The Interaction of Risk Tolerance, Religiosity, and Gender in Explaining Risky Behaviors

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ABSTRACT

It is well established that risk preferences, religiosity, and gender are all strongly correlated with risky behaviors such as smoking, drinking, and criminal activity, and that they are also correlated with each other. Using the Panel Study of Income Dynamics (PSID), I investigate the implications of the correlations among risk preferences, religiosity and gender for the observed effects of each of these variables on risky behaviors. I find that the effects of these variables are all strongly robust to including the others in the regression; although they are correlated, they have entirely independent correlations with risky behaviors.

I INTRODUCTION

In this paper, I look at three factors that have been shown to be strongly correlated with a person's likelihood of engaging in risky behaviors: risk preferences, religiosity, and gender. The individual relationships are well-studied; however, there are also strong correlations among these three factors: women are more risk averse, women are more religious, and people who are more risk averse are more religious. The gender differences have received a significant amount of attention, but the direct relationship between risk preferences and religiosity has received much less attention.

The strong relationships between these factors complicate the interpretation of the observed relationships. For instance, the relationship between religiosity and many risky behaviors is well-documented, and this could lead to the conclusion that religion-based interventions would be an effective way to discourage behaviors such as smoking and drinking. However, it is also possible that the correlation between religiosity and these behaviors only exists because of omitted variable bias, so that increasing religiosity will not in fact cause risky behaviors to decrease; one possible omitted variable is risk tolerance. I thus investigate the implications of the correlations among risk tolerance, religiosity and gender for the observed relationship of each of these variables with risky behaviors to determine whether each of these relationships remains stable when the other factors are taking into account; if the relationship between religiosity and risky behaviors is robust to controlling for risk tolerance that provides support for the hypothesis of a direct causal relationship between religiosity and risky behaviors.

The data I use are from the Panel Study of Income Dynamics (PSID), the only broadly representative dataset that contains measures of both religiosity and risk preferences. The

measure of religiosity I use combines three factors: frequency of attendance at religious services, number of volunteer hours for religious organizations, and amount donated to religious organizations. The measure of risk preferences is based on a series of questions about a choice between a job that guarantees you income for life equal to your current total income and one that has a 50-50 chance of doubling your income and a 50-50 chance of cutting your income by some fraction. I also have detailed demographic and socioeconomic data, as well as information on a number of behaviors such as smoking, drinking, self-employment, and investment decisions.

I show that even though risk preferences, religiosity, and gender are highly correlated, they each have independent correlations with risky behaviors; for instance, controlling for risk tolerance does not significantly lower the estimated correlation between religiosity and risky behaviors. I find strong associations between each of risk tolerance, religiosity, and gender, and almost every risky behavior studied, in the expected directions. As religiosity, risk tolerance, and gender all have associations with behavior of comparable strength, this research reaffirms both the relationship between religiosity and behavior and the validity of risk preferences as a measurement of some individual characteristic that is associated with a wide variety of risky behaviors, as well as the importance of gender in explaining behaviors even when many other factors are controlled for. This research thus provides support for the idea that religious programs may be an effective way to decrease behaviors such as smoking and drinking.

This paper is laid out as follows: section II discusses the background and reviews the literature; section III describes the data used; section IV lays out the empirical approach; section V gives the results; section VI analyzes some subgroups of interest, and section VII concludes.

II BACKGROUND

Religiosity and Risky Behaviors

Iannaccone (1998) provides an excellent summary of the economics of religion literature; it includes two strains of research that are relevant to this paper: first, research on the consequences of religion, which includes many papers documenting a relationship between religion and a wide range of behaviors including drug use, school attendance, and criminal activity; second, research on the factors that cause a person to be more or less religious.

Iannaccone summarizes research done before 1998 documenting a relationship between religion and risky behaviors. Since then, the literature has continued to develop. Recent contributions include Gruber (2005) which uses two facts to look at the effect that exogenous changes in religiosity have on outcomes such as education levels and income. The first fact is that if a higher fraction of a person's neighbors share that person's religion, that person will attend religious services more often; higher religious density causes more religious attendance. The second is that religious density of a neighborhood is partly determined by the ethnic mix of the neighborhood. The religious density of a neighborhood for a certain person can thus be exogenously predicted using the density of different ethnic groups in the neighborhood, not including the person's own ethnic group. Using these facts, he finds strong positive effects of religion on both education and income.

Risk Preferences and Risky Behaviors

Economists have long assumed that there is a stable, measurable characteristic called "risk preference" that can be used to predict people's behaviors across a wide variety of domains. It has also been quite widely assumed that a question which elicits a person's attitude toward

financial risk can create a valid measure of this characteristic. There have been a number of recent attempts to take a closer look at these assumptions in a variety of ways.

The paper I focus on is Barsky et al. (1997) because the questions used to measure risk preferences in this paper are almost the same as the ones in the PSID. Barsky et al. look at measures of risk tolerance, time preference, and intertemporal substitution that were all asked in wave 1 of the Health and Retirement Study (HRS) in 1992; the measure of risk tolerance I use from the PSID is based on the measure used in the HRS. In the risk tolerance section, Barsky et al. look at patterns of risk tolerance with respect to demographic characteristics such as age, sex, and race. They also look at the relationship between risk tolerance and various risky behaviors and find significant effects on variables such as smoking, drinking, home ownership, and investment choices.

Dohmen et al. (2005)extend this work by looking not only at the financial risk question, but also at a question that asks people to say how willing they are, generally, to take risks, on a scale from 0 to 10. They compare the answers to these questions not only to other questions in the survey, but also to behavior in the context of a field experiment. They find that answers to the financial risk question have predictive power for many, but not all, of the risky behaviors they study, while the question asking about general attitude towards risk has predictive power for all behaviors.

Risk Preferences and Religiosity

There are many reasons risk aversion and religiosity could be correlated. First, it could be that people who are more risk averse are more likely to be religious because religion provides insurance. Religion could be thought of as providing several different types of insurance: first, it

can be thought of as providing "spiritual insurance." This idea goes back at least to the 17th century French mathematician and philosopher Blaise Pascal. He developed an argument, referred to as "Pascal's wager," which suggests that you should believe in God (in the Christian sense), and act as if you believe, because, if you can't be certain, denying God's existence is too risky. If you choose not to believe in God and God does exist, you will spend eternity in hell; on the other hand, if you believe in God and God does not exist, you have not lost very much by believing, but if he does exist, you will spend eternity in heaven. Religiosity can thus be thought of as insurance against the possibility of going to hell.

Two other types of insurance that may be provided by religion are consumption and happiness insurance. Dehejia et al. (2005) find evidence that some religious organizations provide consumption insurance and some provide happiness insurance, and Chen (2005) shows that people who were hit hardest by the Indonesian financial crisis became more religious. Clark and Lelkes (2005) also finds evidence, using two large-scale European datasets, that religion can act as happiness insurance in the case of unemployment and divorce.

The causality could also, however, go in the opposite direction: religion could cause people to be more risk averse. This is slightly less intuitive because a person's risk preferences are generally thought of as a stable, exogenous characteristic; Stark (2002) discusses evidence that risk preferences have a physiological basis. However, risk preferences are not always assumed to be stable: Brunnermeier and Nagel (2004) study whether fluctuations in wealth might change a person's risk preferences. It is possible that in addition to discouraging particular risky behaviors, religion, by emphasizing responsibility and planning, for instance, could change a person's overall level of risk aversion. It must be noted that changing risk aversion is very different from changing certain behaviors; if religion causes people to be more risk averse, all

risky behaviors will change, even ones, such as investing in stocks, that are not discouraged by religious leaders. This is very different from changing the behaviors that are regarded as vices and generally discouraged by religious leaders, such as smoking and drinking.

Finally, it is possible that there is not, in fact, any causal relationship between risk aversion and religiosity; it could just be a spurious correlation caused by some third factor. In this paper I do not attempt to differentiate among these different relationships between risk preferences and religiosity; the different possibilities provide context for my work, and I am interested in the implications of this relationship for the effects of risk preferences and religiosity on behavior. I leave it to future work to tease out the causality.

Gender Differences

Women are less likely to engage in risky behaviors than men are; they have lower rates of criminality, smoking, drinking, etc. (Byrnes, Miller and Schafer, 1999). They also have lower risk tolerance, on average (Dohmen et al., 2005). Finally, while the results on the relationships between religiosity and education and religiosity and age are unclear and not consistent, "the data are clear: women consistently demonstrate a greater affinity for religion than men," (Spilka et al., 2003).

Miller and Hoffman (1995) argue, using a nationally representative survey of high school seniors, that controlling for risk tolerance attenuates the gender difference in religiosity. Stark (2002) also argues that the gender difference in religiosity is related to the gender difference in risk preferences. He takes it a step further than Miller and Hoffman, however, by arguing that there is a convincing body of evidence that the gender difference in risk preferences is

physiological, and the gender difference in religiosity is caused by this physiologically based difference in risk preferences.

III DATA

The data for this study come from the *Panel Study of Income Dynamics* (*PSID*), specifically the 1996 & 2003 waves, because the module measuring risk tolerance was in the 1996 wave, while a good measure of religiosity was not available until the 2003 wave. The 2003 wave of the PSID is thus the first time that a large, representative survey has been available that contained good measures of both risk tolerance and religiosity for the same people. The only other large-scale survey that is now available containing measures of both is the Health and Retirement Survey (HRS), which includes both the same risk tolerance measure and a question about attendance at religious services. The HRS, however, is focused on people who were between the ages of 51 and 61 during the first wave of the study in 1992. The PSID is therefore the only dataset that allows one to look at the relationship between risk tolerance and religiosity among a broadly representative sample of individuals.

The survey is asked at the household level, but many of the questions, such as those about smoking and drinking, are asked of both the head and the wife. I thus create individual-level observations, so for households headed by a couple I have two observations, one for the husband and one for the wife. Each observation will also have family-level data such as family income and wealth. The one variable that I have for at most one person per household is risk tolerance; the questions in this module were only asked of the survey respondent, who is usually the head of the household. This is also the only variable that does not come from the 2003 survey—I thus match the risk tolerance measure with the individual ID for the person who was the survey

respondent in the household in 1996 and use this to merge the information into the 2003 data. This leaves me with 12,120 observations for most variables, but only 3,499 observations that include all variables, including risk tolerance.

[FIGURE 1 HERE]

Table 1 shows the means and standard deviations of all of the variables used in the OLS regressions except for risk tolerance (whose distribution is shown in Figure 1.) Column 1 uses all of the data in the 2003 survey, while column 2 uses only the 3,499 observations that contain all data. Panel A shows the demographic variables; some of these values may appear to be too large, for instance an average family income of almost $70,000. This is because families headed by married couples have higher incomes than other families, and these families are counted twice in the data, because observations are at the individual level, rather than the household level. This means that there is only have one observation from each single parent household while there are two observations from each married household. The mean family income using one observation per family is $60,813, which is in fact below the value estimated from the CPS of $66,970.[i]

[TABLE 1 HERE]

Comparing columns 1 and 2, the means are sometimes significantly different; there are two reasons for this difference. First, because the module measuring risk preferences was only used in 1996, this only includes people who were in the survey in both 1996 and 2003. This means that only people who were either the household head or the wife in 1996 and the

household head or wife again in 2003 are included. It also means that the immigrant sample added to the survey to make it more representative in 1997 is excluded. (The survey was representative of the U.S. population in 1968, and since then has been following those same people and their offspring and spouses. That means that immigrants who arrived in the U.S. since 1968 are vastly underrepresented. An immigrant sample was thus added into the survey in 1997.) This explains why the percent Hispanic (and hence percent Catholic) is so much lower in the restricted data. Second, the risk tolerance module in only asked of respondents if they are employed, so the restricted data has higher income, education, etc. and fewer women.

Risk Preferences

The series of questions used to measure risk tolerance are the same as the ones that Barsky et al. use from the HRS; see Barsky et al. (1997) for the logic behind its development. The first question in the series is:

> Suppose you had a job that guaranteed you income for life equal to your current, total income. And that job was (your/your family's) only source of income. Then you are given the opportunity to take a new, and equally good, job with a 50-50 chance that it will double your income and spending power. But there is a 50-50 chance that it will cut your income and spending power by a third. Would you take the new job?

A respondent who answers no is then asked about a 50-50 chance of income being cut by a fifth; a respondent who answers yes is asked about a 50-50 chance of income being cut by a half. So far, this is exactly the same as the module in the HRS. However, while the HRS questions stop at a fifth, in the PSID if a respondent answers no to income being cut by a fifth, the survey goes on to ask about a tenth; if the respondent answers yes to income being cut by a half, the survey goes on to ask about it being cut by 75%. Because of the phrasing of this question, it is only asked of individuals who are currently employed. This series of questions has

the advantage of being about an amount of money that scales by income, so there shouldn't be much variation in the measurement of risk aversion by income level. (And I do not, in fact, find very much variation.)

The HRS, like the PSID, is a panel survey, and the risk tolerance module was asked of everyone for wave 1, and repeated in wave 2 for 10% of the sample. Barsky et al. use the repeated sample to estimate the measurement error in the risk tolerance values and use that to generate a better estimate of risk tolerance. See Barsky et al. (1997) for the details; because the PSID question is so similar but is only asked once, the PSID uses the Barsky et al. calculations for the values of risk tolerance. This means that some information is lost, because the information from the questions about income being cut by a tenth or 75% is dropped and only the information from the questions about income being cut by a third and a fifth is used. This means I lose some variation (although I have the same number of observations); however, the results generated from using the corrected values are much more precise, so I use those data. Figure 1 shows the resulting values of risk tolerance; almost half of the sample (49%) chooses the lowest value, and the other half of the sample is very evenly divided among the other three values (16%, 16%, and 20%.)

Religiosity

The PSID contains 3 potential measures of religiosity: frequency of attendance at religious services, amount donated to religious organizations, and hours spent volunteering for religious organizations. Gruber (2004) used variation in tax rates to show that attendance and giving are substitutes, so combining them should give a more complete measure of religiosity. **(**Whether giving and volunteering are substitutes or complements, in general or in the religious

context, remains an open question (Carlin, 2001), but including volunteering in addition to giving should create an even more complete measure of religious involvement.)

None of these measures of religiosity are distributed normally. Their distribution is much closer to lognormal, but there are many zeros in each of them, so using logs would cut the sample significantly. Figures 2 and 3 show this visually; they are kernel densities of attendance at religious services (times per year) and the log of attendance at religious services, respectively, neither of them including zeros, which are 27% of the observations. Figure 2 shows a distribution where the vast majority of the observations are clustered very close to zero and there is a very, very long tail; figure 3 gives a much clearer view of the distribution—the large peak is at attendance once a week, although there is still a fairly long tail.

[FIGURE 2 HERE]

[FIGURE 3 HERE]

Also, combining these three separate measures into one index of religiosity requires measuring each of them in a comparable way. I have chosen to translate each one into a percentile; all zeros are given a percentile of .01 and the highest 1% are given a percentile of 1.0. The religious index is then the average of the attendance percentile, the giving percentile and the volunteering percentile. Translating each into a percentile allows me to keep all the observations without being concerned about outliers and at the same time allows me to combine the three measures of religiosity. The means of both the original variables and the percentiles are shown in Panel B of Table 1. The average of the percentiles are all well under .5; in fact the mean

volunteering percentile is only 0.15. This is because there are many zeros, and all zeros have a percentile of 0.1.

Risky Behaviors

I follow Barsky et al. in my choice of outcomes to examine in order to allow direct comparison to their results. As a result, the risky behaviors studied are whether individuals have ever smoked and whether they smoke now; whether they drink now and the number of drinks they have per day; whether they are self-employed; whether anyone in their family has had health insurance over the last 2 years; and whether they own their home. The number of drinks per day is a categorical variable where 1 represents less than 1 drink a day, 2 is 1-2 drinks per day, 3 is 3-4 drinks per day, and 4 is 5 or more drinks per day.

I also follow Barsky et al. in looking at investment behaviors. The PSID questions divide financial wealth into four categories: stocks, savings, etc., IRAs, and other assets. The stocks category includes "any shares of stock in publicly held corporations, mutual funds, or investment trusts—not including stocks in employer-based pensions or IRAs." The savings, etc. category includes "any money in checking or savings accounts, money market funds, certificates of deposit, government savings bonds, or treasury bills—not including assets held in employer-based pensions or IRAs." The IRAs category includes IRAs and private annuities. Finally, other assets includes "any other savings or assets, such as bond funds, cash value in a life insurance policy, a valuable collection for investment purposes, or rights in a trust or estate." The sum of these four categories is considered to be a family's total financial assets, and the outcome variables of interest are the fraction of financial wealth that is in each category. Panel C of Table 1 shows the means of all of these outcome variables.

IV EMPIRICAL APPROACH

Part 1: Relationships among the factors

The first step is to examine the relationship among the three factors by running these regressions :

(1) $$REL_i = \beta_1 + \beta_2 RT_i + \beta_3 X_i + \varepsilon$$

(2) $$RT_i = \beta_1 + \beta_2 F_i + \beta_3 X_i + \varepsilon$$

(3) $$REL_i = \beta_1 + \beta_2 F_i + \beta_3 X_i + \varepsilon$$

where REL_i is the religiosity of individual i, RT_i is the risk tolerance of individual i, F_i is a dummy for whether the individual is female, and X_i is my vector of controls. These are each of the possible pairwise regressions of each of the factors on each other and controls, to establish these relationships among the factors before looking at the relationships of these factors with behavior. The controls used are age (35-44, 45-54, 55-64, 65 and above), race (black, Hispanic, other), female, education (high school, some college, college, more than college), religion (Catholic, other Christian, Jewish, other, unknown, none) family income decile, family wealth decile (excluding home equity), and home equity decile.

Part 2: Comparison with the Barsky et al. results

The second step is to compare the results I find with the PSID to the Barsky et al. results using the HRS. For this section I repeat their regressions:

(4) $$Y_i = \beta_1 + \beta_2 RT_i + \beta_3 X_i + \varepsilon$$

Here, Y_i is one of my measures of risky behaviors or investment choices, and X_i contains only my controls for age, race, sex, and religion, as those are the controls used by Barsky et al.

Part 3: Risky Behaviors on Each Factor and Combinations of the Factors

This section discusses regressions of the form

(5) $$Y_i = \beta_1 + \beta_2 R_i + \beta_3 X_i + \varepsilon$$

where Y_i is one of my measures of risky behaviors or investment choices for individual *i;* R_i is either religiosity, risk tolerance, gender, or some combination of these factors; and X_i is a vector of controls. The controls used are the same used in part 1: age, race, female, education, religion, family income decile, family wealth decile (excluding home equity), and home equity decile.

First three separate regressions are run: one with risk tolerance and controls; one with religiosity and controls; and one with gender and controls. These are followed by three regressions that each contain a pair of the factors: one on risk tolerance, religiosity, and controls; one on risk tolerance, gender, and controls; and one on religiosity, gender, anld controls. Finally, I run a regression on risk tolerance, religiosity, and gender combined.[ii]

Following Barsky et al., the observations for the regressions of financial assets are limited in two ways: first, they are limited to those families who have at least $1000 of financial wealth. Second, because these variables are very much at the family-level, as opposed to the individual level, only household heads are used in these regressions.

V RESULTS

Relationships among the factors

Table 2 shows the relationships among risk tolerance, religiosity, and gender; it shows the results of the regressions described in equations 1, 2, and 3. Panel A shows the results of regression 1 (religiosity on risk tolerance) and panel B, columns 1-4 show the results of regression 3 (religiosity on female). Each of columns one to four has a different measure of religiosity as the dependent variable; attendance, volunteering, donations, and the overall index.

[TABLE 2 HERE]

Looking at Panel A, the coefficient on risk tolerance is approximately -0.1 in each column. This means that, because the difference between the highest and lowest values of risk tolerance is 0.42, the least risk tolerant people have a religiosity index that is 4 percentage points higher than the most risk tolerant. This is larger than the difference between men and women of 2.9 percentage points, and as women's higher degree of religiosity is well established in the sociology literature, the fact that risk tolerance has as strong an association as gender indicates the importance of risk tolerance.

Column 3, the regression of donations to religious organizations, stands out because it is the only one where the coefficients are not significant. I do not take this, however, to mean that there is in fact no relationship; rather, this is a data issue. While risk tolerance, gender, religious attendance, and religious volunteering are measured at the individual level, donations are measured at the household level; it is thus not surprising that the relationship is weaker with donations than with the other measures of religiosity.

The final column, column 5 in panel B, shows that women are less risk tolerant than men, by .026, from a modal value, as seen in figure 1, of 0.15.

Comparison with Barsky et al. results for risky behaviors

Next I examine the relationship between risk tolerance and a variety of risky behaviors. Table 3, Panel A shows my regressions of equation (4) replicating the Barsky et al. results in the PSID, while Panel B shows the original Barsky et al. results. My results are generally very similar to the Barsky et al. results, and so serve to validate this measure of risk tolerance, as it is strongly correlated with many risky behaviors; the effect of risk tolerance is significant at the 1% level on a dummy for drinking, number of drinks per day, a dummy for self-employment, a dummy for someone in the household having health insurance**.**[iii]

[TABLE 3 HERE]

My results are broadly similar to the Barsky et al. results. One significant difference is that Barsky et al. find that more risk tolerant people are more likely to smoke now and to have ever smoked, while I find no significant effects and the point estimate on smokes now is negative, though insignificant. Although this is inconsistent with Barsky et al., it is consistent with Dohmen et al. (2005), who find no relationship between current smoking and the response to their financial measure of risk preferences but find a strong, positive relationship between current smoking and their general measure of willingness to take risks. I also find a strong, significant relationship with self-employment, whereas Barsky et al. did not. I also find slightly larger effects on drinking and self-employment, and smaller effects on home ownership; my

results are stronger in some cases and weaker in others, but broadly similar, and upholding the conclusion that risk tolerance is associated with a broad range of risky behaviors.

Risky behaviors on each factor individually and on all three together

The columns of Table 4 are the same as in Table 3; the heading of each one gives the risky behavior that is the dependent variable of the regressions whose results are listed in that column. Panel A is almost exactly the same as Panel A of Table 3, the only difference being that these regressions use my control variables, which are a somewhat broader set than those used in Barsky et al, encompassing income, wealth, and education in addition to race, sex, age, and religion. The coefficients remain very similar, although with the additional controls risk tolerance now does have a significant, positive effect on whether a person has ever smoked; the coefficient in the "smokes now" regression, however, remains small, negative, and insignificant. More risk tolerant people are more likely to have ever smoked, to drink now, to have more drink per day, to be self-employed, and to lack health insurance, and less likely to own a home.

[TABLE 4 HERE]

Panel B shows these same dependent variables on religiosity and controls, and Panel C shows these same ones on gender. The coefficients on religiosity are always the opposite sign of the coefficients on risk tolerance, as long as both are significant. This means that more religious people are less likely to behave in risky ways—the only exception to this is self-employment, which is not significantly related to religiosity. The coefficients on the female dummy, however,

are all significant and all in the opposite direction from risk tolerance—women are less likely to engage in all of these risky behaviors.

Panel D uses the same observations used in panels A-C and risk tolerance, religiosity and gender are all combined into one regression. The coefficients all remain very similar to what they were in panels A – C, although all coefficients which were significant in panels A – C decrease slightly in absolute value in panel D. (Because the results in panel D are so similar to those in panels A-C the results of the regressions on each pair of factors are not shown; they are each very similar as well.) Looking at the magnitudes of the coefficients, we can see that religiosity is the factor with the strongest correlations with behaviors. For instance, consider whether a person drinks now. The most risk tolerant people are 7.9 percentage points more likely to drink than the least risk tolerant people, while people at the 90^{th} percentile of the religiosity distribution are 18.9 percentage less likely to drink than the people at the 10^{th} percentile of the religiosity distribution, and women are 10.7 percentage points less likely to drink than men; although these are all quite large effects, the religiosity effect is certainly the largest.

Comparison with Barsky et al. results for investment choices

In Table 5 I again run regressions that can be compared with the Barsky results, but now with investment choices. Unfortunately, the questions about investments are quite different in the PSID and the HRS, so that it is more difficult to directly compare the two sets of regressions; nevertheless, my results are broadly similar to the Barsky et al. results. The categories that are the same across the two samples, stocks, and IRAs, have very similar results; the coefficient for stocks is about 0.09, while the coefficient for IRAs is very close to zero and insignificant. The category of savings, etc. in the PSID includes bonds, savings, checking, and t-bills, and the

coefficient on this category is within the range set out by the coefficients on these categories by the Barsky et al. results; it is not surprising that this one is not significant at 5% because it combines such disparate categories, some of which have a positive and some a negative relationship with risk tolerance, so the resulting standard error is large.

[TABLE 5 HERE]

Investment choices on each factor individually and on all three together

In table 6, the dependent variables are the fraction of financial wealth in each of four different categories: stocks; savings, etc.; IRAs; and other assets. In Panel A the regressions are run on risk tolerance and controls, in Panel B they are on religiosity and controls, and Panel C on gender and controls. In Panel D the regression is run on all three together. Once again, combining the three together in one regression changes the coefficients very little. These regressions are slightly less straightforward to interpret than the ones of risky behavior, because financial wealth is measured at the family level, while the variables of interest are at the individual level. Because I only use family heads, this looks at the effects of characteristics of the family head.

[TABLE 6 HERE]

The results for risk tolerance are as expected: more risk tolerant heads put more of their wealth into stocks, the riskiest investment, and less into savings, the safest. While in the context of other risky behaviors, religiosity had the opposite effect from risk tolerance, here it is more

complicated; both more risk tolerant and more religious people put less in savings accounts, but while risk tolerant people put that money into stocks instead, religious people put it into IRAs. Finally, families with female heads, controlling for everything else, have less in savings and more in "other assets." This is difficult to interpret because it is unclear what the other assets are here. In addition, this is not an effect of gender but the effect of the gender of the household head, because this regression is run on household heads; however, running the regression on only single household heads yields very similar results.

The only variable here that risk tolerance, religiosity, and gender are all significantly associated with is the fraction of the household's financial wealth that is in savings and checking accounts and other relatively safe assets. Comparing the coefficients in column 2 of panel D, we see that the percentage of financial wealth in these safe assets is 5.4 percentage points lower for the most risk tolerant people than the least risk tolerant people, 4.9 percentage points lower for people at the 90^{th} percentile of the religiosity distribution than people at the 10^{th} percentile, and 6.1 percentage points lower for women then men. So here, the magnitudes of the effect are very comparable, and are all a little more than a 10% change from a mean of 46%.

VI PROSCRIPTIVE VS.NON-PROSCRIPTIVE RELIGIOUS GROUPS

In this section I look at different religious subgroups to learn if religiosity has different relationships with behavior among individuals of different religions.[iv] I split the data according to the division used in Cochran, Beeghley, and Bock (1988) based on attitudes towards alcohol use. In religious groups categorized as non-proscriptive (Jewish, Catholic, Episcopalian, Lutheran, and Presbyterian), alcohol use is permitted in moderation, including in religious

ceremonies. On the other hand, in proscriptive groups, which includes all other Protestant denominations except Methodist, generally "not only is grape juice or some other nonalcoholic beverage substituted for wine in the liturgy, but church doctrine takes an active stand against alcohol use and religious leaders frequently preach about its ill effects," (Cochran, Beeghley, and Bock, 1988). Because the Methodists' stand on alcohol use could be described as somewhat proscriptive, they are not included in either the proscriptive or the non-proscriptive groups.

Dividing the observations into these groups thus generates more information about whether or not the relationship between religiosity and risky behaviors is causal. If being more religious causes an individual to use alcohol less, we would expect this relationship to be much more pronounced among individuals in proscriptive religious groups than in non-proscriptive groups; conversely, if they are both related to a third, omitted variable, we would expect the relationship to exist independently of the religious group.

Table 7 shows the results of performing the regression of risky behaviors on all three variables of interest, as described in equation 5, within these two subgroups. Columns 3 and 4 of panel A show that the relationship between drinking and religiosity is much stronger among people in the non-proscriptive religious denominations than among those in non-proscriptive groups; the other differences between the subgroups are all much smaller and mostly insignificant. These results imply that religion does in fact cause people to decrease alcohol consumption to quite a large degree in religions that strictly proscribe alcohol use. People in proscriptive religious groups at the 90^{th} percentile of the religiosity distribution are a full 30 percentage points less likely to drink than people in those groups who are only at the 10^{th} percentile of the religiosity distribution.

VII CONCLUSION

There is a large literature showing a strong association between religiosity and the level of risky behaviors, between risk tolerance and the level of risky behaviors, and between gender and the level of risky behaviors. However, literature on the relationships among religiosity, risk tolerance, and gender is highly speculative; I use the fact that I have measures of risk tolerance, religiosity, gender, and risky behaviors to look carefully at these relationships. It has been suggested that higher risk aversion causes more religiosity; I find that risk preferences are correlated with religiosity, although I cannot speak to the causality. It has also been suggested that women's higher level of religiosity is caused by the fact that women are more risk averse. I find that this is not true: the gender difference remains the same when risk preferences are controlled for.

In general, I conclude that the effects of religiosity, risk tolerance, and gender on risky behaviors are in fact completely independent; adding the other two variables as controls does not affect the coefficient on the third. I find that risk tolerance, as measured in the PSID, is correlated with many types of behavior, including drinking, health insurance coverage, and investment decisions, which validates this measure of risk preferences as measuring a personal characteristic that has predictive power in many different contexts. Similarly, religiosity is correlated with these behaviors as well, and controlling for risk aversion does not lower the coefficients on religiosity; this reaffirms that religiosity itself is correlated with behaviors, through a channel that is independent of risk aversion. Finally, even when risk aversion and religiosity are controlled for, the gender differences in behavior remain; these gender differences must thus be caused by other factors.

Many risky behaviors, such as smoking and drinking, can have negative externalities, and are therefore of concern to policy-makers. However, we do not have a good understanding of what determines a person's likelihood of engaging in risky behaviors; as a result, we cannot confidently predict the effects of policies on these behaviors. My results further our understanding of these behaviors by showing that risk preferences, religiosity, and gender each have powerful and independent correlations with risky behaviors; this implies that it is important to include them all in studies of these behaviors whenever possible. In addition, they show that even though women are more religious and more risk averse, controlling for religiosity and risk preferences does not change the estimated impact of gender on risky behaviors. This implies that there is another difference between men and women that accounts for their different behaviors, and understanding this gender difference could provide insight into what causes people to engage in risky behaviors.

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Figure 1: Risk tolerance values

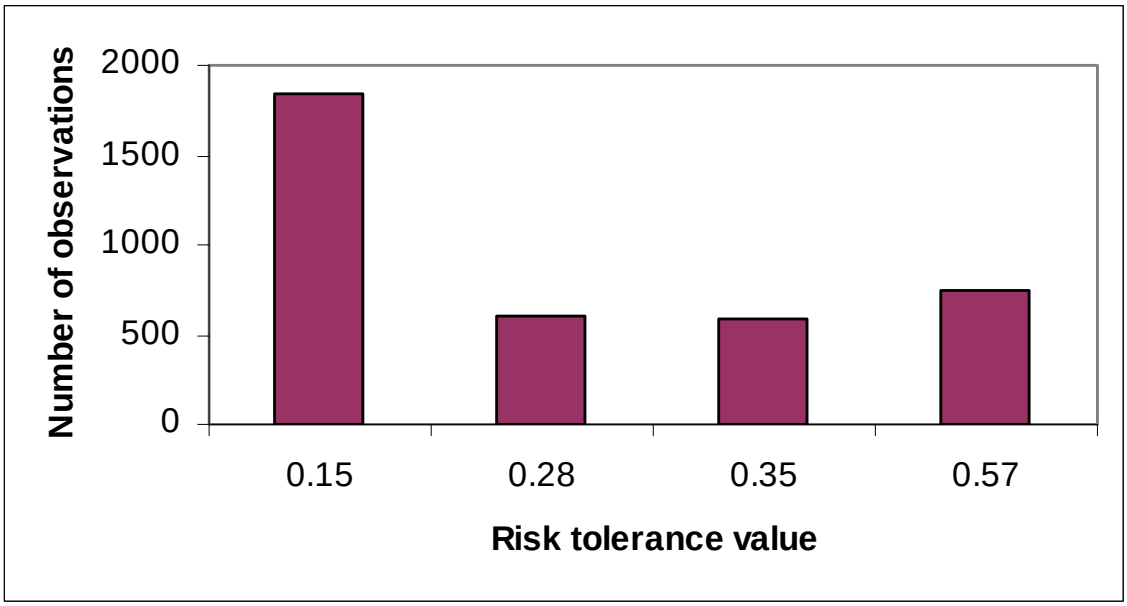

Figure 2: Kernel density of attendance at religious services

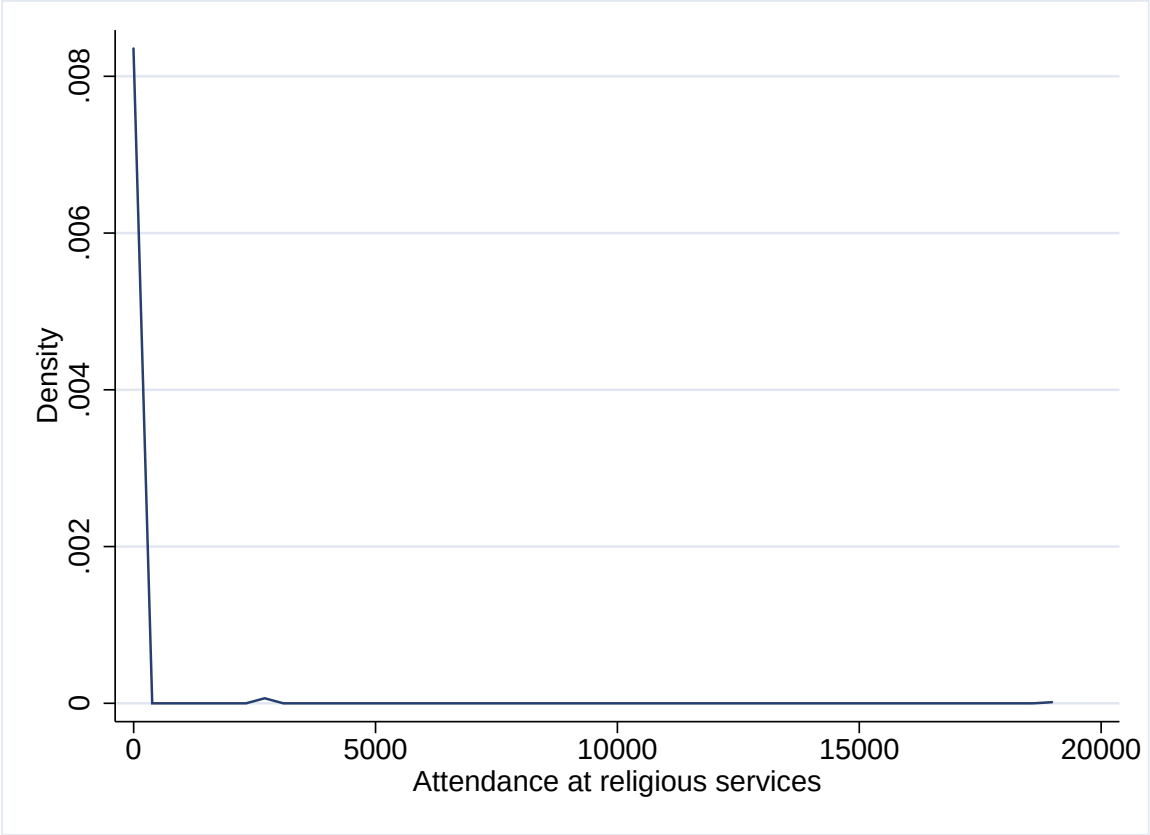

Figure 3: Kernel density of log of attendance at religious services

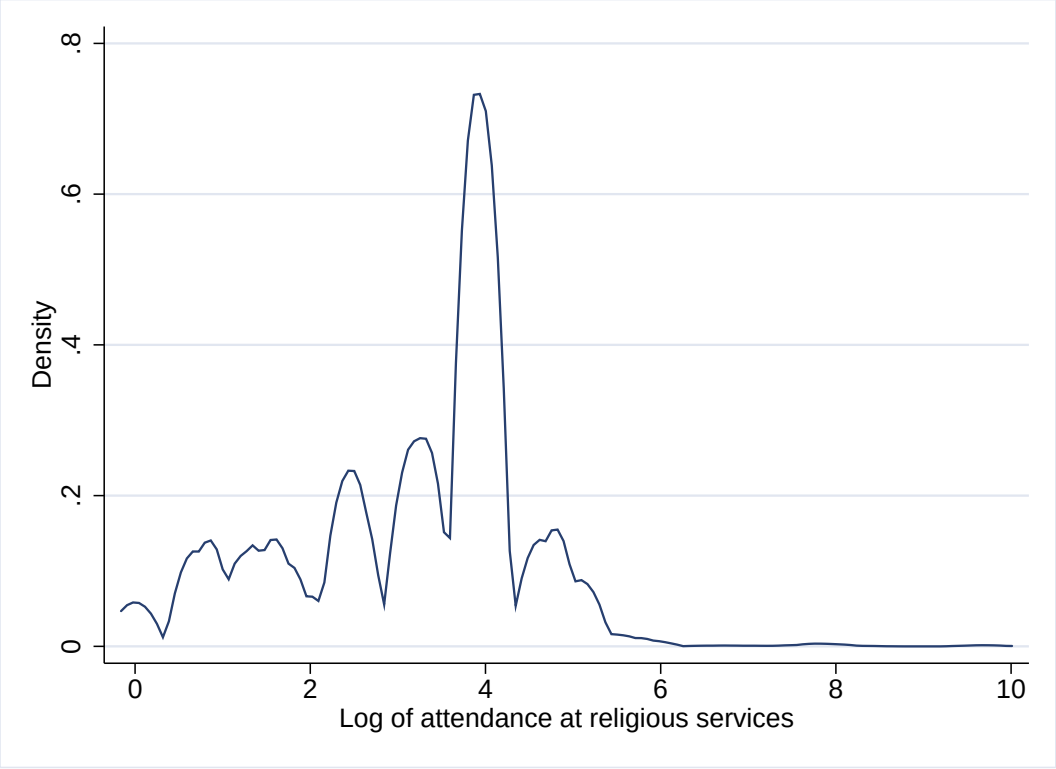

TABLE 1
Means (with standard errors) of all variables

	(1)	(2)
	All data	Restricted Data
Panel A: Demographics		
Female	0.54 (0.007)	0.46 (0.011)
Black	0.095 (0.003)	0.10 (0.006)
Hispanic	0.069 (0.003)	0.019 (0.004)
Other Race	0.14 (0.005)	0.067 (0.006)
Catholic	0.27 (0.006)	0.23 (0.010)
Protestant	0.54 (0.007)	0.60 (0.011)
Other Christian	0.016 (0.002)	0.017 (0.003)
Jewish	0.037 (0.003)	0.040 (0.005)
Other Religion	0.068 (0.003)	0.038 (0.004)
Unknown Religion	0.017 (0.002)	0.0063 (0.002)
No religion	0.052 (0.003)	0.061 (0.006)
Education (years)	13.19 (0.037)	13.82 (0.051)
Age	47.64 (0.21)	47.33 (0.25)
Family income ($1,000s/year)	67.67 (1.35)	78.56 (1.98)
Wealth, excluding home equity ($1,000s)	208.45 (13.68)	253.48 (27.05)
Home equity ($1,000s)	86.87 (2.12)	96.08 (3.38)
Panel B: Religiosity		
Religious attendance (times/year)	39.98 (3.58)	38.74 (5.06)
Religious volunteering (hours/year)	22.60 (2.40)	26.50 (4.90)
Religious donations ($/year)	915.78 (42.08)	980.42 (55.56)
Religious attendance percentile	0.42 (0.004)	0.41 (0.007)
Religious volunteering percentile	0.15 (0.005)	0.17 (0.008)
Religious donations percentile	0.38 (0.006)	0.40 (0.009)
Religiosity index percentile	0.32 (0.004)	0.32 (0.007)
Panel C: Outcome behaviors		
Ever smoked	0.47 (0.007)	0.49 (0.011)
Smoke now	0.20 (0.006)	0.21 (0.009)
Drink now	0.62 (0.007)	0.68 (0.010)
Drinks per day	0.81 (0.011)	0.91 (0.018)
Self-employment	0.11 (0.004)	0.14 (0.008)
No health insurance	0.064 (0.003)	0.047 (0.004)
Home ownership	0.71 (0.006)	0.78 (0.009)
Fraction in stocks	0.17 (0.006)	0.17 (0.008)
Fraction in IRAs, etc.	0.23 (0.007)	0.27 (0.010)
Fraction in savings, etc.	0.50 (0.008)	0.46 (0.012)
Fraction in other assets	0.10 (0.005)	0.10 (0.007)
Observations	12,120	3,499

Weighted individual means, dollar figures are in 2002 dollars. Restricted data includes only those observations that have non-missing values for risk tolerance. The final four variables are calculated only on family heads with at least $1,000 of wealth, so only use 4,764 (all data) or 1,759 (restricted data) observations.

TABLE 2
Relationships Among the Factors

	(1) Attendance	(2) Volunteering	(3) Donations	(4) Religiosity index	(5) Risk tolerance
Panel A: Religiosity regressed on risk tolerance					
Risk	-0.106	-0.106	-0.078	-0.100	
Tolerance	(0.031)**	(0.036)**	(0.040)	(0.028)**	
Panel B: Religiosity and risk tolerance regressed on gender					
Female	0.059	0.038	-0.016	0.029	-0.026
	(0.010)**	(0.012)**	(0.013)	(0.010)**	(0.005)**

Standard errors in parentheses. Regressions include controls for age, race, religion, income, education, wealth, and home equity; only the coefficient for sex is shown . The regressions of attendance and the religiosity index have 3,499 observations and volunteering and donations have 3,550. Dependent variables in columns 1-4 are percentiles which vary from 0.01 to 1.
* significant at 5%; ** significant at 1%

TABLE 3
Risky behavior on risk tolerance, comparison with the Barsky et al. results

	(1) Ever smoked	(2) Smokes now	(3) Drinks now	(4) Drinks per day	(5) Self-employment	(6) No health insurance	(7) Home ownership
Panel A: PSID (author's calculations)							
Risk	0.069	-0.054	0.218	0.335	0.102	0.071	-0.126
Tolerance	(0.052)	(0.043)	(0.048)**	(0.083)**	(0.035)**	(0.027)**	(0.045)**
Panel B: HRS (Barsky et al. calculations)							
Risk	0.092	0.068	0.099	0.256	0.021	0.196	-0.153
Tolerance	(0.030)**	(0.028)*	(0.030)**	(0.053)**	(0.020)	(0.031)**	(0.024)**

Standard errors in parentheses. Regressions include controls for age, sex, race, and religion. Every regression in panel A uses 3,705 observations. All dependent variables except for drinks per day (a categorical variable described in the data section) are dummies. Panel B are the results from Barsky et al. (1997) using the HRS. Each regression in panel B has 11,707 observations except health insurance, which only has 8,642.
* significant at 5%; ** significant at 1%

TABLE 4
Risky behaviors on each factor, and then all three

	(1) Ever smoked	(2) Smokes now	(3) Drinks now	(4) Drinks per day	(5) Self-employment	(6) No health insurance	(7) Home ownership
Panel A: Risk preferences only							
Risk	0.128	-0.036	0.238	0.422	0.101	0.087	-0.113
Tolerance	(0.052)*	(0.043)	(0.050)**	(0.089)**	(0.035)**	(0.026)**	(0.041)**
Panel B: Religiosity only							
Religiosity	-0.197	-0.206	-0.252	-0.495	0.022	-0.033	0.141
	(0.030)**	(0.023)**	(0.029)**	(0.046)**	(0.021)	(0.011)**	(0.022)**
Panel C: Gender only							
Female	-0.075	-0.042	-0.118	-0.337	-0.038	-0.034	0.038
	(0.017)**	(0.014)**	(0.017)**	(0.029)**	(0.011)**	(0.008)**	(0.013)**
Panel D: Risk preferences, religiosity, and gender together							
Risk	0.093	-0.066	0.188	0.299	0.095	0.076	-0.091
Tolerance	(0.052)	(0.043)	(0.049)**	(0.085)**	(0.035)**	(0.026)**	(0.041)*
Religiosity	-0.188	-0.205	-0.236	-0.457	0.029	-0.028	0.135
	(0.030)**	(0.023)**	(0.029)**	(0.045)**	(0.021)	(0.011)*	(0.022)**
Female	-0.068	-0.038	-0.107	-0.317	-0.036	-0.031	0.032
	(0.017)**	(0.014)**	(0.016)**	(0.028)**	(0.011)**	(0.008)**	(0.013)*

Standard errors in parentheses. Regressions include controls for age, race, religion, income, education, wealth, and home equity. Dependent variables are dummy variables except for drinks per day, which is categorical. There are 3,499 observations.

* significant at 5%; ** significant at 1%

TABLE 5
Investment behavior on risk tolerance, comparison with the Barsky et al. results

	(1) Stocks	(2) Bonds	(3) Saving, Checking	(4) T-bills	(5) Savings, etc.	(6) IRAs	(7) Other assets
Panel A: PSID (my calculations)							
Risk	0.086				-0.094	0.038	-0.030
tolerance	(0.040)*				(0.054)$^{+}$	(0.048)	(0.037)
Panel B: HRS (Barsky et al. calculations)							
Risk	0.097	0.015	-0.128	-0.055		-0.006	0.076
tolerance	(0.029)**	(0.008)*	(0.041)**	(0.024)*		(0.037)	(0.025)**

Standard errors in parentheses. Regressions include controls for age, sex, race, and religion. Every regression in panel A uses 1,833 observations. All dependent variables except for drinks per day (a categorical variable described in the data section) are dummies. Panel B are the results from Barsky et al. (1997) using the HRS. Each regression in panel B has 5,012 observations.

$^{+}$ significant at 10%; * significant at 5%; ** significant at 1%

TABLE 6
Investment behavior on each factor, and then all three

	(1) Fraction in stocks	(2) Fraction in savings, etc.	(3) Fraction in IRAs	(4) Fraction in other assets
Panel A: Risk preferences only				
Risk Tolerance	0.072 (0.041)$^{+}$	-0.097 (0.056)$^{+}$	0.040 (0.049)	-0.015 (0.038)
Panel B: Religiosity only				
Religiosity	-0.013 (0.022)	-0.057 (0.031)$^{+}$	0.065 (0.028)*	0.005 (0.022)
Panel C: Gender only				
Female	-0.002 (0.016)	-0.060 (0.024)*	0.026 (0.021)	0.035 (0.018)*
Panel D: Risk preferences when religiosity and gender are controlled for				
Risk Tolerance	0.071 (0.041)$^{+}$	-0.108 (0.056)$^{+}$	0.050 (0.049)	-0.012 (0.038)
Religiosity	-0.010 (0.022)	-0.061 (0.031)*	0.067 (0.028)*	0.005 (0.022)
Female	-0.001 (0.016)	-0.061 (0.024)**	0.027 (0.021)	0.035 (0.018)*

Standard errors in parentheses. Regressions include controls for age, race, religion, income, education, wealth, and home equity. The dependent variables are shares of assets in total financial wealth. There are 1,759 observations.

$^{+}$ significant at 10%; * significant at 5%; ** significant at 1%

TABLE 7
Individuals in Proscriptive vs Non-proscriptive Religions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Ever smoked	Smokes now	Drinks now	Drinks per day	Self-employment	No health insurance	Home ownership
Panel A: Non-proscriptive religions							
Risk	0.279	0.020	0.177	0.355	0.133	0.050	-0.001
Tolerance	(0.115)*	(0.088)	(0.097)$^{+}$	(0.189)$^{+}$	(0.089)	(0.036)	(0.028)
Religiosity	-0.259	-0.254	**0.071**	**-0.158**	-0.001	-0.056	0.037
	(0.070)**	(0.053)**	**(0.053)**	**(0.103)**	(0.049)	(0.018)**	(0.019)*
Female	0.071	0.094	-0.086	-0.291	-0.077	-0.009	-0.010
	(0.057)	(0.047)*	(0.043)*	(0.066)**	(0.033)*	(0.022)	(0.012)
Panel B: Proscriptive religions							
Risk	-0.035	-0.008	0.310	0.565	0.067	0.114	0.009
Tolerance	(0.125)	(0.099)	(0.122)*	(0.215)**	(0.087)	(0.044)*	(0.033)
Religiosity	-0.146	-0.135	**-0.369**	**-0.715**	0.025	-0.033	0.003
	(0.066)*	(0.051)**	**(0.064)****	**(0.104)****	(0.047)	(0.013)*	(0.014)
Female	-0.016	0.034	-0.032	-0.223	-0.083	-0.027	-0.003
	(0.050)	(0.043)	(0.050)	(0.081)**	(0.032)**	(0.014)$^{+}$	(0.011)

Standard errors in parentheses. Regressions include controls for age, race, religion, income, education, wealth, and home equity. Dependent variables are dummy variables except for drinks per day, which is categorical. There are 667 observations in each regression in panel A and 651 observations in panel B.
$^{+}$ significant at 10%; * significant at 5%; ** significant at 1%

*I thank Jonathan Gruber and Esther Duflo for all of their guidance. I also thank seminar participants, especially at the Massachusetts Institute of Technology and Abt Associates, Inc. for their helpful comments.

[i] From http://pubdb3.census.gov/macro/032003/faminc/new07_000.htm

[ii] Although I have used linear regressions exclusively in the results presented here, logits and probits have also been run as appropriate, and all qualitative conclusions hold with these approaches as well.

[iii] Ideally, for comparison purposes, I would limit my sample to the same age range as in the HRS; however, this cuts the sample so much that the coefficients are no longer significant and the standard errors are too large to generate any useful insights.

[iv] I also attempted to analyze two alternative subgroups, individuals with and without children, because of the possibility that the gender effect in particular would be very different among those two groups. Unfortunately, because over 80% of individuals in the data have had children and those without children are different on a number of dimensions, I was unable to generate an informative comparison. As this comparison also lacks a firm theoretical basis the results are omitted.