TWO ESSAYS ON PREMARITAL COHABITATION AND DIVORCE

A Dissertation

by

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ABSTRACT

This dissertation studies the effect of premarital cohabitation on women's propensity to divorce and women's divorce risk. The dissertation focuses on various selection issues in a woman's decision to start a relationship and the form of the relationship, and to dissolve or continue the relationship. The 1995, 2002, and 2006-2010 waves of the National Survey of Family and Growth (NSFG) are used. The sample sizes are 10,847, 7,643, and 12,279 women aged 15 to 44 living in households in the United States in 1995, 2002, and 2006-2010, respectively. The dissertation finds that premarital cohabitation has no effect on women's propensity to divorce and women's divorce risk. Sorting into marriage according to level of religiosity generates the variations among the same levels of religiosity between cohabiting and non-cohabiting couples. The variations can explain the positive correlation between premarital cohabitation and divorce. In absence of the information on both the wife's and the husband's level of religiosity, this dissertation suggests and estimates a selection model. Three different empirical approaches all suggest that living together before marriage does not lead to divorce. Findings of positive correlation between premarital cohabitation and divorce in the previous literature could be attributed to omitted variable bias or sample selection bias.

Overall the rising in cohabitation cannot explain the rise and the fallen in divorce rates. However, the prevalence of cohabitation will induce a thick 'cohabitation' market, and hence improve the quality of cohabiting matches through lowering search costs and increasing the turnover rates of cohabitation. As a result, the correlation between premarital cohabitation and divorce is expected to negative and significant on the basis of newly released survey data such as the 2011-2015 wave of the NSFG.

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1. INTRODUCTION

The rise of cohabitation in the past three decades is well documented (Bumpass et al., 1991; Bumpass and Lu, 2000; Kennedy and Bumpass, 2008) Before 1970s, cohabitation was mainly a phenomenon of the lower educated who are more likely to view cohabitation as a substitute to marriage (Bumpass et al., 1991). Nowadays it has become a norm in the current society of the United States as well as in most Western nations (Kiernan, 2001). Close to one half of women interviewed in 2006-2010 have cohabited with a partner as a first union, compared to 43% of women in 2002, and 34% of women in 1995 (Copen et al., 2013). The divorce rate among women whose marriages have ended within 10 years aged 15-44 in 1995, 2002, and 2006-2010 is 33%, 36%, and 32%, respectively (Copen et al., 2012). The dramatic rise in the popularity of cohabitation may have implications on household formation, dissolution, and living arrangements of children.

The first essay studies the effect of premarital cohabitation on women's propensity to divorce. The essay focuses on various selection issues in women's decision to start a relationship and the form of the relationship, and to dissolve or continue the relationship. The latest three waves of the National Survey of Family and Growth (NSFG) are used. Unlike the existing literature, the full sample is used to identify the women's various selections. The essay finds that premarital cohabitation has no effect on women's propensity to divorce. Findings of positive correlation between premarital cohabitation and divorce in the previous literature could be attributed to sample selection bias. The selection bias can be alleviated if the husband's level of religiosity is controlled. The essay suggests and estimates a selection model when the information on the husband's level of religiosity is not available.

The second essay studies the relationship between premarital cohabitation on

women's hazard to divorce. The essay complements the first essay in three aspects. First, this essay studies the relationship between premarital cohabitation and women's instantaneous rate of divorce rather than women's aggregate rate of divorce. Cox proportional hazard models are used in the analysis. Second, it has been argued that strong correlation between premarital cohabitation and marital instability should be weakened over time because of less selection of divorce-prone women into cohabitation when cohabitation has been a norm in a society. The 1988, 1995, 2002, and 2006-2010 waves of the National Survey of Family and Growth (NSFG) are used to address this argument. Finally, one of quantitative methods to test the hypothesis for self-selection of divorce-prone women into cohabitation is the model used in Lillard et al. (1995), where women's decision to cohabit and decision to divorce are simultaneously modeled. Lillard et al. (1995) find that women's propensity to divorce and to cohabit are positively correlated. However, Reinhold (2010) uses the model of Lillard et al. (1995) with slightly modification and the 2002 wave of the National Survey of Family and Growth (NSFG) argues that the positive self-selection is indeed driven by higher-order marriages. The current study performs the test for self-selection based on the model of Lillard et al. (1995) using cycle 5, 6, and 7, respectively, to recognize the differences between the two studies.

The findings in this essay suggest premarital cohabitation is not a real predictor of women's hazard to divorce, and findings of positive correlation between premarital cohabitation and divorce risk in the previous literature are due to omitting relevant variables bias. Combined with the first essay, premarital cohabitation does not support the learning hypothesis, and couples' level of religiosity plays important role in determining the correlation between premarital cohabitation and divorce when cohabitation is not widely acceptable in the society.

2. LITERATURE REVIEW

There are many empirical studies regarding premarital cohabitation on the hazard of divorce in demographic literature. This literature can be divided into two categories. The first category is to analyze the effect of premarital cohabitation on the hazard of divorce without taking the possible endogeneity of premarital cohabitation into account. Studies using data sets from the United states are Teachman and Polonko (1990) using National Longitudinal Study of the High School Class of 1972 (NLS72) with its follow-up in 1986, DeMaris and Rao (1992) using National Survey of Family and Household (NSFH) collected in 1987 and 1988, Reinhold (2010) pooling cycle 4, 5, and 6 of NSFG collected in 1988, 1995, 2002 respectively, Manning and Cohen (2012) using NSFG data collected from 2006 to 2008. Teachman and Polonko (1990), and DeMaris and Rao (1992) have found that there is a positive correlation between premarital cohabitation and the hazard of marital dissolution. Reinhold (2010) argues that the association between premarital cohabitation and divorce has weakened for more recent birth and marriage cohorts. Manning and Cohen (2012) use the 2006-2008 wave of the NSFG support this argument. The current study updates the results for the United States by using NSFG cycle 4, 5, 6, and cycle 2006-2010. As for studies using data sets outside of the United States, they are Balakrishnan and Rao (1987) using Canadian Fertility Survey in 1984, Bennett et al. (1988) using Women in Sweden collected in 1981, and Svarer (2004) using Integrated Database for Labor Market Research created by Statistics Denmark and collected from 1980 to 1995 on annual basis. In particular, Svarer (2004) found that both premarital cohabitation and the duration of premarital cohabitation are negatively correlated with the hazard of divorce. Its effect with a 2 year mean duration of cohabitation is about 50 % lower hazard to divorce compared with marriage without living together

first. On the contrary, the other two studies did find positive association between premarital cohabitation and marital instability. The effects varied from 50% to 80%.

The second set of the literature is to view premarital cohabitation as endogenous and jointly model the decision to cohabit and the process of marital dissolution. Lillard et al. (1995) is the first paper that attempts to take the possible endogeneity of premarital cohabitation into account by using NLS-72 with its follow-up in 1986. They found that positive correlation between premarital cohabitation and marital instability is due to unobserved heterogeneity. However, Reinhold (2010) using cycle 6 of NSFG found that there is a negative effect of premarital cohabitation on the hazard of divorce after accounting for unobserved heterogeneity. He argued that either the normality assumption or higher-order marriages may lead to this result. After relaxing normality assumption and allowing premarital cohabitation to have different effects on marriage orders, he does not find any evidence to support self-selection of divorce-prone women into cohabitation. He also finds premarital cohabitation is important to stabilize higher-order marriages. Using Austrian Family and Fertility Survey (FFS) collected in 1995-1996, Kulu and Boyle (2010) finds that premarital cohabitation reduces the hazard of marital dissolution after controlling unobserved heterogeneity. As a remark, there is no study that attempts to use an instrumental variable to account for the exogenous variation in the decision to cohabit before marriage.

In their seminar work, Becker et al. (1977) examine the role of age at marriage, years of schooling, age, earnings, and children on both stability of frits marriage and second marriage. In addition to Becker et al. (1977), Lehrer (1988, 1996) analyzes the determinants of marital stability for first marriages and remarriage. The current study updates those estimates by using more recent data from the NSFG. Due to data limitation, the role of uncertainty on stability of marriage is not considered here.

Literature in this vein, Weiss and Willis (1997) use the NLS-72 with its follow-up in 1986 to investigate the role of surprises in marital dissolution, in which predicted earning capacity is measured as surprise. Their results indicate that a positive unexpected shock for the husband's earning capacity enhances marital stability but such a positive shock for the wife's earning capacity reduces marital stability. Using a wider population and a clear indicator to measure the unexpected shock compared with those of Weiss and Willis (1997), Charles and Stephens (2004) found that an unexpected occurrence of a spouse's job displacement raises the hazard of divorce while an unexpected occurrence of a spouse's disability does not. Moreover, this increase in marital instability is only for job losses not for shutdown of plants suggesting that a partner's economic perspective is a more important determinant of marital stability rather than a temporary loss in earnings. Hankins and Hoekstra (2010) studies unexpected income shocks on women's marital decisions. Their results indicate random income shock does not result in high rate of divorce. However, the income shock does affect women's propensity to marry. In dynamic settings, Brien et al. (2006) formalize the gathering information about a potential partner is a key aspect of courtship process, where individuals use cohabitation as a way to hedge future bad shocks and slow learning about match quality is main motivation why cohabiting couples keep cohabiting. Gemici and Laufer (2011) develop a dynamic model of household formation and dissolution, fertility and labor supply. They focus on how divorce policy affects intra-household allocation, fertility decisions, household formation and dissolution. Although their models are quite different, in their policy experiments Brien et al. (2006) and Gemici and Laufer (2011) both predict that raising cost of cohabitation equals to that of marriage, then no one has incentive to cohabit, and introducing cohabitation reduces overall divorce rate.

When setting cohabitation as a substitute to marriage, Adamopoulou (2010) finds

that the narrow gap in gender wage and the depreciation in home appliances weaken the incentives to enter a marriage to explain overwhelmingly increasing in cohabitation in the last decade. Chade and Ventura (2005) show that the number of marriages becomes more sensitive to the increase in the marriage tax penalty. Matouschek and Rasul (2008) found that people prefer to marriage instead of cohabitation because marriage contracts serve as a commitment device. To reinforce this point, the model of Gemici and Laufer (2011) reveals that the lower separation cost of cohabiting unions implies the lower degree of commitment in their relationships that results in less efficient in terms of household production compared with married couples.

3. PREMARITAL COHABITATION AND DIVORCE

The rise of cohabitation in the past three decades is well documented (Bumpass et al., 1991; Bumpass and Lu, 2000; Kennedy and Bumpass, 2008). Before 1970s, cohabitation was mainly a phenomenon of the lower educated who are more likely to view cohabitation as a substitute to marriage (Bumpass et al., 1991). Nowadays it has become a norm in the current society of the United States as well as in most Western nations (Kiernan, 2001). Close to one half of women interviewed in 2006-2010 have cohabited with a partner as a first union, compared to 43% of women in 2002, and 34% of women in 1995 (Copen et al., 2013). The divorce rate among women whose marriages have ended within 10 years aged 15-44 in 1995, 2002, and 2006-2010 is 33%, 36%, and 32%, respectively (Copen et al., 2012). Therefore the rise in the popularity of cohabitation is not associated with a similar trend in divorce. This paper seeks to answer whether premarital cohabitation is a real predictor of women's propensity to divorce.

One of the major reasons why social scientists are interested in individuals' entering or leaving relationships is its welfare implications on both aspects of individuals and society. Welfare policies such as Aid to Family with Dependent Children (AFDC) or Temporary Assistance for Needy Families (TANF) may give individuals incentives to choose different type of relationships if the policy is in favor of some type of relationship (Moffitt et al., 1998, 2009). Likewise, lack of marriage neutrality in the tax system in the United States may affect individuals' marital and dissolution decisions (Alm and Whittington, 1995, 1997, 2003; Chade and Ventura, 2002, 2005; Light and Omori, 2012; Dickert-Conlin, 1999; Whittington and Alm, 1997). Introducing an intermediate type of household formation–nonmarital cohabitation is inevitably complicated the welfare and tax policy consideration (Light and Omori, 2012).

Theoretical arguments regarding factors that affect the likelihood of divorce can track back to (Becker et al., 1977) in which participants in the marriage market have limited information and the probability of divorce can be characterized as a function of expected gains from remaining marriage and a random variable that describes unexpected outcomes. As a result, acceptable marriages at present can be dissolved later as more information is accumulated during course of marriages (Weiss and Willis, 1997; Charles and Stephens, 2004; Brien et al., 2006). In the context of premarital cohabitation, the variance of this random variable is smaller for marriage preceded by cohabitation because living together before marriage gives couples opportunities to learn their match quality. Therefore, given the same gains from marriage, couples living together before their marriages are expected to have lower divorce probabilities than those without.

Despite this intuitive argument, it has been documented in the demographic literature that marriage preceded by cohabitation is less stable than its counterpart (Balakrishnan and Rao, 1987; Bennett et al., 1988; Teachman and Polonko, 1990). It still is inconclusive whether observed positive correlation is causal or spurious. Those who choose to cohabit before marriage may have been more likely to divorce even if they had not lived together first Bennett et al. (1988). It is their original propensity to divorce rather than cohabitation itself that leads to high rate of divorce. On the other hand, cohabitation itself may have a negative impact on individuals' attitudes or values toward the institution of marriage making them divorce-prone (Axinn and Thornoton, 1992; Axinn and Barber, 1997). More importantly, both arguments are not mutually exclusive. It is plausible that both effects exist.

Early literature addressing the self-selection of individuals with higher risk into cohabitation relies on individuals' propensity to cohabit and its correlation with individuals' perceived marital instability (Booth and Johnson, 1988; DeMaris and Mac-

Donald, 1993), perceived match quality (Thomson and Colella, 1992) or attitudes toward divorce (Axinn and Thornoton, 1992; Axinn and Barber, 1997). Lillard et al. (1995) is the first paper to model an individual's decision to cohabit before marriage and decision to dissolve a marriage. They find that the observed positive correlation between premarital cohabitation and marital instability are entirely due to self-selection of divorce-prone women into cohabitation, and there is not any casual effect of premarital on marital outcome when using the National Longitudinal Study of the High School Class of 1972 (NLS-72) with its follow-up in 1986. However, Reinhold (2010) uses the model of Lillard et al. (1995) with slightly modification and the 2002 wave of the National Survey of Family and Growth (NSFG) argues that the positive self-selection is indeed driven by higher-order marriages. In addition, as Lillard et al. (1995) acknowledge that the findings from NLS-72 may not apply to more recent cohorts because NLS-72 can be viewed as single-age cohort, and only individuals who reached their senior year of high school are included in the analysis. Furthermore, the wave 2002 of the NSFG contains a routing error in the survey instrument: about one-third of women whose first marriage had ended were skipped from the questions how and when their marriage ended (Goodwin et al., 2010). Therefore, the results from the wave 2002 are susceptible because most dates of marital dissolution are imputed. For these two reasons, one cannot arrive at any conclusion based on the NLS-72 and the wave 2002 of the NSFG.

In addition to the potential weakness of the data sets, literature so far use multiple marriage spells for a subset of women to identify the selection (Lillard et al., 1995; Reinhold, 2010; Kulu and Boyle, 2010). Identification requires I observe marriage spells when one woman had both premarital cohabitation and not. However, identification based on a subset of women is not necessarily valid to other groups. Moreover, there are no priori reasons to expect the influence of premarital cohabitation on the

first marriage will be the same as on the second and higher-order marriages because there are factors that are unique to remarriage such as stepchildren and the duration of previous marriages. Both the distribution of the age at marriage and the nature of its effect on marital stability are expected to be different (Lehrer, 1996).

In this essay, I formally deal with the selection issues in the sense women's decision to start a relationship, what form this relationship will take (cohabitation or marriage), and to dissolve or continue the relationship when coupled with a particular partner. Therefore, I use the full sample to identify the selection. The proposed econometric model is a nested logit model. The identification relies on a distributional assumption which is the same as previous literature, but does not rely on multiple marriage spells. In addition, I use the wave 1995, 2002, and 2006-2010 of the NSFG in which the waves 1995 and 2006-2010 are more reliable than the wave 2002. The population, which is wider than NLS-72, is 15 to 44 years of age living in the household in the United States in 1995, 2002, and 2006-2010, respectively.

I begin with this problem by using linear probability models. The positive correlation between premarital cohabitation can be completely eliminated if couples whose same levels of religiosity along with other match-specific variables are controlled in the model for cycle 5. However, this positive correlation is also explained if marital duration, age at marriage, premarital conception, premarital live birth, whether women had ever cohabited with any men other than their husbands before marriage, whether women's husband had ever married, and had any kids from a previous relationship are controlled when using cycle 6 and 7, respectively.

However, the wave 1995 of the NSFG is the only one so far as I know which both ask respondents' and their husbands' level of religiosity. Other data such as NLS-72, National Survey of Families and Households (NSFH), National Longitudinal Survey of Youth 1979 (NLS79) and other waves of the NSFG does not ask both two

questions. Without controlling couples whose same levels of religiosity, both the estimate and the standard error of premarital cohabitation on divorce are biased. In this situation, the methodology proposed in this essay is more reliable.

I then use nested logit models to address the women's selections by viewing cohabitors and non-cohabitors as distinct groups in the sense premarital cohabitation on divorce has not only an intercept but also slope effects. First, I allow the alternatives of ever forming a coresidential relationship to have a correlated error. Hence, women's choices are collapsed to two levels of nesting. I then allow women's each choice of entering or exiting contingent on cohabitation or marriage to have a correlated error in which cohabitation and marriage have different correlation structure. In this way, the women's choices are collapsed to five levels of nesting.

First, the results from the 5-level nested logit models are quantitatively similar to those from the 2-level nested models. This result suggests that sample selection bias would not be an issue if the sample of 'ever forming a coresidential relationship' or the sample of 'ever married women' along with 'never forming coresidential women' were used in the analysis based on the property of independent of irrelevant alternative (IIA). In addition, the result from the linear probability model with full controls for cycle 5, which is also quantitatively similar to those from the nested logit models in which match-specific variables including couples' same levels of religiosity need not be controlled, suggest that the sample selection bias can be alleviated if couples whose same levels of religiosity are included in the linear probability models. This result further supports the bias from omitting couples whose same levels of religiosity in the linear probability models for cycle 6 and 7, which is equivalent to the sample selection bias. Taking the results of cycle 7 as an example, the difference in the divorce between marriage preceded by cohabitation and not is -0.0644 from the 2-level nested logit model with $|t|$-value 1.29 and p-value 0.1 which is marginally

significant for one-tailed test compared with $|t|$-value 0.39 and p-value 0.35 in the linear model with full controls. This conclusion thus suggest that a type of sample selection model is preferred if detailed information on husband's traits is not collected in a survey.

To conclude, the findings suggest that premarital cohabitation is not a real predictor of women's propensity to divorce, and the positive correlation between premarital cohabitation and divorce can be attributed to sample selection bias. One application is people who live together with their future spouses before marriage in general are not motivated by learning unknown compatibility. Even if they are motivated by learning, the results suggest that the learning during cohabiting periods cannot predict their subsequent marital stability. However, the results from the nested logit model for cycle 7 suggest that the observed correlation between premarital cohabitation and women's propensity to divorce is expected to be negative and significant on the basis of newly released survey data from the wave 2011-2015 of the NSFG.

3.1 The data source

This study uses latest three cycles of National Survey of Family Growth (NSFG), cycle 5, cycle 6, and 2006-2010 NSFG that contains the information about cohabitation.[1] Cycle 5 and cycle 6 were conducted in January through October 1995, January 2002 to March 2003, respectively, and 2006-2010 NSFG interviews were done in 48 weeks of every year for 4 years from June, 2006 through June, 2010. The total sample size is 10,847 women for cycle 5, 7,643 for cycle 6, and 12,279 for 2006-2010 NSFG from 15 to 44 years of age living in households in the United States. The aim of NSFG cycle 1-5 is to provide detailed information on women's marriage, fertility, divorce, health status, and the health of their children in the United States. Starting from cycle 5, the detailed information on women's cohabitation history is available.

[1] Below I will call 2006-2010 NSFG as cycle 7.

In addition, NSFG of cycle 6 and its subsequent surveys begin to collect male samples where there are 4,928 and 10,403 males in cycle 6 and 7, respectively. The ongoing survey starting in late September of 2011 is again a four year project and is expected to complete about 5000 interviews annually until 2015.

3.2 Descriptive statistics

In this and the next section, I follow the existing literature (e.g., Reinhold 2010) by viewing premarital cohabitation on women's propensity to divorce as an endogenous problem, and use ever married sample. In addition, I shall call cohabitors as those who live with their husband before marriage and non-cohabitors those who do not.

3.2.1 An overview of marital outcome

Table B.1 presents an overview about the relationship between premarital cohabitation and divorce. The columns 1-3 contain information of all marriages regardless of cohabitation status, columns 4-6 are marital status by marriage not preceded by cohabitation, and columns 7-9 are marital status by marriage preceded by cohabitation. Before proceeding, I would like to define the two variables–divorce and premarital cohabitation. The variable of divorce is coded 1 if a woman was divorced or separated from her first husband, and coded 0 if a woman has neither divorced nor separated from her first husband at the end of a survey. The variable of premarital cohabitation is coded 1 if a woman had lived with her first husband prior to their first marriage.[2]

First, younger generation is more like to cohabit prior to marriage, and more recent marriages are more likely to be preceded by cohabitation. As a result, high recent rates of premarital cohabitation may be responsible for the rise in mean age

[2] In the survey of NSFG, this question is "Some couples live together without being married. By living together, we mean having a sexual relationship while sharing the same usual address. Did you and (1st HUSBAND) live together before you got married?"

at first marriage. The percentages of premarital cohabitation are 36%, 48%, and 55%, and the mean ages at first marriage are 22.4, 23.5, and 23.9 for cycle 5, 6, and 7, respectively. In the empirical specification, I will control not only for the cohort effect but also the marriage cohort effect.

In addition, the aggregate divorce rate in U.S. is stable at each point in time. The percentage of divorce is 34 %, 35 % and 35 % for cycle 5, 6, and 7, respectively. Furthermore, aggregate divorce rates for cohabitors and non-cohabitors are similar. The percentages of divorce for marriage not preceded and preceded by cohabitation, respectively, are 34 % and 33 % for cycle 5, 35 % and 36 % for cycle 6, and 34 % and 36 % for cycle 7.

Although the difference in the divorce rate between cohabitors and non-cohabitors is small, marriage preceded by cohabitation on average has shorter marriage duration than its counterpart. The average durations of marriages without living together before marriage are 10.2, 8.4, and 8.6 years compared with 6.9, 6.4, and 6.5 years of marriage preceded by cohabitation for cycle 5, 6, and 7, respectively. This is partially because marriage preceded by cohabitation on average has a higher age at marriage. However, for a given marital duration, cohabitors on average tend to have higher rate of dissolution compared with non-cohabitors.

3.2.2 Descriptive statistics for control variables

Table B.2 gives summary of statistics for variables used in the divorce equation for each cycle of the NSFG. These variables consist of two sets. The first set is women's characteristics at the first marriage. These variables that are all dummy variables are whether a woman had ever conceived, a woman had live birth, and a woman had ever cohabited with any men prior to marriage, whether a woman's first husband had ever married, and had children from a previous relationship.[3] The first

[3] Cycle 5 of NSFG does not ask whether a woman's first husband had children from a previous relationship.

three variables are intended to capture the possibility that a woman may deviate from optimal marital decision. The rest of two variables are intended to control women's search costs. The second set contains individuals' characteristics. These variables are individual's age at the survey, family origin at age 14, race, level of religiosity, current religion affiliation, religion in which an individual was raised, individual's years of schooling, and place of residence.[4] An additional set of match-specific variables measuring positive assortative mating is presented in the Table B.3. The positive assortative mating is optimal if the traits between husband and wife used in the aggregate marital output are complement (Becker, 1973, 1991). These variables are the age difference between husband and wife, whether a spouse has the same years of schooling, race, religious affiliation, and level of religiosity.[5]

Since cohabitors and non-cohabitors may have different characteristics, I regress each independent variable on premarital cohabitation. These differences are also presented in the Tables B.2 and B.3. One caveat is if marriage preceded by cohabitation is sufficiently different from its counterpart, allowing premarital cohabitation has not only an intercept effect but also slope effects on women's latent propensity to divorce may be more appropriate. I shall focus only on the difference in variables between cohabitors and non-cohabitors.

First, in terms of women's premarital fertility behaviors, cohabitors have sufficiently high proportions of premarital conception and premarital live birth than non-cohabitors. The differences of each cycle in premarital conception are 25%, 28% and 32% while differences of each cycle in premarital live birth are 18%, 21%, and 28%. Given that the increase in premarital live birth from cycle 5 to cycle 7 is 10%,

[4] Individuals' level religiosity is based on a survey question in each cycle of NSFG: How important is religion in your daily life? There are three categories: very important, somehow important, and not important.

[5] Cycle 6 and 7 of NSFG do not ask husbands' religious affiliation and level of religiosity. In addition, husbands' years of schooling are asked only if women are currently married or separate. For women who have divorced their husband's information is not collected.

this increase is entirely from cohabitors. In addition, cohabitors also have high proportions of ever cohabited with any men rather than their eventual spouses before marriage than non-cohabitors, and their husbands are more likely to have ever divorced and have kids before getting married to them. For example, Cohabitors who had ever cohabited with any men rather than their future husbands have 13%, 14 %, and 15% higher than non-cohabiotrs for cycle 5, 6, and 7, respectively.

Moving to the differences in individual's characteristics between cohabitors and non-cohabitors, cohabitors are younger, less likely from an intact family when aged 14, less religious than non-cohabitors. For instance, 75%, 79%, and 75% of non-cohabitors are from an intact family compared with 64%, 67%, and 59% of cohabitors for cycle 5, 6, and 7, respectively. Moreover, 62%, 65%, and 66% of non-cohabitors view religion is very important for their daily life while only 45%, 45%, and 43% of cohabitors view religion is very important for cycle 5, 6, and 7, respectively. Younger birth cohorts, the more secular members of a society and individuals who had experienced parental divorce or separate are more prone to cohabit consistent with the most European countries (Kiernan, 2001). To sum up the results of Table B.2, cohabitors are endowed with many different characteristics from non-cohabitors; these differences will affect their mating patterns which I am turning to.

Table B.3 presents couple's traits at marriage. In terms of whether a spouse has the same years of schooling, race, religious affiliation, and level of religiosity, cohabitors have significantly different mating patterns than non-cohabitors, especially religious mating patterns. For example, 62% of cohabitors have the same religious affiliation compared to 74% of non-cohabitors. In addition, given the same level of religiosity within a couple, only 17% of cohabitors think religion is very important while 31% for non-cohabitors. As a result, if a couple's level of religiosity is a determinant of divorce, failing to control this factor will bias the estimate of premarital

cohabitation on divorce.

3.3 Results for linear probability models

In this section I present the results of linear probability regression models for each cycle of the NSFG. The results of cycle 5, 6, and 7 are collected in the Tables B.4, B.5, and B.6, respectively. The divorce equation can be expressed as the following.

$$divorce_i = Mcohort_i\alpha + X_i\beta + T_i\delta + M_i\theta + \gamma Coh_i + \epsilon_i, \tag{3.1}$$

where $divorce_i$ is a binary variable taking the value of 1 if divorce occurs and 0 otherwise; $Mcohort_i$ stands for marriage cohorts which is a set of dummies to capture the fact cohabitors marry late, and more recent marriages are more likely preceded by cohabitation; X_i is a set of covariates that potentially affects women's propensity to divorce and individual's marital decision including marriage duration, age at marriage, premarital conception, premarital live birth, whether women had ever cohabited with any other man prior to marriage, whether women's first husband had ever married, and whether women's first husband had any kids from a previous relationship; T_i is a set of covariates that measures potential types that are individual's characteristics including individual's age, family origin at age 14, race, migration status, level of religiosity, current religion, religion in which the woman was raised, individual's years of schooling, and place of residence; M_i is a set of covariates that measures the underlying quality of match including a spouse's age gap, whether a spouse has the same years of schooling, same race, same religion, and same level of religiosity. The key parameter in the equation (3.1) is γ. I will implement a series of linear probability models for each cycle, and demonstrate most variation in premarital cohabitation is uncorrelated with unmeasured determinants of divorce. That is, I would like to argue that premarital cohabitation is not a real predictor of women's

propensity to divorce.

Table B.4 reports the results of cycle 5. The primary parameter of interest is premarital cohabitation (for short, cohabitation). Without any control, model (1) corresponds to the mean difference in the probability of divorce between cohabitors and non-cohabitors. It is 0.01, the same as reported in the Table B.1. Model (2) adjusts the facts that cohabitors are more likely to marry late than non-cohabitors, and more recent marriage are more likely preceded by cohabitation. The coefficient of cohabitation is 0.076 which significantly differs from zero. This means that cohabitors are more likely to divorce than non-cohabitors other things being equal. Model (3) controls factors that affect women's propensity to divorce and women's marital decision. The coefficient of cohabitation decreases from 0.076 to 0.022, but still is significant. When controlling factors affecting women's propensity to divorce and marital decision, R^2 increases from 0.09 to 0.55. This indicates that a large proportion of variation in cohabitation have explained by these two sets of factors. Model (4) adds a set of individual's characteristics, the coefficient of cohabitation is 0.029. An increase in the magnitude of this coefficient is due to age. More recent birth cohorts (i.e., lower age) are more likely to cohabit, and higher age women are likely to be observed to divorce in a cross-sectional data. Model (5) controls for women's residence. The coefficient of cohabitation is 0.028 and still significantly differs from zero with a t-value 2.85. Model (6) controls husband and wife traits–age differences, whether they have the same years of schooling, race and religion. The coefficient of cohabitation decreases from 0.028 to 0.024, but it is significant. Finally, model (7) adds three variables that represent couples whose same levels of religiosity–not important, somehow important, and very important using different level of religiosity within a couple as a comparison group. The coefficient of cohabitation decreases from 0.024 to 0.01 and becomes insignificant. As a result, most variation in cohabitation

is uncorrelated with unmeasurable determinants of women's propensity to divorce.

Table B.5 presents the results of cycle 6. In the model (1) the mean difference in the probability of divorce between cohabitors and non-cohabitors is -0.02. Controlling marriage cohorts, the coefficient of cohabitation is 0.06 and is significantly different from zero. Model (3) further controls factors affecting women's propensity to divorce and women's marital decision. This coefficient is 0.02 but insignificant, where the t-value is 1.52. The R^2 increases from 0.15 in the model (2) to 0.62 in the model (3). This result implies positive and significant correlation can be explained by those factors. Further adding individual's characteristics in the model (4) and (5), the coefficients of cohabitation are 0.0194 and 0.0195, respectively. Finally, controlling age differences between husband and wife and same race marriage in the model (6), the coefficient decreases from 0.019 to 0.017, where t-value is from 1.46 to 1.25. The results of cycle 5 indicates that if we were to have detailed information about husband's traits, especially husband's religious information, the positive correlation between cohabitation and women's propensity to divorce is expected to be further reduced.

Moving to the results of cycle 7 in the Table B.6, the mean difference in the probability of divorce between cohabitors and non-cohabitors is 0.0006 in the model (1). Once again when controlling marriage cohorts in the model (2), the coefficient of cohabitation becomes significant; its magnitude is 0.07 that is very close to those in the cycle 5 and 6 of model (2). Model (3) further controls factors affecting women's propensity to divorce and women's marital decision. This coefficient becomes 0.015 and again insignificant, where the t-value is 1.18 which is smaller than that in cycle 6. Then adding individual's characteristics in the model (4) and (5), the coefficients of cohabitation are -0.004 and -0.005 which is very close to zero. Further controlling age differences between husband and wife and same race marriage in the model (6)

does not change the result, where the coefficient is -0.005. This means most of controls used in the model (3) to model (6) are irrelevant to women's propensity to divorce, and uncorrelated with cohabitation.

To summarize the findings from Tables B.4 to B.6, premarital cohabitation is not a real predictor of women's propensity to divorce. The positive correlation between premarital cohabitation and divorce is completely eliminated by couples whose same levels of religiosity when using cycle 5 of NSFG. However, this positive correlation is also explained by controlling for marital duration, age at marriage, premarital conception, premarital live birth, whether women had ever cohabited with any other man prior to marriage, whether women's husband had ever married, and whether women's husband had any kids from a previous relationship when using cycle 6 and 7. Although one may conjecture that the increase in the popularity of cohabitation leads to a weaker correlation between cohabitation and divorce, I would rather conjecture this weaker correlation was related to the no fault divorce law. If no fault divorce law shifts bargaining power from men to women or vice versa between couples, then the influence of match-specific variables on women's propensity to divorce would be weaker (Stevenson and Wolfers, 2006). Because observed positive correlation between premarital cohabitation and divorce in cycle 5 could be explained by couples whose same levels of religiosity, and because cycle 5 consist 63% of marriages occurring before 1985 while only 22% and 6% of marriages happen before 1985 for cycle 6 and 7, I think weaker association between match-specific variables and women's propensity to divorce leads to this pattern.[6] The results from Tables B.4 to B.6 also imply that people who cohabit with their future spouses are in general not motivated by learning unknown compatibility.[7] Even if they are motivated by learning, learning something during cohabiting periods cannot predict subsequent

[6] I use 1985 as a cutoff point for the adoption of no fault divorce laws because most states has adopted except for New York.

[7] I do not rule out any other potential benefits of cohabitation.

marital stability. Finally, adding match-specific variables could alleviate the correlation between cohabitation and divorce, especially couples' religious backgrounds.

3.4 The empirical setting of a nested logit model

The empirical setting for implementing a nested logit model requires creating union history, constructing choice set, generating counterfactual union-specific variables, and specifying a tree structure.

3.4.1 An individual's union history

In this section, I first explain how to create an individual's union history and explain the union history selection criteria. Everyone in the sample starts a status of singlehood and is assumed that she is in the matching market when aged 14. Since the primary of this paper is to compute the probabilities of divorce for the first marriage, it is assumed that there is a t_i^* such that a woman i aged t_i^* has hit an event of dissolving her first marriage if applicable and another $\bar{t}_i$ which is the age of woman i at the time of a survey such that she is intact in her current state: single, cohabiting, or intact marriage. To sort out an individual's union history sequentially in order, the procedure is visualized in the Figure A.1, where the single pool represents a single woman is eligible to find a mate.

In the Figure A.1, a single woman i with age τ randomly meets a potential mate, and decides whether she wants to enter a coresidential relationship with a partner she met. If she chooses to form a residential relationship with this particular partner, she must decide whether she wants to cohabit or directly enter into a marriage with this partner. If, instead, she chooses to stay "single", then she is single at that period and goes back to the signal pool, and will continue to search a potential mate when aged $\tau + 1$.[8]

[8] I use "single" to distinguish from cohabitation and marriage. A single woman in this paper means she does not have a coresidential partner.

Continuing to move on, a cohabiting woman in each period must decide whether she wants to turn back to be single or not. If she chooses "not single" after cohabiting for d_τ^c given that she cohabits with current partner at age τ, she has to decide whether she wants to keep cohabiting or enter into a marriage with her current partner. If she chooses "cohabiting" which means there is not enough information to show current relationship is a good match, thus she keeps "cohabiting".[9] If, instead, she chooses "married", her status becomes "married". If she chooses "single", then her status is single and back to the single pool, and will randomly meet a potential mate when aged $\tau + d_\tau^c + 1$.

A married woman needs to choose whether she wants to keep or dissolve the current marriage when this marriage has started at her age τ and has lasted for d_τ^m. If she chooses to divorce and becomes a single woman, she will be censored by the model since the focus of this model is probability of divorce for first marriage. If she chooses not to divorce, she remains married.[10]

This setting assumes that for a woman without change in her status the information accumulated about current relationship is optimal. Women in this model thus behave as if they choose optimal status because time spent on one status has been aggregated. Therefore, an change in women's status is considered in this setting. Consequently, the estimated probabilities of change in a woman's status cannot represent a transitional probabilities because I do not explicitly model time into the framework. Having described a woman's union selection process, the next task is to construct a choice set that is feasible to estimate.

3.4.2 Construct a choice set

Based on the discussion above, Tables B.7 and B.8 present the frequency of union choices by each cycle for nonmarried and married sample, respectively. Everyone

[9] This is a censored case since d_τ^c is arbitrary given such that $d_\tau^c + \tau$ equals to $\bar{t}$.
[10] This also is a censored case since d_τ^m is arbitrary given such that $d_\tau^m + \tau$ equals to $\bar{t}$.

starts out with single status. The total number of statuses for nonmarried women equals to one plus the number of change in women's status at the end of a survey. However, the whole union history of ever married women is truncated at dissolving first marriage or censored at intact first marriage at the end of a survey.

Looking at the bottom of the Table B.7 first, the proportions of nonmarried women who have cohabited more than once are 8%, 9.6%, and 10.8% for cycle 5, 6, and 7, respectively. The increase in the proportion of nonmarried women who have cohabited more than once has two implications. First, nonmarital cohabitation has become more prevalent for more recent birth cohorts so that the percentage of women who never form a coresidential relationship is decreasing over cycles if we only look at nonmarried sample. These percentages of women are 70.2%, 64%, and 60% for cycle 5, 6, and 7, respectively. Second, women are more willing to dissolve an unsatisfactory cohabiting relationship. For example, the percentage of nonmarried women who have ever dissolved a cohabiting relationship has increased from 21% in cycle 5 to 28% in cycle 7. These two imply that the stigma attached on cohabitation is less severe,[11] and the separation cost of cohabitation has reduced over time. Turning back to column 1 and 2 of the Table B.7, a zero change in women's status stand for always single indicating that they never form a coresidential relationship. In case of an odd change in women's status, the possible union combinations are SC, SCSC, SCSCSC, and so on. For an even change in women's status, the possible cases are SCS, SCSCS, SCSCSCS, and so on. To make estimation feasible, I am going to select two latest statuses in case of an odd change in women's status, and select the latest three statuses in case of an even change in women's status.[12] Imposing these selection criterions, the corresponding choices are S, SC, and SCS.

Table B.8 reports the union history of ever married women. The first column

[11] This can be viewed as the cost of forming a cohabiting relationship has declined over time.

[12] The selection of women's latest statuses aims to reduce the size of choice set and to use respondents' more recent information due to the nature of cross-sectional data.

is the number of nonmarital cohabitation, and the second lists the whole possible women's statuses truncated at dissolving first marriage or is censored at intact first marriage at the end of a survey. At the bottom of Table B.8, 7.3 % of women have ever cohabited with a man rather than their future spouses before entering first marriage for cycle 5. This proportion has increased to 11.3% for cycle 6, and to 13.2% for cycle 7. Among those who have never cohabited with a man other than their spouses (the row 1-4 of Table B.8), two-third of women got married without living with their spouses first for cycle 5. This proportion dropped sharply to 55% for cycle 6, and 49% for cycle 7. Together with the increasing trend of women who had ever experienced nonmarital cohabitation before first marriage, cohabitation can account for 50% increases in the average age at the first marriage. For instance, if the average age at first marriage has increased by 2 years, cohabitation would contribute to the increase in the age of first marriage by 1 year. Table B.8 also shows the increasing popularity of forming a cohabitation, and that cohabitation does not necessarily imply one step toward marriage. Combined with the trend of Table B.7, cohabitation has become a social norm and is more like to be a screen device of selecting a mate before entering a marriage.

In the column 1 and 2 of Table B.8, the possible union choices for women who have never experienced nonmarital cohabitation are SCMS, SCM, SMS, and SM. For women who have ever cohabited with a man rather than their spouses, I am going to discard this information. As a result, there are only four possible union choices for married sample. They are SCMS, SCM, SMS, and SM.

The choice set is defined $C = \{S, SCS, SC, SCMS, SCM, SMS, SM\}$ according to the two selection criteria. The choice set contains seven elements. Each element in the choice set, C, is a combination of women's possible status(es) after accumulating the time spent in each status, where S stands for single status; C stands for cohab-

itation; M stands for marriage. Having described women's possible union choices and constructed a choice set, the next task is to generate counterfactual alternative-specific variables that describe the attributes of each element in the choice set.

3.4.3 Generate counterfactual alternative-specific variables

The choice set ends up with seven alternatives, and each individual in the model can only choose one of them. An individual chooses alternative i instead of alternative j based on the relative attractiveness between i and j. To gauge the relative attractiveness among alternatives in the choice set, I have to generate variables that could describe the characteristics of each alternative in the set. These variables are in general called alternative-specific variables. For example, price of products is an alternative-specific variable along with other traits of products in a specified choice set. A higher price of a product implies less attractiveness of that product to a consumer. Since the alternative in the choice set are all related to an individual union choices, I must find variables that could simultaneously affect an individual's choice of entering and/or exiting a relationship. There are four variables considered in this paper. These variables are household income, age at the beginning of a relationship, male's and female's years of schooling.[13] However, attribute-specific variables are not all available for everyone. I compute sample averages by *cohort* and *metropolitan* area based on each choice chosen by individuals,[14] where *cohort* are classified into

[13] Since there are many missing value of self-reported household incomes, imputed household incomes provided by each NSFG cycle are used. A household weekly income in the NSFG, cycle 5 is classified into 18 groups. They are under 135, 135-162, 192-230, 231-268, 308-345, 346-384, 385-480, 481-576, 577-768, 769-961, 962-1153, 1154-1345, 1346-1537, 1538-1730, 1731-1922, 1923 or more; While a household annual income classified into 14 groups for cycle 6 and 7; These 14 groups are under 5000, 5000-7499, 10000-12499, 12500-14999, 15000-19999, 20000-24999, 25000-29999, 30000-34999, 35000-39999, 40000-49999, 50000-59999, 60000-74999, 75000 or more. As for the first group and the final of the income, I take the maximum value and minimum value, respectively. For example, a household weekly income is under 135. Then I use 135 as individuals' income. As for the rest groups, I take a middle point of income for each group. For annual household income, I then divide the middle point of income by 52.

[14] Metropolitan area in the data are classify into three categories–metropolitan, central city; metropolitan, other; non-metropolitan area.

groups along with three metropolitan areas for each cycle of NSFG.[15] The procedure is presented in the Figure A.2.

Figure A.2 shows how alternative-specific variables used in the nested logit model are created. First, all individuals are in the model, and can only choose one of alternatives. If an individual i chooses alternative j, then the attribute x_{ij} exists. If, instead, a individual i' for $i' \neq i$ does not choose alternative j, then $x_{i'j}$ does not exist. Next, for those who do not choose alternative j, sample means are computed based on x_{ij}, for all i who have actually chosen j. Third, the computed sample means, $\bar{x}_{i^*j}$, are then mapped to individual i' based on their *cohort* and *metropolitan*. By doing so, those who do not choose alternative j now have information, $x_{i'j}$. The final step is to combine x_{ij} with $x_{i'j}$ and finish the construction of x_{ij} for all i and j.

3.4.4 The nested logit model

The econometric model proposed is a nested logit model. The choice set contains seven elements with an index j, where $C = \{S, SCS, SC, SCMS, SCM, SMS, SM\}$. The next task is to specify a tree structure before deriving the corresponding likelihood function. Two tree structures is considered which are presented in the Figure A.3 and Figure A.4, respectively. The main difference between these two structures is to allow different correlations among alternatives.

In the nested structure of Figure A.3, cohabitation is viewed as not a singlehood. This structure ends up with a 5-level nested logit model.[16] In addition, the specified choice set only uses women's most recent three statuses for SCS, most recent two

[15] Alternatively, I could simply compute the sample averages of these four variables, and then map these variables to those who does not have these information. This procedure simply allows more variations in these variables. For cycle 5, cohort groups are years of birth from 1950 to 59, from 1960 to 64, from 1970 to 72, and from 1973 to 80. For cycle 6, cohort groups are 1957-67, 1968-77, and 1978-88. For cycle 7, the groups are 1961-69, 1970-73, 1974-76, 1977-79, 1980-84, and 1985-95.

[16] Notice that the Figure A.3 is from a researcher's perspective about how individuals choose their life time union path before their age 44 in which the alternatives in a nest (or a group) having a correlated error. It does not assume that individuals' actual choices are sequential.

statuses for SC, most recent four statuses for $SCMS$, most recent three statuses for SCM, most recent three statuses for SMS, and most recent three statuses for SM. Since the aim of this specification is to estimate the joint probabilities of union choices, it is possible to specify an alternative nested structure as shown in the Figure A.4, where ever forming a coresidential relationship are grouped.

An individual i is assumed to choose one of the alternatives among C that maximizes her utility. The utility that she receives from choosing alternative $j = 1, \ldots, 7$ is

$$U_{ij} = V_{ij} + \epsilon_{ij} = \alpha_j + x'_{ij}\beta + z'_i\delta_j + \epsilon_{ij}, \quad \forall j \in C. \tag{3.2}$$

Utility in the equation above includes a deterministic component, V_{ij}, and an unobservable stochastic component, ϵ_{ij}, where V_{ij} depends both on a vector of attributes j and on a vector of individual characteristics, z_i. I will present descriptive summary statistics of these variables in the next section. In addition, not all the coefficients of individual characteristics in the equation (3.2) are identified, the coefficients of alternative 1 (i.e., never forming a coresidential relationship) have been normalized to be zero, that is $\alpha_1 = 0$ and $\delta_1 = 0$. As a result, one may interpret $\alpha_j + z'_i\delta_j$ with $j \neq 1$ as the net gain from choosing "not always single" relative to "always single". Under this specification, the probability of an individual choosing a particular alternative is derived by the following equation (omitting subscript i)

$$\begin{aligned} Prob(j) &= Prob(U_j > U_k \ \ \forall k \neq j) = Prob(\epsilon_k < V_j + \epsilon_j - V_k \ \ \forall k \neq j), \\ &= \int_{\epsilon_j=-\infty}^{\infty} F_j(V_j + \epsilon_j - V_1, \cdots, \epsilon_j, \cdots, V_j + \epsilon_j - V_7) d\epsilon_j. \end{aligned} \tag{3.3}$$

The nested logit model assumes that ϵ_j is drawn from an extreme value distribution function so that the equation (3.3) has a closed form solution. The distribution

function corresponding to the nested structure in the Figure A.3 is

$$F(\epsilon) = \exp\left\{-e^{-\epsilon_1} - \left[\left(e^{-\frac{\epsilon_2}{\gamma_1}} + \left[e^{-\frac{\epsilon_3}{\lambda}} + \left(\sum_{k=4}^{5} e^{-\frac{\epsilon_k}{\rho}}\right)^{\frac{\rho}{\lambda}}\right]^{\frac{\lambda}{\gamma_1}}\right)^{\frac{\gamma_1}{\theta}} + \left(\sum_{k=6}^{7} e^{-\frac{\epsilon_k}{\gamma_2}}\right)^{\frac{\gamma_2}{\theta}}\right]^{\theta}\right\}$$

where $\epsilon = (\epsilon_1, \ldots, \epsilon_7)$, ρ, λ, γ_1, γ_2, θ scaled parameters (McFadden, 1981, p.238).[17]

Several points should be noted. First, the ratios of scaled parameters, $\frac{\rho}{\lambda}$, $\frac{\lambda}{\gamma_1}$, $\frac{\gamma_1}{\theta}$, $\frac{\gamma_2}{\theta}$, and θ are called dissimilarity parameters or inclusive value parameters reflecting the degree of correlations among unobserved components of alternatives within a nest. In the Figure A.3, there are five nests, A, A_c, A_m, B_c, and B_{cm}, and each nest is scaled by θ, γ_1, γ_2, λ, and ρ, respectively. Under these notations, the corresponding dissimilarity parameters in each nest are θ. $\frac{\gamma_1}{\theta}$, $\frac{\gamma_2}{\theta}$, $\frac{\lambda}{\gamma_1}$, and $\frac{\rho}{\lambda}$. In the second, a necessary and sufficiency condition for the nested choice to be consistent with random utility maximization (RUM) is that the parameter of inclusive values (IV) must lie in the unit interval (McFadden, 1981).[18] Finally, α_j, for each j, is alternative-specific constant representing the mean of the distribution of the unobserved effects in the random component ϵ_j associated with alternative j.

[17] The distribution function corresponding to the nested structure in the Figure A.4 is

$$F(\epsilon) = \exp\left\{-e^{-\epsilon_1} - \left[\sum_{k=2}^{7} e^{-\frac{\epsilon_k}{\theta}}\right]^{\theta}\right\},$$

where $\epsilon = (\epsilon_1, \ldots, \epsilon_7)$, and θ scaled parameters.

[18] There is a growing literature trying to relax this condition, see Börsch-Supan (1990), Koning and Ridder (1994), Herriges and Kling (1996), the sufficient condition for consistent with RUM is IV parameters lie in unit interval. If some of IV parameters a model are greater than one, this indicates the model is consistent for a range of explanatory variables (Train 2003, p. 92; McFadden 1981, p. 248).

The log-likelihood function is

$$\ln L(\Theta) = \sum_{i=1}^{N} \sum_{j=1}^{7} y_{ij} \ln Prob_j(\Theta | x_{ij}, z_i),$$

where $y_{ij} = 1$ if individual i chooses alternative j, 0 otherwise; $\Theta = (\ \alpha_j,\ \beta,\ \delta_j,\ \rho,\ \lambda,\ \gamma_1,\ \gamma_2,\ \frac{\rho}{\lambda},\ \frac{\lambda}{\gamma_1},\ \frac{\gamma_1}{\theta},\ \frac{\gamma_2}{\theta},\ \theta)$, and $Prob_j$ for $j = 1, \ldots, 7$ is implicitly defined in equation (3.3), and V_j is defined in equation (3.2). These estimates are computed by using full information maximum likelihood estimation.

After obtaining the estimates of $(\hat{\alpha}_j,\ \hat{\beta},\ \hat{\delta}_j,\ \hat{\rho},\ \hat{\lambda},\ \hat{\gamma_1},\ \hat{\gamma_2},\ \hat{\theta})$ for $j = 2, \ldots, 7$, $\hat{P}(divorce|married, cohabiting) \equiv P_i(j = 4 \mid j \in B_{cm})$ and $\hat{P}(divorce|married, single)$ $\equiv P_i(j = 6 \mid j \in A_m)$ are computed according to the nested structure in the Figure A.3.[19] The explicit functional forms of these two probabilities are

$$P_i(j = 4 \mid j \in B_{cm}) = \frac{\exp(V_{i4}/\rho)}{\exp(V_{i4}/\rho) + \exp(V_{i5}/\rho)}; \tag{3.4}$$

$$P_i(j = 6 \mid j \in A_m) = \frac{\exp(V_{i6}/\gamma_2)}{\exp(V_{i6}/\gamma_2) + \exp(V_{i7}/\gamma_2)}; \tag{3.5}$$

where $V_{ij} = \alpha_j + \beta x_{ij} + \delta_j z_i$ for $j = 2, \ldots, 7$ with $\alpha_1 = \delta_1 = 0$ for each $i = 1, \ldots, N$. The average predicted probabilities in the equation (3.4) and (3.5) are computed by first putting the individuals' actual values of x_{ij} and z_i and then taking average of each $P_i(j = 4 \mid j \in B_{cm})$ and $P_i(j = 6 \mid j \in A_{cm})$. That is

$$P(j = 4 \mid j \in B_{cm}) = \frac{1}{N} \sum_{i=1}^{N} \frac{\exp(V_{i4}/\rho)}{\exp(V_{i4}/\rho) + \exp(V_{i5}/\rho)}; \tag{3.6}$$

$$P(j = 6 \mid j \in A_m) = \frac{1}{N} \sum_{i=1}^{N} \frac{\exp(V_{i6}/\gamma_2)}{\exp(V_{i6}/\gamma_2) + \exp(V_{i7}/\gamma_2)}. \tag{3.7}$$

[19] The difference between the two probabilities of divorce can be viewed as the average treatment effect where the treatment is premarital cohabitation.

The delta method is used for computing the standard error of the difference between these two probabilities (i.e., (3.6) - (3.7)).[20] Before estimating the model, I first present descriptive statistics for variables used in the model.

3.5 Descriptive statistics for nested logit models

Table B.9 gives summary of statistics for alternative-specific variables for each cycle of NSFG. These variables are individual's household income, age at a relationship, male's and female's years of schooling. For individual characteristics, the summary statistics is presented in Table B.10. I will discuss these variables afterward. It may be more informative to focus only on cycle 5 because of high similarities between three cycles. In addition, there are several aspects to these sample averages because the alternatives contains whether an individual has ever formed a coresidential relationship and whether an individual has ever dissolved a coresidential relationship.

Looking at household income first, the pattern of household income for alternatives is expected. A cohabiting couple or a spouse whose marriage is still intact, in general, has a higher household income while women who had ever dissolved a coresidential relationship regardless of cohabitation or marriage have lower household incomes compared with women who never form a coresidential relationship at the end of the survey. The reasons for this pattern are straight forward. First, conditional on ever forming a coresidential relationship (i.e., only look at alternative 2 to 7), intact couples have higher income than women who had ever dissolved their coresidential relationship because men's wage rate is greater than women's and/or intact couples are both on the labor market. In addition, women who never form a coresidential relationship their income are more likely to include the income of their family while those who had ever dissolved a coresidential relationship are more likely to be economic independence of their parents.

[20] In the 2-level nested logit model, the formulas in the equation (3.6) and (3.7) are the same except for $\rho = \gamma_2 = \theta$.

To infer the sign of coefficient of the income, we have to simultaneously look at the relationship between the average income and the percentage of an alternative chosen by women. To illustrate this point, we may artificially look at alternative 1, 4, 5, 6, and 7 only since the share of these alternatives accounts for 89% of the total 100%. Observing the highest income which is 857.8 corresponds to a share of 15% compared with the modest income 657.7 but with highest share of 26%. This implies that household income is negatively correlated with the likelihood of a given alternative chosen.

There are two ways to explore its economic relevant regarding union choices as stated in (Becker, 1973; Becker et al., 1977). The first is related to an individual's choice whether to form a coresidential relationship. A single woman is willing to form a household if and only if the combined wealth is greater than that of staying single. The average household income for women who never form a coresidential relationship is 657.7 compared with the overall mean income 663.6. Therefore, higher household income implies higher likelihood a woman will form a household. In addition, conditional on ever forming a coresidential relationship, intact relationships have higher income than dissolved relationships implying that higher income could stabilize coresidential relationships.

Then turning to age at a relationship, for alternative 1 and 2 this variable measures the average age that a woman ever had a sexual relationship with a partner in more recent five years while for alternative 4 to 7 this variable measures age at the first marriage. Conditional on ever forming a relationship, cohabitors have higher age at a relationship partially because they may entail higher search cost and partially because they have spent some time in a cohabiting relationship no matter whether they have converted their cohabiting relationships into marriage. To infer coefficient of age at a relationship, a slightly negative correlation between age at a relationship

and percentage of a given alternative chosen. The highest age at a relationship is 26.5 only with a share of 7 % while the highest share is 26 % which has an average age at a relationship 24 ((26.2+21.6)/2). Finally, looking at alternative 4 to 7, we can infer higher age at marriage implies lower likelihood to dissolve a marriage.

Moving to male's years of schooling, women who never form a coresidential relationship are more likely to meet a man with higher years of schooling than those who had ever form a coresidential relationship. Intuitively, these women search longer than those who had ever forming a coresidential relationship, and tend to have a better match when entering a coresidential relationship. In addition, percentage of a given alternative chosen is positively correlated with male's years of schooling. This indicates that increase in male's overall years of schooling also increase overall women's utility. Finally, looking at alternative 4 to 7, there are two patterns that could be inferred. First, in terms of husband's years of schooling the two types of marriage does not have significant difference. Further, lower husband's years of schooling implies higher chance of divorce.

Similar to male's years of schooling, women who never form a coresidential relationship tend to have higher years of schooling. In addition, percentage of a given alternative chosen is also positively correlated with female's years of schooling. This implies that women's overall years of schooling are increasing over time. Contrary to male's years of schooling, women who had divorced do not have significantly lower years of schooling than those who do not divorce for two types of marriage.

Moving to alternative chosen across cycles of the NSFG, a pattern of retreat from marriage is evident when cohabitation has become acceptable living arrangement. First, percentage of women who never form a residential relationship has climbed over cycles. In addition, the percentage of women who is currently cohabiting in cycle 5 is 4 % while this percentage is 9% in cycle 7. Income may explain this

pattern. For instance, the average income in cycle 5 for women who are currently cohabiting is 742 compared to 644 in cycle 7. A substantial decrease (increase) in the household income may weaken cohabiting couples' (singles') propensity to marrying. Moreover, the shares of marriage preceded by cohabitation (i.e., alternative 4 and 5) are constant across three cycles suggesting that the reduction in marriage rate is from marriage not preceded by cohabitation. For example, the total shares of alternative 6 and 7 is 40% in cycle 5 compared to 20% in cycle 7. Uneven retreat from marriage across income and educational groups is discussed in (Lundberg and Pollak, 2013).

Table B.10 gives sample means of individuals' characteristics used in the choice equation. The individuals' demographic variables include whether an individual ever had premarital conception, whether an individual ever had premarital live birth, an individual's level of religiosity, age at the survey, whether an individual is from intact family before age 14, race, birth place, years of schooling measured at the end of a survey, an individual's current religion, religion in which an individual was raised, place of residence (metropolitan or non-metropolitan).

A slightly decrease in premarital conception across cycles while a slightly increase in premarital live birth. This together implies premarital investment in children has increased. This may enhance stability of a relationship because children are union-specific investment. I use these two variables to capture state-dependent effects since I ignore some of individuals' union history.

As for Individuals demographic characteristics, the average ages at the end of survey are 31, 29, and 29 for cycle 5, 6, and 7 respectively. The percentages of individual from intact family are 66%, 69%, and 61% for each cycle. Furthermore, cycle 5 have more proportion of non-Hispanic white and less proportion of Hispanic than those of cycle 6 and 7. The percentages of years of schooling greater than 12

are 43%, 51%, 48% for cycle 5, 6, 7, respectively. In particular, cycle 5 has more high school graduates while cycle 6 and 7 have more college graduates. There is an increase in the proportion of women who live in metropolitan central city. 35% of women live in the central city for cycle 5 while 38% and 42% of women live in the city for cycle 6 and 7. In terms of saving living expenses, those residing in metropolitan areas have more incentive to cohabit.

Individual's level of religiosity has weakened over cycles. This result also reflects on the proportion of women who currently have no religion. The percentage of women who feel religion is not important is 10 % compared with those of 19% and 24 % for cycle 6 and 7. In addition, 11 % of women have no religious affiliation in cycle 5 but this percentage has increased to 19% in cycle 7. However, there is only a small change in the proportion of women whose families does not have religious affiliation.

3.6 Results for nested logit models

Table B.11 presents 5-level nested logit model estimation for alternative-specific variables. The results of individual-specific variables are collected in the Tables B.12, B.13, and B.14 for cycle 5, 6, and 7, respectively. I then compute the average difference in the probability of divorce between marriage preceded by cohabitation and marriage not preceded by cohabitation. Although I do not report the estimates of 2-level nested logit model, I also compute its corresponding average difference in the probability between marriage preceded by cohabitation and marriage not preceded by cohabitation. For the sake of comparison, the results from linear probability models are reproduced. These probabilities are summarized in Table B.15. I shall not pay any attention to the estimates reported in Tables B.11, B.12, B.13, and B.14 because my primary interest is whether the differences in the probability between cohabitors and non-cohabitors are significantly different from zero.

Table B.15 gives the average predicted probability of divorce.[21] Based on the 5-level nested logit model, the average probability of divorce for cohabitors is 33.35%, 29.9%, and 26.5% while that for non-cohabitors is 32.1%, 29.8%, and 32.8% for cycle 5, 6, and 7, respectively. The difference in the probability of divorce between cohabitors and non-cohabitors for cycle 5, 6, and 7 is 1.25%, 0.1%, and $-$ 6.3%, respectively. Using delta method to compute its corresponding standard error, these differences in the probability of divorce are all insignificant under conventional level of significance. As a result, I fail to find any evidence to support that cohabitors are more likely to divorce than non-cohabitors. These results are robust to the alternative nested structure as shown in the Figure A.4. In the 2-level nested logit model, the probabilities of divorce for cohabitors are 33.07%, 29.28%, and 25.28% while those for non-cohabitors are 31.53%, 29.11%, and 31.72% for cycle 5, 6, and 7, respectively. The differences in the probability of divorce between the two groups are 1.5%, 0.17%, and -6.4% for cycle 5, 6, and 7, respectively. Once again all these differences are not significantly different from zero. The high similarity in the average predicted probabilities and their corresponding standard errors between 5-level and 2-level nested logit models suggest that implementing a 5-level nested logit model does not gain much from allowing that cohabitors and non-cohabitors have different correlations (i.e., different scaled parameters) in the choice of divorce and not to divorce.

Detailed information in the cycle 5 of the NSFG provides us an opportunity to evaluate the relative advantage of using a nested logit model (or a type of a sample selection model). The difference in the probability of divorce between cohabitors and non-cohabitors is 1.25% for the 5-level nested logit model, and is 1.1% for the linear probability model (model (7) of Table B.4). In the nested logit model, I only use four

[21] Without causing any confusion, I shall use cohabitors to stand for marriage preceded by cohabitation, and non-cohabitors to stand for marriage not preceded by cohabitation.

alternative-specific variables to account for the alternatives in the choice set without using any match-specific variables to correct the positive correlation between premarital cohabitation and women's propensity to divorce. In addition, given the similar results from the 5-level and 2-level nested logit models, this implies that I could use either the sample of ever forming a coresidential relationship (i.e., alternative 2, ..., 6, and 7) or use the sample of ever married women along with never forming a coresidential relationship (i.e., alternative 1, 4, 5, 6, and 7) without introducing a sample selection bias based on the property of independent of irrelevant alternative (IIA).[22] However, a sample selection bias would arise if I use only ever married sample. This bias could be alleviated if couples whose same levels of religiosity are well controlled in the linear probability model for cycle 5.

For cycle 6, the difference in the probability of divorce between cohabitors and non-cohabitors in the 2-level nested logit model is 0.17% with standard error 0.1. Therefore, the remaining positive correlation between premarital cohabitation and women's propensity to divorce for cycle 6 is entirely corrected by the nested logit model. For cycle 7 the difference in the probability of divorce between cohabitors and non-cohabitors is $-$ 6.3% with standard error 0.06 while that difference is $-$ 0.5% with standard error 0.01 based on linear probability model. Linear probability models tend to over-estimates the difference in the probability of divorce between two groups. The conclusion is still valid even if I do not use a type of selection model. The suggestion from the discussion is that if we do not have detailed information about couple's traits, and if we are only interested in understanding whether premarital cohabitation is a real predictor of women's propensity to divorce, then implementing a sample selection model is preferred to implement a reduced-form model if detailed information on husband's traits is unavailable, especially husband's

[22] IIA states that when people are asked to choose among a set of alternatives, their odds of choosing i over j should not depend on whether some other alternative k is present or absent.

religious backgrounds.

3.7 Summary of premarital cohabitation and divorce

This section seeks to answer whether premarital cohabitation is a real predictor of women's propensity to divorce. I formally deal with the selection issue in the sense women's all possible selections of union formation and dissolution are explicitly considered. Therefore, I use full sample to identify the selection. Data are from the wave 1995, 2002, and 2006-2010 of the NSFG, where the population is 15 to 44 years of age living in the household in the United States in 1995, 2002, and 2006-2010, respectively.

I begin the analysis by using linear probability models where only those women who had ever married are used in the analysis. The positive correlation between premarital cohabitation and divorce is entirely vanished if couple's same levels of religiosity are included in the model when using cycle 5 of NSFG. However, this positive correlation is also explained by controlling for marital duration, age at marriage, premarital conception, premarital live birth, whether women had ever cohabited with any other man prior to marriage, whether women's husband had ever married, and whether women's husband had any kids from a previous relationship when using cycle 6 and 7.

However, the wave 2002 and 2006-2010 of the NSFG does not ask detailed information on husband's traits including his religiosity. In this situation, I use nested logit models to address the women's selections.

The results from the 5-level nested logit models are quantitatively similar to those from the 2-level nested models. This result suggests that sample selection bias would not be an issue if the sample of 'ever forming a coresidential relationship' or the sample of 'ever married women' along with 'never forming coresidential women' were used in the analysis based on the property of independent of irrelevant alternative

(IIA). However, the sample selection bias is an issue if only married sample are used in the analysis. In addition, the result from the linear probability model with controls of couples whose same levels of religiosity for cycle 5 is also quantitatively similar to those from the nested logit models without controlling couples' same levels of religiosity. This conclusion suggests that the sample selection bias can be alleviated if couples whose same levels of religiosity are controlled. This result suggests the potential bias from omitting couples whose same levels of religiosity in the linear probability models for cycle 6 and 7, which is equivalent to the sample selection bias. Although it turns out no gains from using nested logit models, the results from nested logit models for cycle 6 and 7 suggest that a type of sample selection model is preferred if husband's traits are not collected in a survey.

4. PREMARITAL COHABITATION AND HAZARD OF DIVORCE

This essay studies the relationship between premarital cohabitation and hazard of divorce, which complements the first essay in three aspects.

First, this essay studies the relationship between premarital cohabitation and women's instantaneous rate of divorce rather than women's aggregate rate of divorce. Cox proportional hazard models are used in the analysis.

Second, it has been argued that strong correlation between premarital cohabitation and marital instability should be weakened over time because of less selection of divorce-prone women into cohabitation when cohabitation has been a norm in a society. I use the 1988, 1995, 2002, and 2006-2010 waves of the National Survey of Family and Growth (NSFG) which contains from earliest to most recent information on premarital cohabitation to address this argument.

Finally, one of quantitative methods to test the hypothesis for self-selection of divorce-prone women into cohabitation is the model used in Lillard et al. (1995), where women's decision to cohabit and decision to divorce are simultaneously modeled. Lillard et al. (1995) find that women's propensity to divorce and to cohabit are positively correlated. However, Reinhold (2010) uses the model of Lillard et al. (1995) with slightly modification and the 2002 wave of the National Survey of Family and Growth (NSFG) argues that the positive self-selection is indeed driven by higher-order marriages. The current study performs the test for self-selection based on the model of Lillard et al. (1995) using cycle 5, 6, and 7, respectively, to recognize the differences between the two studies. This essay is the first paper to investigate whether self-selection of divorce-prone women into cohabitation has changed over time.

This positive correlation is completely vanished when couples whose same lev-

els of religiosity along with couples' other traits are controlled for cycle 5. This result suggests that this positive correlation in cycle 4 is due to failing control the husband's religiosity. However, this positive correlation also explained by women's characteristics prior to marriage for cycle 6 and 7. As a result, marriage preceded by cohabitation and not in terms of match characteristics tend to have similar effects on women's divorce risk when cohabitation has become an acceptable living arrangement. In addition, using the model of Lillard et al. (1995) to perform one of tests for self-selection of divorce-prone women into cohabitation, I fail to find any evidence to support for self-selection hypothesis based on the 1995 and 2006-2010 waves of the NSFG. Overall, the findings in this essay suggest premarital cohabitation is not a real predictor of women's hazard to divorce, and findings of positive correlation between premarital cohabitation and divorce risk in the previous literature are due to omitting relevant variables bias.

4.1 The data

This section uses latest four cycles of National Survey of Family Growth (NSFG), cycle 4, cycle 5, cycle 6, and 2006-2010 NSFG which contains the information about cohabitation.[1] Cycle 4, cycle 5 and cycle 6 were conducted in January through August 1988, January through October 1995, and January 2002 to March 2003, respectively, and 2006-2010 NSFG interviews were done in 48 weeks of every year for 4 years from June 2006 through June 2010. The total sample size is 8,450 women for cycle 4, 10,847 for cycle 5, 7,643 for cycle 6, and 12,279 for 2006-2010 NSFG from 15 to 44 years of age living in households in the United States. The aim of NSFG cycle 1-5 is to provide detailed information on women's marriage, fertility, divorce, health status, and the health of their children in the United States. Starting from cycle 5, the detailed information on women's cohabitation history is available.[2] In addition,

[1] I will call the 2006-2010 wave of the NSFG as cycle 7.

[2] Cycle 4 only contains very limited information on cohabitation.

the cycle 6 and its subsequent surveys begin to collect male samples where there are 4,928 and 10,403 males in cycle 6 and 7, respectively. The ongoing survey starting in late September of 2011 is again a four year project and is expected to complete about 5000 interviews annually until 2015.

4.2 Descriptive statistics for marital outcomes

In this section, I only use ever married sample to present summary statistics. That is, each married woman is eligible to hazard of divorce. Table B.16 presents an overview about the relationship between premarital cohabitation and divorce. The columns 1-3 contain information of all marriages regardless of cohabitation status, columns 4-6 are marital status by marriage not preceded by cohabitation, and columns 7-9 are marital status by marriage preceded by cohabitation. Before proceeding, I would like to define the two variables–divorce and premarital cohabitation. The variable of divorce is coded 1 if a woman was divorced or separated from her first husband, and coded 0 if a woman has neither divorced nor separated from her first husband at the end of a survey. The variable of premarital cohabitation is coded 1 if a woman had lived with her first husband prior to their first marriage.

The rise of cohabitation, and its consequence and its relationship between divorce rate are described. First, younger generation is more like to cohabit prior to marriage, and more recent marriages are more likely to be preceded by cohabitation. As a result, high recent rates of premarital cohabitation may be responsible for the rise in mean age at first marriage. The percentages of premarital cohabitation are 27%, 36%, 48%, and 55%, and the mean ages at first marriage are 21.5, 22.4, 23.5, and 23.9 for cycle 4, 5, 6, and 7, respectively. In addition, the aggregate divorce rate in U.S. is stable at each point in time. The percentage of divorce is 34%, 34 %, 36 % and 35 % for cycle 4, 5, 6, and 7, respectively. Furthermore, marriage preceded by cohabitation on average has shorter marriage duration than its counterpart. The

average durations of marriages without living together before marriage are 10.2, 10.2, 8.4, and 8.6 years compared with 6.1, 6.9, 6.4, and 6.5 years of marriage preceded by cohabitation for cycle 4, 5, 6, and 7, respectively. This is partially because marriage preceded by cohabitation on average has a higher age at marriage. However, for a given marital duration, cohabitors on average tend to have higher rate of dissolution compared with non-cohabitors.

4.2.1 Control variables in the hazard equations

Table B.17 gives summary of statistics for variables used in the Cox regressions. These variables consist of two sets. The first set is women's characteristics at the first marriage. These variables that are all dummy variables are whether a woman had ever conceived, a woman had live birth, and a woman had ever cohabited with any men prior to marriage, whether a woman's first husband had ever married, and had children from a previous relationship.[3] The first three variables are intended to capture the possibility that a woman may deviate from optimal marital decision. The rest of two variables are intended to control women's search costs. The second set contains individuals' characteristics. These variables are individual's age at the survey, family origin at age 14, race, level of religiosity, current religion affiliation, and individual's years of schooling.[4] An additional set of match-specific variables measuring positive assortative mating is presented in Table B.18. The positive assortative mating is optimal if the traits between husband and wife used in the aggregate marital output are complement (Becker, 1973). These variables are the age difference between husband and wife, whether a spouse has the same years of schooling, race,

[3] Cycle 4 does not contain detailed information on women's cohabitation history, whether a woman's first husband had ever married, and had any children from a previous relationship. In addition, cycle 5 does not ask whether a woman's first husband had children from a previous relationship.

[4] Cycle 4 does not ask women's level of religiosity, where women's level religiosity is based on a survey question in each cycle of NSFG: How important is religion in your daily life? There are three categories: very important, somehow important, and not important.

religious affiliation, and level of religiosity. Since cohabitors and non-cohabitors may have different characteristics, I regress each independent variable on premarital cohabitation. These differences are also presented in Tables B.17 and B.18. I shall focus only on the difference in variables between cohabitors and non-cohabitors.

First, in terms of women's premarital fertility behaviors, cohabitors have sufficiently high proportions of premarital conception and premarital live birth than non-cohabitors. The differences of each cycle in premarital conception are 26%, 25%, 28% and 32% while differences of each cycle in premarital live birth are 20%, 18%, 21%, and 28%. Cohabitors also have high proportions of ever cohabited with any men rather than their eventual spouses before marriage than non-cohabitors, and their husbands are more likely to have ever divorced and have kids before getting married to them. For example, cohabitors who had ever cohabited with any men rather than their future husbands have 13%, 14 %, and 15% higher than non-cohabiotrs for cycle 5, 6, and 7, respectively.

In addition, in terms of women's characteristics, cohabitors are younger, less likely from an intact family when aged 14, less religious than non-cohabitors. For example, the age difference between non-cohabitors and cohabitors is 3.13 in cycle 4 while is 0.7 in cycle 7. This result suggests that marriage preceded by cohabitation has become a norm in the United States. 84%, 75%, 79%, and 75% of non-cohabitors are from an intact family compared with 75%, 64%, 67%, and 59% of cohabitors for cycle 4, 5, 6, and 7, respectively. The proportions of no religious affiliation for cohabitors are 9%, 14%, 16%, and 21% compared to 4%, 7%, 8%, and 10% for non-cohabitors. Younger birth cohorts, the more secular members of a society and individuals who had experienced parental divorce or separate are more prone to cohabit consistent with the most European countries (Kiernan, 2001). To sum up the results of Table B.17, cohabitors are endowed with many different characteristics

from non-cohabitors.

Table B.18 presents couple's traits at marriage. When cohabitation is rare, age difference between cohabitors and their husband are larger than that of non-cohabitors. However, when cohabitation has become prevalent, age difference between a spouse for cohabitors and non-cohabitors is similar. Cohabitors are less religious than non-cohabitors. As a result, premarital cohabitation consist lower proportions of the same religious affiliation and level of religiosity between the husband and the wife. Since couples' religion and religiosity are important determinant of divorce, failing to control this factor will bias the estimate of premarital cohabitation on divorce risk.

4.3 Results for Cox proportional hazard models

In this section, I present Cox proportional hazard models for each cycle of NSFG. The results of cycle 4, 5, 6, and 7 are collected in Tables B.19, B.20, B.21, and B.22, respectively. For the sake of comparison, the main results of each cycle are presented in Table B.23. The Cox proportional hazard model can be expressed as the following.

$$\begin{aligned} h_i^d(t; Mcrt_i, X_i, T_i, M_i, Coh_i) &= h_0^d(t) \exp(Mcrt_i\alpha + X_i\beta + T_i\delta + M_i\theta + \gamma Coh_i) \\ \ln h_i^d(t; Mcrt_i, X_i, T_i, M_i, Coh_i) &= \ln h_0^d(t) + Mcrt_i\alpha + X_i\beta + T_i\delta + M_i\theta + \gamma Coh_i, \end{aligned} \tag{4.1}$$

where $h_i^d(t; Mcrt_i, X_i, T_i, M_i, Coh_i)$ is the transition rate at marital duration t for the transition from marriage state to the divorce state conditional on the time-invariant covariates, $Mcrt_i$, X_i, T_i, M_i, and Coh_i; $h_0^d(t)$ is baseline hazard that is common to all individuals in the population and a function of marriage duration, t, alone; Furthermore, $h_0^d(t)$ serves as a constant term in the equation (4.1), and is left unspec-

ified.[5] Time-invariant covariates part, $Mcrt_i$ stands for marriage cohorts which is a set of dummies to capture the fact cohabitors marry late, and more recent marriages are more likely preceded by cohabitation; X_i is a set of covariates that potentially affects women's propensity to divorce and individual's marital decision including age at marriage, premarital conception, premarital live birth, whether women had ever cohabited with any other man prior to marriage, whether women's first husband had ever married, and whether women's first husband had any kids from a previous relationship; T_i is a set of covariates that are individual's characteristics including individual's age, family origin at age 14, race, migration status, level of religiosity, current religion, and individual's years of schooling. M_i is a set of covariates that measures the underlying quality of match including age difference between the husband and the wife, whether a spouse has the same years of schooling, same race, same religion, and same level of religiosity. The key parameter in the equation (4.1) is γ. For a positive (negative) γ, this represents cohabitors are $\exp(\gamma - 1) \times 100\%$ more (less) likely to divorce than non-cohabitors, given any marriage duration. In addition, there is no heterogeneity in premarital cohabitation, and all covariates are assumed to be exogenous and have the same proportional effects on the hazard of divorce for any given marital duration, t. I will implement a series of Cox proportional hazards models for each cycle, and demonstrate most variation in premarital cohabitation is uncorrelated with unmeasured determinants of women's propensity to divorce.

Model (1) of Table B.23 for each cycle, without any control in the model (1), the coefficient of premarital cohabitation (for short, cohabitation) is about 0.25, 0.29, 0.19, and 0.24 for cycle 4, 5, 6, and 7, respectively. These results indicate that cohabitors are associated with 28% ((exp(0.2458) − 1)%), 33%, 18%, and 27%

[5] This model is semi-parametric. As a result, it is less efficient than parametric model such as Weibull proportional hazards model.

higher risk to divorce than non-cohabitors for cycle 4, 5, 6, and 7, respectively. Two points can be inferred from these results. First, we cannot conclude the selection of divorce-prone women into cohabitation as previous literature suggested has weakened over time when we simply look at these two variables. For example, the proportion of premarital cohabitation is 27% in cycle 4 while is 56% in cycle7. However, the coefficient of cohabitation and its corresponding standard error between the two cycles are similar. In addition, without controlling any covariates the result from cycle 6 is unreliable due to data flaw: those who ended their marriage were skipped from the questions how and when their marriage ended. The nonrandom skip may lead to the results because the most dates of marital dissolution for nonrandom skip are entirely imputed.

Focusing on model (5) in each cycle, the association of premarital cohabitation with divorce has weakened over time when adding controls into the models. The coefficient of cohabitation is 0.17, 0.16, 0.02, and 0.01 for cycle 4, 5, 6, and 7, respectively, in which the coefficients of cohabitation for cycle 6 and 7 are insignificant under conventional level of significance. Reinhold (2010) argues that different selection into cohabitation among educational groups may explain the weakened association between premarital cohabitation and marital instability. This essay suggests an alternative explanation. It may be that the correlation between women's divorce risk and women's religiosity has weakened over time when cohabitation has become an acceptable living arrangement.

In the model (6) of cycle 5, I further control the same levels of religiosity between couples and use different level of religiosity between couples as a comparison group. The coefficient of cohabitation decreases from 0.16 to 0.05 and becomes insignificant. Two points suggest from this result. First, the observed positive correlation between premarital cohabitation and divorce risk in cycle 4 is because levels of religiosity

between couples are not controlled suggesting premarital cohabitation is not a real predictor of women's hazard to divorce. Furthermore, women's levels of religiosity in cycle 7 are insignificant suggesting the association between women's religiosity and divorce has weakened over time. This result is more likely driven by retreat from marriage for those who view religion is not important or somehow important. Given these results, the positive correlation between premarital cohabitation and marital instability is due to self-selection of the less religious into cohabitation. If this statement is correct, there should be no evidence to support divorce-prone women self-select into cohabitation when performed a test for self-selection by using the model developed by Lillard et al. (1995).

4.4 A test of self-selection

One of quantitative methods to test the hypothesis for self-selection of divorce-prone women into cohabitation is the model used in Lillard et al. (1995), where women's decision to cohabit and decision to divorce are simultaneously modeled. A facility of this model is to test whether the two decisions are correlated. If it were to be found the two are positively correlated, then self-selection hypothesis is supported; otherwise evidence suggests an alternative hypothesis. They find that the observed positive correlation between premarital cohabitation and marital instability are entirely due to self-selection of divorce-prone women into cohabitation, and there is not any casual effect of premarital on marital outcome when using the National Longitudinal Study of the High School Class of 1972 (NLS-72) with its follow-up in 1986. However, Reinhold (2010) uses the model of Lillard et al. (1995) with slightly modification and the 2002 wave of the National Survey of Family and Growth (NSFG) argues that the positive self-selection is indeed driven by higher-order marriages. However, the results of Reinhold (2010) are based on cycle 6 of NSFG that are doubtful due to data flaw as pointed out in the previous section. In addition, NLS-

72 can be viewed as single-age cohort, and only individuals who reached their senior year of high school are shown in the survey. These two reasons suggest a reassessment based on a wider population and a clean data set. The primary purpose to implement this model is to test whether women's unobserved heterogeneity are both correlated with the decision to cohabit and divorce.

4.4.1 Model specification

A subset of women may have married more than once. It is assumed that the hazard is the same for all spells for the same women. Therefore, for each marriage, m, there is an equation that describes women's hazard to divorce, and another equation that determines women's propensity to cohabit premaritally.[6] This joint decision model can be expressed in the following two equations.

$$\ln h_m(X_m^d, Coh_m, t_m, \delta) = \alpha_0 + \alpha_1^{'} DurM(t_m) + \alpha_2^{'} DurB(t_m) + \alpha_3^{'} X_m^d + \beta Coh_m + \delta \tag{4.2}$$

$$I_m = \beta_0 + \beta_1^{'} X_m^c + \epsilon + \eta_m \tag{4.3}$$

$$Coh_m = \begin{cases} 1 & \text{if } I_m > 0, \\ 0 & \text{otherwise.} \end{cases}$$

where (δ_i, ϵ_i) represents individual i's unobserved heterogeneity that is individual-specific not marriage-specific. Heterogeneity component in equation (4.2), δ_i, measures individual i's propensity to dissolve a marriage m. The other heterogeneity component in equation (4.3), ϵ_i, describes individual i's propensity to cohabit prior to marriage. In addition, η_m is assumed to be distributed $i.i.d.$ according to a standard normal distribution, $\eta_m \sim i.i.d.N(0,1)$ for all m, and is also assumed to be

[6] Here we also use ever married sample. Thus, the decision to cohabit premaritally is equivalent to marriage that preceded by cohabitation.

marriage-specific stochastic component. Therefore, η_m is not only independent of $\eta_{m'}$ for all $m' \neq m$ by *i.i.d.* assumption but also independent of ϵ_i and δ_i since the heterogeneity components enter the equations additively. X_m^d consists of a set of time-invariant covariates that includes a dummy for higher order marriages, age at marriage, whether a woman had ever cohabited with any other man prior to marriage, a woman had ever conceived, a woman had live birth, a woman's first husband had ever married, and had children from a previous relationship, age difference between husband and wife, women's age at the survey, family origin at age 14, race, years of schooling, level of religiosity, and current religion affiliation. X_m^c consists the same covariates except for age at marriage.[7]

The corresponding baseline hazard and survivor functions for equation (4.2) are

$$h_{0m}^d(t_m) = \exp\left\{\alpha_0 + \alpha_1^{'} DurM(t_m) + \alpha_2^{'} DurB(t_m)\right\},$$

and

$$S_{0m}^d(t_m) = \exp\left\{-\int_{t_{0m}}^{t_m} h_{0m}^d(v)dv\right\}$$

for each marriage m. Then conditional on unobserved heterogeneity δ, hazard and survivor functions, respectively, are

$$h_m^d(t_m) = h_{0m}^d(t_m)\exp\left\{\alpha_3^{'} X_m^d + +\beta Coh_m + \delta\right\},$$

[7] In cycle 5, husband's age and his former marital status are not asked in higher order marriage.

and

$$S_m^d(t_m) = \exp\left\{-\int_{t_{0m}}^{t_m} h_m^d(v)dv\right\}$$
$$= \exp\left\{-\int_{t_{0m}}^{t_m} h_{0m}^d(v)dv\right\}^{\exp\left\{\alpha_3' X_m^d + + \beta Coh_m + \delta\right\}}$$

for each marriage m.

To estimate this model, some distribution describing individuals' heterogeneity are required. It is assumed that (δ_i, ϵ_i) is drawn from a bivariate normal distribution with means $(0, 0)$. That is,

$$\begin{pmatrix} \delta_i \\ \epsilon_i \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_\delta^2 & \sigma_{\delta\epsilon} \\ \sigma_{\delta\epsilon} & \sigma_\epsilon^2 \end{pmatrix}\right). \tag{4.4}$$

Therefore, the test for self-selection of divorce-prone women into cohabitation is whether $\rho_{\delta\epsilon} \equiv \sigma_\delta \sigma_\epsilon \sigma_{\delta\epsilon} = 0$. If $\rho_{\delta\epsilon}$ is significantly greater than zero, this indicates that women's decision to cohabit and to divorce are positively correlated, and self-selection of divorce-prone women into cohabitation is supported; otherwise, an alternative explanation is needed.

Conditional on individual-specific heterogeneity, ϵ_i, the probabilities of premarital cohabitation are independent because η_m and $\eta_{m'}$ are independent for any $m \neq m'$, but they are correlated due to unknown ϵ_i. Therefore, marginal likelihood for equation (4.2) is obtained by integrating out the unknown heterogeneity component, ϵ_i. That is,

$$L_{coh} = \int_{-\infty}^{\infty} \frac{1}{\sigma_\epsilon}\phi(\frac{\epsilon}{\sigma_\epsilon}) \prod_{m=1}^{M} \Phi\left((2Coh_m - 1)\left(\beta_0 + \beta_1' X_m^c + \epsilon\right)\right) d\epsilon,$$

for each i, where Φ denotes the cumulative normal distribution and ϕ is its density

function.

Similarly, conditional on (δ_i, ϵ_i), the two equations are independent.[8] The joint marginal likelihood is thus to integrate out the unobserved heterogeneity components. That is,

$$L = \int_{\delta}\int_{\epsilon} \frac{1}{\sigma_\delta \sigma_\epsilon}\phi(\frac{\delta}{\sigma_\delta}, \frac{\epsilon}{\sigma_\epsilon}|\rho_{\delta\epsilon})\Pi_{m=1}^{M}[S_m(X_m^d, Coh_m, t_m^*, \delta)h_m(X_m^d, Coh_m, t_m^*, \delta)^{D_m} \\ \Phi\left((2Coh_m - 1)\left(\beta_0 + \beta_1' X_m^c + \epsilon\right)\right)]d\epsilon d\delta$$

for each i, where t_m^* is the completed marriage spell for marriage m if $D_m = 1$, and is a censored duration of marriage m if $D_m = 0$.

4.4.2 Identification

The identification of premarital cohabitation relies on multiple marriages for a subset of women who had ever divorced. That is, I observe marriage spells for one woman who had both premarital cohabitation and not. After accounting for the correlation between decision to dissolve a marriage and decision to cohabit, the remaining intraperson variation in Coh_m from marriage to marriage represents the direct effect of premaritally cohabiting with individuals' eventually spouses on the hazard of dissolution (Lillard et al., 1995). The abilities of this model are not only to compute the direct effect of premarital cohabitation on the hazard of divorce but also to test whether there is a self-selection of divorce-prone individuals into cohabitation. If the hazard to divorce and the propensity to cohabit are correlated, that is, $\rho_{\delta\epsilon} = \sigma_\delta \sigma_\epsilon \sigma_{\delta\epsilon} \neq 0$, then there is a self-selection of women with a higher (lower) risk of marital dissolution into cohabitation, if $\rho_{\delta\epsilon} > 0$ (if $\rho_{\delta\epsilon} < 0$). However, these do not come without any cost. Three crucial assumptions are imposed– a functional form assumption, the structure of hazard and probit equations in which

[8] Here the implicit assumption is each censoring marriage spell in the hazard equation (4.2) is independent that is very restrictive assumption.

all coefficients are restricted to be the same across marriage, and each censoring marriage is exogenous. These assumptions imply not only the hazard of the first marriage and the higher-order marriages but also propensity to enter first marriage and higher-order marriage are the same for women. For these reasons, I shall focus on the test for self-selection hypothesis.

Before presenting the estimation results, Table B.24 gives the distribution of marriage for each cycle, and Table B.25 presents the variations of premarital cohabitation for subset of women. I only use women's first three marital spells if women who had ever married more than once for cycle 5, 6 and 7, respectively.

In Table B.24, a less than 0.5% of women who had ever married more than three times for each cycle. In addition, 19%, 16%, and 13% of women who had ever married more than once. Along with other assumptions, these women is the source of identification for premarital cohabitation on the hazard of divorce. Turning to marriage spells, 82%, 84%, and 87% of marriages are the first marriages which correspond to the number of women used in the analysis for cycle 5, 6, and 7, respectively. 15%, 13%, and 11% of marriages are the second-order marriages which correspond to the number of women who had ever married more than once. Finally, 2.4%, 2%, and 1.6% of marriage are the third-order marriages which correspond to the number of women who had ever marriage more than twice.

Table B.25 presents the variations in premarital cohabitation. Two points are easy observed from Table B.25. Divorced women are more likely to cohabit, and cohabitors are more likely to cohabit premaritally than non-cohabitors if they had ever divorced. For example, 36.1%, 49%, 56% of first marriages are preceded by cohabitation while 65%, 70%, 71%, and 65%, 68%, 71% of second and third marriages are preceded by cohabitation for cycle 5, 6, 7, respectively. Moreover, 77.8 %, 79.3%, and 81.7% of women who had cohabited premaritally with their first husband their

second marriages are preceded by cohabitation while 59%, 62.4%, and 61.9% of women who had not cohabited premaritally their first husband their second marriages are preceded by cohabitation.

To further understand whether divorced women are also more likely to divorce in their subsequent marriage, Table B.26 reports characteristics of marriage spells by each cycle of NSFG. I shall focus on higher-order marriage only. First, cohabitors are less likely to divorce in the higher-order marriages. In addition, there is no difference in the duration of higher-order marriage and average age at second and third marriages between cohabitors and non-cohabitors. For instance, percentage of intact marriage by cohabitors and non-cohabitors for each cycle, 68% and 70%, of cohabitors' second and third marriages are intact compared to 64% and 63% of non-cohabitors' for cycle 5. Similarly, for cycle 6 and 7, 65% and 78%, 61% and 64% of cohabitors' second and third marriages are intact compared to 69% and 36%, 55% and 48% of non-cohabitors', respectively. Since the durations of higher-order marriage for cohabitors are similar to that for non-cohabitors, and since non-cohabitors have higher proportion of dissolving higher-order marriage, we may expect the correlation between premarital cohabitation and women's hazard of divorce are negative for cycle 6 and 7. In addition, we may also expect that there is no evidence that divorced women are also more likely to divorce in their subsequent marriage.

4.5 Results for joint estimations

Table B.27 reports the results of hazard equation for cycle 5, 6, and 7, and the corresponding probit estimations for premarital cohabitation are collected in Table B.28. There are three model specifications in Tables B.27 and B.28. Model (1) represents the hazard equation without women's heterogeneity; model (2) adds women's heterogeneity, but restricting the correlation between hazard to divorce and decision to cohabit before a marriage to be zero. This is equivalent to separately estimate

each equation. Finally, model (3) presents the hazard equation with correlation between the two equations. The positive correlation between two equations indicates that women with higher divorce risk are more likely to cohabit premaritally. The test for self-selection hypothesis is whether this positive correlation is significantly greater from zero.

For cycle 5, the coefficient of premarital cohabitation (for short, cohabitation) in the model (1) is 0.09 and is significantly different from zero. Allowing women's heterogeneity in the model (2), the coefficient of cohabitation is marginally significant. Finally, allowing the possible correlation between two equations in the model (3), the coefficient of cohabitation is 0.029 and insignificant under conventional level of significance. However, there is no any evidence to show a positive correlation between women's heterogeneity components, indicating self-selection of divorce-prone women into cohabitation is rejected based on cycle 5.

Moving to cycle 6, the coefficient of cohabitation is -0.17 that is significantly different from zero even without considering women's heterogeneity. This result suggests that higher-order marriage preceded by cohabitation are more stable. Then model (2) adding women's heterogeneity into the hazard equation, the coefficient of premarital cohabitation is about -0.22. Finally, without restricting the correlation between the two equations, the coefficient becomes about -0.5. More importantly, the correlation between two equations is positive correlated, indicating divorce-prone women are more likely to cohabit with their eventual spouses. These results presented here are qualitatively similar to Reinhold (2010, table 3).

Turning to cycle 7, the coefficient of cohabitation in the model (1) is -0.1 that significantly differs from zero. Allowing women's heterogeneity in the hazard equation in the model (2), the coefficient is -0.14. Finally, allowing correlation between two equations in the model (3), the coefficient of premarital cohabitation is -0.27

and still significantly different from zero. However, the correlation between the two equations is not significant which is consistent to the result of cycle 5, but contrasts with the result of cycle 6.

To summarize the results from Table B.27, first using cycle 5 and 7 of NSFG, there is no any evidence to support self-selection of divorce-prone women into cohabitation. In addition, the correlations between women's decision to cohabit and to divorce are estimated at 0.08 and 0.17 for cycle 5 and 7, respectively, while the correlation is estimated at 0.56 for cycle 6. Given relatively good data quality of cycle 5 and 7, the results from cycle 6 are artificial because nonrandom skippness of women who ended their marriage from the questions how and when their marriage ended. This nonrandom skippness is clearly correlated with divorce. Furthermore, the nonrandom skippness is also correlated with premarital cohabitation as discussed in (Reinhold, 2010, pp. 730-31). Together, these results suggest a positive correlation between premarital cohabitation and divorce. Based on results of cycle 5 and 7 that the hypothesis for self-selection of divorce-prone women into cohabitation is rejected under a wider population. This conclusion supports the positive correlation between premarital cohabitation and marital instability is due to self-selection of the less religious into cohabitation when cohabitation is not prevalent in the society.

4.6 Summary of premarital cohabitation and hazard of divorce

The section studies the relationship between premarital cohabitation and hazard of divorce in which the dependent variable is the instantaneous rate of divorce per year of marriage duration. The Cox proportional hazard models are used to study the relationship, where the data are from cycle 4, 5, 6, and 7 of the NSFG. Then one of tests for self-selection of divorce-prone women into cohabitation is implemented.

First, Cox proportional hazard regressions suggest that premarital cohabitation is not a real predictor of women's hazard to divorce. The positive correlation be-

tween premarital cohabitation and hazard of divorce is alleviated by couples whose same levels of religiosity for cycle 5. The conclusion suggests the positive correlation between premarital cohabitation and marital instability for cycle 4 are suffered omitting revelent variables bias. However, the difference in the hazard of divorce between marriage preceded by cohabitation and not preceded by cohabitation is also explained by women's characteristics prior to marriage for cycle 6 and 7. The result indicates when cohabitation has become an acceptable living arrangement, the association between women's religiosity and divorce has weakened over time, which is more likely driven by retreat from marriage for those who view religion is not important or somehow important.

Moreover, using the model of Lillard et al. (1995) to perform one of tests for self-selection of women with higher risk into cohabitation, there is no any evidence to support this hypothesis in a wider population. the conclusion is consistent with the notion that the positive correlation between premarital cohabitation and marital instability is due to self-selection of the less religious into cohabitation.

5. CONCLUSION

This dissertation seeks to answer whether premarital cohabitation is a real predictor of women's propensity to divorce as well as women's hazard to divorce. I study the effect of premarital cohabitation on the probability of divorce in the section 3. I formally deal with the selection issue in the sense women's all possible selections of union formation and dissolution are explicitly considered. Therefore, I use full sample to identify women's selections. The 1995, 2002, and 2006-2010 waves of the NSFG are used. I then continue to study the relationship between premarital cohabitation and marital stability in which the 1988, 1995, 2002, and 2006-2010 waves are used.

I begin the analysis by using linear probability models where only those women who had ever married are used in the analysis. The positive correlation between premarital cohabitation and divorce is entirely vanished if couple's same levels of religiosity are included in the model when using cycle 5 of NSFG. However, this positive correlation is also explained by controlling for marital duration, age at marriage, premarital conception, premarital live birth, whether women had ever cohabited with any other man prior to marriage, whether women's husband had ever married, and whether women's husband had any kids from a previous relationship when using cycle 6 and 7.

However, the wave 2002 and 2006-2010 of the NSFG does not ask detailed information on husband's traits including his religiosity. I estimate nested logit models to address the women's selections because characteristics between cohabitors and non-cohabitors are different.

The results from nested logit models suggest that premarital cohabitation is not a real predictor of women's propensity to divorce. In addition, the results from

the nested logit model for cycle 7 suggest that the observed correlation between premarital cohabitation and women's propensity to divorce is expected to be negative and significant on the basis of newly released survey data from the wave 2011-2015 of the NSFG.

In the section 4, Cox proportional hazard models are used to study the relationship between premarital cohabitation and marital stability. Cox proportional hazard regressions suggest that premarital cohabitation is not a real predictor of women's hazard to divorce. The positive correlation between premarital cohabitation and hazard of divorce is alleviated by couples whose same levels of religiosity for cycle 5. The conclusion suggests the positive correlation between premarital cohabitation and marital instability for cycle are suffered omitting revelent variables bias. However, the difference in the hazard of divorce between marriage preceded by cohabitation and not preceded by cohabitation is also explained by women's characteristics prior to marriage for cycle 6 and 7. The result indicates when cohabitation has become an acceptable living arrangement, the association between women's religiosity and divorce has weakened over time, which is more likely driven by retreat from marriage for those who view religion is not important or somehow important. Moreover, using the model of Lillard et al. (1995) to perform one of tests for self-selection of women with higher risk into cohabitation, there is no any evidence to support this hypothesis in a wider population.

Overall, the findings in the dissertation suggest premarital cohabitation is not a real predictor of women's propensity to divorce as well as women's hazard to divorce, and findings of positive correlation between premarital cohabitation and divorce risk in the previous literature are due to either sample selection bias or omitting relevant variables bias. This dissertation suggests that premarital cohabitation does not support the learning hypothesis, and level of religiosity between a couple plays

an important role in determining the correlation between premarital cohabitation and divorce when cohabitation is not widely acceptable in the society.

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APPENDIX A

FIGURES

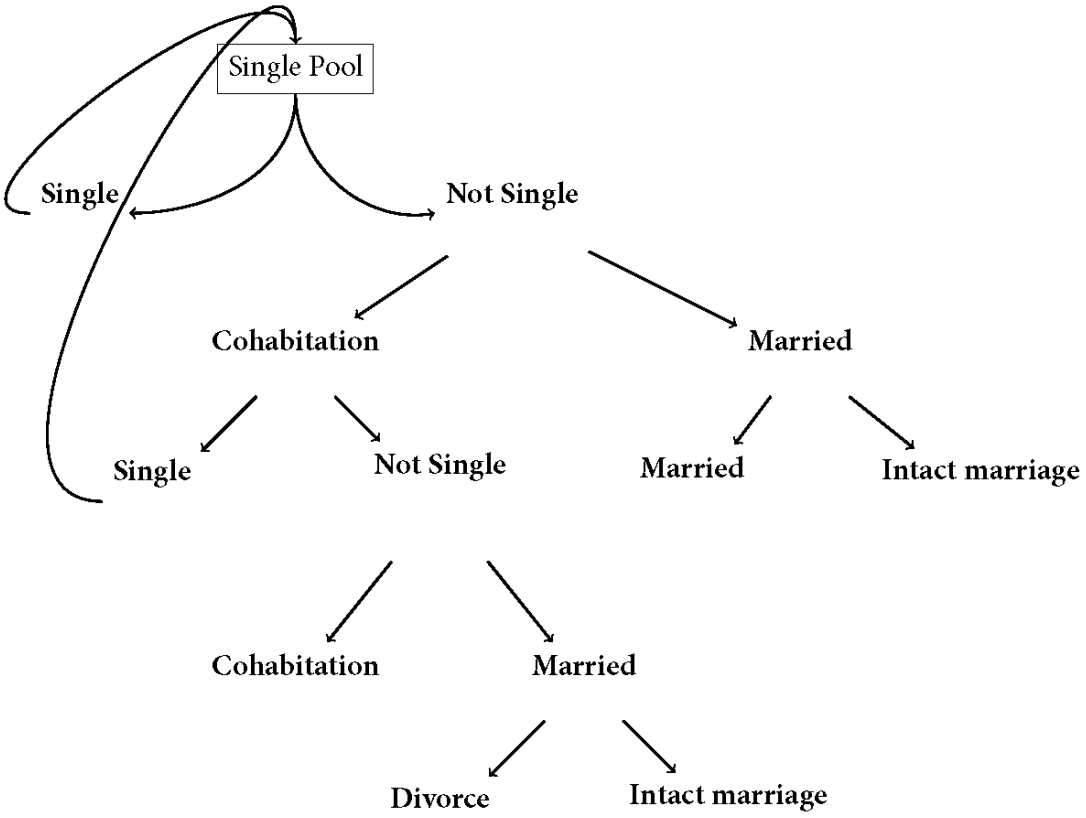

Figure A.1: The Paths of Union Choices

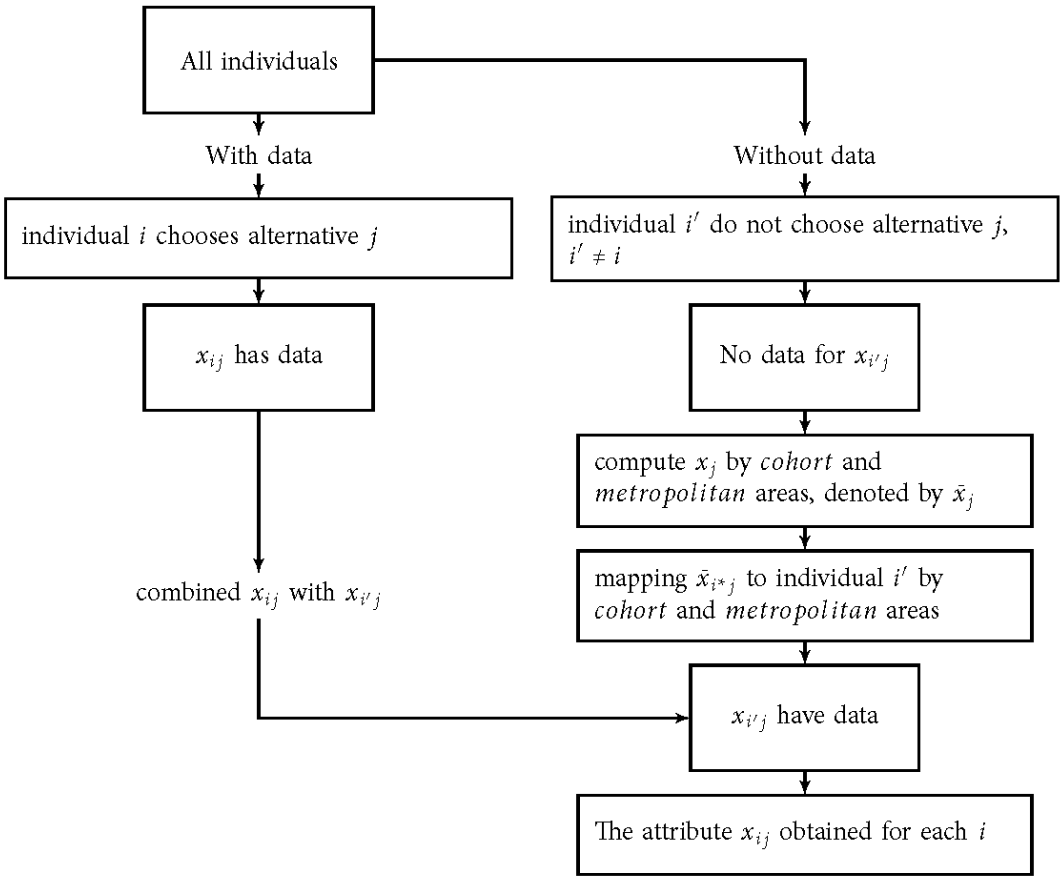

Figure A.2: The Procedures of Creating Alternative-Specific Variables

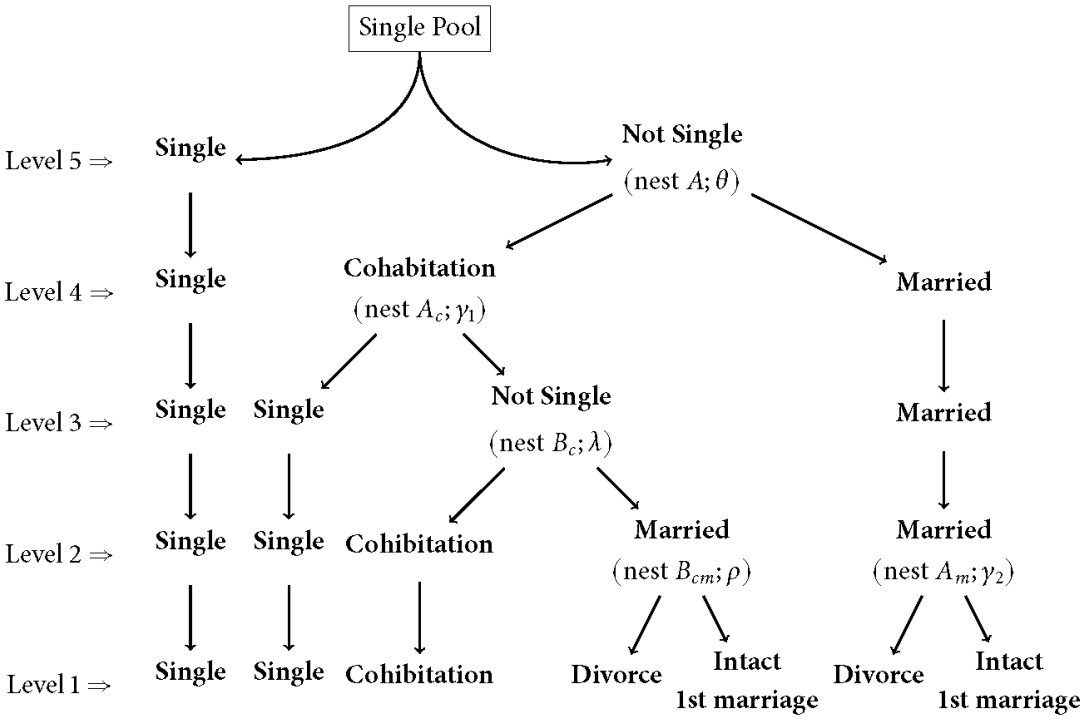

Figure A.3: Clusterng in Alternatives: Cohabitation Is Not a Singlehood

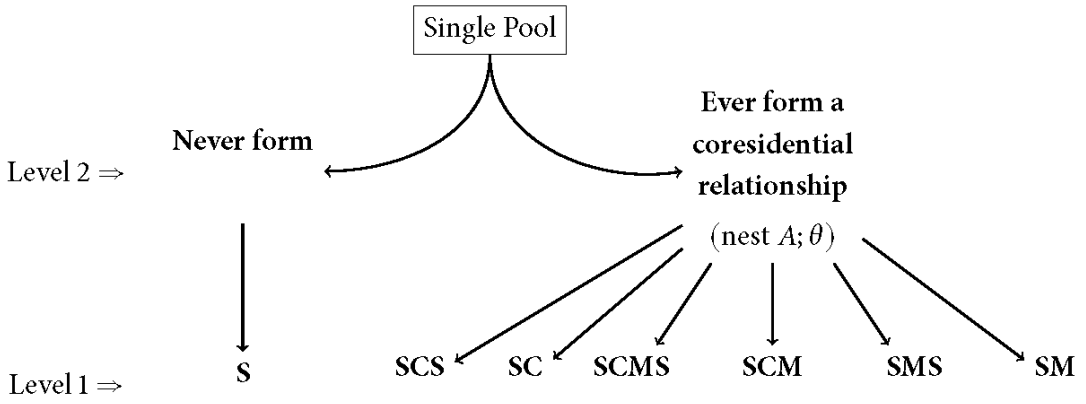

Figure A.4: Clusterng in Alternatives, by Ever Forming a Coresidential Relationship

APPENDIX B

TABLES

Table B.1: Sample Means for Selected Variables by Cohabitation and Marital Status

	All marriages			Without premarital cohabitation			With premarital cohabitation		
Marital status	All	Intact	Not Intact	All	Intact	Not Intact	All	Intact	Not Intact
NSFG, cycle 5									
Premarital cohabitation	0.36	0.36	0.35						
Divorce	0.34			0.34			0.33		
Marriage duration	9.0	10.7	5.6	10.2	12.3	6.1	6.9	7.9	4.8
Cohabitation duration							1.7	1.8	1.3
Age at marriage	22.4	23.2	20.8	21.5	22.3	20.1	23.8	24.7	22.1
Number of marriages	6,517	4,310	2,207	4,190	2,750	1,440	2,327	1,560	767
NSFG, cycle 6									
Premarital cohabitation	0.48	0.47	0.48						
Divorce	0.35			0.35			0.36		
Marriage duration	7.4	8.7	5.0	8.4	10.0	5.2	6.4	7.3	4.7
Cohabitation duration							2.1	2.3	1.9
Age at marriage	23.5	24.4	21.8	22.5	23.3	21.0	24.5	25.6	22.7
Number of marriages	3,905	2,524	1,381	2,050	1,338	712	1,855	1,186	669
NSFG, cycle 7									
Premarital cohabitation	0.55	0.55	0.57						
Divorce	0.35			0.34			0.36		
Marriage duration	7.5	8.7	5.2	8.6	10.2	5.6	6.5	7.4	4.9
Cohabitation duration							2.2	2.4	1.9
Age at marriage	23.9	24.9	22.2	22.8	23.7	21.2	24.8	25.8	23.0
Number of marriages	5,410	3,502	1,908	2,412	1,591	821	2,998	1,911	1,087

[1] Each cell in the table is un-weighted. Birth cohort spans from 1950 to 1979 for cycle 5, from 1957 to 1985 for cycle 6, and from 1961 to 1992 for cycle 7. The corresponding years of marriage are from 1964 to 1995 for cycle 5, from 1972 to 2002 for cycle 6, and from 1977 to 2010 for cycle 7 (NSFG 2006-2010).

Table B.2: Sample Means for Women's Characteristics at Marriage and Individual's Characteristics

	Cycle 5				Cycle 6				Cycle 7			
	Total	cohabitor (1)	non-cohabitor (2)	(1) − (2)	Total	cohabitor (1)	non-cohabitor (2)	(1) − (2)	Total	cohabitor (1)	non-cohabitor (2)	(1) − (2)
Premarital conception	0.40	0.56	0.31	0.25**	0.43	0.58	0.30	0.28**	0.45	0.60	0.28	0.32**
Premarital live birth	0.16	0.27	0.09	0.18**	0.21	0.32	0.11	0.21**	0.26	0.38	0.10	0.28**
Ever cohabited	0.08	0.16	0.03	0.13**	0.12	0.19	0.05	0.14**	0.14	0.21	0.06	0.15**
Husband ever married	0.15	0.24	0.11	0.13**	0.15	0.20	0.10	0.10**	0.15	0.18	0.11	0.08**
Husband had kids					0.16	0.22	0.11	0.11**	0.19	0.25	0.11	0.13**
Age (year)	34.31	32.93	35.08	−2.16**	33.85	33.31	34.33	−1.01**	33.99	33.66	34.39	−0.72**
Family origion: intact	0.71	0.64	0.75	−0.11**	0.73	0.67	0.79	−0.12**	0.66	0.59	0.75	−0.16**
Race: non-Hispanic white	0.66	0.67	0.66	0.02	0.60	0.63	0.58	0.04**	0.58	0.62	0.54	0.08**
Race: non-Hispanic black	0.16	0.18	0.15	0.03**	0.14	0.16	0.12	0.04**	0.13	0.15	0.11	0.05**
Race: Hispanic	0.15	0.12	0.16	−0.04**	0.21	0.18	0.24	−0.06**	0.23	0.19	0.28	−0.09**
Race: other races	0.03	0.03	0.03	0.00	0.06	0.06	0.06	0.01	0.10	0.06	0.15	−0.09**
Born outside of U.S.A.	0.13	0.09	0.15	−0.06**	0.20	0.14	0.25	−0.11**	0.22	0.14	0.31	−0.17**
Level of religiosity:												
not important	0.08	0.12	0.06	0.06**	0.16	0.22	0.11	0.11**	0.20	0.26	0.12	0.14**
somehow important	0.36	0.43	0.32	0.11**	0.29	0.33	0.24	0.09**	0.27	0.31	0.22	0.10**
very important	0.56	0.45	0.62	−0.17**	0.55	0.45	0.65	−0.20**	0.53	0.43	0.66	−0.23**
Religion: no religion	0.09	0.14	0.07	0.07**	0.12	0.16	0.08	0.09**	0.16	0.21	0.10	0.11**
Religion: Catholic	0.30	0.28	0.32	−0.04**	0.30	0.28	0.32	−0.04**	0.27	0.25	0.30	−0.05**
Religion: Protestant	0.52	0.50	0.54	−0.04**	0.52	0.49	0.54	−0.05**	0.47	0.48	0.45	0.03*
Religion: other religion	0.08	0.08	0.08	−0.00	0.06	0.06	0.06	−0.01	0.10	0.06	0.15	−0.04**
Religion raised: no religion	0.06	0.08	0.04	0.04**	0.07	0.09	0.05	0.04**	0.08	0.10	0.05	0.05**
Religion raised: Catholic	0.36	0.36	0.36	−0.01	0.38	0.37	0.39	−0.01	0.36	0.35	0.37	−0.02
Religion raised: Protestant	0.55	0.54	0.56	−0.03*	0.50	0.50	0.50	−0.01	0.46	0.49	0.42	0.06**
Religion raised: other religion	0.03	0.02	0.03	−0.00	0.05	0.04	0.06	−0.02*	0.10	0.06	0.15	−0.10**
Years of schooling:												
less than 12	0.17	0.17	0.16	0.01	0.18	0.20	0.17	0.03*	0.18	0.20	0.16	0.04**
equal to 12	0.40	0.38	0.41	−0.03*	0.24	0.24	0.23	0.01	0.24	0.25	0.23	0.02
between 13 and 15	0.26	0.27	0.26	0.02	0.30	0.30	0.30	−0.00	0.28	0.28	0.28	0.00
greater or equal 16	0.17	0.17	0.17	0.01	0.28	0.26	0.30	−0.03*	0.29	0.26	0.33	−0.06**
Metropolitan: central city	0.30	0.31	0.29	0.03*	0.33	0.35	0.32	0.02	0.36	0.36	0.37	−0.00
Metropolitan: other	0.49	0.49	0.49	0.01	0.51	0.51	0.51	0.00	0.46	0.45	0.47	−0.02
Metropolitan: not	0.21	0.19	0.22	−0.03**	0.16	0.14	0.17	−0.03*	0.17	0.19	0.16	0.03*

[1] Each cell in the table is un-weighted.
[2] ** $p < 0.01$, * $p < 0.05$.

Table B.3: Sample Means for Match-Specific Variables

	Cycle 5				Cycle 6				Cycle 7			
	Total	cohabitor (1)	non-cohabitor (2)	(1) − (2)	Total	cohabitor (1)	non-cohabitor (2)	(1) − (2)	Total	cohabitor (1)	non-cohabitor (2)	(1) − (2)
Husband − Wife												
age difference	2.77	2.94	2.67	0.27∗	2.70	2.80	2.62	0.18	2.83	2.92	2.71	0.22
age difference ≥ 4	0.28	0.32	0.25	0.07∗∗	0.29	0.31	0.27	0.04∗	0.30	0.32	0.28	0.04∗∗
age difference ≤ -2	0.05	0.08	0.04	0.04∗∗	0.08	0.09	0.07	0.02∗	0.09	0.10	0.07	0.02∗∗
Same years of schooling	0.46	0.43	0.47	−0.05∗∗								
Same race	0.90	0.87	0.92	−0.04∗∗	0.87	0.84	0.90	−0.06∗∗	0.86	0.84	0.88	−0.04∗∗
Same religion affiliation	0.70	0.62	0.74	−0.13∗∗								
Heter-level of religiosity	0.50	0.52	0.48	0.04∗∗								
Same level of religiosity:	0.50	0.48	0.52	−0.04∗∗								
not important	0.06	0.09	0.04	0.05∗∗								
somehow important	0.19	0.22	0.17	0.05∗∗								
very important	0.26	0.17	0.31	−0.14∗∗								

[1] Each cell in the table is un-weighted.
[2] ** $p < 0.01$, * $p < 0.05$.

Table B.4: Linear Probability Model: Determinants of Divorce for Cycle 5

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Premarital cohabitation	-0.0101	0.0758***	0.0215**	0.0285***	0.0280***	0.0239**	0.0110
	(-0.77)	(5.89)	(2.13)	(2.89)	(2.85)	(2.43)	(1.14)
Year of marriage: 1964-74		0.0926***	0.1856***	-0.0942***	-0.0929***	-0.0905***	-0.0891***
		(4.20)	(12.94)	(-4.85)	(-4.79)	(-4.68)	(-4.72)
Year of marriage: 1980-84		-0.0958***	-0.2251***	0.0378**	0.0366**	0.0360**	0.0374**
		(-4.71)	(-18.46)	(2.12)	(2.06)	(2.03)	(2.15)
Year of marriage: 1985-89		-0.1848***	-0.4981***	0.0274	0.0244	0.0248	0.0270
		(-9.23)	(-34.31)	(0.91)	(0.81)	(0.82)	(0.92)
Year of marriage: 1990-95		-0.3358***	-0.8714***	-0.0843*	-0.0884**	-0.0871**	-0.0755*
		(-18.32)	(-52.84)	(-1.92)	(-2.01)	(-1.99)	(-1.77)
Marriage duration			-0.0586***	-0.0613***	-0.0611***	-0.0603***	-0.0572***
			(-77.22)	(-72.19)	(-71.71)	(-68.89)	(-61.84)
Age at marriage			-0.0328***	-0.0703***	-0.0703***	-0.0707***	-0.0675***
			(-4.07)	(-7.66)	(-7.68)	(-7.76)	(-7.61)
Age at marriage, squared			0.0004***	0.0001	0.0001	0.0001	0.0001
			(2.62)	(0.81)	(0.85)	(0.83)	(0.77)
Premarital conception			0.0175	0.0060	0.0060	0.0043	0.0023
			(1.64)	(0.58)	(0.58)	(0.42)	(0.23)
Premarital live birth			0.0277*	0.0253	0.0246	0.0251	0.0255
			(1.73)	(1.55)	(1.51)	(1.55)	(1.61)
Ever cohabited			0.0405**	0.0349*	0.0353*	0.0333*	0.0343*
			(2.06)	(1.86)	(1.88)	(1.81)	(1.86)
Husband ever married			0.0323**	0.0224*	0.0227*	0.0369***	0.0319**
			(2.53)	(1.79)	(1.82)	(2.81)	(2.50)
Age (year)				0.0550***	0.0547***	0.0540***	0.0514***
				(18.64)	(18.49)	(18.31)	(17.69)
Family origin: intact				-0.0096	-0.0083	-0.0079	-0.0083
				(-0.93)	(-0.82)	(-0.78)	(-0.84)
Born outside of U.S.A.				-0.0235	-0.0259	-0.0180	-0.0206
				(-1.42)	(-1.57)	(-1.09)	(-1.27)
Level of religiosity:							
somehow important				-0.0148	-0.0132	-0.0127	
				(-0.81)	(-0.72)	(-0.70)	
very important				-0.0209	-0.0194	-0.0155	
				(-1.12)	(-1.04)	(-0.83)	
Metropolitan: central city					0.0360***	0.0338***	0.0304**
					(2.80)	(2.65)	(2.45)
Metropolitan: other					0.0041	0.0024	-0.0005
					(0.37)	(0.22)	(-0.04)
Husband − Wife age gap ≥ 4						-0.0237**	-0.0237**
						(-2.34)	(-2.38)
Wife − Husband age gap ≥ 2						0.0539**	0.0512**
						(2.57)	(2.49)
Same years of schooling						-0.0007	0.0022
						(-0.08)	(0.27)
Same race						-0.0094	-0.0094
						(-0.61)	(-0.62)
Same religion						-0.0528***	-0.0250**
						(-5.35)	(-2.52)
Same level of religiosity:							
not important							-0.0351*
							(-1.73)
somehow important							-0.1063***
							(-9.28)
very important							-0.1510***
							(-14.29)
Constant	0.3335***	0.4193***	1.6554***	0.5031***	0.5004***	0.5697***	0.5865***
	(42.10)	(27.23)	(16.70)	(4.22)	(4.21)	(4.72)	(5.02)
Race dummies	no	no	no	yes	yes	yes	yes
Religion dummies	no	no	no	yes	yes	yes	yes
Religion raised dummies	no	no	no	yes	yes	yes	yes
Years of schooling dummies	no	no	no	yes	yes	yes	yes
Observations	6,517	6,517	6,517	6,517	6,517	6,517	6,517
R^2	0.000	0.092	0.552	0.587	0.588	0.591	0.607

[1] Each linear probability regression is weighted. The weight is from cycle 5 of NSFG.

[2] Reference groups are: year of marriage between 1975-79; non-Hispanic white; level of religiosity, not important; currently no religion; no religion raised; years of schooling less than 12; non-metropolitan area; husband − wife age gap > 4 or wife − husband > 2. heter-level of religiosity between a couple.

[3] Race dummies include Hispanic white (reference), non-Hispanic black, Hispanic, and other races; Religion dummies include no religion (reference), Catholic, Protestant, and other religions; Religion in which the respondent was raised dummies include no religion (reference), Catholic, Protestant, and other religions.

[4] parentheses are t values; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.5: Linear Probability Model: Determinants of Divorce for Cycle 6

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Premarital cohabitation	-0.0246	0.0663***	0.0221	0.0194	0.0195	0.0166
	(-1.14)	(3.34)	(1.52)	(1.45)	(1.46)	(1.25)
Year of marriage: 1985-89		-0.1037**	-0.2434***	0.0242	0.0260	0.0249
		(-2.51)	(-10.14)	(0.73)	(0.78)	(0.75)
Year of marriage: 1990-94		-0.2793***	-0.5459***	-0.0609	-0.0584	-0.0613
		(-8.61)	(-26.53)	(-1.32)	(-1.26)	(-1.33)
Year of marriage: 1995-99		-0.4149***	-0.8957***	-0.1869***	-0.1849***	-0.1882***
		(-13.86)	(-40.82)	(-2.82)	(-2.79)	(-2.86)
Year of marriage: 2000-02		-0.5242***	-1.1985***	-0.3281***	-0.3281***	-0.3332***
		(-17.64)	(-48.05)	(-4.01)	(-4.02)	(-4.10)
Marriage duration			-0.0616***	-0.0630***	-0.0630***	-0.0630***
			(-47.82)	(-49.68)	(-49.62)	(-49.94)
Age at marriage			-0.0174	-0.0367***	-0.0366***	-0.0361***
			(-1.54)	(-3.23)	(-3.20)	(-3.15)
Age at marriage, squared			0.0001	-0.0003	-0.0003	-0.0003
			(0.68)	(-1.39)	(-1.39)	(-1.39)
Premarital conception			0.0896***	0.0689***	0.0702***	0.0693***
			(4.38)	(4.13)	(4.21)	(4.13)
Premarital live birth			-0.0169	-0.0057	-0.0074	-0.0053
			(-0.70)	(-0.25)	(-0.33)	(-0.23)
Ever cohabited			0.0168	0.0017	-0.0022	-0.0036
			(0.86)	(0.09)	(-0.12)	(-0.20)
Husband ever married			0.0299	0.0334*	0.0356*	0.0291
			(1.50)	(1.74)	(1.86)	(1.46)
Husband had kids			0.0335*	0.0204	0.0196	0.0165
			(1.73)	(1.06)	(1.01)	(0.85)
Age (year)				0.0450***	0.0451***	0.0450***
				(10.42)	(10.44)	(10.45)
Family origin: intact				-0.0157	-0.0163	-0.0144
				(-1.00)	(-1.03)	(-0.91)
Born outside of U.S.A.				-0.0081	-0.0071	-0.0049
				(-0.45)	(-0.39)	(-0.27)
Level of religiosity: somehow important				-0.0366	-0.0365	-0.0376
				(-1.21)	(-1.21)	(-1.26)
Level of religiosity: very important				-0.0467	-0.0470	-0.0478
				(-1.59)	(-1.59)	(-1.63)
Years of schooling: equal to 12				0.0171	0.0188	0.0186
				(0.81)	(0.89)	(0.88)
Years of schooling: between 12 and 15				0.0064	0.0067	0.0060
				(0.31)	(0.33)	(0.29)
Years of schooling: greater or equal 16				-0.0264	-0.0253	-0.0263
				(-1.20)	(-1.16)	(-1.19)
Metropolitan: central city					0.0181	0.0166
					(0.92)	(0.85)
Metropolitan: other					-0.0162	-0.0165
					(-0.92)	(-0.94)
Husband − Wife age gap ≥ 4						0.0117
						(0.78)
Wife − Husband age gap ≥ 2						-0.0166
						(-1.01)
Same race						-0.0369**
						(-2.02)
Constant	0.3488***	0.5444***	1.6329***	0.4035**	0.3974**	0.4253**
	(20.90)	(19.65)	(11.54)	(2.42)	(2.37)	(2.47)
Race dummies	no	no	no	yes	yes	yes
Religion dummies	no	no	no	yes	yes	yes
Religion raised dummies	no	no	no	yes	yes	yes
Observations	3,905	3,905	3,905	3,905	3,905	3,905
R^2	0.001	0.147	0.624	0.653	0.654	0.655

[1] Each linear probability regression is weighted. The weight is from cycle 6 of NSFG.

[2] Reference groups are: year of marriage between 1972-84; non-Hispanic white; level of religiosity, not important; currently no religion; no religion raised; years of schooling less than 12; non-metropolitan area; husband − wife age gap > 4 and wife − husband > 2.

[3] Race dummies include Hispanic white (reference), non-Hispanic black, Hispanic, and other races; Religion dummies include no religion (reference), Catholic, Protestant, and other religions; Religion in which the respondent was raised dummies include no religion (reference), Catholic, Protestant, and other religions.

[4] parentheses are t values; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.6: Linear Probability Model: Determinants of Divorce for Cycle 7

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Premarital cohabitation	0.0006	0.0713***	0.0156	-0.0044	-0.0047	-0.0054
	(0.03)	(4.12)	(1.18)	(-0.32)	(-0.34)	(-0.39)
Year of marriage: 1990-94		-0.1668***	-0.1831***	0.0797***	0.0788***	0.0781***
		(-5.02)	(-8.84)	(3.07)	(3.05)	(3.02)
Year of marriage: 1995-99		-0.2584***	-0.4389***	0.0440	0.0424	0.0410
		(-8.53)	(-21.11)	(1.25)	(1.20)	(1.16)
Year of marriage: 2000-04		-0.3692***	-0.7540***	-0.0353	-0.0372	-0.0403
		(-12.63)	(-31.68)	(-0.72)	(-0.75)	(-0.82)
Year of marriage: 2005-10		-0.4616***	-1.0437***	-0.1494**	-0.1520**	-0.1544**
		(-15.91)	(-39.58)	(-2.46)	(-2.51)	(-2.54)
Marriage duration			-0.0588***	-0.0621***	-0.0621***	-0.0619***
			(-52.64)	(-44.55)	(-44.48)	(-44.25)
Age at marriage			-0.0607***	-0.0763***	-0.0766***	-0.0758***
			(-4.90)	(-5.91)	(-5.93)	(-6.01)
Age at marriage, squared			0.0009***	0.0004*	0.0004*	0.0004
			(3.83)	(1.66)	(1.68)	(1.64)
Premarital conception			0.0541***	0.0254*	0.0253*	0.0242
			(3.33)	(1.65)	(1.65)	(1.58)
Premarital live birth			0.0372*	0.0383**	0.0387**	0.0399**
			(1.90)	(2.01)	(2.03)	(2.10)
Ever cohabited			-0.0451***	-0.0592***	-0.0595***	-0.0619***
			(-2.64)	(-3.38)	(-3.39)	(-3.51)
Husband ever married			-0.0068	-0.0125	-0.0125	-0.0155
			(-0.32)	(-0.62)	(-0.62)	(-0.73)
Husband had kids			0.0619***	0.0363*	0.0368*	0.0353*
			(3.08)	(1.86)	(1.89)	(1.77)
Age (year)				0.0488***	0.0487***	0.0484***
				(14.47)	(14.40)	(14.23)
Family origin: intact				-0.0457***	-0.0458***	-0.0450***
				(-3.37)	(-3.39)	(-3.36)
Born outside of U.S.A.				-0.0011	-0.0015	0.0005
				(-0.06)	(-0.08)	(0.03)
Level of religiosity: somehow important				-0.0443	-0.0450	-0.0446
				(-1.13)	(-1.14)	(-1.14)
Level of religiosity: very important				-0.0195	-0.0198	-0.0201
				(-0.51)	(-0.52)	(-0.53)
Years of schooling: equal to 12				-0.0481**	-0.0487**	-0.0482**
				(-2.11)	(-2.13)	(-2.09)
Years of schooling: between 12 and 15				0.0084	0.0086	0.0099
				(0.25)	(0.26)	(0.30)
Years of schooling: greater or equal 16				-0.0314	-0.0311	-0.0306
				(-0.96)	(-0.95)	(-0.94)
Metropolitan: central city					-0.0007	-0.0010
					(-0.04)	(-0.06)
Metropolitan: other					0.0069	0.0072
					(0.43)	(0.45)
Husband − Wife age gap ≥ 4						0.0135
						(0.95)
Wife − Husband age gap ≥ 2						0.0250
						(1.24)
Same race						-0.0269
						(-1.40)
Constant	0.3014***	0.5146***	2.1356***	0.7928***	0.8002***	0.8200***
	(22.26)	(19.95)	(13.71)	(4.51)	(4.54)	(4.64)
Race dummies	no	no	no	yes	yes	yes
Religion dummies	no	no	no	yes	yes	yes
Religion raised dummies	no	no	no	yes	yes	yes
Observations	5,410	5,410	5,410	5,410	5,410	5,410
R^2	0.000	0.106	0.524	0.595	0.595	0.595

[1] Each linear probability regression is weighted. The weight is from cycle 7 of NSFG.

[2] Reference groups are: year of marriage between 1977-89; non-Hispanic white; level of religiosity, not important; currently no religion; no religion raised; years of schooling less than 12; non-metropolitan area; husband − wife age gap > 4 or wife − husband > 2.

[3] Race dummies include Hispanic white (reference), non-Hispanic black, Hispanic, and other races; Religion dummies include no religion (reference), Catholic, Protestant, and other religions; Religion in which the respondent was raised dummies include no religion (reference), Catholic, Protestant, and other religions.

[4] parentheses are t values; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.7: The Unmarried Sample Frequency of Changes in Statuses, by Cycle

Change in a status	Status[1]	Nonmarried Sample					
		Cycle 5		Cycle 6		Cycle 7	
		Freq.	%	Freq.	%	Freq.	%
0	S	2,771	70.2	2,161	64.1	3,958	60.3
1	SC	336	8.5	406	11.99	779	11.87
2	SCS	524	13.3	482	14.24	1,112	16.95
3	SCSC	84	2.2	80	2.36	243	3.7
4	SCSCS	138	3.5	160	4.73	320	4.88
5	SCSCSC	21	0.5	27	0.80	61	0.93
6	SCSCSCS	51	1.3	46	1.36	62	0.94
7	SCSCSCSC	8	0.2	3	0.09	7	0.11
8	SCSCSCSCS	6	0.02	4	0	17	0
9	SCSCSCSCSC	3	0.08	0	0	0	0
10	SCSCSCSCSCS	3	0.08	2	0.06	0	0
11	SCSCSCSCSCSC	0	0	0	0	0	0
12	SCSCSCSCSCSCS	0	0	1	0.03	0	0
Change in statuses ≤ 2		3,631	92	3,048	90.4	5,848	89.2
Change in statuses ≥ 3		314	8	323	9.6	710	10.8
Total		3,945	100	3,371	100	6,558	100

* The paths of union choices are collected in the figure 1.
[1] All cells are unweighted.

Table B.8: The Married Sample Frequency of Changes in Statuses, by Cycle

Cohabited w/. other before 1st marriage (#)	Status[1]	Married Sample Cycle 5 Freq.	Cycle 5 %	Cycle 6 Freq.	Cycle 6 %	Cycle 7 Freq.	Cycle 7 %
0	SCMS	728	10.82	607	15.14	923	17.06
	SCM	1,325	19.75	982	24.5	1,487	27.49
	SMS	1,481	22.05	675	16.84	775	14.33
	SM	2,700	40.12	1,288	32.14	1,509	27.9
1	SCSCMS	81	1.22	75	1.87	121	2.24
	SCSCM	219	3.3	202	5.04	336	6.21
	SCSMS	30	0.48	31	0.77	36	0.67
	SCSM	74	1.11	54	1.35	67	1.24
2	SCSCSCMS	12	0.21	19	0.47	28	0.52
	SCSCSCM	32	0.49	48	1.2	77	1.42
	SCSCSMS	4	0.06	4	0.1	13	0.24
	SCSCSM	10	0.16	7	0.17	12	0.22
3	SCSCSCSCMS	6	0.09	5	0.12	4	0.07
	SCSCSCSCM	5	0.07	8	0.2	12	0.22
	SCSCSCSMS	1	0.01	0	0	0	0
	SCSCSCSM	0	0	1	0.02	2	0.04
4	SCSCSCSCSCMS	1	0.01	0	0	1	0.02
	SCSCSCSCSCM	0	0	1	0.02	5	0.09
	SCSCSCSCSMS	1	0.01	0	0	1	0.02
	SCSCSCSCSM	0	0	0	0	0	0
5	SCSCSCSCSCSCMS	1	0.01	0	0	0	0
	SCSCSCSCSCSCM	0	0	0	0	0	0
	SCSCSCSCSCSMS	0	0	0	0	0	0
	SCSCSCSCSCSM	0	0	0	0	0	0
6	SCSCSCSCSCSCSCMS	0	0	0	0	0	0
	SCSCSCSCSCSCSCM	0	0	1	0.02	0	0
	SCSCSCSCSCSCSMS	0	0	0	0	0	0
	SCSCSCSCSCSCSM	0	0	0	0	0	0
8	SCSCSCSCSCSCSCSCSCMS	0	0	0	0	0	0
	SCSCSCSCSCSCSCSCSCM	1	0.01	0	0	0	0
	SCSCSCSCSCSCSCSCSMS	0	0	0	0	0	0
	SCSCSCSCSCSCSCSCSM	0	0	0	0	0	0
Never cohabited w/. other before 1st marriage		6,231	92.7	3,531	88.7	4,685	86.8
Ever cohabited w/. other before 1st marriage		485	7.3	450	11.3	711	13.2
Total		6,716	100	3,981	100	5,396	100

* The paths of union choices are collected in the figure 1.
[1] All cells are unweighted.

Table B.9: Sample Means for Alternative-Specific Variables, by Alternative

Cycle 5	Alternative							
Variables	1	2	3	4	5	6	7	Total
Household income (weekly)	657.7	498.9	742.1	499.3	857.8	544.5	844.9	663.6
Age at a relationship (year)	26.2	26.5	25.5	21.2	23.9	19.5	21.6	23.5
Male's years of schooling	13.4	12.6	12.1	11.8	12.7	11.8	12.8	12.5
Female partner's years of schooling	13.0	12.4	12.3	12.4	12.9	12.2	13.0	12.6
Alternative chosen	0.26	0.07	0.04	0.08	0.15	0.14	0.26	0.14
Cycle 6	Alternative							
Variables	1	2	3	4	5	6	7	Total
Household income (weekly)	679.0	479.2	668.7	528.7	825.3	574.4	797.2	650.4
Age at a relationship (year)	25.8	26.3	24.6	21.8	24.4	20.2	22.7	23.7
Male's years of schooling	13.7	12.9	12.3	12.4	13.2	12.8	13.6	13.0
Female partner's years of schooling	13.4	12.4	12.6	12.6	13.3	12.8	13.6	13.0
Alternative chosen	0.29	0.09	0.07	0.09	0.17	0.10	0.18	0.14
Cycle 7	Alternative							
Variables	1	2	3	4	5	6	7	Total
Household income (weekly)	688.6	529.2	644.3	552.7	831.8	619.4	820.7	669.5
Age at a relationship (year)	26.2	26.4	24.8	21.7	24.2	20.1	22.5	23.7
Male's years of schooling	13.4	12.6	12.2	11.7	12.9	12.4	13.7	12.7
Female partner's years of schooling	13.6	12.8	12.5	12.5	13.2	12.7	13.8	13.0
Alternative chosen	0.33	0.13	0.09	0.09	0.16	0.07	0.13	0.14

[1] Alternative chosen represents the proportion of each alternative chosen by individuals. The sample sizes are 10,661, 7,352, and 11,954 for cycle 5, 6, and 7 respectively.

[2] Alternative 1 stands for women who never form a coresidential relationship, denoted by S; alternative 2 stands for cohabiting in the first period, and then single in the second period, denoted by SCS; alternative 3 stands for currently cohabiting, denoted by SC; alternative 4 stands for cohabiting in the first period, entering a marriage in the second period, and dissolving the first marriage in the third period, denoted by $SCMS$; alternative 5 stands for cohabiting in the first period, entering a marriage in the second period, and intact first marriage at the end of the survey, denoted by SCM; alternative 6 stands for entering the first marriage in the first period, dissolving this first marriage in the second period, and truncated by the setting thereafter, denoted by SMS; alternative 7 stands for entering the first marriage in the first period, and intact first marriage at the end of the survey, denoted by SM.

Table B.10: Sample Means for Demographic Variables, by Cycle

Variables	Cycle 5	Cycle 6	Cycle 7
Premarital conception	0.35	0.33	0.32
Premarital live birth	0.14	0.16	0.17
Level of religiosity: not important	0.10	0.19	0.24
Level of religiosity: somehow important	0.39	0.30	0.30
Level of religiosity: very important	0.51	0.51	0.46
Age (year)	30.6	29.4	28.6
Family origin: intact	0.66	0.69	0.61
Race: non-Hispanic white	0.60	0.55	0.51
Race: non-Hispanic black	0.22	0.20	0.21
Race: Hispanic	0.14	0.21	0.22
Race: other races	0.03	0.05	0.06
Born outside of U.S.A.	0.11	0.17	0.17
Years of schooling: less than 12	0.25	0.27	0.28
Years of schooling: equal to 12	0.32	0.23	0.24
Years of schooling: between 13 and 15	0.24	0.28	0.26
Years of schooling: greater or equal 16	0.19	0.23	0.22
Religion: no religion	0.11	0.14	0.19
Religion: Catholic	0.29	0.30	0.26
Religion: Protestant	0.52	0.50	0.47
Religion: other religion	0.08	0.06	0.08
Religion raised: no religion	0.06	0.08	0.10
Religion raised: Catholic	0.34	0.37	0.34
Religion raised: Protestant	0.56	0.50	0.47
Religion raised: other religion	0.03	0.05	0.09
Metropolitan: central city	0.35	0.38	0.42
Metropolitan: other	0.46	0.47	0.43
Metropolitan: not	0.19	0.15	0.15
Number of observation	10,661	7,352	11,954

[1] Each cell in the table is un-weighted. The weighted observations representing U.S. women 15-44 years of age living in households in the United States are 59,515,000, 59,873,000, and 60,275,000 for cycle 5, 6, and 7, respectively.

Table B.11: Nested Logit Model: Results for Alternative-Specific Variables, by Cycle

Variables	Cycle 5	Cycle 6	Cycle 7
Alternative-specific attributes[2]			
ln(household income) (weekly)	−0.673***	−0.958***	−0.823***
	(−9.04)	(−10.55)	(−10.65)
Age at a relationship (year)	−0.003	−0.039***	−0.033***
	(−0.52)	(−2.93)	(−2.83)
Male's years of schooling	0.052***	0.083***	0.079***
	(4.23)	(4.07)	(3.80)
Female's years of schooling	0.056***	0.083***	0.112***
	(4.51)	(3.38)	(5.41)
Scaled parameters [3]			
Level 5			
Nest A: θ	0.268***	0.412***	0.418***
	(8.67)	(9.62)	(8.50)
Level 4			
Nest A_c: γ_1	0.518***	0.637***	0.617***
	(6.72)	(7.28)	(9.49)
Level 3			
Nest B_c: λ	0.320***	0.479***	0.497***
	(8.18)	(9.29)	(9.87)
Level 2			
nest B_{cm}: ρ	0.472***	0.693***	0.817***
	(8.08)	(7.97)	(7.76)
Nest A_m: γ_2	0.590***	0.879***	0.998***
	(7.28)	(5.81)	(5.33)
Log-pseudolikelihood	−78896.9	−78880.57	−77638.3
Number of observation	10,661	7,352	11,954

[1] The sample weights are from each cycle of NFSG in maximum likelihood estimation. Standard errors are adjusted for clustering on each individual, and used robust standard errors. The base group is alternative 1, which is "always single" or women who never form a coresidential relationship. The ln(household income) is used instead of household income to reduce the computation time.

[2] Estimation results for individuals' characteristics are collected in Tables B.12, B.13, and B.14, respectively.

[3] For relevant nests, please refer to figure 2.

[4] parentheses are t values; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.12: Nested Logit Model: Results of Cycle 5 for Individuals' Characteristics

	Alternative					
Variables	2	3	4	5	6	7
Premarital conception	1.362***	1.298***	1.319***	1.265***	1.425***	1.179***
	(12.12)	(11.96)	(12.26)	(12.13)	(13.26)	(11.20)
Premarital live birth	−1.202***	−1.136***	−1.429***	−1.295***	−1.673***	−1.506***
	(−8.47)	(−7.98)	(−9.90)	(−9.23)	(−11.40)	(−10.76)
Level of religiosity:						
somehow important	0.183	0.257**	0.244*	0.310***	0.264**	0.445***
	(1.38)	(2.15)	(1.93)	(2.68)	(2.14)	(3.79)
very important	0.076	0.153	0.295**	0.308**	0.286**	0.660***
	(0.52)	(1.19)	(2.17)	(2.48)	(2.17)	(5.10)
Age (year)	0.209***	0.203***	0.266***	0.250***	0.289***	0.256***
	(24.79)	(24.68)	(25.97)	(28.38)	(22.93)	(26.75)
Family origin: intact	−0.459***	−0.398***	−0.427***	−0.385***	−0.436***	−0.205***
	(−5.65)	(−5.21)	(−5.47)	(−5.34)	(−5.60)	(−2.79)
Race: non-Hispanic black	−0.576***	−0.999***	−1.162***	−1.188***	−1.089***	−1.211***
	(−4.53)	(−9.28)	(−10.11)	(−10.79)	(−9.76)	(−11.12)
Race: Hispanic	−0.021	0.064	0.073	−0.093	0.012	0.052
	(−0.15)	(0.50)	(0.54)	(−0.75)	(0.09)	(0.42)
Race: other races	−0.329	−0.561***	−0.278	−0.593***	−0.796***	−0.365**
	(−1.53)	(−2.64)	(−1.39)	(−3.19)	(−3.63)	(−2.01)
Born outside of U.S.A.	0.336**	0.413***	0.246	0.538***	0.394***	0.637***
	(2.12)	(2.94)	(1.63)	(4.01)	(2.75)	(4.80)
Years of schooling:						
equal to 12	0.566***	0.569***	0.445***	0.644***	0.449***	0.726***
	(5.68)	(6.12)	(4.57)	(7.16)	(4.78)	(8.08)
between 13 and 15	0.043	0.070	−0.051	0.088	−0.195*	0.177*
	(0.41)	(0.70)	(−0.50)	(0.94)	(−1.90)	(1.87)
greater or equal 16	−0.238*	−0.187	−0.634***	−0.165	−0.823***	−0.097
	(−1.85)	(−1.51)	(−5.01)	(−1.41)	(−6.11)	(−0.82)
Religion: Catholic	−0.617***	−0.361**	−0.477***	−0.259	−0.417**	−0.141
	(−3.35)	(−2.14)	(−2.74)	(−1.58)	(−2.48)	(−0.87)
Religion: Protestant	−0.407**	−0.226	−0.213	−0.104	−0.162	−0.026
	(−2.54)	(−1.53)	(−1.41)	(−0.73)	(−1.10)	(−0.18)
Religion: other religion	−0.816***	−0.468**	−0.442**	−0.401**	−0.563***	−0.314*
	(−3.63)	(−2.45)	(−2.25)	(−2.15)	(−2.86)	(−1.70)
Religion raised: Catholic	0.018	−0.275	−0.347*	−0.360**	−0.272	−0.356**
	(0.09)	(−1.54)	(−1.94)	(−2.09)	(−1.53)	(−2.08)
Religion raised: Protestant	0.161	−0.127	−0.171	−0.214	−0.027	−0.125
	(0.91)	(−0.80)	(−1.07)	(−1.39)	(−0.17)	(−0.82)
Religion raised: other religion	0.398	−0.124	−0.297	−0.256	−0.248	−0.206
	(1.38)	(−0.49)	(−1.14)	(−1.08)	(−0.95)	(−0.87)
Metropolitan: central city	−0.115	−0.328***	−0.328***	−0.287***	−0.291***	−0.339***
	(−1.27)	(−3.90)	(−3.81)	(−3.61)	(−3.44)	(−4.27)
Metropolitan: not	0.040	0.099	0.186*	0.339***	0.303***	0.349***
	(0.37)	(1.02)	(1.92)	(3.63)	(3.17)	(3.78)
Constant	−5.642***	−4.849***	−6.726***	−5.969***	−7.551***	−6.584***
	(−21.65)	(−21.49)	(−20.68)	(−22.48)	(−18.32)	(−20.77)

[1] The sample weight is from cycle 5 of NFSG in maximum likelihood estimation. Standard errors are adjusted for clustering on each individual, and used robust standard errors. The base group is alternative 1, which is "always single".
[2] parentheses are t values; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.13: Nested Logit Model: Results of Cycle 6 for Individuals' Characteristics

	Alternative					
Variables	2	3	4	5	6	7
Premarital conception	1.421***	1.541***	1.661***	1.475***	1.847***	1.237***
	(8.87)	(10.40)	(10.53)	(10.23)	(9.77)	(8.02)
Premarital live birth	−0.819***	−0.894***	−1.651***	−1.185***	−1.692***	−1.213***
	(−4.55)	(−5.13)	(−7.87)	(−6.30)	(−7.16)	(−6.24)
Level of religiosity:						
somehow important	−0.202	−0.248	−0.236	0.088	−0.052	0.174
	(−0.92)	(−1.31)	(−1.05)	(0.48)	(−0.18)	(0.89)
very important	−0.280	−0.471**	−0.240	−0.030	−0.118	0.525**
	(−1.29)	(−2.47)	(−1.06)	(−0.17)	(−0.41)	(2.57)
Age (year)	0.188***	0.180***	0.280***	0.242***	0.307***	0.235***
	(16.17)	(16.82)	(19.52)	(21.74)	(14.87)	(19.88)
Family origin: intact	−0.677***	−0.672***	−0.780***	−0.566***	−0.833***	−0.283**
	(−5.75)	(−6.29)	(−6.38)	(−5.41)	(−4.94)	(−2.42)
Race: non-Hispanic black	−0.550***	−0.797***	−1.152***	−1.258***	−1.258***	−1.448***
	(−3.61)	(−5.28)	(−7.16)	(−8.68)	(−6.97)	(−9.66)
Race: Hispanic	0.188	0.448***	0.241	0.243	0.209	0.418***
	(1.05)	(3.01)	(1.41)	(1.63)	(1.06)	(2.75)
Race: other races	−0.072	−0.435*	−0.371	−0.344	−0.621**	−0.449*
	(−0.25)	(−1.76)	(−1.37)	(−1.38)	(−1.98)	(−1.92)
Born outside of U.S.A.	0.318*	0.507***	0.221	0.485***	0.321	0.743***
	(1.68)	(3.36)	(1.15)	(3.06)	(1.60)	(4.78)
Years of schooling: equal to 12	0.418***	0.445***	0.374***	0.516***	0.550***	0.548***
	(3.01)	(3.48)	(2.60)	(3.97)	(3.36)	(4.22)
between 13 and 15	0.091	0.311**	0.080	0.431***	0.197	0.456***
	(0.64)	(2.44)	(0.56)	(3.53)	(1.30)	(3.74)
greater or equal 16	−0.255	−0.047	−0.693***	0.209	−0.567***	0.365**
	(−1.46)	(−0.30)	(−3.63)	(1.38)	(−2.66)	(2.32)
Religion: Catholic	−0.085	−0.002	−0.189	−0.402*	−0.356	−0.039
	(−0.29)	(−0.01)	(−0.67)	(−1.65)	(−1.04)	(−0.15)
Religion: Protestant	0.152	0.139	0.292	0.069	0.194	0.287
	(0.58)	(0.61)	(1.10)	(0.31)	(0.61)	(1.19)
Religion: other religion	0.331	0.302	0.311	−0.135	−0.005	−0.097
	(1.10)	(1.08)	(0.95)	(−0.43)	(−0.01)	(−0.32)
Religion raised: Catholic	−0.316	−0.185	0.030	−0.015	0.424	−0.332
	(−1.30)	(−0.90)	(0.13)	(−0.08)	(1.37)	(−1.58)
Religion raised: Protestant	−0.447**	−0.286	−0.297	−0.248	0.139	−0.325*
	(−2.03)	(−1.54)	(−1.42)	(−1.38)	(0.49)	(−1.84)
Religion raised: other religion	−0.505*	−0.390	−0.111	−0.049	−0.063	0.150
	(−1.72)	(−1.46)	(−0.34)	(−0.15)	(−0.15)	(0.55)
Metropolitan: central city	0.111	0.082	0.036	−0.070	−0.082	−0.058
	(0.92)	(0.77)	(0.30)	(−0.68)	(−0.62)	(−0.57)
Metropolitan: not	−0.105	0.213	−0.021	0.106	0.132	0.237*
	(−0.63)	(1.55)	(−0.13)	(0.85)	(0.81)	(1.92)
Constant	−4.853***	−4.484***	−7.573***	−5.920***	−9.227***	−6.553***
	(−15.21)	(−16.24)	(−17.41)	(−18.99)	(−11.87)	(−17.44)

[1] The sample weight is from cycle 6 of NFSG in maximum likelihood estimation. Standard errors are adjusted for clustering on each individual, and used robust standard errors. The base group is alternative 1, which is "always single".

[2] parentheses are t values; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.14: Nested Logit Model: Results of Cycle 7 for Individuals' Characteristics

	Alternative					
Variables	2	3	4	5	6	7
Premarital conception	1.628***	1.751***	1.557***	1.550***	1.869***	1.313***
	(12.00)	(12.94)	(10.44)	(11.70)	(11.06)	(8.66)
Premarital live birth	−1.149***	−1.009***	−1.405***	−1.181***	−1.809***	−1.598***
	(−7.01)	(−6.02)	(−7.26)	(−6.81)	(−8.35)	(−7.89)
Level of religiosity:						
somehow important	−0.138	0.086	0.315	0.340	0.672**	0.452*
	(−0.58)	(0.43)	(1.09)	(1.56)	(2.11)	(1.79)
very important	−0.283	−0.083	0.198	0.319	0.476	1.078***
	(−1.19)	(−0.41)	(0.69)	(1.49)	(1.49)	(3.98)
Age (year)	0.222***	0.201***	0.311***	0.270***	0.316***	0.270***
	(19.04)	(17.60)	(19.36)	(21.22)	(15.99)	(19.62)
Family origin: intact	−0.519***	−0.537***	−0.801***	−0.485***	−0.724***	−0.144
	(−5.56)	(−5.78)	(−6.88)	(−5.28)	(−5.77)	(−1.29)
Race: non-Hispanic black	−0.530***	−0.983***	−1.160***	−1.358***	−1.278***	−1.406***
	(−4.26)	(−7.55)	(−7.21)	(−9.80)	(−7.30)	(−9.36)
Race: Hispanic	0.175	0.209*	−0.141	−0.030	0.059	0.056
	(1.19)	(1.69)	(−0.86)	(−0.23)	(0.33)	(0.41)
Race: other races	−0.036	−0.512**	−0.563**	−0.817***	−0.791**	−0.549***
	(−0.14)	(−2.28)	(−2.08)	(−3.67)	(−2.39)	(−2.58)
Born outside of U.S.A.	0.011	0.385***	0.236	0.361**	0.610***	0.615***
	(0.06)	(2.81)	(1.24)	(2.53)	(3.13)	(4.34)
Years of schooling:						
equal to 12	0.471***	0.540***	0.532***	0.475***	0.650***	0.736***
	(3.86)	(4.61)	(3.68)	(3.87)	(3.92)	(5.32)
between 13 and 15	0.085	0.004	−0.056	0.122	0.025	0.351**
	(0.67)	(0.03)	(−0.37)	(0.98)	(0.15)	(2.50)
greater or equal 16	−0.353**	−0.146	−0.994***	0.105	−0.761***	0.429**
	(−2.19)	(−0.96)	(−4.32)	(0.69)	(−2.88)	(2.45)
Religion: Catholic	−0.277	−0.413*	−0.840**	−0.512**	−1.107***	−0.412
	(−1.05)	(−1.83)	(−2.52)	(−2.09)	(−3.00)	(−1.41)
Religion: Protestant	0.119	−0.182	−0.226	−0.233	−0.616*	−0.201
	(0.46)	(−0.82)	(−0.70)	(−0.97)	(−1.76)	(−0.71)
Religion: other religion	−0.372	−0.421	−0.340	−0.435	−0.573	−0.347
	(−1.17)	(−1.37)	(−0.89)	(−1.49)	(−1.47)	(−1.12)
Religion raised: Catholic	−0.028	−0.029	0.039	0.148	0.415	0.002
	(−0.15)	(−0.16)	(0.18)	(0.82)	(1.51)	(0.01)
Religion raised: Protestant	−0.233	−0.289*	−0.268	0.008	0.454*	−0.072
	(−1.34)	(−1.76)	(−1.34)	(0.05)	(1.70)	(−0.38)
Religion raised: other religion	0.011	−0.317	−0.166	−0.021	0.092	0.388*
	(0.04)	(−1.28)	(−0.58)	(−0.09)	(0.28)	(1.65)
Metropolitan: central city	0.303***	0.153	0.090	0.163*	0.112	0.277***
	(3.11)	(1.61)	(0.79)	(1.72)	(0.88)	(2.79)
Metropolitan: not	0.214	0.254**	0.471***	0.471***	0.558***	0.453***
	(1.58)	(2.02)	(3.32)	(3.95)	(3.56)	(3.53)
Constant	−5.877***	−4.920***	−8.396***	−6.903***	−9.548***	−8.170***
	(−19.11)	(−18.16)	(−17.60)	(−20.19)	(−12.73)	(−15.82)

[1] The sample weight is from cycle of NFSG in maximum likelihood estimation. Standard errors are adjusted for clustering on each individual, and used robust standard errors. The base group is alternative 1, which is "always single".
[2] parentheses are t values; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.15: Average Predicted Probabilities of Nested Logit Models and Linear Probability Models

	Cycle 5	Cycle 6	Cycle 7
5-level nested logit model[1]			
(1) P(divorce | married, cohabiting, single)	0.3335	0.299	0.2653
(2) P(divorce | married, single)	0.321	0.298	0.328
(1) − (2)	0.0125	0.001	-0.0627
Standard error	(0.09)	(0.10)	(0.06)
Number of observations	10,661	7,352	11,954
2-level nested logit model[2]			
(1)' P(divorce | married, cohabiting, single)	0.3307	0.2928	0.2528
(2)' P(divorce | married, single)	0.3153	0.2911	0.3172
(1)' − (2)'	0.0154	0.0017	-0.0644
Standard error	(0.08)	(0.08)	(0.05)
Number of observations	10,661	7,352	11,954
Linear probability model[3]			
P(divorce | cohabitors) − P(divorce | non-cohabitors)	0.011	0.0166	-0.0054
Standard error	(0.01)	(0.013)	(0.014)
Number of marriages	6,517	3,905	5,410

[1] The nesting structure is in the figure 2. Computation of average predicted probabilities is based on equation (3.6) and (3.7). Standard error of the difference between P(divorce | married, cohabiting, single) and P(divorce | married, single) is based on delta method.

[2] The nesting structure is in the figure 3. Computation of average predicted probabilities is based on equation 3.6 and 3.7 in which $\rho = \gamma_2 = \theta$, where θ are 0.41, 0.58, and 0.6 for cycle 5, 6, and 7, respectively. Standard error of the difference between P(divorce | married, cohabiting, single) and P(divorce | married, single) is based on delta method.

[3] Replicate from Table B.4 of model (7) for cycle 5, Table B.5 of model (6) for cycle 6, and Table B.6 of model (6) for cycle 7.

[4] parentheses are standard errors.

Table B.16: Selected Variables by Cohabitation and Marital Status

	All marriages			Without premarital cohabitation			With premarital cohabitation		
Marital status	All	Intact	Not Intact	All	Intact	Not Intact	All	Intact	Not Intact
NSFG, cycle 4									
Premarital cohabitation	0.27	0.28	0.24						
Divorce	0.34			0.35			0.31		
Marriage duration	9.1	10.7	5.9	10.2	12.3	6.3	6.1	6.8	4.6
Cohabitation duration							1.5	1.6	1.4
Age at marriage	21.5	22.1	20.3	20.8	21.4	19.7	23.3	23.8	22.1
Number of marriages	5,049	3,339	1,710	3,694	2,399	1,295	1,355	940	415
NSFG, cycle 5									
Premarital cohabitation	0.36	0.36	0.35						
Divorce	0.34			0.34			0.33		
Marriage duration	9.0	10.7	5.6	10.2	12.3	6.1	6.9	7.9	4.7
Cohabitation duration							1.7	1.8	1.3
Age at marriage	22.4	23.2	20.8	21.5	22.3	20.1	23.8	24.6	22.1
Number of marriages	6,544	4,329	2,215	4,196	2,754	1,442	2,348	1,575	773
NSFG, cycle 6									
Premarital cohabitation	0.49	0.48	0.50						
Divorce	0.36			0.35			0.36		
Marriage duration	7.4	8.7	5.0	8.4	10.0	5.2	6.4	7.3	4.7
Cohabitation duration							2.1	2.3	1.9
Age at marriage	23.5	24.4	21.8	22.5	23.4	21.0	24.5	25.5	22.7
Number of marriages	4,004	2,582	1,422	2,056	1,343	713	1,948	1,239	709
NSFG, cycle 7									
Premarital cohabitation	0.56	0.55	0.57						
Divorce	0.35			0.34			0.36		
Marriage duration	7.5	8.7	5.2	8.6	10.2	5.6	6.5	7.5	4.9
Cohabitation duration							2.2	2.4	1.9
Age at marriage	23.9	24.9	22.2	22.9	23.7	21.2	24.8	25.8	22.9
Number of marriages	5,457	3,528	1,929	2,415	1,594	821	3,042	1,934	1,108

[1] Each cell in the table is un-weighted. Birth cohort spans from 1943 to 1971 for cycle 4, from 1950 to 1979 for cycle 5, from 1957 to 1985 for cycle 6, and from 1961 to 1992 for cycle 7. The corresponding years of marriage are from 1958 to 1988 for cycle 4, from 1964 to 1995 for cycle 5, from 1972 to 2002 for cycle 6, and from 1977 to 2010 for cycle 7 (NSFG 2006-2010).

Table B.17: Women's Characteristics at Marriage and Backgrounds

	Cycle 4				Cycle 5				Cycle 6				Cycle 7			
	Total	coh (1)	non-coh (2)	(1) − (2)	Total	coh (1)	non-coh (2)	(1) − (2)	Total	coh (1)	non-coh (2)	(1) − (2)	Total	coh (1)	non-coh (2)	(1) − (2)
Premarital conception	0.37	0.56	0.30	0.26**	0.40	0.57	0.31	0.25**	0.43	0.58	0.30	0.28**	0.45	0.59	0.28	0.32**
Premarital live birth	0.15	0.29	0.09	0.20**	0.16	0.27	0.09	0.18**	0.21	0.32	0.11	0.21**	0.26	0.38	0.10	0.28**
Ever cohabited					0.08	0.16	0.03	0.13**	0.12	0.19	0.05	0.14**	0.14	0.20	0.06	0.15**
Husband ever married					0.16	0.24	0.11	0.13**	0.15	0.20	0.10	0.10**	0.15	0.18	0.11	0.08**
Husband had kids									0.16	0.22	0.11	0.11**	0.19	0.25	0.11	0.14**
Age (year)	33.2	30.9	34.1	-3.13**	34.3	32.9	35.1	-2.16**	33.8	33.4	34.3	-0.96**	34.0	33.7	34.4	-0.70**
Family origion: intact	0.74	0.75	0.84	-0.13**	0.71	0.64	0.75	-0.11**	0.73	0.67	0.79	-0.12**	0.66	0.59	0.75	-0.16**
Race/Ethnicity:																
non-Hispanic white	0.66	0.61	0.68	-0.07**	0.66	0.67	0.66	0.01	0.60	0.61	0.58	0.03*	0.58	0.62	0.54	0.08**
non-Hispanic black	0.24	0.29	0.22	0.07**	0.16	0.18	0.15	0.03**	0.14	0.16	0.12	0.04**	0.13	0.15	0.11	0.04**
Hispanic	0.07	0.07	0.07	-0.00	0.15	0.12	0.16	-0.04**	0.21	0.18	0.24	-0.06**	0.23	0.19	0.28	-0.08**
other races	0.03	0.04	0.03	0.01	0.05	0.06	0.05	0.01	0.06	0.06	0.06	0.01	0.10	0.06	0.15	-0.09**
Born outside of U.S.A.	0.08	0.08	0.08	-0.00	0.13	0.09	0.15	-0.06**	0.20	0.15	0.25	-0.10**	0.22	0.15	0.31	-0.16**
Level of religiosity:																
not important					0.08	0.12	0.06	0.07**	0.16	0.22	0.11	0.11**	0.20	0.26	0.12	0.14**
somehow important					0.36	0.43	0.32	0.10**	0.29	0.33	0.24	0.08**	0.27	0.31	0.22	0.10**
very important					0.56	0.45	0.62	-0.17**	0.55	0.45	0.65	-0.19**	0.53	0.43	0.66	-0.23**
Current religion:																
no religion	0.05	0.09	0.04	0.05**	0.09	0.14	0.07	0.07**	0.12	0.16	0.08	0.09**	0.16	0.21	0.10	0.11**
Catholic	0.25	0.25	0.26	-0.01	0.30	0.28	0.32	-0.04**	0.30	0.29	0.32	-0.03*	0.27	0.25	0.30	-0.05**
Protestant	0.66	0.62	0.68	-0.05**	0.55	0.52	0.57	-0.05**	0.52	0.49	0.54	-0.06**	0.47	0.48	0.45	0.03*
other religion	0.03	0.03	0.03	0.00	0.03	0.03	0.04	-0.01	0.06	0.04	0.06	-0.02*	0.10	0.04	0.08	-0.04**
Years of schooling:																
less than 12	0.21	0.21	0.21	0.01	0.17	0.18	0.16	0.01	0.18	0.21	0.17	0.04**	0.18	0.20	0.16	0.04**
equal to 12	0.42	0.37	0.44	-0.06**	0.40	0.38	0.41	-0.03*	0.24	0.25	0.23	0.01	0.24	0.25	0.23	0.02
between 13 and 15	0.23	0.26	0.22	0.03*	0.26	0.27	0.26	0.02	0.30	0.29	0.30	-0.01	0.28	0.28	0.28	0.00
greater or equal 16	0.14	0.16	0.13	0.03*	0.17	0.17	0.17	0.00	0.28	0.25	0.30	-0.04**	0.29	0.26	0.33	-0.06**

[1] Each cell in the table is un-weighted.

Table B.18: Match-Specific Variables

	Cycle 4				Cycle 5				Cycle 6				Cycle 7			
	Total	coh (1)	non-coh (2)	(1) − (2)	Total	coh (1)	non-coh (2)	(1) − (2)	Total	coh (1)	non-coh (2)	(1) − (2)	Total	coh (1)	non-coh (2)	(1) − (2)
A spouse's Age difference	2.75	3.14	2.60	0.54**	2.77	2.93	2.67	0.26*	2.69	2.77	2.61	0.17	2.83	2.93	2.71	0.22
greater than or equal 4	0.26	0.32	0.24	0.08**	0.28	0.32	0.25	0.06**	0.29	0.31	0.27	0.04*	0.31	0.32	0.28	0.04**
less than or equal 2	0.04	0.07	0.03	0.03**	0.05	0.08	0.04	0.04**	0.08	0.09	0.07	0.02*	0.09	0.10	0.07	0.02**
Traits between a spouse:																
Same years of schooling	0.51	0.49	0.52	-0.03	0.46	0.43	0.47	-0.05**								
Same race/ethnicity					0.90	0.87	0.92	-0.05**	0.87	0.84	0.90	-0.06**	0.86	0.84	0.88	-0.04**
Same religion affiliation					0.69	0.61	0.74	-0.13**								
Heter-level of religiosity					0.50	0.48	0.52	-0.04**								
Same level of religiosity:					0.50	0.52	0.48	0.04**								
not important					0.06	0.09	0.04	0.05**								
somehow important					0.19	0.21	0.17	0.04**								
very important					0.26	0.17	0.31	-0.14**								

[1] Each cell in the table is un-weighted.

Table B.19: Cox Model: Determinants of Divorce Risk for Cycle 4

Variables	(1)	(2)	(3)	(4)	(5)
Premarital cohabitation	0.2458 * **	0.2269 * **	0.2220 * **	0.1727 * *	0.1700 * *
	(0.068)	(0.072)	(0.077)	(0.079)	(0.079)
Year of marriage: 1970-74		−0.1027	−0.3340 * **	0.2910	0.2907
		(0.085)	(0.088)	(0.192)	(0.192)
Year of marriage: 1975-79		0.0776	−0.0322	0.2543 * *	0.2572 * *
		(0.082)	(0.083)	(0.112)	(0.113)
Year of marriage: 1980-84		−0.0233	0.0267	−0.2379*	−0.2375*
		(0.097)	(0.098)	(0.123)	(0.123)
Year of marriage: 1985-88		−0.0020	0.1488	−0.3366	−0.3351
		(0.177)	(0.180)	(0.224)	(0.224)
Age at marriage			−0.3794 * **	−0.2768 * **	−0.2692 * **
			(0.071)	(0.079)	(0.080)
Age at marriage, squared			0.0061 * **	0.0055 * **	0.0053 * **
			(0.002)	(0.002)	(0.002)
Premarital conception			0.2966 * **	0.2568 * **	0.2606 * **
			(0.068)	(0.069)	(0.069)
Premarital live birth			0.2394 * *	0.0914	0.0876
			(0.098)	(0.105)	(0.105)
Age (year)				−0.0577 * **	−0.0575 * **
				(0.016)	(0.016)
Family origin: intact				−0.1688 * *	−0.1667 * *
				(0.068)	(0.068)
Race: non-Hispanic black				0.2202 * **	0.2145 * **
				(0.074)	(0.074)
Race: Hispanic				0.1292	0.1259
				(0.128)	(0.128)
Race: other races				−0.1818	−0.1798
				(0.206)	(0.206)
Born outside of U.S.A.				−0.4322 * **	−0.4412 * **
				(0.144)	(0.145)
Religion: Catholic				−0.3783 * **	−0.3771 * **
				(0.136)	(0.136)
Religion: Protestant				−0.3315 * **	−0.3318 * **
				(0.127)	(0.128)
Religion: other religion				−0.2130	−0.2133
				(0.225)	(0.224)
Years of schooling: equal to 12				−0.0803	−0.0820
				(0.082)	(0.082)
Years of schooling: between 12 and 15				−0.1765	−0.1744
				(0.108)	(0.109)
Years of schooling: greater or equal 16				−0.3000 * *	−0.2981 * *
				(0.149)	(0.150)
Husband − Wife age difference ≥ 4					0.0447
					(0.068)
Wife − Husband age difference ≥ 2					0.0186
					(0.168)
Same years of schooling					0.0346
					(0.057)
Observations	5,049	5,049	5,049	5,049	5,049

[1] Each Cox proportional hazard regression is weighted. The weight is from cycle 4 of NSFG. Reference groups are: year of marriage between 1958-69; non-Hispanic white; currently no religion; years of schooling less than 12; husband − wife age difference < 4 and wife − husband age difference < 2.

[2] Robust standard errors are in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (Two-tailed).

Table B.20: Cox Model: Determinants of Divorce Risk for Cycle 5

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Premarital cohabitation	0.2873***	0.3364***	0.2878***	0.2285***	0.1618**	0.0504
	(0.054)	(0.054)	(0.063)	(0.063)	(0.063)	(0.062)
Year of marriage: 1964-74		0.1371**	−0.1049	−0.0606	−0.0558	−0.0877
		(0.064)	(0.067)	(0.110)	(0.113)	(0.114)
Year of marriage: 1980-84		−0.1197	0.0102	−0.0265	−0.0136	−0.0183
		(0.073)	(0.074)	(0.095)	(0.095)	(0.096)
Year of marriage: 1985-89		−0.1252	0.0645	−0.0254	−0.0016	0.0124
		(0.078)	(0.080)	(0.157)	(0.160)	(0.157)
Year of marriage: 1990-95		−0.0520	0.1809*	0.0454	0.0765	0.1577
		(0.090)	(0.100)	(0.217)	(0.220)	(0.219)
Age at marriage			−0.3540***	−0.3290***	−0.3343***	−0.3036***
			(0.047)	(0.050)	(0.049)	(0.052)
Age at marriage, squared			0.0052***	0.0050***	0.0050***	0.0046***
			(0.001)	(0.001)	(0.001)	(0.001)
Premarital conception			0.2579***	0.1998***	0.1691***	0.1528***
			(0.053)	(0.053)	(0.054)	(0.053)
Premarital live birth			0.3171***	0.2231***	0.2341***	0.2281***
			(0.080)	(0.084)	(0.082)	(0.085)
Ever cohabited			0.2793***	0.2372**	0.1890*	0.1929*
			(0.102)	(0.103)	(0.097)	(0.105)
Husband ever married			0.3105***	0.2937***	0.3518***	0.2627***
			(0.064)	(0.065)	(0.071)	(0.072)
Age (year)				−0.0090	−0.0092	−0.0161
				(0.015)	(0.015)	(0.015)
Family origin: intact				−0.1864***	−0.1818***	−0.1838***
				(0.050)	(0.050)	(0.049)
Race: non-Hispanic black				0.3815***	0.4069***	0.3581***
				(0.073)	(0.073)	(0.076)
Race: Hispanic				0.1049	0.0838	0.0567
				(0.103)	(0.101)	(0.096)
Race: other races				−0.0227	−0.1470	0.0639
				(0.143)	(0.139)	(0.133)
Born outside of U.S.A.				−0.2864***	−0.1822*	−0.2442**
				(0.104)	(0.105)	(0.105)
Level of religiosity: somehow important				−0.2028**	−0.2159**	
				(0.094)	(0.095)	
Level of religiosity: very important				−0.3759***	−0.3202***	
				(0.095)	(0.095)	
Religion: Catholic				−0.1601*	−0.0596	−0.0659
				(0.095)	(0.094)	(0.091)
Religion: Protestant				−0.0900	0.0708	0.1107
				(0.090)	(0.090)	(0.087)
Religion: other religion				−0.1731	−0.2846*	−0.1709
				(0.147)	(0.146)	(0.138)
Years of schooling: equal to 12				0.0410	0.0361	0.0340
				(0.080)	(0.075)	(0.074)
Years of schooling: between 12 and 15				0.1178	0.0730	0.0632
				(0.081)	(0.078)	(0.081)
Years of schooling: greater or equal 16				−0.1668	−0.1455	−0.1504
				(0.109)	(0.105)	(0.111)
Husband − Wife age difference ≥ 4					−0.0986*	−0.0690
					(0.054)	(0.055)
Wife − Husband age difference ≥ 2					0.3566***	0.2966**
					(0.122)	(0.120)
Same years of schooling					−0.1333***	−0.0986**
					(0.045)	(0.045)
Same race					−0.1954**	−0.2078**
					(0.097)	(0.092)
Same religion					−0.6897***	−0.4071***
					(0.043)	(0.041)
Heter-level of religiosity between a couple (Reference group)						
Same level of religiosity: not important						−0.1018
						(0.098)
Same level of religiosity: somehow important						−0.9167***
						(0.075)
Same level of religiosity: very important						−1.7450***
						(0.085)
Observations	6,544	6,544	6,544	6,544	6,544	6,544

[1] Each Cox proportional hazard regression is weighted. The weight is from cycle 5 of NSFG. Reference groups are: year of marriage between 1975-79; non-Hispanic white; level of religiosity, not important; currently no religion; years of schooling less than 12; husband − wife age difference < 4 and wife − husband age difference < 2; heter-level of religiosity between a couple.

[2] Robust standard errors are in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (Two-tailed).

Table B.21: Cox Model: Determinants of Divorce Risk for Cycle 6

Variables	(1)	(2)	(3)	(4)	(5)
Premarital cohabitation	0.1869 * *	0.2702 * **	0.1340	0.0385	0.0196
	(0.082)	(0.084)	(0.090)	(0.086)	(0.085)
Year of marriage: 1985-89		−0.1115	0.1395	0.2766*	0.2982*
		(0.113)	(0.120)	(0.158)	(0.161)
Year of marriage: 1990-94		−0.4494 * **	−0.0769	0.1500	0.1677
		(0.116)	(0.131)	(0.218)	(0.219)
Year of marriage: 1995-99		−0.5412 * **	−0.1435	0.1904	0.2041
		(0.132)	(0.133)	(0.309)	(0.312)
Year of marriage: 2000-02		−0.4756 * *	−0.0061	0.3888	0.4092
		(0.202)	(0.210)	(0.354)	(0.350)
Age at marriage			−0.1931 * **	−0.2061 * **	−0.2150 * **
			(0.065)	(0.067)	(0.065)
Age at marriage, squared			0.0020	0.0021	0.0022
			(0.001)	(0.001)	(0.001)
Premarital conception			0.5002 * **	0.4034 * **	0.4012 * **
			(0.111)	(0.103)	(0.102)
Premarital live birth			0.1064	0.0489	0.0513
			(0.108)	(0.112)	(0.112)
Ever cohabited			0.1314	0.0619	0.0767
			(0.129)	(0.125)	(0.126)
Husband ever married			0.2508 * *	0.3030 * *	0.3446 * **
			(0.121)	(0.116)	(0.123)
Husband had kids			0.3094 * *	0.2573*	0.2667*
			(0.129)	(0.131)	(0.134)
Age (year)				0.0197	0.0209
				(0.017)	(0.018)
Family origin: intact				−0.3411 * **	−0.3375 * **
				(0.093)	(0.094)
Race: non-Hispanic black				0.3406 * **	0.3438 * **
				(0.103)	(0.103)
Race: Hispanic				−0.0809	−0.1308
				(0.123)	(0.121)
Race: other races				0.4334	0.4817*
				(0.288)	(0.282)
Born outside of U.S.A.				−0.3527 * **	−0.3106 * *
				(0.133)	(0.135)
Level of religiosity: somehow important				−0.4051*	−0.4299 * *
				(0.207)	(0.202)
Level of religiosity: very important				−0.5391 * *	−0.5601 * **
				(0.210)	(0.205)
Religion: Catholic				0.2784	0.3154
				(0.224)	(0.224)
Religion: Protestant				0.2087	0.2394
				(0.220)	(0.216)
Religion: other religion				−0.1768	−0.2731
				(0.195)	(0.203)
Years of schooling: equal to 12				0.2112 * *	0.2032 * *
				(0.100)	(0.099)
Years of schooling: between 12 and 15				0.1005	0.1011
				(0.129)	(0.129)
Years of schooling: greater or equal 16				−0.1172	−0.1190
				(0.133)	(0.133)
Husband − Wife age difference ≥ 4					−0.0961
					(0.100)
Wife − Husband age difference ≥ 2					0.1063
					(0.177)
Same race					−0.2399 * *
					(0.101)
Observations	4,004	4,004	4,004	4,004	4,004

[1] Each Cox proportional hazard regression is weighted. The weight is from cycle 6 of NSFG. Reference groups are: year of marriage between 1972-84; non-Hispanic white; level of religiosity, not important; currently no religion; years of schooling less than 12; husband − wife age difference < 4 and wife − husband age difference < 2.

[2] Robust standard errors are in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (Two-tailed).

Table B.22: Cox Model: Determinants of Divorce Risk for Cycle 7

Variables	(1)	(2)	(3)	(4)	(5)
Premarital cohabitation	0.2403 * **	0.3210 * **	0.2026 * *	0.0302	0.0124
	(0.071)	(0.068)	(0.077)	(0.078)	(0.078)
Year of marriage: 1990-94		−0.3559 * **	−0.0113	−0.1663	−0.1705
		(0.109)	(0.115)	(0.147)	(0.147)
Year of marriage: 1995-99		−0.4431 * **	−0.0292	−0.2487	−0.2453
		(0.113)	(0.112)	(0.211)	(0.211)
Year of marriage: 2000-04		−0.4828 * **	0.0043	−0.3140	−0.3390
		(0.125)	(0.123)	(0.289)	(0.285)
Year of marriage: 2005-10		−0.0755	0.4818 * **	0.0116	0.0148
		(0.151)	(0.153)	(0.372)	(0.372)
Age at marriage			−0.3411 * **	−0.3308 * **	−0.3183 * **
			(0.083)	(0.089)	(0.088)
Age at marriage, squared			0.0050 * **	0.0055 * **	0.0051 * **
			(0.002)	(0.002)	(0.002)
Premarital conception			0.4279 * **	0.3080 * **	0.2915 * **
			(0.084)	(0.082)	(0.080)
Premarital live birth			0.1781	0.1027	0.1330
			(0.111)	(0.112)	(0.110)
Ever cohabited			−0.2058	−0.3052 * *	−0.3542 * **
			(0.131)	(0.137)	(0.134)
Husband ever married			0.1219	0.1729	0.1167
			(0.118)	(0.112)	(0.114)
Husband had kids			0.3326 * **	0.2361 * *	0.2209 * *
			(0.100)	(0.100)	(0.099)
Age (year)				−0.0224	−0.0233
				(0.017)	(0.017)
Family origin: intact				−0.3057 * **	−0.2956 * **
				(0.077)	(0.076)
Race: non-Hispanic black				0.3863 * **	0.3659 * **
				(0.110)	(0.111)
Race: Hispanic				−0.1209	−0.1896*
				(0.120)	(0.113)
Race: other races				−0.2320	−0.2335
				(0.220)	(0.211)
Born outside of U.S.A.				−0.2270*	−0.1991
				(0.117)	(0.121)
Level of religiosity: somehow important				0.1153	0.1097
				(0.201)	(0.191)
Level of religiosity: very important				−0.2774	−0.2949
				(0.201)	(0.190)
Religion: Catholic				−0.3938*	−0.3496
				(0.230)	(0.220)
Religion: Protestant				−0.2543	−0.2261
				(0.214)	(0.202)
Religion: other religion				−0.0742	−0.1767
				(0.149)	(0.160)
Years of schooling: equal to 12				0.2301 * *	0.2489 * *
				(0.110)	(0.111)
Years of schooling: between 12 and 15				0.1949	0.2144*
				(0.126)	(0.124)
Years of schooling: greater or equal 16				−0.3506 * *	−0.3192 * *
				(0.146)	(0.141)
Husband − Wife age difference ≥ 4					0.2274 * **
					(0.076)
Wife − Husband age difference ≥ 2					0.5367 * **
					(0.158)
Same race					−0.3592 * **
					(0.096)
Observations	5,457	5,457	5,457	5,457	5,457

[1] Each Cox Proportional regression is weighted. The weight is from cycle 7 of NSFG. Reference groups are: year of marriage between 1972-84; non-Hispanic white; level of religiosity, not important; currently no religion; years of schooling less than 12; husband − wife age difference < 4 and wife − husband age difference < 2.

[2] Robust standard errors are in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (Two-tailed).

Table B.23: Cox Model: Determinants of Divorce Risk, by Cycle

	Cycle 4		Cycle 5			Cycle 6		Cycle 7	
Variables	(1)	(5)	(1)	(5)	(6)	(1)	(5)	(1)	(5)
Premarital cohabitation	0.2458***	0.1700**	0.2873***	0.1618**	0.0504	0.1869**	0.0196	0.2403***	0.0124
	(0.068)	(0.079)	(0.054)	(0.063)	(0.062)	(0.082)	(0.085)	(0.071)	(0.078)
Age at marriage		−0.2692***		−0.3343***	−0.3036***		−0.2150***		−0.3183***
		(0.080)		(0.049)	(0.052)		(0.065)		(0.088)
Age at marriage, squared		0.0053***		0.0050***	0.0046***		0.0022		0.0051***
		(0.002)		(0.001)	(0.001)		(0.001)		(0.002)
Premarital conception		0.2606***		0.1691***	0.1528***		0.4012***		0.2915***
		(0.069)		(0.054)	(0.053)		(0.102)		(0.080)
Premarital live birth		0.0876		0.2341***	0.2281***		0.0513		0.1330
		(0.105)		(0.082)	(0.085)		(0.112)		(0.110)
Ever cohabited				0.1890*	0.1929*		0.0767		−0.3542***
				(0.097)	(0.105)		(0.126)		(0.134)
Husband ever married				0.3518***	0.2627***		0.3446***		0.1167
				(0.071)	(0.072)		(0.123)		(0.114)
Husband had kids							0.2667*		0.2209**
							(0.134)		(0.099)
Age (year)		−0.0575***		−0.0092	−0.0161		0.0209		−0.0233
		(0.016)		(0.015)	(0.015)		(0.018)		(0.017)
Family origin: intact		−0.1667**		−0.1818***	−0.1838***		−0.3375***		−0.2956***
		(0.068)		(0.050)	(0.049)		(0.094)		(0.076)
Race: non-Hispanic black		0.2145***		0.4069***	0.3581***		0.3438***		0.3659***
		(0.074)		(0.073)	(0.076)		(0.103)		(0.111)
Race: Hispanic		0.1259		0.0838	0.0567		−0.1308		−0.1896*
		(0.128)		(0.101)	(0.096)		(0.121)		(0.113)
Race: other races		−0.1798		−0.1470	0.0639		0.4817*		−0.2335
		(0.206)		(0.139)	(0.133)		(0.282)		(0.211)
Born outside of U.S.A.		−0.4412***		−0.1822*	−0.2442**		−0.3106**		−0.1991
		(0.145)		(0.105)	(0.105)		(0.135)		(0.121)
Level of religiosity:									
somehow important				−0.2159**			−0.4299**		0.1097
				(0.095)			(0.202)		(0.191)
very important				−0.3202***			−0.5601***		−0.2949
				(0.095)			(0.205)		(0.190)
Religion: Catholic		−0.3771***		−0.0596	−0.0659		0.3154		−0.3496
		(0.136)		(0.094)	(0.091)		(0.224)		(0.220)
Religion: Protestant		−0.3318***		0.0708	0.1107		0.2394		−0.2261
		(0.128)		(0.090)	(0.087)		(0.216)		(0.202)
Religion: other religion		−0.2133		−0.2846*	−0.1709		−0.2731		−0.1767
		(0.224)		(0.146)	(0.138)		(0.203)		(0.160)
Years of schooling:									
equal to 12		−0.0820		0.0361	0.0340		0.2032**		0.2489**
		(0.082)		(0.075)	(0.074)		(0.099)		(0.111)
between 12 and 15		−0.1744		0.0730	0.0632		0.1011		0.2144*
		(0.109)		(0.078)	(0.081)		(0.129)		(0.124)
greater or equal 16		−0.2981**		−0.1455	−0.1504		−0.1190		−0.3192**
		(0.150)		(0.105)	(0.111)		(0.133)		(0.141)
Husband − Wife									
age difference ≥ 4		0.0447		−0.0986*	−0.0690		−0.0961		0.2274***
		(0.068)		(0.054)	(0.055)		(0.100)		(0.076)
age difference ≤ -2		0.0186		0.3566***	0.2966**		0.1063		0.5367***
		(0.168)		(0.122)	(0.120)		(0.177)		(0.158)
Same years of schooling		0.0346		−0.1333***	−0.0986**				
		(0.057)		(0.045)	(0.045)				
Same race				−0.1954**	−0.2078**		−0.2399**		−0.3592***
				(0.097)	(0.092)		(0.101)		(0.096)
Same religion				−0.6897***	−0.4071***				
				(0.043)	(0.041)				
Same level of religiosity:									
not important					−0.1018				
					(0.098)				
somehow important					−0.9167***				
					(0.075)				
very important					−1.7450***				
					(0.085)				
Years of marriage dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
% of premarital cohabitation	27%		36%			49%		56%	
Observations	5,049		6,544			4,004		5,457	

[1] The results are from Tables B.19 to B.22. Reference groups are: years of marriage between 1958-69 for cycle 4, 1975-79 for cycle 5, 1972-84 for cycle 6, and 1977-89 for cycle 7; non-Hispanic white; level of religiosity, not important; currently no religion; years of schooling less than 12; husband − wife age difference < 4 and wife − husband age difference < 2; heter-level of religiosity between a couple.

[2] Robust standard errors are in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (Two-tailed).

Table B.24: Distribution of Marriage and Marriage Spell, by Cycle

	Cycle 5		Cycle 6		Cycle 7	
Times of marriage	observation	%	observation	%	observation	%
Once	5,521	81.47	3,365	83.89	4,719	86.92
Twice	1,058	15.61	548	13.66	607	11.18
Three times	169	2.49	83	2.07	94	1.73
Four times	24	0.35	12	0.3	7	0.13
Five times or over[1]	5	0.07	3	0.07	2	0.04
Total	6,777	100	4,011	100	5,429	100
	Cycle 5		Cycle 6		Cycle 7	
Marriage spell (#)	marriage	%	marriage	%	marriage	%
Single spell	6,777	82.34	4,011	84.35	5,429	86.98
Two spells	1,256	15.26	646	13.59	710	11.37
Three spells	198	2.41	98	2.06	103	1.65
Total	8,231	100	4,755	100	6,242	100

[1] One woman in cycle 7 had ever married six times.
[2] Each cell in the table is un-weighted.

Table B.25: Variations in Premarital Cohabitation

	Cycle 5			Cycle 6			Cycle 7		
		dissolved 1st marriage			dissolved 1st marriage			dissolved 1st marriage	
	Total	cohabitors	non-cohabitors	Total	cohabitors	non-cohabitors	Total	cohabitors	non-cohabitors
1st marriage preceded by cohabitation	36.1			48.8			55.7		
2nd marriage preceded by cohabitation	64.6	77.8	59.1	70.1	79.5	63.5	71.8	82.6	62.0
3rd marriage preceded by cohabitation	64.7	73.9	61.8	69.4	68.4	70.0	70.9	76.0	66.0
The 2nd marriage (#)	1,256	369	887	646	268	378	710	339	371
The 3rd marriage (#)	198	46	152	98	38	60	103	50	53

[1] Each cell in the table is un-weighted.

Table B.26: Characteristics of Marriage, by Marriage Order and Premarital Cohabitation

				Cohabitors			Non-cohabitors		
	marriage order			marriage order			marriage order		
Cycle 5	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Intact marriage	0.65	0.67	0.67	0.65	0.68	0.70	0.65	0.64	0.63
Marriage duration	8.9	6.2	4.1	6.8	6.1	4.5	10.1	6.5	3.4
Age at marraige	22.3	28.9	32.9	23.7	29.0	32.8	21.5	28.8	33.1
				Cohabitors			Non-cohabitors		
	marriage order			marriage order			marriage order		
Cycle 6	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Intact marriage	0.65	0.65	0.61	0.64	0.64	0.74	0.66	0.68	0.33
Marriage duration	7.4	5.5	5.1	6.4	5.4	5.5	8.4	5.8	4.2
Age at marraige	23.5	29.7	32.6	24.5	29.6	32.5	22.5	30.0	32.9
				Cohabitors			Non-cohabitors		
	marriage order			marriage order			marriage order		
Cycle 7	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Intact marriage	0.65	0.59	0.58	0.64	0.60	0.62	0.66	0.55	0.50
Marital duration	7.5	5.4	3.7	6.6	5.4	3.6	8.6	5.6	3.8
Age at marraige	23.9	29.9	34.0	24.8	29.9	34.0	22.9	30.0	34.0

[1] Each cell in the table is un-weighted.

Table B.27: Hazard Equation of Marital Dissolution, by Cycle

	Cycle 5			Cycle 6			Cycle 7		
Variable	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Premarital Cohabitation	0.0899 * *	0.0916*	0.029	−0.1767 * **	−0.2174 * **	−0.5064 * **	−0.0955*	−0.1436 * *	−0.2730 * *
	(0.040)	(0.050)	(0.096)	(0.051)	(0.061)	(0.119)	(0.051)	(0.062)	(0.130)
Higher-order marriage	0.4683 * **	0.0822	0.1099	0.5190 * **	0.2984 * **	0.3646 * **	0.4288 * **	0.1487	0.1711
	(0.058)	(0.090)	(0.095)	(0.074)	(0.104)	(0.107)	(0.065)	(0.096)	(0.106)
Age at marriage	−0.1080 * **	−0.1229 * **	−0.1230 * **	−0.1064 * **	−0.1225 * **	−0.1230 * **	−0.1087 * **	−0.1245 * **	−0.1246 * **
	(0.005)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.006)	(0.008)	(0.008)
Premarital conception	0.4808 * **	0.5586 * **	0.5665 * **	0.6732 * **	0.7381 * **	0.7632 * **	0.5513 * **	0.6456 * **	0.6590 * **
	(0.046)	(0.058)	(0.059)	(0.061)	(0.072)	(0.075)	(0.061)	(0.076)	(0.077)
Premarital live birth	−0.0339	−0.0413	−0.0321	−0.3888 * **	−0.3733 * **	−0.3153 * **	−0.1481 * *	−0.1780 * *	−0.145
	(0.057)	(0.073)	(0.074)	(0.069)	(0.082)	(0.087)	(0.066)	(0.084)	(0.090)
Husband ever married				0.2855 * **	0.3415 * **	0.3707 * **	0.018	0.0384	0.0539
				(0.076)	(0.088)	(0.090)	(0.070)	(0.085)	(0.086)
Husband had kids				0.1687 * *	0.1811 * *	0.1994 * *	0.2268 * **	0.2647 * **	0.2695 * **
				(0.072)	(0.084)	(0.086)	(0.063)	(0.077)	(0.078)
Age difference:									
greater than or equal 4				−0.1704 * **	−0.1720 * *	−0.1622 * *	0.1046 * *	0.1300 * *	0.1281 * *
				(0.060)	(0.070)	(0.072)	(0.052)	(0.065)	(0.065)
less than or equal 2				0.0126	0.0812	0.1075	0.4826 * **	0.4731 * **	0.4802 * **
				(0.091)	(0.102)	(0.108)	(0.089)	(0.104)	(0.106)
Family origin: intact	−0.1691 * **	−0.2290 * **	−0.2352 * **	−0.3643 * **	−0.4154 * **	−0.4443 * **	−0.2837 * **	−0.3545 * **	−0.3705 * **
	(0.039)	(0.054)	(0.055)	(0.053)	(0.069)	(0.072)	(0.046)	(0.063)	(0.064)
Born outside of U.S.A.	−0.2234 * **	−0.2652 * **	−0.2719 * **	−0.2343 * **	−0.2788 * **	−0.3163 * **	−0.2923 * **	−0.3527 * **	−0.3714 * **
	(0.079)	(0.096)	(0.097)	(0.087)	(0.105)	(0.109)	(0.080)	(0.101)	(0.102)
Level of religiosity:									
somehow important	−0.1195	−0.1561	−0.1639*	−0.1961*	−0.2807*	−0.2947 * *	0.0365	0.0471	0.0473
	(0.073)	(0.097)	(0.097)	(0.118)	(0.145)	(0.148)	(0.128)	(0.165)	(0.166)
very important	−0.2043 * **	−0.2755 * **	−0.2910 * **	−0.3190 * **	−0.4323 * **	−0.5023 * **	−0.2019	−0.2482	−0.2814*
	(0.073)	(0.097)	(0.099)	(0.116)	(0.143)	(0.148)	(0.127)	(0.163)	(0.167)
σ_δ		0.8900 * **	0.8889 * **		0.7290 * **	0.7739 * **		0.8621 * **	0.8644 * **
		(0.072)	(0.073)		(0.095)	(0.095)		(0.083)	(0.088)
σ_ϵ			0.6037 * **			0.4420 * **			0.6248 * **
			(0.068)			(0.097)			(0.089)
$\rho_{\delta\epsilon}$			0.0886			0.5789 * *			0.1717
			(0.120)			(0.227)			(0.163)
Log-Likelihood	−17846.33	−17802.09	−22735.5	−10480.27	−10464.5	−13450.78	−12174.01	−12139.9	−15622.8

[*] Model (1) is the hazard equation without heterogeneity; model (2) is the hazard equation with heterogeneity but restricting $\rho_{\delta\epsilon} = 0$; model (3) is the hazard equation with heterogeneity and without restricting $\rho_{\delta\epsilon} = 0$.

[1] Each model also includes splines of marriage duration, splines of the first marital birth, race , years of schooling , and religious dummies. Splines of marriage duration (year) are 0-1, 1-4, 4-10, and 10 over; splines of the first marital birth (year) are 0-1, 1-2, and 2 over; race dummies include Hispanic white (reference), non-Hispanic black, Hispanic, and other races; years of schooling dummies include less than 12 (reference), equal to 12, between 12 and 15, and greater or equal 16; Religion dummies include no religion (reference), Catholic, Protestant, and other religions.

[2] Each regression is weighted. Asymptotic standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (two-sided).

Table B.28: Probit Estimation for Premarital Cohabitation, by Cycle

	Cycle 5			Cycle 6			Cycle 7		
Variable	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Constant	0.1717 * **	0.2279 * **	0.2312 * **	0.2968 * **	0.3306 * **	0.3454 * **	0.6137 * **	0.7272 * **	0.7286 * **
	(0.064)	(0.080)	(0.081)	(0.085)	(0.094)	(0.097)	(0.075)	(0.096)	(0.097)
Higher-order marriage	0.8070 * **	0.9877 * **	0.9654 * **	0.4143 * **	0.4725 * **	0.3726 * **	0.2726 * **	0.3696 * **	0.3223 * **
	(0.038)	(0.055)	(0.063)	(0.056)	(0.064)	(0.078)	(0.054)	(0.065)	(0.078)
Premarital conception	0.4100 * **	0.4655 * **	0.5665 * **	0.2889 * **	0.2989 * **	0.7632 * **	0.3301 * **	0.3789 * **	0.6590 * **
	(0.035)	(0.042)	(0.059)	(0.045)	(0.049)	(0.075)	(0.046)	(0.056)	(0.077)
Premarital live birth	0.4712 * **	0.5539 * **	−0.0321	0.4950 * **	0.5364 * **	−0.3153 * **	0.7024 * **	0.8331 * **	−0.145
	(0.047)	(0.057)	(0.074)	(0.060)	(0.067)	(0.087)	(0.057)	(0.073)	(0.090)
Husband ever married				0.3668 * **	0.3901 * **	0.3707 * **	0.0761	0.1187*	0.0539
				(0.063)	(0.068)	(0.090)	(0.059)	(0.070)	(0.086)
Husband had kids				0.0823	0.1025	0.1994 * *	0.3538 * **	0.3995 * **	0.2695 * **
				(0.064)	(0.069)	(0.086)	(0.055)	(0.067)	(0.078)
Age difference ≥ 4				0.0917 * *	0.1031 * *	0.1069 * *	0.0669	0.0743	0.0739
				(0.046)	(0.050)	(0.051)	(0.042)	(0.050)	(0.050)
Age difference ≤ 2				0.0762	0.0788	0.0872	0.2340 * **	0.2774 * **	0.2750 * **
				(0.063)	(0.067)	(0.071)	(0.058)	(0.069)	(0.070)
Family origin: intact	−0.2518 * **	−0.2986 * **	−0.2352 * **	−0.1281 * **	−0.1460 * **	−0.4443 * **	−0.3066 * **	−0.3581 * **	−0.3705 * **
	(0.032)	(0.041)	(0.055)	(0.043)	(0.048)	(0.072)	(0.038)	(0.048)	(0.064)
Non-Hispanic black	−0.1127 * *	−0.1306 * *	0.3060 * **	0.1096	0.1249	0.3934 * **	−0.1240 * *	−0.1208	0.4209 * **
	(0.053)	(0.065)	(0.081)	(0.071)	(0.079)	(0.109)	(0.059)	(0.073)	(0.099)
Hispanic	−0.1313 * *	−0.1527 * *	0.1107	−0.0623	−0.0715	−0.1957*	−0.2437 * **	−0.2660 * **	0.0147
	(0.057)	(0.071)	(0.096)	(0.071)	(0.078)	(0.113)	(0.060)	(0.074)	(0.106)
other races	−0.0586	−0.0841	−0.157	−0.02	−0.0258	−0.1927	−0.4385 * **	−0.5042 * **	0.1815
	(0.083)	(0.100)	(0.161)	(0.104)	(0.114)	(0.178)	(0.076)	(0.098)	(0.143)
Born outside of U.S.A.	−0.2047 * **	−0.2485 * **	−0.2719 * **	−0.2756 * **	−0.2993 * **	−0.3163 * **	−0.2885 * **	−0.3604 * **	−0.3714 * **
	(0.059)	(0.072)	(0.097)	(0.066)	(0.074)	(0.109)	(0.057)	(0.072)	(0.102)
Years of schooling:									
=12	−0.0534	−0.0602	−0.2369 * **	−0.1091*	−0.1227*	0.0944	−0.1165 * *	−0.1470 * *	0.2493 * **
	(0.042)	(0.052)	(0.067)	(0.060)	(0.068)	(0.094)	(0.057)	(0.071)	(0.087)
≥12 and ≤ 15	0.0119	0.0154	−0.1773 * *	−0.0543	−0.0591	0.0387	−0.0596	−0.0733	0.1833 * *
	(0.045)	(0.057)	(0.075)	(0.060)	(0.067)	(0.092)	(0.057)	(0.071)	(0.089)
≥ 16	0.0084	0.0114	−0.4045 * **	−0.0653	−0.0702	−0.2426 * *	−0.0225	−0.0231	−0.4560 * **
	(0.049)	(0.060)	(0.089)	(0.063)	(0.070)	(0.107)	(0.059)	(0.073)	(0.108)
Religiosity:									
some important	−0.1479 * **	−0.1873 * **	−0.1639*	−0.2507 * *	−0.2602 * *	−0.2947 * *	−0.3822 * **	−0.4421 * **	0.0473
	(0.057)	(0.071)	(0.097)	(0.099)	(0.109)	(0.148)	(0.111)	(0.134)	(0.166)
very important	−0.5260 * **	−0.6320 * **	−0.2910 * **	−0.6707 * **	−0.7203 * **	−0.5023 * **	−0.9633 * **	−1.1437 * **	−0.2814*
	(0.057)	(0.074)	(0.099)	(0.098)	(0.110)	(0.148)	(0.109)	(0.138)	(0.167)
Current Religion:									
Catholic	−0.1550 * **	−0.1870 * **	−0.1383	−0.0642	−0.0683	0.3877 * *	0.2742 * *	0.3178 * *	−0.2112
	(0.056)	(0.070)	(0.095)	(0.112)	(0.123)	(0.170)	(0.119)	(0.144)	(0.176)
Protestant	−0.2717 * **	−0.3219 * **	−0.0912	−0.097	−0.1146	0.0846	0.1942*	0.2254	−0.2089
	(0.053)	(0.067)	(0.088)	(0.111)	(0.122)	(0.162)	(0.117)	(0.142)	(0.175)
other religions	−0.0344	−0.0393	−0.0502	0.0017	0.01	0.3273	−0.1146	−0.1425	−0.0793
	(0.076)	(0.095)	(0.128)	(0.125)	(0.140)	(0.214)	(0.126)	(0.152)	(0.199)
σ_δ			0.8889 * **			0.7739 * **			0.8644 * **
			(0.073)			(0.095)			(0.088)
σ_ϵ		0.5996 * **	0.6037 * **		0.4002 * **	0.4420 * **		0.6250 * **	0.6248 * **
		(0.066)	(0.068)		(0.099)	(0.097)		(0.087)	(0.089)
$\rho_{\delta\epsilon}$			0.0886			0.5789 * *			0.1717
			(0.120)			(0.227)			(0.163)
Log-Likelihood	−4779.18	−4933.43	−22735.5	−2992.49	−2989.26	−13450.78	−3496.45	−3483.75	−15622.8

[*] Model (1) is the decision to cohabit without heterogeneity; model (2) is the decision to cohabit with heterogeneity but restricting $\rho_{\delta\epsilon} = 0$; model (3) is the decision to cohabit with heterogeneity and without restricting $\rho_{\delta\epsilon} = 0$;

[1] Each regression is weighted. Asymptotic standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (two-sided).