity in the magnitude of the U.S. states coefficient with estimates from the cross-country estimations: An average coefficient of 0.088 in estimations (1)–(4) implies a 10% increase in women's labor force participation in the U.S. is associated with an 11.5% increase in cohabitation rates.

The final estimation incorporates the earliest U.S. Census data available on cohabiting partners, taken in 1990. Table 6 presents a difference-in-differences regression on increases in cohabitation across U.S. states from 1990 to 2000. Nearly all coefficients carry the expected sign, though of the four key variables, only the coefficients on changes in women's labor force participation are statistically significant. Men's income, interestingly, is significant in one of the estimations and consistently negative. This is also true in the estimations on levels, hinting that as male incomes rise, cohabitation appears to be more rare. The coefficients on the religious variables are insignificant in the differences estimation, probably due to only relatively minor changes over 10 years that are not captured well by the data. Though seemingly unlikely, I attempted to control for the possibility of greater rates of "liberalization" in some states by utilizing the change in Republican vote percentage in the general elections between 1992 and 2000 in each state.

A potential problem with difference-in-differences estimations is the issue that historical momentum of a third factor (for example a long-term movement toward liberal lifestyles in some states as distinct from others) may produce spurious correlations in the data between variables in the estimations. To try to control for this problem, I included the *lagged* difference in the Republican vote in each state from 1980 to 1992 in specification (4). The coefficient is positive (yet only significant at the 21% level), but does somewhat dampen the magnitude of the women's labor force coefficient. Yet once more women's labor force participation is uniquely significant at the 10 percent level in most estimations, though the magnitude is somewhat smaller than in the two other data sets, with an average coefficient among the four estimations in Table 6 equal to 0.0488. The prediction from the 1990-2000 difference estimations then is that a 10% increase in women's labor force participation is associated with a 6.4% increase in cohabitation.

Although the historical panel data set doesn't exist that could provide stronger tests on the causes of the increase in cohabitation rates, the more recent existing data does seem to yield some insight into the rise of cohabitation as an alternative family arrangement in western culture. That

women's labor force participation is uniquely significant in all three sets of data estimations, using different data sets and estimation techniques, and that the magnitudes of the coefficients are relatively similar, is the most striking result from the empirical study.

V. CONCLUSION

Why has marriage in some form existed as a fundamental institution in virtually every society and culture? The answer is that marriage serves a crucial role in creating stable forms of cooperation within the nuclear family. It creates this stability by endogenizing altruistic behavior within the family better than relationships that embody lower forms of commitment such as informal cohabitation. Since within marriage a partner is more apt to accept consequences for selfish behavior rather than exit the relationship, selfish behavior is more likely to lie off the equilibrium path.

Cohabitation as a pre-marital screening device has become increasingly popular, to the point of being a social norm in some western sub-cultures; it also has strong intuitive appeal. Yet the data consistently indicate a negative association between pre-marital cohabitation and marital satisfaction. This paper has attempted to clarify why this may be so, arguing that it appears to be *commitment* rather than mere *togetherness* that lays the foundation for long-term cooperation and happiness in family relationships. This, of course, is the traditional wisdom. It is hoped, nevertheless, that examining relationships in a formal framework yields insight into the subtle rationale that lies in the background of this wisdom.

What explanation does this paper give about the rise of cohabitation in western society? The following story would be consistent with the theoretical and empirical results of this research: Until the 1960s, arguably the primary function of marriage was not emotional and personal fulfillment, but an exchange based on traditional contributions of money (by the husband) and time (by the wife) to household formation and the raising of children. The value of this exchange enhanced the reward accruing from household cooperation (the value x the model). As gender roles began to blur in the 1960s and 1970s, young adults began to be able to function more independently as autonomous multi-taskers, with women entering and gaining upward mobility in the labor force in greater numbers, and men becoming more willing (and even eager) to engage in activities such as cooking meals and raising children. While these trends were clearly positive for the household in many respects, they began to change the payoffs to relational conflict and cooperation. As women entered the work force, this both eroded some of the value of the family division of labor while simultaneously increasing the reservation payoffs received after a divorce or break-up (ν and α in

the model). Changes in these payoffs may have been further augmented by the legalization of abortion, and by declining numbers of Christian adherents in some areas in the western industrialized world, such that the consensus view supporting marriage over cohabitation as a social norm became less clear. While the traditional gains from exchange in marriage slowly dissipated, what remained was the need for personal companionship and the emotional fulfillment of relationship. However, the relative ease at which members of the partnership could function independently diminished the checks to self-interested behavior within relationships and consequences of relational failure. As men and women needed each other less within the household, long-term marital cooperation became more difficult, making marriage, from an *ex ante* standpoint, a somewhat riskier and less attractive proposition, given any doubt about the potential for relational harmony. Given the increased risks in marriage and the continuing need for emotional fulfillment, cohabitation may have thus arisen as a seemingly safer alternative.

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Figure 1

The Relationship Game

		Bubba: Stay Home/ Fix Sink	Bubba: Go Out Drinkin'
Candy	Be Sweet	x, x	$-z, y$
	Nag Bubba	$y, -z$	0, 0

Figure 2

Defection Deterrence (DD) and Consequence Acceptance (CA) Curves

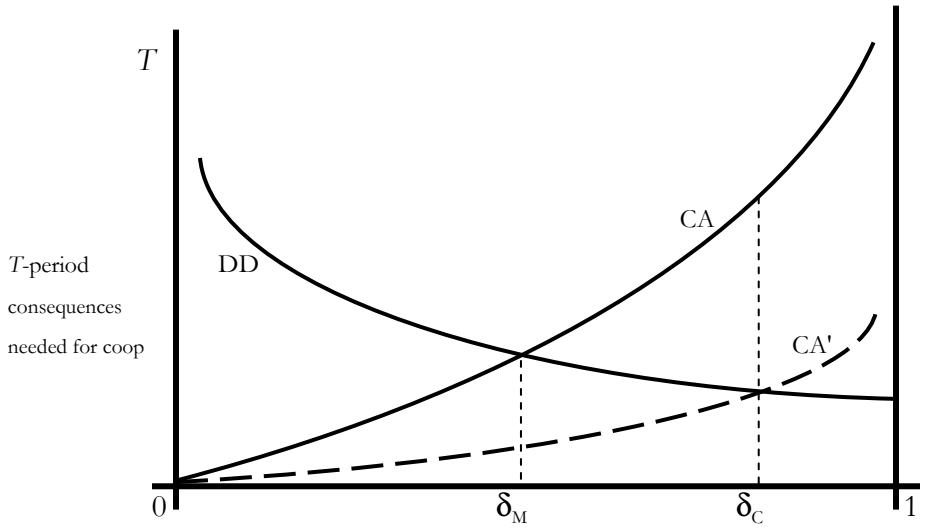
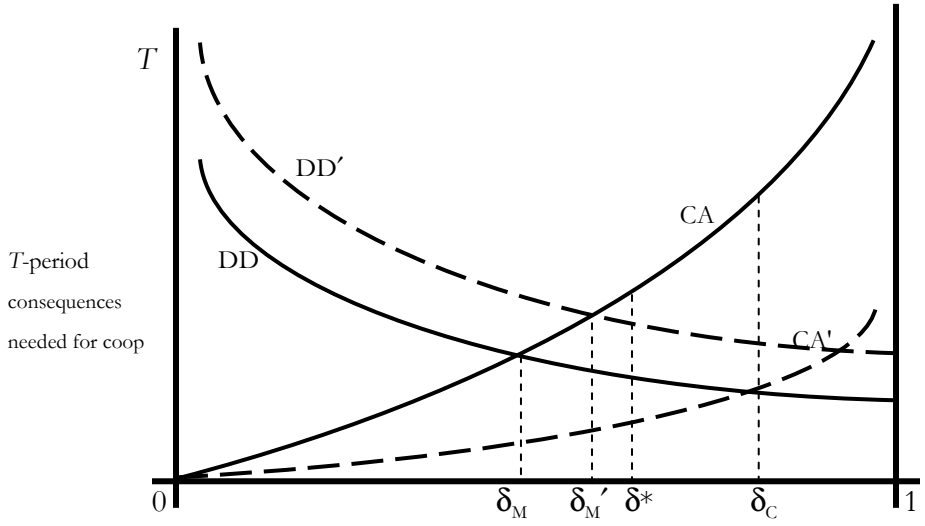
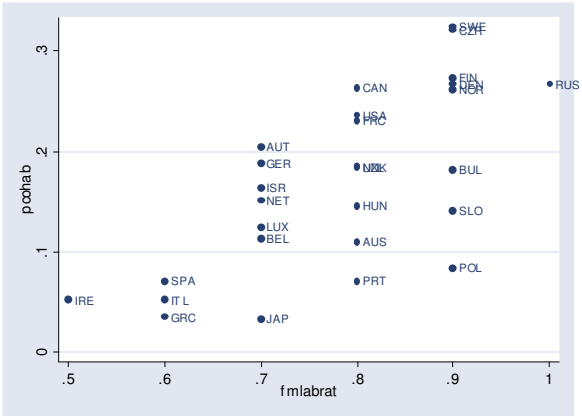


Figure 3

Effect of Pre-Marital Cohabitation on Trust and Cooperation

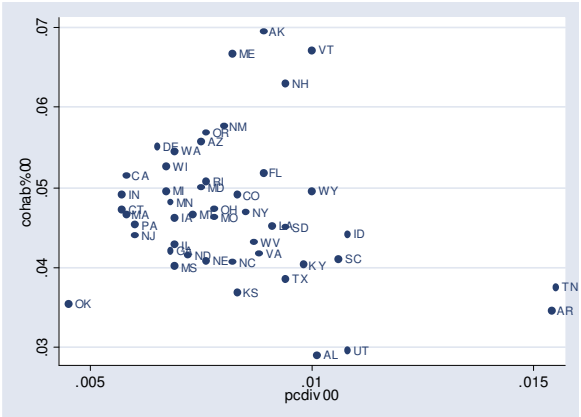




*Plot 1***:** Cross-country 1994 ever-cohabitated rates and female labor participation ratios.

Plot 2: Cross country 1994 ever-cohabitated rates and divorce rates.

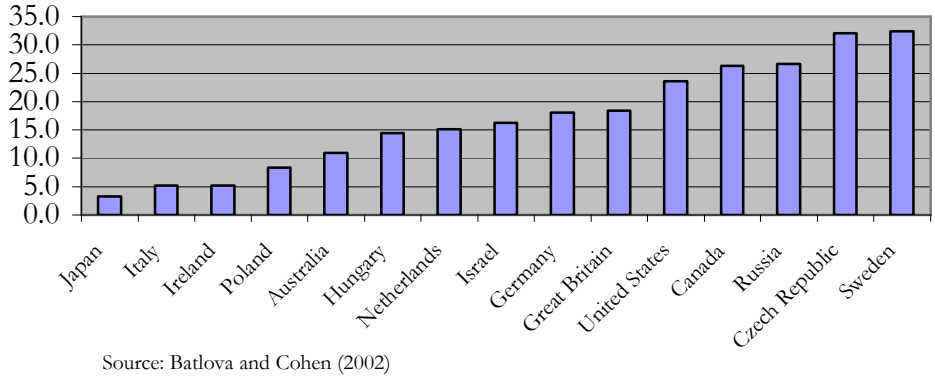
Plot 3: U.S. states, 2000 cohabitation rates and female labor participation rates.



Plot 4: U.S. states, 2000 cohabitation rates and divorce rates. (Note: NV = 0.07, 0.065, HW = 0.02, 0.053.)

Table 1

Percentage of Adults Who Report Ever Having Cohabited with a Partner Outside of Marriage, Selected Countries



Source: Batlova and Cohen (2002)

Table 2

Percentage of U.S. Respondents Who Agree with Statement, "*Is it all right* (*sic*) *for an unmarried couple to live together as long as they have plans to marry?*"

	1976-77	1980-81	1985-86	1989-90	1993-94	1997-98
Men	**46.9%**	**42.3%**	**53.1%**	**54.8%**	**61.6%**	**66.9%**
N	3,290	3,342	2,970	2,698	2,416	2,386
Women	**33.0%**	**33.3%**	**39.3%**	**47.9%**	**51.2%**	**59.1%**
N	3,423	3,325	3,226	2,584	2,760	2,597

Source: Thornton and Young-de Marco (2001). Data source: U.S. National Survey of Families and Households.

Table 3

Predicted Effects of Social Changes on Cohabitation

	$\frac{\partial \delta^*}{\partial x} < 0$	$\frac{\partial \delta^*}{\partial \alpha} > 0$	$\frac{\partial \delta^*}{\partial v} >$ or < 0	
Historical Change:	**Δx**	**$\Delta \alpha$**	**Δv**	Probable Effect on δ^* (cohabitation rate)
Liberalization of divorce laws/ introduction of no-fault divorce	0	0	+	?
Development and dissemination of oral contraception	+	+	+	?
Legalization of abortion, *e.g.* Roe vs. Wade, 1973.	0	+	0	+
Increase in women's labor force participation and wages	−	+	+	+

Table 4

Two-Stage Least Squares Estimations

Dependent Variable: Fraction of Adults Indicating Cohabitation During Lifetime, $\overline{X}$ = 0.166

Variable: (1994 Data)	$\overline{X}$	Sample Size: 28 countries[d]			Sample Size: 20 countries		Variable Explanation/Source:
		OLS	--2SLS Estimations--				
		(1)	(2)	(3)	(4)	(5)	(6)	
ABORTONDEM?[a]	0.643	0.0429	0.0396	0.0382	0.0431	0.0457	0.0369	Dummy = 1 if Abortion on Demand: Center for Reproductive Rights
		(1.51)	(1.38)	(1.30)	(1.41)	(1.41)	(0.88)	
FAMLABRATIO	0.781	0.3139	0.5126	0.5052	0.5497	0.5944	0.6080	F/Male Lab. Force Participation Ratio: World Devopment Indicators
		(2.38)**	(1.92)*	(1.88)*	(1.57)	(1.43)	(1.64)	
DIVORCERATE[b]	5.439	0.0280	0.03296	0.0322	0.0221	0.0381	0.0239	Divorce Rate: UN Marriage & Divorce Statistics
		(1.84)*	(1.22)	(1.15)	(1.22)	(1.15)	(1.18)	
PILLLEGAL?[c]	0.928	0.0140			-0.0220	-0.0436		Legality of the Contraceptive Pill in 1994.
		(0.25)			(-0.28)	(-0.42)		
CATHOLIC?	0.321	-0.0220	-0.0028		-0.0013	0.0154	0.0282	Dummy = 1 if Predominately Catholic Country
		(-0.70)	(0.06)		(-0.03)	(0.24)	(0.44)	
NOMCATHOLIC?	0.428			-0.0095				Fraction of Population Nominally Catholic: World Factbook
				(-0.18)				
Constant		-0.172	-0.3306	-0.3174	-0.3159	-0.3729	-0.3878	
		(-1.78)*	(-1.51)	(-1.39)	(-1.43)	(0.299)	(-1.38)	
R^2		0.5914	0.536	0.543	0.532	0.588	0.4151	
F-stat, p-value		6.4, 0.001	5.2, 0.003	5.5, 0.003	5.1, 0.003	3.7, 0.01	3.8, 0.026	
First Stage Estimations:			Coeff: t-stat: F-stat, p:	Coeff: t-stat: F-stat, p:	Coeff: t-stat: F-stat:	Coeff: t-stat: F-stat, p:	Coeff: t-stat: F-stat, p:	
FAMLABRATIO (Instrument: FEMTERCENRL)	1.216		0.3167 (2.45)** 3.67, 0.02	3.088 (2.33)** 3.26, 0.03	0.2619 (2.07)* 4.1, 0.001	0.2404 (1.72)* 2.8, 0.06	0.2597 (1.93)* 3.3, 0.026	Tertiary Fem. Enroll. Ratio: World Development Indicators
DIVORCERATE[b] (Instrument: NOFAULTAVAIL?)	0.857		1.311 (3.20)*** 3.96, 0.01	1.259 (3.00)*** 3.65, 0.02		1.406 (3.19)*** 4.9,0.001		No Fault Divorce Available? Source: Author Research

[a]Defined as unqualified access to abortion during the initial gestational phase. [b]Divorce rates are the number of final divorce decrees granted under civil law per 1,000 population. Instrumental variable estimations on divorce rate are provided in estimations 2, 3 and 5; uninstrumented in 1, 4 and 6. [c]The contraceptive pill was illegal in both Ireland and Japan at the time of the cohabitation data, 1994. (t-statistics are given in parentheses.) [d]Countries in Batlova and Cohen's original sample of 20 include Australia, Ireland, Italy, Austria, Czech Republic, Germany, Israel, the Netherlands, Japan, Canada, the United States, the United Kingdom, Hungary, Sweden, Norway, Bulgaria, Slovenia, Poland and Russia. Those from Kiernan's study include Belguim, Denmark, Finaland, France, Greece, Luxemburg, Portugal, and Spain.

Table 5

Two-Stage Least Squares Estimations

Dependent Variable: Fraction of Opposite-Sex Cohabiting Households (Levels), $\overline{\mathbf{X}}$ =0.0474

Variable: (Year: 2000)	$\overline{\mathbf{X}}$	**Sample Size: 50 U.S. States**				**Variable Explanation/Source:**
		(1)	(2)	(3)	(4)	
WOMINCOM	0.728	0.0316	0.0346	0.0316		Women's avg. income as fraction of men's avg. income by state[a]
		(0.89)	(0.82)	(0.88)		
WOMPLFPART	0.617	0.09139	0.0891	0.0917	0.0829	Female labor force partic. rate (US Bureau of Labor Stat.)
		(1.70)*	(1.46)	(1.70)*	(1.63)	
PCDIVORCE	0.010	0.2696	0.2491	0.2769	0.2331	Per-capita divorce rate (Center for Disease Control)
		(0.67)	(0.57)	(0.60)	(0.47)	
PCABORTION	0.00287	-0.3125	-0.3870	-0.3036	-0.3200	Per capita abortions by state (Dep. of Heath & Hum. Serv)
		(-0.16)	(-0.19)	(-0.15)	(-0.17)	
PILLINSURE	0.200	-0.0025	-0.0023	-0.0026	-0.0013	State mandated insurance coverage of the pill by 1999
		(-0.52)	(-0.42)	(-0.48)	(-0.22)	
CHRISTADHER	0.483	-0.0627	-0.0636	-0.0624	-0.0663	Christian Adherents (Regular Church Attenders Only)
		(-6.51)***	(-5.72)***	(-5.38)***	(-5.05)***	
PERCCATHOL	0.196	0.0469	0.0484	0.0474	0.0467	Percent Catholic (American Religion Archive)
		(5.15)***	(3.46)***	(4.59)***	(4.73)***	
PERCURBAN	0.682	-0.0162	-0.0157	-0.0164	-0.0091	Percentage of households by state located in urban areas
		(-1.30)	(-1.19)	(-1.22)	(-0.46)	
MENSINC	27.790 ($000)				-0.00372	Average Men's Income by state
					(-0.76)	
REPUB2000	0.145		0.00003			Percent Voted Conservative (Republican) in 2000 Election
			(0.16)			
BLUESTATE	0.380			0.00022	0.00164	Dummy = 1 if "Blue State" (Voted Republican in 2004)
				(0.07)	(0.59)	
Constant		-0.0009	-0.0031	0.0300	0.0370	
		(-0.03)	(-0.11)	(-0.04)	(0.94)	
R^2		0.7066	0.7139	0.7046	0.7253	
F-stat, p-value		12.89, 0.00	11.73, 0.00	11.11, 0.00	11.71, 0.00	
First Stage Estimations:		Coeff: t-stat: F-stat, p:	Coeff: t-stat: F-stat, p:	Coeff: t-stat: F-stat:	Coeff: t-stat: F-stat, p:	**Instrumental Variable Explanation/Source:**
WOMPLFPART (Instrument: PCTOTENR)	1.216	1.700 (2.15)* 2.27, 0.04	1.631 (2.11)* 2.51, 0.02	1.594 (2.02)* 2.24, 0.39	1.865 (2.52)** 3.2, 0.004	Per Capita Enrollment in Degree-Granting Institutions US Nat'l. Center for Educ.
PCDIVORCE (Instrument: DURAREQ)	0.857	-0.0007 (-1.90)* 2.28, 0.04	-0.0006 (-1.74)* 1.99, 0.06	-0.0006 (-1.56) 2.37, 0.03	-0.0006 (-1.37) 2.71, 0.01	Duration Requirement for Settlement of Divorce: Elrond and Spector (2000)
PCABORTION (Instrument: PCHEALTHEX)	0.857	1.421 (4.28)*** 7.50, 0.00	1.401 (4.22)*** 6.75, 0.00	1.391 (4.12)*** 6.75, 0.00	1.480 (4.42)*** 6.39, 0.00	State-level Per Capita Health Expenditures: Milbank Memorial Fund

[a]Data is from 2000 US Census unless otherwise noted. (*t*-statistics are given in parentheses.)

Table 6

Difference-in-Differences Estimations, 1990-2000

Dependent Variable: Change in Fraction of Cohabiting Households (Differences), $\overline{\mathbf{X}}$ = 0.0143

Variable: (Year: 2000)	$\overline{\mathbf{X}}$	**Sample Size: 50 U.S. States**				**Variable Explanation/Source:**
		(1)	(2)	(3)	(4)	
DWOMINCOM	0.0664	-0.1505 (-0.54)	-0.0144 (-0.49)	-0.01351 (-0.45)	0.00060 (0.02)	Change in women's inc. as fraction of men's avg. income by state, 1990-2000[a]
DWOMPLFPART	0.0298	0.0513 (2.22)**	0.0506 (2.04)**	0.0540 (2.11)**	0.03938 (1.41)	Change in female labor force partic. rate, 1991-2000 (US Bureau of Labor Stat.)
DPCDIVORCE	0.0047	0.0035 (0.07)	0.00314 (0.06)	-0.0105 (-0.18)	0.0113 (0.18)	Change in per-capita divorce rate, 1990-2000 (Center for Disease Control)
DPCABORTION	-0.0012	0.1333 (0.25)	0.1376 (0.26)	0.0760 (0.14)	0.0760 (0.14)	Change in per cap abortions by state, 1990-2000 (Dept. of H. & Hum. Serv.)
DPILLINSURE	0.200	-0.0010 (-0.91)	-0.0010 (-0.83)	-0.00073 (-0.54)	-0.0011 (-0.80)	Change in state mandated insurance coverage of contraceptive pill 1990-99
DCHRISTADHER	-0.0449	-0.1002 (-1.02)	-0.0010 (-1.01)	-0.0044 (-0.32)	0.0080 (0.47)	Change in per capita Christian Adherents, 1990-2000
DPERCCATHOL	0.00721	0.00021 (0.01)	-0.00043 (-0.02)	-0.00738 (-0.31)	-0.01299 (-0.54)	Change in Cath. Adherents 1990-2000 (American Religion Archive)
DMENSINC	8.038 ($000)	-0.00058 (-1.69)*	-0.00043 (-1.43)	-0.00046 (-1.07)	-0.00037 (-0.85)	Change in Average Men's Income by state, 1990-2000
DREPUB9200	12.199		0.000091 (0.10)	-0.000022 (-0.21)	0.000084 (0.62)	Change in percent voted Republican between 1992 and 2000 General Election
DREPU8092					0.001553 (1.26)	Change in percent voted Republican between 1980 and 1992 General Election
BLUESTATE	0.380			-0.00101 (-0.59)	-0.00078 (-0.46)	Dummy = 1 if "Blue State" (Voted Republican in 2004)
Constant		0.0184 (4.94)	0.0181 (3.83)	0.0181 (3.80)	0.0181 (3.83)	
R^2		0.283	0.283	0.289	0.289	
F-stat, p-value		2.02, 0.064	1.76, 0.11	1.59, 0.145	1.61, 0.135	

[a]Data is from 2000 US Census unless otherwise noted. (*t*-statistics are given in parentheses.)