Desperation or Desire?
The Role of Risk Aversion in Marriage

Christy Spivey, Ph.D.*

August, 2006

Abstract

The effect of an individual's risk aversion on time to marriage is examined using survival analysis. The financial risk aversion measure is based on a series of hypothetical gambles over family income that were offered to respondents of the National Longitudinal Survey of Youth 1979. A search model predicts that, the more risk averse the individual, the shorter the time to first marriage. The estimates support the theory, indicating that risk aversion significantly affects time to marriage, with more risk averse respondents marrying sooner than their more risk loving counterparts. Within-family analyses using sibling data reveal a similar pattern. In addition, the effect of risk aversion on time to marriage is larger in magnitude and more statistically significant for men. One possible explanation for the different results between the sexes is that women value risk aversion as a desirable trait in potential mates.

* *Assistant Professor, Department of Economics and Finance, Southern Illinois University at Edwardsville, Edwardsville, IL 62026, USA. Email: cspivey@siue.edu.* This is a preliminary draft. I wish to thank Daniel Hamermesh, Stephen Trejo, Gerald Oettinger, Paul Wilson, Jonathan Fisher, and seminar participants at the University of Texas at Austin and Texas A&M University for many helpful comments and suggestions.

I. Introduction

Attitudes toward risk are an important determinant of a vast array of decisions, including ones with a big impact on life, such as marriage and divorce, the choice of education, or the choice of career. Most empirical studies of behavior ignore this fact and implicitly assume risk preferences are identical across households. Such a strategy undoubtedly results in appreciably different predicted behavior than does one that permits risk preferences to vary. Unfortunately, few datasets allow for construction of a measure of interpersonal variation in risk that is based on economic theory. As a result, few empirical studies explicitly investigate the impact of risk preference on behavior, and none employ an empirical measure of risk aversion to investigate the relationship between risk preferences and marriage.

This paper uses information on risk preferences from the 1979 National Longitudinal Survey of Youth (NLSY79) and survival analysis to predict how interpersonal variation in these preferences affects the time to marriage in the context of a search model. Thus, one main contribution of this paper is to add to the literature on how risk attitudes affect behavior. While other studies do employ a similar measure of risk aversion, most of these studies ask what demographic variables affect risk aversion. A few ask how these measures affect behaviors like the propensity to smoke or invest in risky assets. These studies are, however, cross-sectional, and do not employ survival analysis as does this paper.

Another contribution of this paper is to expand upon our understanding of what motivates individuals to get married. Many of the usual suspects are difficult to measure, such as love, the desire for emotional support, the desire to be needed, the desire to have

children, and the importance of the financial incentives and economies of scale that marriage provides. In empirical studies, researchers can control for observable characteristics, such as age and education, some of which probably serve as proxies for unobservable characteristics. Risk aversion directly affects the timing of marriage decision due to the uncertainty that is inherent in the process of searching for a mate, yet no previous studies use an empirical measure of risk aversion to study marital history.

I borrow a search model from the employment literature and show that, due to the uncertainty of the process, the more risk averse marry sooner. Risk preference variables are constructed from a series of hypothetical gambles over lifetime income that were offered to respondents in the NLSY79. I examine how the risk preference variables affect the hazard rate into marriage and present estimates that support the theoretical predictions. I also exploit sibling data from the NLSY79 to examine the robustness of the empirical results by controlling for unobserved family effects that might be correlated with risk attitudes and find qualitatively similar results. In addition, I find that risk preferences affect the timing of marriage differentially for the sexes, with a larger and more statistically significant effect of risk preferences on the hazard rate into marriage for men. One possible explanation for this finding is that women value risk aversion as a desirable characteristic in a spouse. This explanation is supported by other empirical evidence. Specifically, spouse quality, in terms of education and other measurable traits, is lower for more risk averse men than for more risk loving men. This finding is in accordance with a prediction of the search model: the reservation "price" is decreasing in risk aversion. On the other hand, spouse quality of more risk averse women is not consistently lower than for more risk loving women, suggesting that more than a

woman's own risk aversion affects her decision to marry. Overall, the results suggest that risk preferences have some causal influence on the timing of marriage, whether it be from a supply-side standpoint in the case of the basic search model or from a demand-side standpoint, where risk aversion is a desirable trait.

The remainder of the paper is organized as follows. The next section discusses the related literature and the types of risk measures typically used by economists. Section III presents the theoretical model, while Section IV discusses the data and descriptive statistics. Section V presents and discusses the empirical findings. Finally, the last section contains concluding remarks.

II. Literature Review

Various approaches have been taken in the literature to construct empirical measures of risk aversion that vary across individuals. The two main methods used to calculate measures based on economic theory (an Arrow-Pratt measure) are (i) evaluating the actual behavior of individuals; and (ii) asking them hypothetical questions with specific scenarios. For both methods, the argument of the utility function has varied (consumption and asset allocation, for example). Depending on the argument used, a single set of preferences can be represented by different measures of risk aversion[1].

Not all datasets contain consumption information, and asset information is often incomplete and inaccurate. Since this is the case with the NLSY79, this review focuses on studies that construct an empirical measure of risk aversion through hypothetical questions asked of respondents. Unlike many studies that evaluate actual behavior, these

[1] However, Meyer and Meyer (2004), in a preliminary work, show that if adjustments are made to various risk aversion measures that represent the same preferences in order to compare them directly, the variation in the computed risk aversion measures is significantly reduced.

studies allow construction of a risk aversion measure for a representative sample of the population and do not focus on just one segment of the population, such as stock market investors or agricultural producers.

When respondents are asked for a reservation price for a gamble over their lifetime family income, the Arrow-Pratt measure of relative risk aversion can be constructed. Often, the questionnaire asks whether respondents would be willing to accept a gamble over their income. Depending on the answer, respondents are then asked whether they would be willing to accept a more risky or less risky gamble. The respondents can then be put into one of four categories of risk aversion, and the bounds on the Arrow-Pratt measure can be calculated. However, only a handful of surveys contain the type of questions required to do this. Several studies utilize these data to explore how demographic variables affect risk aversion, and fewer use these measures to investigate how risk aversion affects behavior. Since many decisions over the course of an individual's life are influenced by attitudes toward risk, whether consciously or subconsciously, the few studies employing data that investigate the effect of risk attitudes on behavior are of particular interest. Apparently, however, no existing studies focus directly on the relationship between interpersonal variation in risk aversion and marriage outcomes.

Determinants of Risk Aversion

Studies that focus on how demographic variables affect risk aversion, as opposed to the effects of risk aversion on a specified outcome, include Miyata (2003), Hartog et al., (2002), and Donkers et al. (1999). A common finding is that observable characteristics tend to explain a small amount of the variation in risk aversion among

people. This finding supports the idea that each person has some innate risk preference, though it may evolve over time due to age, having children, etc. Nevertheless, there are some relationships between risk aversion and demographic characteristics that are noteworthy.

Donkers et al. and Hartog et al., using several cross-sectional Dutch datasets, find that females are more risk averse than men, older individuals exhibit more risk aversion, and income is negatively correlated with risk aversion. Hartog et al. also find that civil servants are more risk averse than private sector employees, and the self-employed are less risk averse. The relationships found between risk preferences and demographic variables in the two studies are for the most part expected, which is encouraging for the usefulness of their risk measures. However, one disadvantage is that both studies use surveys that ask individuals about lottery tickets, not their income.

In one dataset used by Hartog et al., marriage is significantly related to risk aversion; single and cohabiting individuals are less risk averse than married couples. Since marriage can be viewed as a contract that increases the cost of separation, the authors argue that risk averse individuals will want to make it more difficult for their partner to leave. Miyata, using the results of investment games played by 400 households in rural Indonesia to identify attitudes toward risk, finds that one's living situation is significant; an individual living with parents is less risk averse than one living in a nuclear household.

Risk Aversion and Behavior

In studies that explore how risk aversion affects behavior, risk attitudes are found to be correlated in an expected way with behavior almost without exception. Barsky et

al. (1997) explore the impact of risk aversion on a variety of behaviors for about 11,000 individuals aged 51-61 using the Health and Retirement Study, which uses the same format of risk questions as the NLSY79[2]. They find, as expected, that those who smoke, drink heavily, have no health or life insurance, hold stocks or risky assets, and immigrate are more risk tolerant. In each instance, the coefficient on the measure of risk tolerance is significant, but there is so much variability in these behaviors that risk tolerance explains little of it (though the latter is true for all covariates).

Guiso and Paiella (2001) use the 1995 Bank of Italy's Survey of Household Income and Wealth, which asks 8,135 households what they would pay for a security that provides equal probability of gaining 10 million lire or losing all capital invested. Their findings are similar to that of Barsky et al. in that the effects of risk attitudes are as expected. More specifically, risk averse individuals are more likely to work in the public sector and less likely to be self-employed, have a much lower probability of holding risky assets, and are less likely to move and be job changers. The degree of risk aversion has a negative effect on the probability of moving from place of birth, changing jobs, and incurring chronic disease. It is encouraging that similar survey questions in different countries yield a similar distribution of risk attitudes and correlations with observed behavior.

Of course, there are valid criticisms and potential sources of noise in attempting to measure risk attitudes through experiments and hypothetical questions. For example, some respondents may not understand the questions but nonetheless answer them. Those

[2] Barsky et al. ask respondents about lotteries over income rather than spending or consumption because pretesting of the survey instruments revealed that respondents better understood income lotteries. They argue that, given the low levels of financial wealth of most respondents, permanent income and permanent labor income are similar. They argue that the lottery questions can be interpreted as asking respondents about "permanent consumption."

who are risk averse may be less likely to answer if the questions are not properly understood. Moreover, perhaps their responses do not match what their decisions would be in reality[3]. Experimental attempts to measure risk preferences have brought forth concerns about preference reversal violations of expected utility theory[4]. In addition, respondents may value their job for more than pecuniary reasons and so be hesitant to leave it for a large expected increase in income.

Furthermore, in previous studies it has been common to assume that a single, intrinsic risk preference, measured by taking chances over money, dictates risk taking in all spheres of life. However, there are different kinds of risk aversion, and it is quite plausible that an individual might be willing to take chances with their money but not their health. A recent study by Dohmen et al. (2005) sheds some light on this issue using the 2004 wave of the German Socioeconomic Panel (SOEP). The survey asks approximately 22,000 individuals several different types of risk questions. Respondents are asked the same type of questions about gambles over lifetime income used in the NLSY79, but they are also asked about their willingness to take chances in five different domains: financial matters, career, health, car driving, and sports and leisure. The study finds that, while average willingness to take risks is different across domains, there is a strong correlation across domains. Overall, there is evidence that a single risk parameter is relevant for all domains to some extent. The authors argue that their findings may indicate some "malleability" of risk preferences but more probably are indicative of differences in how individuals perceive risk across domains.

[3] However, Binswanger (1981), Camerer and Hogarth (1999), and Dohmen at al. (2005) find that hypothetical experiments are not at a serious disadvantage to games with real financial rewards.
[4] See Harless and Camerer (1994).

Despite their imperfection, risk measures constructed from hypothetical questions may still be informative. The questions are designed so that bounds on the Arrow-Pratt measure of risk aversion can be calculated, so economic theory is not ignored. Using these measures should be viewed as steps along the way to better understanding what determines and what is affected by interpersonal variation in risk.

III. Theoretical Model

The question remains: Does marriage attract the risk averse sooner than risk lovers, all else equal? Marriage may or may not increase "emotional risk." Certainly entering into marriage opens up the possibility of divorce, which is more costly than ending a cohabiting union. However, since a marriage contract raises the cost of separating, the conditional probability of a union ending may be lower once marriage has occurred. Sahib and Gu (2002) show that the "risk premium," which compensates an individual for the potential failure of a marriage, is smaller for the more risk averse. Thus, more risk averse individuals need fewer incentives to enter into marriage.

Marrying sooner than the average person should be attractive to the risk averse because it mitigates the uncertainty of the future. Finding an "acceptable" mate is easier than finding the "perfect" mate, and the risk averse searcher may be willing to accept one of the first options that come along because hope is low that an even better option will come along in the future. As Pissarides (1974) and Lippman and McCall (1976) argue in the job search literature, more risk averse individuals attach less value to further search because any searcher must compare an offer that is known with the uncertainty of another draw from the wage distribution.

First consider a simple one-sided partial equilibrium model of marital search, in the spirit of the familiar one-sided job search model. Here, however, it is necessary to relax the standard assumption of risk neutrality and allow for concavity of the utility function. Searchers are infinitely-lived and identical in all respects except for their degree of risk aversion, with discount factor β and concave monotonically increasing utility functions $U_i(q_i)$, where q_i denotes the quality of the offer received by searcher i in the marriage market. Quality is an index of traits of the individual making the offer, which captures their worth as a marriage partner. It may include measurable traits such as income as well as intangible characteristics. For now, I will assume that the risk aversion of the offerer is not included in their quality, so that the searcher does not care about a potential mate's level of risk aversion. Also assume that all singles are part of the marriage market, women are searchers, with men making the offers. A two-sided search framework will be discussed later.

Women receive a single offer per period from the distribution $F(q)$ with support $[0,\infty)$, taken as given for now, so that the probability of receiving an offer does not depend upon the man's level of risk aversion. The offer at hand can be accepted and the marriage lasts forever[5], or the offer can be rejected and the woman can continue searching without the possibility of recalling previous offers of marriage. Denote the expected present discounted value of an offer of quality level q_i as Q_i and the expected present discounted utility from searching as S_i. Then the payoff to accepting a current offer of q_i^0 can be expressed as follows:

[5] When this assumption is relaxed and an exogenous probability of divorce is allowed, the relevant predictions of the search model still follow.

$$Q_i^0 = \frac{U_i(q_i^0)}{1-\beta} \tag{1}$$

Assuming no costs to search and that the flow of utility equals 0 while searching, the value of searching for one more period is

$$S_i = \beta E_q \{\max(Q_i, S_i)\} \tag{2}$$

The offer is accepted if $Q_i^0 \geq S_i$, implying a reservation quality $\overline{q}_i$ such that

$$\frac{U_i(\overline{q}_i)}{1-\beta} = S_i, \text{ or } \frac{U_i(\overline{q}_i)}{1-\beta} = \beta E_q \left\{ \max(\frac{U_i(q_i)}{1-\beta}, \frac{U_i(\overline{q}_i)}{1-\beta}) \right\}. \tag{3}$$

Then, $$\frac{U_i(\overline{q}_i)}{1-\beta} = \beta \int_0^{\overline{q}} \frac{U_i(\overline{q}_i)}{1-\beta} \partial F(q) + \beta \int_{\overline{q}_i}^{\infty} \frac{U_i(q_i)}{1-\beta} \partial F(q). \tag{4}$$

This is equivalent to $$\frac{U_i(\overline{q}_i)}{1-\beta} = \frac{\beta}{1-\beta} U_i(\overline{q}_i) + \frac{\beta}{1-\beta} \int_{\overline{q}}^{\infty} [U_i(q_i) - U_i(\overline{q}_i)] \partial F(q), \tag{5}$$

which simplifies to $$U_i(\overline{q}_i) = \frac{\beta}{1-\beta} \int_{\overline{q}}^{\infty} [U_i(q_i) - U_i(\overline{q}_i)] \partial F(q). \tag{6}$$

Equation (6) implicitly defines the searcher's reservation quality $\overline{q}_i$, equating the opportunity cost of searching one more period with the expected lifetime benefit of one more search, given the current offer q_i^0. In other words, Equation (6) holds when q_i^0 equals $\overline{q}_i$.

To determine how an individual's risk aversion affects the reservation wage, Pratt's (1964) Theorem is useful. Pratt defines the risk premium r_i as the amount of money that makes an individual indifferent between a certain amount and a gamble with an expected value equal to the certain amount; i.e.,

$$EU_i(I) = U_i(EI - r_i). \tag{7}$$

If $r_i > 0$, then the individual is risk averse. Pratt also shows that the risk premium varies directly with the Arrow-Pratt coefficient of absolute risk aversion. Given this definition of the risk premium, it is not difficult to see how r_i affects the search problem in the current context. A positive risk premium increases the opportunity cost of searching one more period, or, equivalently, decreases the expected lifetime benefit of another search. The higher the risk premium, the more quality that is required to induce the individual to give up the certain offer in the current period for the uncertain outcome of further search.

To show this more rigorously, assume that there are two levels of risk aversion among searchers. Type A searchers are globally more risk averse than type B searchers, so

$$U_A(q) = G[U_B(q)] \tag{8}$$

for some strictly concave and monotonically increasing function *G*. Pratt's Theorem implies that $r_A > r_B$ for all *q*. If the two searchers are faced with the same quality distribution, then the more risk averse searcher has the lower reservation quality level. In other words, given *F(q)*, if $U_A(q) = G[U_B(q)]$ for all *q*, then $\overline{q}_A < \overline{q}_B$. In the context of job search, this result has been established by Nachman (1975), Hall et al. (1979), and Vesterlund (1997)[6]. It is well known that a lower reservation level leads to an earlier optimal stopping time, so the expected duration of singledom is shorter for the more risk averse. This results simply because the per period probability of accepting an offer is $(1 - F(\overline{q}_i))$, which is decreasing in $\overline{q}_i$.

The one-sided search problem can be extended to a two-sided one, for now maintaining the assumption that a potential partner's risk aversion does not enter an individual's utility function through the quality index. Both sexes are searching, and for

[6] See the Appendix for proof of this proposition.

simplicity assume each searcher is matched with another once per period. One sex initiates an offer, and does so if the other's quality exceeds their reservation level. The offeree accepts if their reservation quality level is exceeded, so the more risk averse the offeree, the more likely the acceptance occurs. Thus, in the basic two-sided model, the prediction that the more risk averse marry sooner still holds.

If searchers value risk aversion as a desirable trait in potential mates, so that one's quality is a function of one's risk aversion, the model becomes slightly more complex. Suppose, for simplicity, that only a female's utility is increasing in the male's risk aversion through his quality index. If men initiate offers, more risk averse men do so because their reservation quality is more likely to be exceeded. Own risk aversion may still affect women's probability of accepting an offer, and so the risk averse women may require lower levels of quality to exceed their reservation level. Nevertheless, because women value risk aversion, they are more likely to accept, the more risk averse the man, all else equal. If women initiate offers, they are more likely to do so to men with higher levels risk aversion, holding their own risk aversion constant. The man accepts if his reservation quality level is exceeded, and the more risk averse the man, the more likely an acceptance occurs. If women demand risk aversion but their own risk aversion does not affect the likelihood of ending the search process, then own risk aversion should matter more for men in the timing of marriage. However, if risk aversion is demanded by women and affects their reservation quality, then the extent to which the effect of own risk aversion on time to marriage will differ between the sexes is ambiguous.

IV. Data and Empirical Specification

The NLSY79, which began annual interviews in 1979 with over 12,000 individuals aged 14–22, continued interviewing that sample annually through 1993, and since 1994 has followed the group with interviews every two years. The NLSY79 contains three subsamples: a cross-sectional sample of 6,111 respondents designed to be representative of the civilian U.S. youth population; a supplemental sample of 5,295 respondents designed to oversample civilian Hispanic, black, and economically disadvantaged non-black/non-Hispanic U.S. youth; and a sample of 1,280 respondents designed to represent the population ages 17–21 who were enlisted in the military.

Following the 1984 interview, 1,079 members of the military subsample were no longer eligible for interview, but 201 respondents randomly selected from the entire military subsample remained in the survey. Following the 1990 interview, none of the 1,643 members of the economically disadvantaged, non-black/non-Hispanic subsample were eligible for interview. In 1993, a key year for this study, 9,011 individuals were available for interview, and they are followed in this study from 1979 until 2002. Because the household was the primary sampling unit in the initial surveys, several thousand pairs of siblings are included in the data, and this will prove useful in the empirical estimation.

One advantage of using the NLSY79 for this analysis is the detail of respondents' marital histories. Information on marriages and divorces is not limited to marital status at the time of interview. At each interview, respondents are also asked for the month and year each of their marriages began and ended. This serves to fill in missing information

if a respondent has not been interviewed each year of the survey and also serves to clarify and correct inconsistent marital history data.

Risk Measure

An underutilized series of questions from the 1993 wave of interviews allows construction of a variable indicating an individual's attitude toward income risk. Respondents, then aged 28-36, were asked two questions relevant to constructing this variable. All respondents were asked the following question (Gamble 1):

> "Suppose that you are the only income earner in the family, and you have a good job guaranteed to give you your current (family) income every year for life. You are given the opportunity to take a new and equally good job, with a 50-50 chance that it will double your (family) income and a 50-50 chance that it will cut your (family) income by a third. Would you take the new job?"

If the answer was "No," respondents were then asked the following (Gamble 2):

> "Suppose the chances were 50-50 that it would double your family income and 50-50 that it would cut it by 20 percent. Would you take the new job?"

If the answer to the first question was "Yes," respondents were asked the following (Gamble 3):

> "Suppose the chances were 50-50 that it would double your family income and 50-50 that it would cut it in half. Would you still take the new job?"

These three questions allow categorization of respondents into four groups. Respondents who answered "No" to both questions will from now on be referred to as "Very Strongly

Risk Averse"; 46% of respondents fall into this category. Respondents who answered "Yes" to both questions will be called "Weakly Risk Averse," and 25% fall into this category. Respondents who answered "No" to the first question but "Yes" to the second will be called "Strongly Risk Averse," and this applies to 12% of respondents. Those who answered "Yes" to the first question and "No" to the second will be referred to as "Moderately Risk Averse," which applies to the remaining 17% of the respondents. This distribution of risk preferences is consistent with that found in previous studies, in which slightly more than a third to slightly more than one half of individuals fall into the most risk averse category.

The responses of individuals are viewed as resulting from an expected utility calculation. If U is the individual's utility function and I the lifetime income, or "permanent consumption" in Barsky et al.'s terminology, then an expected utility maximizer will accept the 50-50 gamble of doubling lifetime income rather than cutting it by the fraction 1-α if the following holds:

$$\frac{1}{2}U(2I)+\frac{1}{2}U(\alpha I)\geq U(I) \tag{9}$$

In other words, the expected utility of the gamble is at least as great as the utility from having current income for certain. Note that the labels assigned to the categories correspond to varying degrees of risk aversion, since the NLSY79 gambles are more than actuarially fair (the expected values are always greater than I):

$$EI\text{ Gamble 1} = \frac{1}{2}(2I)+\frac{1}{2}(\frac{2}{3}I)=\frac{4}{3}I \tag{10}$$

$$EI\text{ Gamble 2} = \frac{1}{2}(2I)+\frac{1}{2}(\frac{4}{5}I)=\frac{7}{5}I \tag{11}$$

$$EI \text{ Gamble } 3 = \frac{1}{2}(2I) + \frac{1}{2}(\frac{1}{2}I) = \frac{5}{4}I \tag{12}$$

Therefore, a risk neutral agent would accept any of the three gambles. As I have labeled the categories, only a Weakly Risk Averse individual would accept all of the lotteries.

An advantage to using this risk measure is that respondents are asked to gamble over family income, and respondents are asked to consider that family income is own income. Therefore, if the respondent is not the main breadwinner in the family, the survey design attempts to eliminate the potential problem that the respondent would be more or less likely to gamble with the spouse's income. In addition, measuring risk aversion in this way requires no assumption on the form of the respondent's utility function. It only requires that relative risk aversion is constant over the relevant region. One disadvantage, however, is that respondents are not asked these questions in an earlier year. When the risk questions are first asked, over 50% of respondents have been or are married, which presents possible endogeneity problems. Marital decisions could certainly have an impact on risk attitudes.

Respondents are not asked these risk questions on a regular basis over time. However, the NLSY79 did repeat these questions in 2002. In 2002, 54% of respondents are considered Very Strongly Risk Averse, 18% are Weakly Risk Averse, 12% are Strongly Risk Averse, and 16% are Moderately Risk Averse. While a similar percentage of respondents fall into the middle two categories in 2002 as in 1993, there has been an overall shift towards risk aversion. Appendix Table A1 illustrates the change in risk category between 1993 and 2002. Of those who were Weakly Risk Averse in 1993, about 24% remained in the same category in 2002, 35% became Very Strongly Risk Averse, and 17% were not interviewed in 2002. It is not surprising that fewer

respondents are willing to take big risks in 2002, since respondents are almost ten years older, have more children, and face more responsibility in general. While this pattern cannot help resolve endogeneity issues, it does support the argument that individuals have an inherent risk parameter that is shifted over time by changes in personal characteristics and circumstances.

The remainder of the descriptive statistics will focus on the 1993 risk measures since they avoid more endogeneity problems than do the 2002 risk measures. In addition, only 7,224 respondents were available to answer the risk questions in 2002, compared to over 9,000 in 1993. Table 1 presents the distribution of risk aversion by demographic characteristics. Women are relatively more risk averse than men, with 49% being Very Strongly Risk Averse to the men's 43%. As expected, a higher percentage of men are Weakly Risk Averse, with 29% compared to women's 21%. In addition, even within the age group of 28-36, the young tend to be more risk tolerant. It is encouraging that these data reveal the above two patterns with respect to sex and age, as they corroborate the findings of past studies.

Table 1 also reveals that respondents with children in the house are more risk averse in general, although those with children ages 6 to 13 are the most risk averse among parents. The distribution of risk aversion is similar for all races, with whites slightly less Weakly Risk Averse. Respondents with less than a high school education are more polarized than the general population, with a comparatively large percentage falling into the Very Strongly Risk Averse and Weakly Risk Averse categories. High school graduates are more risk averse than the general population, while college

graduates and those who have attended graduate school are less risk averse, with a higher percentage falling into the middle two categories of risk aversion.

Table 2, which is critical to exploring the relationship between marriage and risk aversion, presents the distribution of risk aversion by age at first marriage. There is a clear trend between age at first marriage and risk category. For the total population, the percentage of Very Strongly Risk Averse respondents never increases and almost always decreases with age at first marriage, and the percentage of Weakly Risk Averse respondents never decreases and almost always increases with age at first marriage. When the same analysis is carried out by sex, the trends remain almost as strong for both sexes. For women, the only exception is the 21-25 year age group, at which point the percentage of Weakly Risk Averse individuals falls before increasing for the subsequent age group. For men, the same age group is the exception, where the percentage of Weakly Risk Averse individuals falls temporarily and the percentage of Very Strongly Risk Averse increases temporarily.

Empirical Specification

I estimate a hazard model to investigate the determinants of time to first marriage. Survival analysis is appropriate for the questions at hand for at least two reasons. First, it is necessary to substitute for the normality assumption that Ordinary Least Squares requires, since assuming normality of time to an event is problematic. Second, right-censored spells (those individuals who never get married during the timeframe of the data) should be included in the analysis in order to fully utilize the information contained in the data. Hazard models handle both right-censored spells and time-varying covariates fairly easily. I use the semiparametric Cox proportional hazards model because no

assumption is made about the underlying shape of the baseline hazard. Under proportional hazards, the hazard rate into marriage for person *j* at time *t* is

$$h_j(t) = h_0(t)e^{X_j(t)\beta} \tag{13}$$

where $h_0(t)$ is the baseline hazard faced by everyone at time *t*. The estimated coefficients (β's) on the explanatory variables (*X*'s) shift the hazard rate up or down, depending on their signs. To expound, if *T* is denoted as the random variable representing time to failure, $f(t)$ is *T*'s probability density function, and $F(t)$ is the cumulative distribution function, then the survivor function $S(t) = 1-F(t) = \Pr(T>t)$ reports the probability of surviving beyond time *t*. Following from this, the hazard function $h(t) = f(t)/S(t)$ is the probability that the failure event occurs in a given interval, conditional upon the subject having survived to the beginning of the interval, divided by the width of the interval. Cox regression results are based on forming, at each failure time, the risk pool and then maximizing the partial log likelihood of observed failure outcomes, accounting for right censoring.

In the jargon of survival analysis, "failure" in this analysis means a first marriage occurs. I assume individuals become "at risk" to fail at age 16[7]. While respondents are not legally adults at this age, they gain a certain measure of independence since, at the time, 16 was the youngest age at which individuals could marry without parental consent in most states. On a more practical note, several hundred respondents get married before the age of 18, but only about 60 are married prior to age 16. Analysis time *t* is thus measured in months from turning age 16, and the failure time is marked by the number of months that elapse until first marriage.

[7] Results are not substantively different when I assume individuals first become "at risk" at age 18.

The empirical specification includes dummy variables for the risk categories, excluding the Weakly Risk Averse category. Since the risk questions asked of respondents require dichotomous answers (yes/no), not reservation prices, I cannot employ expected utility theory to calculate exact Arrow-Pratt measures of risk aversion. It is possible, however, to use expected utility theory to calculate bounds on the Arrow-Pratt measures[8], but these are not included in the regressions. They contain no more information than the dummy variables, as each individual in the same risk category would have the same bounds on the Arrow-Pratt measure. I am concerned about the ordinal properties of the risk measure, and the indicator variables capture this ordinality.

Other explanatory variables include education, the log of the respondent's weekly real income, dummy variables for sex, race (white, black, other), the age of children in the household (no children, children less than 6, and children over 6), region (south, west northeast, north central), whether the current residence is urban or rural, whether respondents are currently living with their parents, and whether they lived with their parents until age 18. Explanatory variables are collected annually for respondents, and every two years starting in 1994. The empirical estimation of a hazard model with time-varying covariates requires the assumption that the explanatory variables remain constant between respondent interviews. This is clearly an oversimplification, but, as Wooldridge (2001) points out, researchers cannot get very far empirically without this assumption.

The hazard model specified in Equation (13) assumes there is no unobserved heterogeneity in the probability of transition to first marriage. It is likely, however, that unobserved family-specific traits, such as attitudes about marriage and age at marriage,

[8] The bounds of the Arrow-Pratt measure of relative risk aversion are [0,1) for the Weakly Risk Averse, [1,2) for the Moderately Risk Averse, [2,3.76) for the Strongly Risk Averse, and [3.76,∞) for the Very Strongly Risk Averse.

affect time to first marriage. Moreover, it is possible that the unobserved heterogeneity is correlated with one or more of the covariates. If this is the case, parameters estimated via the typical proportional hazards model will be biased, as the hazard framework usually assumes that any unobserved heterogeneity is uncorrelated with the covariates. Family-specific unobserved heterogeneity may be correlated with our covariates of interest, the risk attitude variables. Depending on when risk attitudes form, parental attitudes about risk may be transferred to children to a certain extent. For this reason, I also estimate a model with family fixed effects by exploiting the availability of sibling data in the NLSY79. The hazard rate becomes

$$h_{jk}(t) = h_0(t)e^{X_{jk}(t)\beta+\delta_k} \tag{14}$$

for sibling j in family k, where δ_k represents the unobserved family heterogeneity.

V. Results

Table 3 presents the results of two Cox proportional hazards estimations. First, I present estimates of the proportional hazards model in Equation (13) for the full sample interviewed in 1993, assuming no unobserved heterogeneity (Specification 1). Second, I present estimates of the same proportional hazards model for the full sample with standard errors adjusted to allow for possible correlation within families (Specification 2). This specification also stratifies on variables that fail the proportional hazards test at the 0.01 level of significance. This means that a separate baseline hazard is estimated for the stratified variables, which are sex, race, region of residence, whether or not the respondent is enrolled in school, and whether or not they live in an urban location. In

other words, for example, I do not constrain the hazard function for males to be a proportional replica of the hazard function for females.

The results indicate risk preferences do matter. A Wald test shows that all of the coefficients on the risk preference variables are significant at the 1% level. Relative to the Weakly Risk Averse, being in any other risk category shifts the hazard up and increases the conditional probability of marriage. The hazard ratios are presented for ease of interpretation. The hazard ratios for Specification 1 tell us that someone who is Very Strongly Risk Averse faces a hazard rate that is 1.31 times the hazard faced by someone who is Weakly Risk Averse, while someone who is Moderately Risk Averse faces a hazard rate that is 1.19 the hazard faced by the Weakly Risk Averse. The hazard ratios for Specification 2 are very similar. Figure 1 compares the estimated hazards for the Weakly Risk Averse and Very Strongly Risk Averse groups. The shape of the hazard is not surprising; it increases sharply at first and almost monotonically decreases thereafter. After about 75 month of analysis time (months since age 16), the hazard exhibits consistent duration dependence in the sense that the longer a respondent remains single, the lower the conditional probability of marriage. Moreover, the hazard for the Very Strongly Risk Averse lies above that for the Weakly Risk Averse at all analysis times.

Most of the other explanatory variables in Specification 1 shift the hazard in the expected direction. For example, being male shifts the hazard down since, in any given interval, the conditional probability of marriage is lower for men. In the NLSY79, men marry an average of two years later than women. Living in an urban area or in the Northeast decreases the conditional probability of marriage. While there may be a larger

selection of mates in urban areas, there are also a larger variety of activities than in rural areas and perhaps less traditional views about marriage and family. Conversely, living in the South increases the probability of marriage. Being enrolled in school and currently living with parents also decreases the hazard rate. Having lived with both parents until age 18 increases the hazard rate, but this coefficient is not statistically significant. Income increases the hazard rate, and educational attainment decreases it at first. Surprisingly, after about the high school level of educational attainment, education begins to increase the hazard. This unexpected result could be due in part to reverse causality, where marriage decisions cause educational outcomes. The hazard ratios for the variables remain very similar under Specification 2, with the one exception that having no children in the household now reduces the hazard rate. This seems to capture demand-side behavior more than in Specification 1, since single women with no children have no need for a father figure.

Although the ideal situation would involve the risk questions being asked before any marriages occur, it could also be helpful to perform the survival analysis only for marriages that occur after the 1993 questions are asked. Unfortunately, this is problematic because the respondents are already aged 28-36 in 1993 and only a few hundred respondents are married after 1993. In fact, the frequency of first marriages peaks almost a decade before 1993. Nevertheless, the hazard analysis performed on the sample limited to those who marry after 1993 yields the expected sign for all risk categories. Results are presented in Appendix Table A2. While the estimated coefficients are not statistically significant, the fact that being Very Strongly Risk Averse

increases the hazard rate the most relative to the Weakly Risk Averse category is encouraging.

To support the idea that at least some element of risk attitudes is intrinsic, I have repeated the Cox hazards estimation using the risk preference variables for 2002. The results are presented in Appendix Table A3. The signs of the risk variable coefficients and the pattern of the hazard ratios are the same as in Specification 1 in Table 3, which uses the 1993 risk variables. The estimated coefficients are statistically significant at the 5% level, which is less significant that in Specification 1. It is encouraging that the results hold up fairly well when using a risk measure that is collected almost ten years after the first measure. Also, the hazard ratios are smaller in magnitude and have a smaller variance when the 2002 risk measures are used than when the 1993 measures are used. If reverse causality was a problem in that the longer an individual is married, the more risk averse he or she becomes, then we would expect to see a larger magnitude and variance in the hazard ratios when the 2002 variables are used. .

The above results support the theory presented; nevertheless, causality cannot be assumed. It may be that unobserved heterogeneity in families explains the results, but the NLSY79 can be used to shed some of this doubt. A useful feature of the NLSY79 is its inclusion of multiple-respondent households. In 1979, over 46% of the total sample consisted of siblings in 2,448 households. Table 4 presents the estimation of the basic hazard rate in Equation (13) for the sample of siblings interviewed in 1993 (Specification 3). The hazard ratios for the risk preference variables are extremely similar as in the full sample. Table 4 also presents estimates of the model in Equation (14) for the sample of siblings interviewed in 1993, allowing for fixed unobserved heterogeneity at the family

level (Specification 4). The results indicate that unobserved heterogeneity at the family level cannot explain the results found in the cross-section regarding the effect of risk attitudes on time to marriage. The statistical significance of the risk variables remains comparable to previous results. In addition, the effect of risk preference on time to marriage is actually magnified once fixed effects are included. For example, once fixed heterogeneity is taken into account, the Very Strongly Risk Averse face a hazard 75% greater than the Weakly Risk Averse compared to a hazard 34% greater when fixed effects are excluded. Finding that the basic results are upheld when family fixed effects are included makes a causal interpretation of the effect of risk attitudes on marriage more plausible.

Supply-Side or Demand-Side Behavior?

Table 5 presents the basic hazard estimation separately for the two sexes and reveals an interesting difference. While the signs on the coefficients of the risk variables remain the same as for estimation on the whole sample, the hazard ratios suggest that the effect of risk preference on time to marriage is magnified for men for the Very Strongly Risk Averse and the Weakly Risk Averse. Moreover, the statistical significance of these two risk categories is much greater for men[9]. Overall, the results suggest that risk preferences matter more for men than women when it comes to the timing of marriage. A possible explanation of the differential results between the sexes, one hinted at in the theory section, is that both supply-side and demand-side behavior are reflected in the estimates. On the supply side, the more risk averse marry sooner because of the uncertainty of future prospects. On the demand side, women view risk aversion as a

[9] The same pattern is observed when the Cox proportional hazards estimation is performed separately for the sexes using the 2002 risk preference variables. Results are available upon request.

desirable trait in a mate because risk averse men may exhibit more responsible behavior, financially and otherwise, than their more risk loving counterparts. Risk aversion signals that a potential husband will not take unnecessary risks and will therefore be a good provider or partner. This finding points to another reason that the more risk averse may marry sooner; namely, marriage is a form of risk pooling that provides insurance against unexpected shocks to income or health. Perhaps women value this aspect of marriage more so than men.

Risk aversion should also have some bearing on who an individual marries, not only when they marry. If the basic job search model holds, then the risk averse respondents will not only marry sooner than their more risk loving counterparts but will also settle for a lower reservation quality level. Thus, their spouses should have less desirable characteristics than the spouses of more risk loving respondents. On the other hand, on the demand side, if risk aversion is a trait that women find desirable in men, then risk averse men may have other desirable traits as well. Spousal characteristics are limited in the NLSY79, but Table 6 presents the majority of spousal characteristics of married respondents by risk category. The spouses of married, Very Strongly Risk Averse men have less desirable characteristics (education, income, hours worked, fraction that work) than the spouses of married, Weakly Risk Averse men. The education variable may be the most relevant in this situation, since the labor supply variables for wives are partly determined by household preferences over the wife's allocation of time. However, this may also be evidence that risk aversion is a signal of being a good provider, since the more risk averse men match up with women who work less. Overall, these basic descriptive statistics support the predictions of a basic marriage search model

in which the risk averse individual accepts a lower reservation quality and therefore marries earlier. In contrast, the spouses of married, Very Strongly Risk Averse women are not consistently less desirable. While incomes and years of education are lower for spouses of risk averse women, the differences in the means of these variables between the Weakly Risk Averse and Very Strongly Risk Averse wives are not statistically significant. However, husbands fare better in other categories. These basic statistics do corroborate the result that risk attitudes affect time to marriage more strongly for men. Risk averse men may be willing to accept a lower reservation quality (less desirable spousal characteristics in general) in order to marry sooner and avoid future uncertainty about the likelihood of meeting a marriageable partner again. While some risk averse women marry sooner as well, they also value risk aversion in their mates, which magnifies the effect of risk preference on men's time to marriage.

VI. Conclusion

Understanding the role that risk preferences play in influencing behavior is important, since risk attitudes likely play a central role in all kinds of decision-making. While this need to understand the relationship between individual variation in risk attitudes and behavior is widely acknowledged, limited empirical studies exist that undertake the task. This is largely due to a lack of the type of data required to construct empirical measures of risk aversion. Nevertheless, some appropriate data do exist, but no studies have analyzed the relationship between risk preferences and the timing of marital decisions. The current study attempts to do just this.

The initial theoretical motivation is a basic search model inspired by job search. The model predicts that the more risk averse searcher's penchant for a certain outcome results in a lower reservation quality compared to their more risk loving counterparts, and thus they enter into marriage sooner. The initial empirical results, including within-family analyses, support this basic prediction. Further inspection of the data suggests that risk preferences affect marital decisions differentially between the sexes. Risk attitudes seem to have a larger and more statistically significant effect on time to marriage for men than for women. This leads to the hypothesis that demand-side behavior, not only supply-side behavior, may be reflected in the empirical results. Women may view high levels of risk aversion as a desirable characteristic, so that a potential mate's quality increases with risk aversion. Since the basic search model predicts that the risk averse have a lower reservation quality level than other searchers, one might expect the characteristics of their spouses to be less desirable than the spousal characteristics of the more risk loving. Some basic descriptive statistics support this prediction for spouses of men, but not spouses of women. This outcome further supports the hypothesis that women's demand for risk aversion is on display, since the spouses of risk averse women actually have more desirable characteristics than other spouses.

Several extensions specific to the study at hand come to mind. First, the theoretical model could be made more realistic. At present, the model implicitly assumes that remaining single is strictly dominated by searching for a spouse. In addition, marriage may be attractive to the risk averse for additional reasons not modeled here. In particular, marriage may act as a form of insurance in which access to pooled resources insures against unexpected shocks. Next, richer data would allow analysis of other

intriguing questions, such as how risk preferences influence the transition from cohabitation to marriage and whether population trends in age at first marriage over time can be partially attributed to changes in risk preferences.

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Table 1

Distribution of Risk Aversion in 1993 by Characteristics (%)

	Very Strongly Risk Averse	*Strongly Risk Averse*	*Moderately Risk Averse*	*Weakly Risk Averse*	*Observations*
Total Population	46	12	17	25	9,008
Sex:					
Men	43	11	17	29	4,462
Women	49	13	17	21	4,546
Age:					
28-30	44	12	18	27	3,274
31-33	47	12	17	24	3,566
34-36	48	12	16	24	2,168
Education:					
Less than high school	46	8	16	30	1,303
High school	49	11	16	24	3,915
Some college	45	13	18	24	2,086
College graduate	41	15	19	25	1,059
Graduate School	41	18	18	23	644
Race:					
White	46	13	18	23	4,528
Black	47	10	15	28	2,720
Hispanic	46	11	16	27	1,760
Kids:					
No kids in HH	41	11	17	30	3,510
Kids less than 6 in HH	48	13	17	22	3,479
Kids 6 to 13 in HH	51	11	16	21	1,802
Kids 14 and older in HH	50	10	16	25	214

Table 2

Distribution of Risk Aversion by Age at First Marriage (%)

Age at First Marriage	*Very Strongly Risk Averse*	*Strongly Risk Averse*	*Moderately Risk Averse*	*Weakly Risk Averse*	*Observations*
			All		
Less than 21	52	11	16	21	2,092
21-25	49	13	17	21	2,340
25-30	43	14	18	25	1,619
30+	41	13	18	29	1,055
Never Married	41	10	16	34	1,723
			Women		
Less than 21	53	11	16	20	1,435
21-25	50	16	18	17	1,145
25-30	46	17	16	21	695
30+	45	13	17	26	443
Never Married	45	11	17	27	729
			Men		
Less than 21	47	11	16	25	657
21-25	49	10	16	24	1,195
25-30	42	12	19	27	924
30+	38	12	19	31	612
Never Married	38	9	15	38	994

Table 3

Survival Analysis of Time to First Marriage

Cox Proportional Hazards Model Using 1993 Risk Measure

	Basic Model (Specification 1)				*Stratified Model with Clustered Standard Errors (Specification 2)*			
Variable	**Coefficient**	**Hazard Ratio**	**z**	**P>|z|**	**Coefficient**	**Hazard Ratio**	**z**	**P>|z|**
Very Strongly Risk Averse	0.269	1.31	7.46	0.000	0.270	1.31	7.46	0.00
Strongly Risk Averse	0.233	1.26	4.82	0.000	0.236	1.27	4.98	0.00
Moderately Risk Averse	0.171	1.19	3.82	0.000	0.182	1.20	4.03	0.00
White	0.095	1.10	2.28	0.023				
Black	-0.525	0.59	-11.06	0.000				
Male	-0.239	0.79	-8.02	0.000				
Education	-0.126	0.88	-3.17	0.002	-0.067	0.94	-1.57	0.12
Education Squared	0.006	1.01	4.05	0.000	0.004	1.00	2.23	0.03
No Kids in HH	0.041	1.04	0.48	0.630	-0.127	0.88	-1.38	0.17
Kids Less than 6 in HH	0.196	1.22	2.16	0.031	0.056	1.06	0.58	0.56
Urban	-0.159	0.85	-4.20	0.000				
Log Weekly Real Income	0.150	1.16	16.70	0.000	0.151	1.16	15.55	0.00
Enrolled in School	-0.488	0.61	-11.49	0.000				
Lived with Parents until 18	0.046	1.05	1.50	0.135	0.058	1.06	1.82	0.07
Northeast	-0.174	0.84	-3.98	0.000				
South	0.126	1.13	3.32	0.001				
West	0.000	1.00	-0.01	0.992				
Live with Parents Now	-0.166	0.85	-5.31	0.000	-0.192	0.83	-5.94	0.00

Figure 1

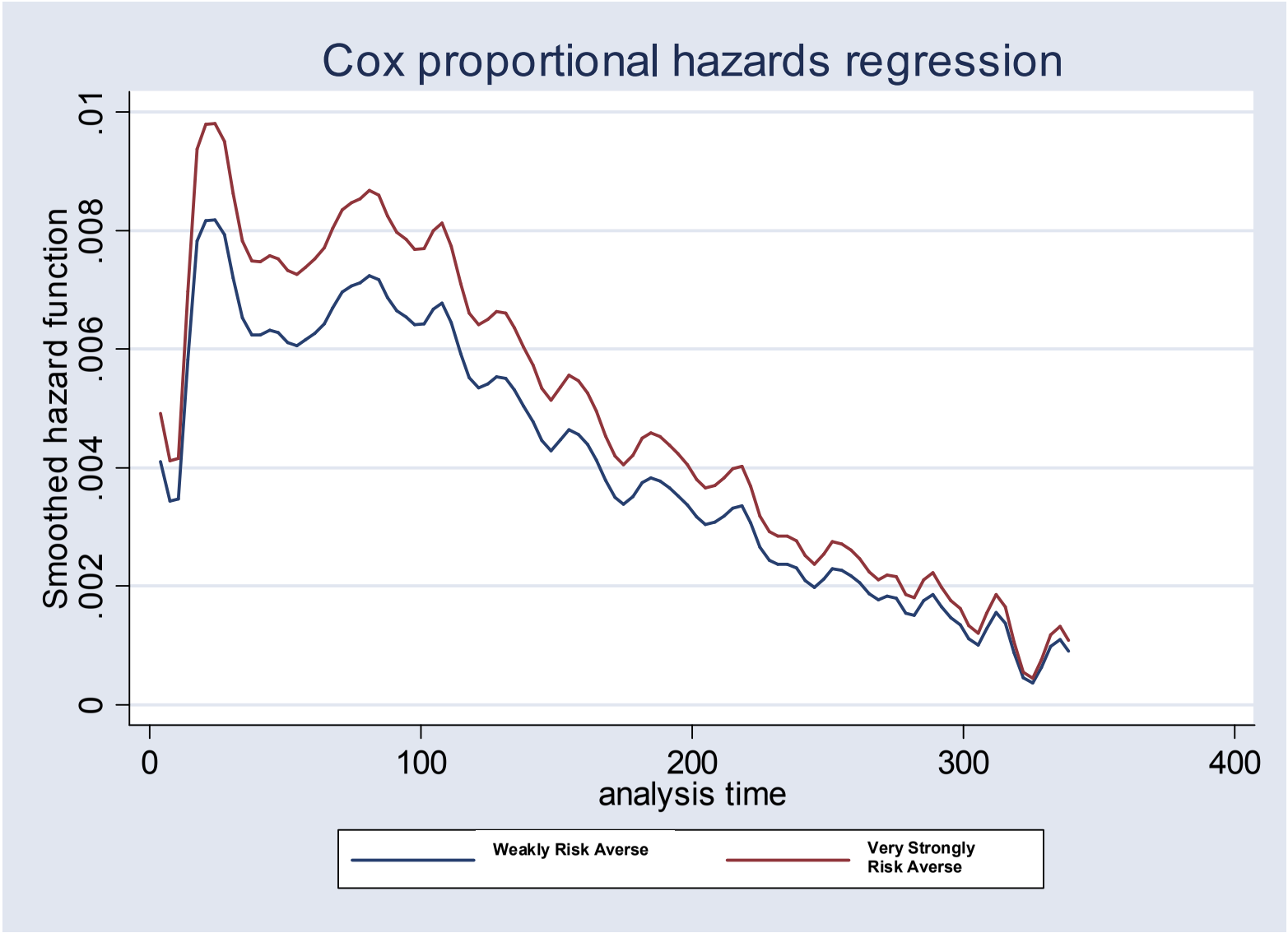
Cox proportional hazards regression
Smoothed hazard function
0
.002
.004
.006
.008
.01
0
100
200
300
400
analysis time
Weakly Risk Averse
Very Strongly Risk Averse

Table 4

Survival Analysis of Time to First Marriage for Siblings

Cox Proportional Hazards Model Using 1993 Risk Measure

	Basic Model (Specification 3)				*Basic Model with Sibling Fixed Effects (Specification 4)*			
Variable	**Coefficient**	**Hazard Ratio**	**z**	**P>|z|**	**Coefficient**	**Hazard Ratio**	**z**	**P>|z|**
Very Strongly Risk Averse	0.293	1.34	6.11	0.000	0.561	1.75	6.69	0.000
Strongly Risk Averse	0.207	1.23	3.18	0.001	0.400	1.49	3.59	0.000
Moderately Risk Averse	0.181	1.20	2.98	0.003	0.399	1.49	3.88	0.000
White	0.057	1.06	1.03	0.301				
Black	-0.549	0.58	-8.58	0.000				
Male	-0.279	0.76	-7.00	0.000	-0.641	0.53	-9.06	0.000
Education	-0.024	0.98	-0.41	0.682	-0.148	0.86	-1.26	0.207
Education Squared	0.002	1.00	1.05	0.296	0.009	1.01	2.08	0.037
No Kids in HH	0.219	1.25	1.84	0.067	0.537	1.71	3.55	0.000
Kids Less than 6 in HH	0.353	1.42	2.77	0.006	0.598	1.82	4.20	0.000
Urban	-0.141	0.87	-2.73	0.006	0.125	1.13	1.37	0.172
Log Weekly Real Income	0.150	1.16	12.26	0.000	0.163	1.18	10.29	0.000
Enrolled in School	-0.481	0.62	-8.44	0.000	-0.495	0.61	-7.34	0.000
Lived with Parents until 18	0.061	1.06	1.41	0.157	-0.004	1.00	-0.03	0.974
Northeast	-0.108	0.90	-1.86	0.063	-0.038	0.96	-0.17	0.861
South	0.147	1.16	2.88	0.004	0.518	1.68	3.07	0.002
West	0.040	1.04	0.67	0.504	0.271	1.31	1.54	0.124
Live with Parents Now	-0.149	0.86	-3.56	0.000	-0.194	0.82	-3.73	0.000

Table 5

Survival Analysis of Time to First Marriage by Gender

Cox Proportional Hazards Model Using 1993 Risk Measure

	Men (Specification 5)				*Women (Specification 6)*			
Variable	**Coefficient**	**Hazard Ratio**	**z**	**P>|z|**	**Coefficient**	**Hazard Ratio**	**z**	**P>|z|**
Very Strongly Risk Averse	0.382	1.47	7.80	0.000	0.169	1.18	3.17	0.002
Strongly Risk Averse	0.278	1.32	4.00	0.000	0.173	1.19	2.53	0.011
Moderately Risk Averse	0.247	1.28	4.06	0.000	0.096	1.10	1.45	0.148
White	0.079	1.08	1.35	0.178	0.118	1.13	1.99	0.047
Black	-0.530	0.59	-7.95	0.000	-0.517	0.60	-7.58	0.000
Education	-0.205	0.81	-3.73	0.000	-0.045	0.96	-0.73	0.464
Education Squared	0.009	1.01	4.39	0.000	0.003	1.00	1.42	0.155
No Kids in HH	-0.151	0.86	-0.83	0.408	-0.023	0.98	-0.22	0.822
Kids Less than 6 in HH	0.191	1.21	0.96	0.338	0.040	1.04	0.38	0.702
Urban	-0.226	0.80	-4.33	0.000	-0.101	0.90	-1.82	0.069
Log Weekly Real Income	0.201	1.22	13.91	0.000	0.110	1.12	9.14	0.000
Enrolled in School	-0.484	0.62	-7.37	0.000	-0.497	0.61	-8.86	0.000
Lived with Parents until 18	0.013	1.01	0.30	0.768	0.071	1.07	1.59	0.111
Northeast	-0.187	0.83	-3.00	0.003	-0.172	0.84	-2.79	0.005
South	0.222	1.25	4.19	0.000	0.048	1.05	0.88	0.380
West	-0.033	0.97	-0.52	0.603	0.033	1.03	0.53	0.596
Live with Parents Now	-0.244	0.78	-5.46	0.000	-0.069	0.93	-1.57	0.117

Table 6

Spousal Characteristics of Married Respondents by Risk Attitudes

	Married Men		*Married Women*	
	Weakly Risk Averse	Very Strongly Risk Averse	Weakly Risk Averse	Very Strongly Risk Averse
Fraction that Work	0.75	0.73	0.93*	0.95*
Hours Worked	32.80*	31.73*	43.00	43.56
Income	16,247*	13,833*	30,676	29,974
Education	12.88	12.75	12.79	12.68
Fraction Weeks Worked in Year	0.68	0.67	0.88*	0.91*

Appendix

Proposition: Given *F(q)*, if $U_A(q) = G[U_B(q)]$ for all q, then $\bar{q}_A < \bar{q}_B$.

Proof: Let B's optimal strategy be to reject all offers $q < \bar{q}_B$ and accept otherwise. Let W_B denote the random payoff that is generated from following this strategy. Similarly, let A's optimal strategy be to reject all offers $q < \bar{q}_A$ and accept otherwise, and let W_A denote the random payoff generated by this strategy. Now it must be determined if q_B is an acceptable offer to a type A searcher. Per the above notation, the following holds:

$$U_A(\bar{q}_B) = G[U_B(\bar{q}_B)] = G[EU_B(W_B)] \tag{A1}$$

Since W_B is associated with B's optimal strategy, searcher B is worse off when following A's strategy, so

$$G[EU_B(W_B)] > G[EU_B(W_A)] \equiv G[U_B(E(W_A) - r_{B,W_A})], \tag{A2}$$

where r_{B,W_A} is the risk premium B would pay to avoid the random payoff W_A.. Since A's risk premium is larger than B's,

$$G[U_B(E(W_A) - r_{B,W_A})] > G[U_B(E(W_A) - r_A)] \equiv U_A(\bar{q}_A). \tag{A3}$$

Thus, $$U_A(\bar{q}_B) > U_A(\bar{q}_A), \text{ so } \bar{q}_B > \bar{q}_A. \tag{A4}$$

In other words, any quality level that type B is willing to accept is also acceptable to the type A searcher, so A's reservation quality is less than B's.

Table A1
Change in Risk Category
By Percent of 1993 Risk Category

	2002 Risk Category				
1993 Risk Category	Very Strongly Risk Averse	Strongly Risk Averse	Moderately Risk Averse	Weakly Risk Averse	Missing
Very Strongly Risk Averse	53.5	8.7	10.6	11.4	15.8
Strongly Risk Averse	42.0	15.7	13.5	14.2	14.6
Moderately Risk Averse	40.1	11.8	18.5	14.5	15.2
Weakly Risk Averse	35.2	9.5	14.5	23.8	17.0

Table A2

Survival Analysis of Time to First Marriage for Marriages Occurring After 1993

Cox Proportional Hazards Model Using 1993 Risk Measure

Variable	Coefficient	Hazard Ratio	z	P>|z|
Very Strongly Risk Averse	0.113	1.12	1.22	0.224
Strongly Risk Averse	0.042	1.04	0.32	0.752
Moderately Risk Averse	0.070	1.07	0.62	0.534
White	-0.055	0.95	-0.44	0.658
Black	-0.274	0.76	-2.11	0.035
Male	0.183	1.20	2.09	0.037
Education	-0.077	0.93	-0.68	0.498
Education Squared	0.004	1.00	1.01	0.312
No Kids in HH	-0.337	0.71	-2.48	0.013
Kids Less than 6 in HH	0.043	1.04	0.29	0.773
Urban	-0.133	0.88	-1.20	0.228
Log Weekly Real Income	0.043	1.04	2.09	0.037
Enrolled in School	0.033	1.03	0.21	0.831
Lived with Parents until 18	-0.058	0.94	-0.71	0.475
Northeast	-0.047	0.95	-0.40	0.691
South	0.152	1.16	1.51	0.131
West	0.137	1.15	1.12	0.262
Live with Parents Now	-0.228	0.80	-2.04	0.042

Table A3

Survival Analysis of Time to First Marriage

Cox Proportional Hazards Model Using 2002 Risk Measure

Variable	Coefficient	Hazard Ratio	z	P>|z|
Very Strongly Risk Averse	0.166	1.18	3.90	0.000
Strongly Risk Averse	0.126	1.13	2.25	0.024
Moderately Risk Averse	0.105	1.11	2.00	0.045
White	0.062	1.06	1.37	0.170
Black	-0.547	0.58	-10.69	0.000
Male	-0.227	0.80	-7.11	0.000
Education	-0.087	0.92	-1.97	0.048
Education Squared	0.005	1.00	2.81	0.005
No Kids in HH	0.029	1.03	0.33	0.744
Kids Less than 6 in HH	0.183	1.20	1.90	0.057
Urban	-0.130	0.88	-3.22	0.001
Log Weekly Real Income	0.152	1.16	15.72	0.000
Enrolled in School	-0.479	0.62	-10.58	0.000
Lived with Parents until 18	0.034	1.03	1.02	0.306
Northeast	-0.174	0.84	-3.71	0.000
South	0.141	1.15	3.50	0.000
West	-0.012	0.99	-0.25	0.805
Live with Parents Now	-0.189	0.83	-5.61	0.000