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RISK TOLERANCE AND ALCOHOL DEMAND AMONG ADULTS AND OLDER ADULTS

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ABSTRACT

This study has two primary goals. These are the examination of the effect of risk tolerance on individuals' demand for alcohol and second, the examination of the demand for alcohol by older adults over the age of 55. The data sets employed are multiple waves from the Panel Study of Income Dynamics (PSID) and the Health and Retirement Study (HRS). While risk tolerance can impact the level of alcohol consumption, it may also affect the sensitivity of demand to prices. There are parallels between the economist's and the psychologist's concept of risk tolerance. Research on attitudes towards risk by psychologists is part of a larger theoretical and empirical literature on personality traits. Psychologists have found risk tolerance to be an important determinant of alcohol consumption. The empirical results indicate that risk aversion has a significant negative effect on alcohol consumption, with the prevalence and consumption among risk-tolerant individuals being six to eight percent higher. Furthermore, the tax elasticity is similar across both risk-averse and risk-tolerant individuals. This suggests that tax policies may be effective in deterring alcohol consumption even among those who have a higher propensity for alcohol use. The significance of research on alcohol demand by individuals ages 55 and older is highlighted by the increased potential for alcohol-related adverse consequences among this demographic group. Comparing younger adults (ages 21-54) with older adults, responses to taxes and prices are higher among the older sub-population. The tax elasticity is estimated at -0.05 for younger adults, compared to -0.20 for older adults.

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I. Introduction

Over 55 percent of the U.S. adult population are current drinkers.[1] While the overall prevalence rate has remained relatively stable over the past decade, there is some evidence that problematic drinking may be on the rise (Figures 1-3). Data from the National Epidemiologic Survey on Alcohol and Related Conditions indicate that the number of adults with an alcohol abuse or dependence disorder has increased by 14 percent between 1991-1992 and 2001-2002, adjusting for population growth (Grant et al., 2004). There is extensive literature documenting the association between such excessive drinking and lost productivity, crime and violence, injuries, and premature mortality.[2] In 2000, there were a total of 140,000 alcohol-attributable deaths, making alcohol consumption the third leading cause of mortality behind smoking and poor diet or inactivity (Mokdad at al., 2004). Alcohol-related morbidity also imposes considerable strain on the public healthcare system. Among the uninsured, hospital stays related to alcohol abuse comprise the fourth most common reason for hospitalization, and a quarter of all alcohol-related stays involve Medicaid patients (Owens et al., 2007). Estimates place the overall economic costs of alcohol abuse at $228 billion annually.[3] Amidst these concerns, the public sector has regulated the sale and consumption of alcoholic beverages through taxation, controls over distribution and availability, and use restrictions.

While there is a large literature examining the demand for alcohol, there remain several gaps that may further inform on the effectiveness of public policies aimed at controlling alcohol consumption. This study revisits the demand for alcohol, addressing some of these gaps and extending the literature in two novel aspects. The first is the inclusion of risk preference in the demand for alcohol. There is some common ground between how economists and psychologists view risk preference. This links the economic concept of risk to a larger literature on personality characteristics. Cutler and Glaeser (2005) show that unobserved heterogeneity across individuals accounts for most of the variance in alcohol consumption and other unhealthy behaviors. Typically, in studies of alcohol demand (as well as of other risky behaviors or health investments), out of necessity, such differences are subsumed in the residual without further consideration, due to lack of information.

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[1] Calculation from the 2006 Behavioral Risk Factor Surveillance System.
[2] See NIAAA (2000), and Parker and Auerhahn (1998) for a review of these studies.
[3] This estimate is based on the cost-of-illness approach conducted by Harwood (2000). The estimated costs in 1998 amount to $184.6 billion, which in current 2006 dollars comprise $228 billion.

This study explicitly considers the confounding effect of preferences towards risk-taking in the alcohol demand function, utilizing unique data on risk tolerance from two large-scale population surveys: the Panel Study of Income Dynamics (PSID) and the Health and Retirement Study (HRS). Research on risk tolerance by psychologists links the economist's concept to a larger theoretical and empirical literature on personality traits (Vlek and Stallen, 1980), and shows that attitude towards risk may also be an important predictor of alcohol use and other addictive behaviors. Thus, incorporating risk tolerance in the demand function may improve the estimation process.

Accounting for risk tolerance may also inform on any differential effects of prices and policy on alcohol use across heterogeneous sub-populations. The most fundamental law in economics posits that increases in costs would be expected to lower alcohol consumption. Various econometric studies have found confirmation of this negatively-sloped demand function for alcohol. However, an estimation of the average price or policy response for the overall population may mask important differences across groups. While many individuals regularly consume alcohol without imposing internal or external harm, the distribution of alcohol consumption in the U.S. is far from uniform.[4] Among current drinkers, the top quintile is responsible for over 65 percent of total alcohol consumption, and the top decile is responsible for 55 percent of total consumption.[5] Since it is immoderate or problem drinking that leads to high social costs, it is important to determine whether policies are affecting the behavior of target groups most likely to over-consume alcohol. Dave (2005, 2007), for instance, shows that in the case of illicit drugs, hardcore users are less price-responsive relative to casual users, which may limit the effectiveness of further increases in drug prices towards reducing heavy drug use. Data from the HRS indicate that individuals with the highest level of risk tolerance consume almost 30 percent more alcohol and are 32 percent more likely to binge, relative to the most risk-averse individuals.[6] Guiding effective public policy requires information on whether the impact of price-based policies differs across groups that significantly differ in their alcohol consumption. Even if risk tolerance raises participation in risky behaviors, these individuals may still be relatively price-sensitive, in which case policies that raise the cost of consuming alcohol would also be effective in reducing use among the heavy users. On the other hand, if tolerance towards risk

[4] Indeed this skewness in the distribution of consumption among individuals is the motivation behind the widespread use of the two-part model with log transformation (Manning et al., 1995).
[5] Calculations are based on reported data for total number of drinks consumed in the prior month by individuals ages 21 and older, from the 2005 Behavioral Risk Factor Surveillance System.

tempers the effect of prices, then broad cost-based policies may have limited efficacy and more targeted interventions may be necessary. From an exploratory standpoint, this analysis will also shed light on whether and if so, by what extent, price responsiveness varies across a fundamental indicator of personality. There have been no prior studies that have investigated the effects of risk tolerance in the individual's alcohol demand function.

The second contribution of this study is a separate focus on older adults. Incorporating consistent information from the PSID and the HRS allows separate analyses for adults (ages 21-54) and older adults (age 55+). While alcohol consumption generally declines over the life cycle, younger cohorts have had increasing prevalence of alcohol consumption particularly at older ages (NIAAA, 2000). For instance, comparing individuals aged 60 years and older, drinking prevalence is 26.7 percent among those born between 1924 and1930 versus 36.2 percent among those born between 1931 and 1940. Figures 1-3 also show that overall alcohol prevalence as well as heavy drinking has generally trended upwards among older adults over the past decade. Surveys conducted in health-care settings generally find an increasing prevalence of alcohol-related disorders among the older demographic, in contrast with general population-based surveys. Looking at elderly hospital admissions, for example, 6 to 11 percent exhibit symptoms of alcoholism. The rate increases to 14 percent among elderly hospital emergency department admissions (Council on Scientific Affairs, 1996).

In addition to general alcohol-related harms, older individuals may be particularly susceptible to other adverse consequences. For instance, aging can increase sensitivity to alcohol-related health effects due to a reduced tolerance for alcohol (NIAAA, 1998). Equal amounts of alcohol consumption lead to a higher blood alcohol concentration (BAC) as the individual ages due to a decrease in the amount of body fluid in which to dilute the alcohol. Reduced tolerance also induces the onset of alcohol-related effects, such as compromised cognitive and behavioral functioning, at lower doses. Higher use of prescription medications among the elderly further raises the likelihood of adverse alcohol-related interactions. Pringle et al. (2005) find that among adults ages 65 and older, 77 percent of prescription drug users are exposed to medications with potentially adverse interactions with alcohol. Furthermore, among users of such alcohol-interactive drugs, 19 percent reported concomitant alcohol use. Even after adjusting for more intensive use of medications, older adults (65+) account for a disproportionately large

[6] Binge drinking in the HRS is defined as consuming 4 or more drinks in a single occasion.

share of adverse drug reactions (Moore et al., 2007). Despite these concerns, there is very limited research on alcohol use among the older sub-population. Broad population-based studies show that alcohol taxes and prices deter use. However, it is not clear whether certain groups of interests have higher or lower price sensitivity. The aging of the demographic combined with an increased potential for alcohol-related harms underscores the relevance of examining the demand and price-sensitivity for older adults.

II. Relevant Studies

An extensive empirical literature by economists has examined the impact of the price of alcoholic beverages on consumption. A review of older studies, based on individual-level data, suggests that the demand for alcohol is responsive to shifts in prices though there is considerable variation in estimates of the price elasticity (Leung and Phelps, 1993). More recent studies confirm this negative price response, and further point to important differences among certain demographic groups. Manning et al. (1995), based on data from a supplement to the 1983 National Health Interview Survey, find that the median drinker is price responsive, with an estimated elasticity of -1.19; however, the elasticity significantly decreases in magnitude for the heavy drinkers. In fact, at the 95th percentile of drinkers, they cannot reject the hypothesis that demand is perfectly inelastic. Kenkel (1996), using the same data, further shows that the price responsiveness varies considerably and positively with respect to drinking-related health information. Heavy drinking by the most-informed consumers is much more price elastic than moderate drinking, while the estimated price elasticities of heavy drinking for the least-informed consumers are not statistically significant. Chaloupka and colleagues (2002) provide a good review of the literature looking at the effects of alcohol prices on consumption and indicators of alcohol abuse such as motor vehicle fatalities, adverse health effects, and violence and crime.

Studies have also considered specific demographic sub-populations and found differences, though not always consistently, with respect to the price sensitivity. Laixuthai and Chaloupka (1993) employ data from the 1982 and 1989 Monitoring the Future (MTF) surveys of high school seniors. They find that for both years, higher beer excise taxes significantly reduced the frequency of drinking as well as the probability of heavy drinking. Using longitudinal data on youths ages 17-29 from the MTF surveys, Grossman et al. (1998) apply the rational addiction paradigm of Becker and Murphy (1988) to estimate a long-run price elasticity of -0.65. Chaloupka and Wechsler (1996) investigate college drinking patterns

and find significantly negative price effects for underage drinking and binge drinking among female students. However, no effects are found for males. Saffer and Chaloupka (1999) utilize data from the National Household Surveys of Drug Abuse (1988, 1990, and 1991) to estimate differential price responses for various demographic groups. They find similar price elasticities for the frequency of past month alcohol use among males and females; however, blacks were found to be less sensitive relative to other races and especially whites. Cook and Moore (2001) study youth drinking patterns from the National Longitudinal Surveys of Youth (NLSY) 1979 cohort. Their results indicate that among youths between the ages of 17 to 32, the excise tax on beer has a significant deterrent effect on past month participation though not on bingeing. For some specifications, elasticity estimates suggest that females may be more price-sensitive. Saffer and Dave (2006) study alcohol consumption among adolescents based on the MTF and the NLSY-97 data. They find that measures of alcohol participation and bingeing are responsive to the weighted price of alcohol. Analyses stratified on various demographic characteristics suggest that the elasticity estimates are larger for females and for whites. While the literature has focused on the overall population and youths, there have been no studies that have specifically investigated the price response of older adults.

According to NIAAA (2000), alcohol use and abuse are best viewed as functions of a combination of genetic, psychological and social influences. Although the association between psychiatric disorders and alcohol has been widely researched by psychologists (Kessler et al., 1996), there has been little work in this area by economists. Only one study to date has considered differential demand responses with respect to mental disorders. Saffer and Dave (2005) estimate the effect of mental illness on the demand for addictive substances, including alcohol participation. They show that individuals with a history of mental illness are 26 percent more likely to consume alcohol. Accounting for the endogenous selection of mental illness, individuals diagnosed with a mental disorder in the past year or in their lifetime are also found to be more sensitive to alcohol prices relative to healthy individuals. The price elasticity for individuals with a recent or lifetime mental illness is estimated at -0.49 to -0.63, versus -0.38 for individuals with no mental illness.

There has been no research that has integrated personality traits into the economist's alcohol demand function. Specifically, no prior study has considered the differential response of demand to price variations, across measures of risk tolerance. Research by psychologists has linked the economist's

concept of risk tolerance to broader aspects of personality.[7] For instance, Cloninger's (1987) tridimensional personality scale employs as its foundation characteristics measuring an individual's propensity towards "harm avoidance," "novelty seeking," and "reward dependence" – which closely resemble the economist's concept of risk tolerance. Each of these traits is considered moderately heritable, developmentally and situationally stable, and associated with specific neural systems that mediate different types of stimulus-response relationships (Menza et al., 1993). Thus, these components of risk tolerance reflect an underlying biogenic structure of personality that may interact with environmental stimuli.

Several empirical evaluations have applied the tridimensional model to substance-abusing populations (Howard et al., 1997). Individuals who score high on "novelty seeking" and low on "harm avoidance" are more likely to have early onset of alcohol abuse, for instance. These individuals are defined by Cloninger as confident and danger-seeking, and correspond well to economist's classification of individuals who are highly tolerant of risk. While psychologists have long studied the "addiction-prone personality,"[8] this study is the first to incorporate measures of risk tolerance into estimates of the alcohol demand function and in relationship to the individual's response to economic factors.

III. Analytical Framework

One objective of this study is to assess how risk tolerance affects an individual's alcohol use and their response to shifts in the price of alcohol. Since alcohol is ultimately a consumer good, this question can be framed within the context of utility theory with uncertain income.

(1) $U = f (A , Y; e)$

Equation 1 specifies an individual's utility as a function of alcohol consumption (A) and income Y that can be used to consume other goods, with exogenous preference parameter (e). The marginal utility of alcohol consumption is positive and diminishing.[9] The positive outcomes associated with alcohol use

[7] Research on risk preference by psychologists (Vlek and Stallen, 1980) and by economists (Rabin, 2002) also tends to overlap to some degree.

[8] A recent work of the same title (Barnes et al., 2000) provides an empirical study of the etiology of alcohol and drug abuse and personality. Findings suggest that there is a causal link between personality traits and the onset of alcohol abuse.

[9] The utility function may also be extended to incorporate the addictive stock accumulated through past alcohol consumption. This stock has a negative effect on current utility, reflecting tolerance or harmful addiction, and a positive effect on the current utility, reflecting the reinforcement of past consumption on current consumption. Expanding the model does not alter the basic conclusions with respect to risk tolerance.

include intoxication and stimulation of the dopamine receptors in the brain's pleasure center. Moderate alcohol use can also have positive health effects and improve social functioning. Short-run negative consequences of drinking include dehydration and gastrointestinal disorders, reduced productivity, an increased probability of accidental injury including automobile accidents, perpetrating or being a victim of violence or crime, and sexual abuse. Long-run effects can also include addiction, loss of employment, problems in interpersonal relationships, and more serious health consequences such as cirrhosis of the liver and obesity (NIAAA, 2000).

The role of an individual's tolerance towards risk in the alcohol demand function stems from the fact that these outcomes are probabilistic rather than known with certainty. The potential positive and negative effects of alcohol consumption map into a potential set of gains and losses in income or utility. The consumer maximizes an expected utility function that takes into account these subjective probabilities and the set of gains and losses.[10] Concavity of the expected utility function with respect to income is equivalent to risk aversion, and the more concave (that is, the higher is the degree of diminishing marginal utility of income) the more risk averse is the consumer.[11] Intuitively, a risk-averse individual places a higher weight on the loss in income than on an equal sized gain. As the expected utility function becomes less concave (more convex), the degree of risk aversion declines and the individual becomes more tolerant of risk. In this case, the weight attached to the potential loss from alcohol consumption declines, and conversely is shifted towards greater weight on the potential gain from alcohol consumption. Ceteris paribus, it follows from expected utility maximization that individuals who are more risk tolerant will have a higher demand for alcohol. Simple correlations generally confirm this prediction. Andrucci et al. (1989) and Gerra et al. (1999) show that individuals with high levels of novelty-seeking and low levels of harm-avoidance are more likely to abuse substances. Similarly, Barsky et al. (1997) link increased tolerance towards risk with higher alcohol consumption. However, these studies do not estimate this link within a demand framework, and do not control for other factors that are correlated with alcohol use and may be confounding this relationship.

[10] For instance, if the individual will experience a decline in income by among L from adverse reactions to alcohol consumption realized with subjective probability p, then the following expected utility function is maximized: $p*U(Y - L) + (1-p)*U(Y)$.

[11] Risk aversion is therefore a function of the second derivative of the expected utility function, though it needs to be normalized in order to make the consumer's behavior invariant to transformation of the expected utility function. The Arrow-Pratt measure of risk aversion normalizes the second derivative by

The degree of risk aversion may also affect an individual's response to alcohol price and policy. Since risk-tolerant individuals are more likely to consume alcohol, and may do so at immoderate levels, it is important to determine whether public policy prescriptions of higher alcohol taxes would be effective for this high-use group. In this respect, theory is ambiguous. Generally, price sensitivity depends inversely on the magnitude of the second derivative of the utility function with respect to alcohol consumption, the rate at which marginal utility diminishes. The faster the rate of decrease, the less price-sensitive is the consumer. Since, in its general form, income (and other goods) can interact with alcohol consumption in the utility function, risk aversion may therefore have an effect on the price elasticity of demand. If marginal utility of alcohol use diminishes rapidly for risk-tolerant individuals, then they may be less responsive to price. On the other hand, risk tolerant consumers may have a higher price elasticity if their rate of diminishing marginal utility is lower. Studies, based on the Cloninger tridimensional scale, have generally found that two different types of temperaments have a higher propensity for alcohol abuse (Howard et al., 1997). Type I temperaments have low novelty-seeking, but high harm-avoidance and reward-dependence characteristics. Type 2 temperaments have high novelty-seeking traits but score low on harm-avoidance and reward-dependence. Thus, it is difficult to say a priori how marginal utility diminishes for these consumers, and therefore how they would react to shifts in costs. Due to this theoretical ambiguity, the nature of the price response for risk tolerant versus risk-averse individuals remains an empirical question.

Empirical Models

The following specifications will be estimated based on the above discussion.[12]

(2) $$A_{ist} = B_0 + B_1 P_{st} + B_2 R_{is} + B_3 Y_{ist} + B_4 X_{ist} + B_5 H_{ist} + \mu_s + \nu_t + \varepsilon_{ist}$$

Equation (2) represents the alcohol demand function for the i^{th} individual residing in state s at year t. Alcohol consumption (A) depends on prices and policies (P) regulating the sale and consumption of alcohol, income (Y), and other socio-demographic factors (X) such as age, gender, race, and education, with ε representing a classical error term. An indicator (R) that dichotomizes individuals as risk averse or risk tolerant will also be included. Alternative models that contain measures of physical and mental health

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dividing it by the first: -U''(Y) / U"(Y).

[12] In the case of dichotomous alcohol participation, models will be estimated via probit. Where measures on intensity of use are available, models will be estimated for log use conditional on participation, within a two-part modeling framework. Standard errors are adjusted for correlation at the individual level, using

status (H) are also estimated. Studies have found that mental illness raises participation in substance use including alcohol, consistent with the self-medication hypothesis (Saffer and Dave, 2005). Certain physical ailments (diabetes, gastrointestinal disorders) or even general poor health may also reduce the individual's demand for alcohol. Since the key policy instrument (alcohol taxes) vary at the state level over time, it is important to control for unobserved state-specific factors and time trends. Specifications are therefore estimated with a vector of state (μ) and year (ν) fixed effects.[13]

In order to allow for differential price responses across risk-tolerant and risk-averse individuals, the above specification can be expanded to include an interaction between the price measure (P) and the indicator of risk tolerance (R). In some specifications where limited sample size is an issue, differential price responses are estimated using such an interaction effect. These specifications restrict the effect of other factors to be the same across groups, while allowing the price effect to differ. However, in general, a more flexible formulation based on sample stratification is followed to allow for differences in all parameters across risk tolerance.

(3) $A_{ist \mid \text{Risk Averse}} = B_0 + B_1 P_{st} + B_2 Y_{ist} + B_3 X_{ist} + B_4 H_{ist} + \mu_s + \nu_t + \varepsilon_{ist}$

(4) $A_{ist \mid \text{Risk Tolerant}} = \alpha_0 + \alpha_1 P_{st} + \alpha_2 Y_{ist} + \alpha_3 X_{ist} + \alpha_4 H_{ist} + \gamma_s + \delta_t + \eta_{ist}$

Comparison of the parameters (B_1) and (α_1) informs on whether risk-tolerant individuals are more or less sensitive to price changes, relative to risk-averse individuals.

IV. Data

Panel Study of Income Dynamics

The empirics are based on two large-scale population surveys, the Panel Study of Income Dynamics and the Health and Retirement Study. The Panel Study of Income Dynamics (PSID) is a longitudinal study of a representative sample of individuals and their family units, conducted by the Institute of Social Research. Originating in 1968, the PSID core sample combines the Survey Research Center sample, which is a cross-sectional national sample, and the Survey of Economic Opportunity sample, which is a national sample of low-income families. From 1968 till 1996, individuals from families

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STATA's cluster option.

[13] Longitudinal data from the PSID and the HRS also permit the estimation of person fixed effects models. However, since the policy variables are measured at the state level, including individual fixed effects would deplete degrees of freedom and inflate the standard errors. As long as the policy variables at the state level are orthogonal to the individual, omitting the person-specific fixed effects will not affect the consistency of the estimates. Furthermore, since the risk aversion instrument is time-invariant, this also

in the core sample were interviewed every year, including adults as they have grown older and their respective family units. From 1997, data collection became biennial. A number of other changes were also made, including a reduction in the core sample and the introduction of a refresher sample of post-1968 immigrant families and their adult children, in order to keep the sample representative.

A dichotomous indicator for current alcohol consumption is constructed from the PSID data. Among individuals between the ages of 21 to 54, 66 percent are current drinkers; the prevalence decreases with age as evidenced in the older cohort from the Health and Retirement Study. Detailed information on various health measures is also available. An index of functional difficulties associated with bathing, dressing, eating, walking, and getting outside is created and ranges from zero to five. Dichotomous measures are also constructed for lifetime diagnoses of hypertension, diabetes, heart disease, and stroke. A depression scale, ranging from zero to four, measures the number of depression-related symptoms experienced in the past month. Indicators for age, gender, race, ethnicity, marital status, and education are defined and included in the models. Measures of labor force attachment are also constructed, capturing whether the individual is currently working (part time or full time), unemployed, or retired. Additional variables are defined in Table 1.

Health and Retirement Study

The Health and Retirement Study (HRS) is conducted by the Institute for Social Research at the University of Michigan. It is an ongoing longitudinal study, which began in 1992 and is repeated biennially.[14] Prior to 1998, the HRS cohort included individuals born between 1931 and 1941, and a separate Study of Assets and Health Dynamics among the Oldest Old (AHEAD) included individuals born before 1924. Since 1998, AHEAD respondents have been contacted as part of a joint data collection effort with the HRS, and the sample frame was also expanded by including cohorts born between 1924 and 1930 and those born between 1942 and 1947. As older adults are over-represented in the HRS, this is an ideal dataset, in terms of sample size and available information on correlates of alcohol use, to study alcohol demand for this segment of the population. The present analysis utilizes the first seven waves, spanning 1992 through 2005, and restricts the sample to older adults ages 55 and over. This yields a maximum sample size of about 107,000 person-wave observations.

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precludes controlling for individual fixed effects in the preferred specifications.

[14] Blacks, Hispanics, and Florida residents are oversampled. Sampling weights are provided to adjust for

Both dichotomous and continuous measures of alcohol use are constructed. The dichotomous indicator measures whether the individual currently participates in drinking. The individual is also asked about their frequency and intensity of alcohol consumption.[15] Based on these questions, a measure of the average number of drinks consumed daily is obtained. Approximately 35 percent of older adults are current drinkers. Among those who drink, slightly less than one drink is consumed daily on average.[16]

The HRS is administered for the specific purpose of studying life-cycle changes in health and economic resources, and includes detailed information on various health outcomes. A composite index is defined to measure difficulties associated with mobility. It ranges from zero to five and indicates difficulties in walking one block, walking several blocks, walking across a room, climbing one flight of stairs, and climbing several flights of stairs. Additional indicators are defined separately for whether the respondent reports that he or she has been diagnosed with the following illnesses: diabetes, heart disease, stroke, and high blood pressure. The HRS contains a depression scale, as defined by the Center for Epidemiologic Studies (CES), which ranges from zero to eight. This CESD score measures the sum of adverse mental health symptoms for the past week (listed in Table 1). Studies have confirmed the validity and reliability of the CESD scale as a screening instrument for the identification of major depression in older adults (Irwin et al., 1999).

Measures are selected from the HRS to ensure consistency with variables constructed from the PSID. Indicators for age, gender, race, ethnicity, marital status, and education are defined and included in the models. Measures of labor force attachment are also constructed, capturing whether the individual is currently working (part time or full time), unemployed, or retired. Real income is calculated for each individual from all available sources including earnings, pension, supplemental security, social security

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unequal probabilities of sample selection.

[15] In waves 1 and 2, the respondent is asked directly about the number of drinks that they consume per day, in general. The responses are categorical, which are coded at their midpoints and top-coded at five or more drinks. For waves 3-7, the respondent is asked about the number of days that they consume alcohol in an average week, and the number of drinks consumed on average when they drink. The responses to these questions are continuous. To ensure consistency with the questions in waves 1 and 2, responses in waves 3-7 are also top-coded at 5 or more drinks daily. Very few drinkers are in the top category (2.25 percent). While the change in the questions after wave 2 is a potential concern, restricting the sample to waves 3-7 does not significantly alter the results. Estimating a spline model by interacting the price measure with a dichotomous indicator to represent the break also yields similar estimates to those reported.

[16] A standard drink is considered to be the amount of beverage containing approximately 0.5 ounces of alcohol. This is about 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of distilled spirits.

retirement, and other government transfers deflated by the consumer price index.[17] Description of these covariates is provided in Table 1.

Risk Tolerance Module

A module probing the individual's tolerance towards risk is administered to 11,707 individuals in the first wave of the HRS and 8,125 entrants into the study in subsequent waves. Measures of risk aversion are obtained from a series of questions involving willingness to gamble over lifetime income with varying probabilities. The module has undergone considerable testing in order to minimize misunderstandings and additional complications in interpretation, and to ensure consistency with the economist's concept of risk preference. Barsky et al. (1997) provide a detailed analysis of the survey instrument. Answers to the questionnaire separate the individuals into four distinct categories of risk preference, ranging from the most risk tolerant to the most risk averse.[18] The majority of respondents 55 years and older (64 percent) can be classified in the most risk-averse category, with 15 percent comprising the second most risk-averse group, and 21 percent divided equally among the two least risk-averse categories. In order to maximize sample sizes and ensure consistent comparison in the stratified models, an indicator for the most risk-averse category is included in the specifications. When stratifying across risk tolerance, the most risk-averse individuals (64 percent) are compared to the other three categories.[19]

One validation of the HRS risk tolerance instrument comes from relating it to behaviors that would be expected to vary with an individual's propensity to take risks (Barsky et al., 1997). Data from the HRS indeed show that more risk-averse individuals participate less in risky behaviors such as smoking and drinking. Risk-averse individuals would also be expected to take steps to insure themselves; this is confirmed by the simple means, which indicate that the prevalence of health insurance and life insurance

[17] Models were also estimated with alternate measures, including net household income. Since this measure is missing for a larger proportion of the sample, reported specifications control for individual income instead. Results between the two measures are similar.

[18] The categories can be ranked in order, without any functional form restrictions on the preference parameters or the utility function.

[19] Results are not qualitatively affected in comparing the most risk-averse (64 percent of the sample) with the most risk-tolerant (11 percent), excluding the middle two categories. The direction of the effects remains the same, though the magnitude of the differences is expectedly larger since the comparison involves the two extreme categories of risk tolerance. While the risk module has undergone testing before being included in the HRS, interpretation or misreporting may lead to errors in classifying an individual into the exact risk category. However, in dichotomizing the risk measure into risk aversion versus risk tolerance, such classification errors are minimized.

is higher among those who are risk averse, relative to those who are more risk tolerant. For instance, in wave 1, the difference in coverage rates between the most risk averse and the most risk-tolerant individuals (prior to obtaining Medicare) is six percentage points. Barsky et al. (1997) also look at self-employment and immigration status. One of the largest voluntary risks is self-employment since the income stream of the self-employed generally has a higher variance that that for salaried employees. Similarly, immigration into the U.S. and migration within the U.S. may also be indicative of a more daring personality. In the HRS, self-employment, immigrant status, and region of residence (western U.S.) are significantly correlated with risk tolerance in the expected direction. Risk tolerance is also found to be a significant predictor of the composition of household assets. More risk-averse respondents have a higher share of their portfolio in relatively safe assets, such as Treasury bonds and savings accounts, whereas more risk-tolerant individuals are more likely to place their assets in equities.

Since virtually all respondents in the HRS only partake in the risk module once, the measure of risk tolerance is time-invariant. This is not a concern since studies have shown that personality traits associated with risk tolerance are generally stable, have a biogenic basis, and have some constancy across various situations (Howard et al., 1997; Menza et al., 1991). A very small subset of individuals (n=717) responded to the module in both waves 1 and 2. Barsky et al. (1997) show that the distribution of risk aversion is relatively stable for these individuals across both waves.

The PSID contains the identical risk tolerance module as the HRS. This allows a comparison of estimates for a large representative sample of older individuals from the HRS with adults from the PSID, based on equivalent sets of specifications. The PSID analysis is restricted to three waves that contain information on the respondent's alcohol use: 1999, 2001, and 2003. While about 6,900 households overall (comprising of about 11,000 individuals) are surveyed in 1999, the risk tolerance module is administered to a subset of individuals. For specifications based on risk tolerance, the sample size is limited to 9,700 person-wave observations.

Based on the PSID, about 43 percent of adults between the ages of 21 and 54 can be categorized as the most risk-averse. This is less than the rate in the HRS, though the variation can be attributed to the difference in the age groups and other sample characteristics. When restricting the PSID sample to individuals 55 years of age and older, the prevalence of risk aversion (62.3 percent) is much

closer to that found in the HRS (63.9 percent). The consistency of these rates across two independent samples is validating. Appendix 1 provides added information on the risk preference module.

Appended Variables

Information on the respondent's state of residence is available in the PSID and made available to this project for the HRS. Policy measures affecting the sale and consumption of alcohol are merged to records in both datasets based on the interview period and the state of residence. As a proxy for the cost of alcohol, the state excise tax on beer is utilized for several reasons.[20] First, focusing on the state excise tax bypasses the simultaneity between price and demand. Changes in the state-level excise tax are plausibly exogenous to the individual's alcohol demand, often changing in response to the state's budgetary needs. Excise tax rates on wine and liquor are poor proxies for the prices of wine and liquor in control (monopoly) states because such states derive most of their revenue from the sale of wine and liquor from the price markups rather than from the excise taxes. Beer, however, is sold privately in monopoly states. Changes in excise tax rates within states over time are also strongly correlated with changes in the respective alcohol beverage price. A one-cent increase in the excise tax has been shown to raise the price by at least as much (Kenkel, 2005; Young and Bielinska-Kwapisz, 2002). Excise tax rates on beer, wine and liquor are also highly correlated as are their prices ($\rho > 0.5$). Thus, the beer tax provides a good proxy for the cost of alcohol while bypassing colinearity issues with including multiple tax rates in the specification. While some uniformity has emerged in certain other alcohol-related regulations such as the minimum purchase age or blood alcohol concentration (BAC) limits, there remains substantial variation in alcohol excise taxes. States have enacted widely differing rates, leaving considerable room for policy manipulation. For instance, the beer tax currently ranges from $0.02 per gallon in Wyoming to $1.07 per gallon in Alaska. Thus, estimates of the tax elasticity also provide a direct estimate of the effect of an important public policy tool. Furthermore, the price elasticity of alcohol demand can be recovered from the tax elasticity based on the percent of the tax represented in the price and the tax pass-through rate. Data on the state-level excise tax for beer are obtained from the Brewers' Almanac, published annually by the U.S. Brewers' Association.

[20] The nominal federal excise tax on beer has remained constant since 1991, after increasing from $9 to $18 per gallon that year. Shifts in the real value of the federal excise tax will be captured in the time dummy variables.

In order to control for state-level sentiment related to alcohol regulation and other policy shifts concurrent to taxes, three additional measures are included in the specifications. The first is a dichotomous indicator for those states that control the wholesaling and/or retailing of distilled spirits.[21] The second measure represents the percent of the state population residing in dry counties where there is no sale of alcoholic beverages (available from the Brewers Almanac). A dichotomous indicator is also created for whether the given state had an effective 0.08 BAC per se law in the month and year that the respondent was interviewed. In these states, it is illegal to drive or operate a motor vehicle with a BAC at or above 0.08 percent in and of itself, and impairment does not need to be demonstrated. As of July 2004, all states plus D.C. had adopted these laws. However, since the sample period covers 1992-2005, there was considerable variation due to the timing of when the laws were enacted in each state (National Conference of State Legislatures website).

Weighted means for the full HRS and PSID samples along with stratification by risk tolerance are presented in Table 1. Risk-tolerant individuals are found to have a significantly higher prevalence of drinking as well as higher daily consumption. There are also important differences in risk tolerance across demographic groups. For instance, males are relatively more risk tolerant as are Whites. Risk-tolerant individuals are also less likely to be married, and their schooling distribution is shifted more towards higher levels of education. Both the PSID and the HRS show that risk tolerance is similarly positively correlated with parental education. Among older risk-tolerant individuals, more are likely to be unemployed and fewer are currently working or retired. Income also seems to increase with risk tolerance, consistent with a higher average return for individuals who may be bearing greater risks through self-employment or working in riskier occupations. There is some evidence across both age groups that risk-tolerant individuals have fewer indications of physical illnesses, but a higher indication of depression. It is noteworthy that certain characteristics of the state or residence also vary across risk-averse and risk-tolerant groups. For instance, those who are risk averse are more likely to reside in states with stricter alcohol regulations: higher alcohol taxes, more likely to have enacted BAC 0.08 laws, higher percentage of the population residing in dry counties, and state monopoly on retailing and wholesaling of alcoholic beverages. While these simple correlations may reflect other observed and

[21] Over the sample period, there are 18 such monopoly states: AL, IA, ID, ME, MI, MS, MT, NH, NC, OH, OR, PA, UT, VT, VA, WA, WV, and WY.

unobserved factors, they also point to risk tolerance as a potential confounder in an individual's alcohol demand and its sensitivity to prices and policy. The multivariate models presented in the next section account for these differences.

V. Results

Table 2 presents estimates of the baseline specification in equation (2), for adults (ages 21-54) based on the PSID and older adults (ages 55 and up) based on the PSID and the HRS. The first column estimates a basic model for adults utilizing a sparse set of covariates. Beer tax has a significant and negative effect on current alcohol participation, with the tax participation elasticity estimated at -0.04. This specification controls for unobserved state sentiment towards alcohol regulation by including indicators for the BAC 0.08 per se law and for whether the state controls the retailing and / or wholesaling of alcoholic beverage. The percent of the state population residing in dry counties is also included. Enactment of the BAC 0.08 law significantly reduces current drinking as does residing in a state with more dry counties. For instance, a 10 percent increase in the population residing in dry counties is associated with a four percentage point decline in the probability of drinking. These regulations raise the non-monetary cost of consuming alcohol, through higher penalties and search or time costs, and therefore reduce alcohol participation. Residing in a monopoly state that controls the distribution of spirits seems to increase the probability of drinking. This may reflect substitution from the consumption of spirits to the consumption of beer or wine (Nelson, 2003; Holden and Wagenaar, 1990). Even if total ethanol consumption is lower in monopoly states, higher alcohol participation may be reflecting higher beer consumption relative to liquor.

Since the PSID analysis is based on three waves, it is not feasible to control for unobserved state sentiment through state-level fixed effects. There is not sufficient variation in the excise tax rate within each state over this period to allow for the fixed effects. For example, regressing the tax on state and year fixed effects yields an R-squared of 0.99, suggesting that only about one percent of the variation in taxes represents within-state variation. Hence, specification 1 proxies for unobserved state sentiment through other measures of alcohol regulation. Specification 2 controls for state-level fixed effects for comparison. As expected, the lack of state-specific time-series variation results in imprecision, inflating the standard error for the tax effect. However, it is somewhat reassuring that the magnitude of the effect

and the elasticity remain similar. Subsequent models utilizing the PSID omit the state fixed effects in favor of a more parsimonious set of controls for state sentiment.

Specification 3 expands on the basic model by incorporating risk aversion, labor market behavior, parental education, and health measures. Risk-averse individuals have a significantly lower probability of current alcohol participation relative to those who are more tolerant of risk. Unadjusted means showed a difference in participation by about 11 percentage points. In the multivariate model, this effect diminishes, though still remaining sizeable at 5.8 percentage points. The tax elasticity is significantly negative and remains stable at -0.04.

Demographic variations in alcohol demand are often taken for granted and attributed to differences in tastes or culture. However, incorporation of risk tolerance in the alcohol demand function can inform on some of these differences. For instance, males participate more in drinking. However, after controlling for risk tolerance in specification 3, the marginal effect of being male on participation declines by over two percentage points.[22] This is consistent with males being more tolerant of risk, as indicated by the simple means. Similarly, it is true that non-Whites have been consistently found to have a lower drinking prevalence. Part of this effect may reflect differences in attitudes towards risk, especially for Blacks who are more likely to be risk averse. Similarly, while married individuals drink less, the effect magnitude is diminished upon controlling for risk since married individuals tend to be relatively more risk averse.

Educated individuals are more likely to participate in drinking, though here also the effect magnitude diminishes for those who have completed college since there is a positive association between risk tolerance and education. There is a small significantly positive effect of income on drinking, with the elasticity estimated at 0.10.[23] The coefficients on the age categories confirm that drinking prevalence declines with age. Relative to individuals not in the labor force (disabled, homemakers, students), those who are employed, unemployed, or retired also have higher alcohol participation. Drinking is negatively associated with household size. This may reflect lower drinking prevalence in households with children present or in family units, where the individual may be internalizing the external costs of their drinking on

[22] Specification 3 also controls for health measures, which may have confounded prior estimates of demographic effects. However, in comparing specification 3 to an equivalent model excluding risk tolerance, the patterns remain similar.

[23] Since the dependent variable captures any alcohol participation, this net income effect reflects both a

household members. For the PSID sample, the effects of health measures are generally insignificant. This may be due to the low prevalence of some of these illnesses in the adult population, or it may reflect that at least for younger adults (21-54), these health outcomes may not have consistent effects on drinking propensity. For older adults (below), these health conditions lead to significant reduction in alcohol participation.

Specifications 4 and 5 estimate the demand function for adults 55 years of age and older, based on the HRS. Since the HRS sample is observed for a maximum of seven waves (1992-2005), there is sufficient variation in excise taxes within states over this period to allow for state fixed effects. Increases in the beer tax significantly reduce current drinking among older adults. Furthermore, the older demographic appears to be far more price-sensitive relative to younger adults; the tax elasticity is about four to five times larger and is estimated at between -0.17 and -0.22. To ascertain that this increase in the tax response relative to the younger demographic is not an artifact of the sampling differences between the PSID and the HRS, a similar specification is also estimated for the PSID restricted to older adults. Specification 6 suggests that the estimated marginal effect and elasticity are robust across both the PSID and the HRS samples. These estimates indicate that drinking among older adults is more sensitive to prices, relative to the general population.[24]

The simple means suggest that older risk-averse individuals have a lower prevalence of drinking by about 5.4 percentage points. Specification 6 shows that while the effect diminishes somewhat after controlling for other confounders, it remains significant at 3.3 percentage points. The effects of the other covariates are generally similar to those discussed above.

The next set of specifications reported in Table 3 explore whether response to taxes varies across risk-averse and risk-tolerant individuals across both age groups. These models estimate equations (3) and (4), stratifying the samples based on risk tolerance. For both age groups, increases in the beer tax significantly reduce alcohol participation, with higher elasticities being estimated for the older demographic as before. Among younger adults from the PSID, the marginal effect of the tax is relatively similar for both risk-averse and risk-tolerant individuals.[25] A likelihood-ratio (LR) test was implemented to

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positive income effect for moderate drinking and a potentially negative effect for heavy drinking.

[24] This may reflect a change in beverage composition among older drinkers, who may prefer wine or spirits over beer, relative to younger drinkers.

[25] Similarly, the marginal effects for the policy measures including Percent Dry and Monopoly state are

check if the marginal effect is significantly different across both risk aversion categories;[26] there is no significant difference. For older adults in the HRS, the marginal effect and the tax elasticity suggest that risk-tolerant individuals may be more sensitive to prices relative to those who are more risk averse. However, this difference is not statistically significant based on the LR test. These estimates suggest that even among groups that are more likely to consume and abuse alcohol, demand is relatively sensitive to prices.

Specification Checks

The models thus far have considered the response of taxes at the extensive margin, on the decision to currently consume alcohol. Policies may also affect the intensity of consumption, conditional on being a drinker. Data on average daily number of drinks consumed from the HRS allow estimation of the alcohol demand function at the intensive margin. Specification 1 in Table 4 suggests that taxes can also reduce the level of alcohol consumption, though the consumption elasticity (-0.086) is smaller in magnitude compared to the participation elasticity for older adults. This is consistent with demand studies for the general population, which have also found larger elasticities at the extensive margin; that is, most of the price effect operates through the decision to drink rather than the level of drinking conditional on participation (Chaloupka et al., 2002; NIAAA, 2000; Manning, 1995). Risk aversion continues to be a significant predictor of alcohol consumption. Across models 1 and 2, risk-averse drinkers consume between 5.5 and 8.6 percent less alcohol.

Model 2 also allows for the tax effect at the intensive margin to differ between the risk categories. Since alcohol participation among older adults is about 35 percent, estimating the conditional demand significantly restricts the sample size. Thus, a parsimonious specification, which includes an interaction term between the beer tax and risk aversion, is employed to allow any difference in the tax effect. The coefficient on the interaction term is positive, suggesting that risk-tolerant individuals may be more sensitive to taxes. However, the large standard error on the interaction effect does not allow the rejection

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also stable across both risk groups.

[26] This test is performed by estimating a model with all individuals, and including interaction terms for all variables except the alcohol policy and also including the risk aversion indicator. The LR test is carried out by comparing the values of the log-likelihood function with and without the restrictions imposed: $LR = -2[\ln L^* - \ln L_{\text{RISK AVERSE}} - \ln L_{\text{RISK TOLERANT}}]$. If the restriction is valid as under the null hypothesis, then imposing it should not lead to a large reduction in the log-likelihood function for the overall sample ($\ln L^*$). The ratio is asymptotically distributed as a Chi-squared density function with degrees of freedom equal to the number of restrictions, which is one because only the alcohol tax coefficient is restricted.

of the null that the tax response is similar across both groups. This is consistent with the alcohol participation models which also followed the same pattern.

While these results suggest that excise taxes do have an impact on the level of alcohol use, across both risk groups, it is specifically problem drinking that imposes externalities and is the target of public policy. Specifications 3 and 4 therefore examine the tax response on chronic drinking, conditional on being a current drinker. Chronic drinking is defined by a dichotomous indicator for whether the respondent consumes more than two drinks daily, on average.[27] Approximately 10 percent of drinkers in the HRS fall in this category. The estimated tax elasticity is significantly negative and of a similar magnitude to the participation elasticity among all individuals. The interaction effect in model 4 is insignificant, suggesting that taxes can reduce the propensity of chronic alcohol use even among risk-tolerant individuals. Risk aversion has a negative effect on problem consumption, though the coefficients are imprecisely estimated. Unadjusted means show that the prevalence of chronic drinking is significantly higher among risk-tolerant individuals by about 10 percent.

Specification 5 exploits the longitudinal waves of the HRS and restricts the sample to ever-drinkers. This results in a slight difference in the control group that is used for identification of the tax response. That is, among those individuals who drink, some may shift in and out of current drinking status. This model checks whether this response is related to changes in the excise tax. Thus, individuals who never drink and therefore do not change their drinking status over the sample period are excluded. The tax elasticity declines somewhat in magnitude from -0.17 to -0.10. This is presumably because current drinking propensity for ever-drinkers is less responsive to prices. Also, in the prior specification, never-drinkers served as part of the control group against which to compare the responses of those who do drink. By excluding the never-drinkers, ever-drinkers who change their alcohol participation are being compared to those who do not. Employing this alternative control group for identification, the tax elasticity of older adults continues to be larger in magnitude relative to younger adults.

Economic models of addiction typically predict that current consumption depends on past consumption (as a proxy for the accumulated addictive stock) due to the reinforcement effect. Thus,

[27] Redefining the chronic use indicator to reflect more than 3 drinks daily does not significantly alter the results. The elasticity magnitude declines to about -0.20 and the standard errors inflate due to the lower

current addictive consumption would also be a function of past prices.[28] Specification 6 includes both the current and the one-year lagged excise tax. Since excise taxes within a state are highly correlated over time due to infrequent changes, the standard errors are substantially inflated. However, judging from the magnitudes, the current and lagged tax effects in specification 6 almost add up to the current tax effect in specification 5 that excludes the lagged excise tax. This suggests that the contemporaneous tax response may also be picking up the effect of past taxes, and may in some sense be more indicative of the long-run elasticity that takes account of changes in past and present prices on current consumption.

While the estimates and differences have been interpreted with respect to the economist's concept of risk aversion, one potential concern is that the risk instrument may be reflecting differences in time preference rather than attitudes towards risk per se. Theoretically, some of the effects of risk tolerance are difficult to disentangle from the effects of differential discount rates. For instance, more present-oriented individuals with a high discount rate would also be predicted to participate more in risky activities such as alcohol and cigarette use since they are likely to discount the future harmful consequences. From a policy perspective, it is immaterial whether the risk-tolerant group is reflecting a more dismissive attitude towards risk or a higher discount rate. Since these individuals, regardless of whether they are risk-tolerant or present-oriented or both, are heavier consumers of alcohol, it is important to explore the extent to which their demand is sensitive to variations in taxes. Nevertheless, for interpretation purposes, it may be helpful to determine that the risk tolerance instrument is indeed picking up variation in attitudes towards risk.

The HRS administered a module on preferred consumption paths to 198 respondents in order to elicit estimates of time preference parameters. Barsky et al. (1997) show that for these individuals, their degree of risk aversion is uncorrelated with time preference. Alternately, specifications 7-9 in Table 4 also confirm that the risk tolerance categories are reflecting variations beyond discount rates. Individuals in the HRS are also asked about their relevant financial planning horizon. While certainly prone to

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prevalence of this measure of heavy use.

[28] This is the case for myopic addiction wherein the individual maximizes current utility and does not consider future consequences. With rational addiction, wherein the individual maximizes lifetime utility, current consumption depends on past and future consumption (Becker and Murphy, 1988). Hence, demand would also be a function of future prices in addition to contemporaneous and lagged prices. Since the focus of this study is on risk tolerance and differences in responses across risk tolerance, the rational addiction framework is abstracted from. Empirically identifying the effects of current, past, and future prices is complicated by the collinearity in the price series.

measurement error and noise, variations in the planning horizon, conditional on age, would partially reflect differences in time preference. Accounting for age, more future-oriented individuals with lower discount rates should take greater account of future events and therefore have more distant planning horizons. The marginal effects and elasticity estimates remain robust to controlling for the individual's reported planning horizon. The tax elasticity for older adults continues to be larger than younger adults, and there are no significant differences in the tax response across risk groups. Combined with earlier evidence that the risk tolerance module correctly predicts behaviors that it would be expected to predict a priori (self-employment, insurance status, etc.), there is some evidence that the measure is indeed indicative of an individual's propensity to undertake risk.

Sample Attrition

Selective sample attrition is not a concern with the PSID sample since the analysis employs only three waves (1999-2003) and the demographic of interest comprises young adults in relatively good health. In the HRS, however, selective attrition may be relevant due to the longer period of study and the older demographic. The average mortality rate between waves is 2.3 percent. Thus, about 14 percent of the individuals who were surveyed in the first wave (1992) have died by the seventh wave (2004). The mortality rate for the HRS sample is consistent with the Social Security Administration life table mortality rates (Kapteyn et al., 2006).

The specific concern is that since alcohol-related illnesses are a significant cause of premature death, mortality among the heavy drinkers may lead to a progressively selective sample in later waves that consumes less alcohol. Results thus far consistently indicate that older adults are far more responsive to tax policies than younger adults. It is important to determine if this effect is being driven by attrition bias. If the heavier drinkers, who may be less responsive to price, are being progressively excluded from the sample, then the remaining price response may be biased upwards. Controlling for physical and mental health status alleviates some of this concern. Table 5 also presents two additional strategies to inform on potential bias due to such attrition.

First, specifications 1-3 utilize a balanced sample that only includes individuals who are observed in all seven waves. If selective attrition is severe, then results from the unbalanced panel (Tables 2 and 3) versus the balanced panel would be expected to be different. Comparing the marginal effects and tax elasticities from the balanced panel to those reported earlier, there are no material differences.

The second approach employs inverse probability weights (IPW) to adjust for selection bias due to observable characteristics (Fitzgerald, Gottschalk and Moffitt, 1998). This involves using baseline characteristics (gender, race, ethnicity, education, parental education, religion, and native-born) along with other time-varying factors (age indicators, wave indicators, census division indicators) and lagged covariates (income, marital status, and health insurance) to predict survival status. Most importantly, observed illness conditions in the previous wave and the number of drinks consumed in the previous wave are also included to predict survival. Since past health status is observed, this model is able to correctly predict about 77 percent of the attritors, based on a very conservative cutoff of 0.9 for the predicted probability; with the standard cutoff of 0.5, the prediction rate is 92 percent. The IPW correction involves weighting observations by $1/p_i$, where p_i represents the probability of survival, therefore giving more weight in the regression to those individuals whose observable characteristics predict higher attrition rates. The results in specifications 4-6 show that the elasticity magnitudes decline somewhat as expected, since attrition bias may have inflated the price response. However, the general pattern of results and conclusions remains unaffected.

VI. Discussion

Economists have long recommended increases in the price of alcohol as a tool to reduce consumption and related external costs. However, these recommendations have generally been based on studies of the overall population or limited demographic subgroups. Specifically, there have been no prior studies that have considered the drinking behavior of the older demographic. Given the aging of the population combined with an increased potential for alcohol-related harms, it is important to study whether older adults respond to tax policies and to what extent. This study is the first to provide estimates comparing the tax response of younger and older adults. Results indicate that not only is alcohol use (participation, intensity, and heavy drinking) among older adults responsive to taxes, but these adults also have much higher tax elasticities compared to younger adults. Thus, higher excise taxes would be particularly effective in curtailing use for this sub-population.

While the analysis in this study focused on state-level excise taxes to provide direct estimates of an important policy tool, the tax elasticity can also be translated into the price elasticity for comparison. Specifically, if taxes are passed through to prices at a rate of α, then the following characterizes the relation between the price elasticity ε_P and the tax elasticity ε_T (Kenkel, 2005): $\varepsilon_P = \varepsilon_T (\alpha * T/P)^{-1}$

If α is one, as would be the case under competitive conditions, then a one-cent increase in the tax would lead to a corresponding one-cent increase in price. Under monopolistic conditions, with a constant elasticity demand curve, α would exceed one. Indeed studies have generally found the pass-through rate to be larger than one, on the order of 1.6 to 2 or more (Kenkel, 2005; Young and Bielinska-Kwapisz, 2002). Employing an α of 1.5 and noting that excise taxes account for about eight to nine percent of the price of beer, the price elasticity can be determined by multiplying the tax elasticity by a factor of 7.4. Thus, the participation elasticity for younger adults (ages 21-54) is between -0.31 and -0.37. Adults ages 55 and older have a much larger price response, with the participation price elasticity estimated at between -1.28 and -1.63. Furthermore, their conditional consumption elasticity is between -0.64 and -0.81. Thus, older adults appear to be among the most price sensitive of all demographic subgroups.

Estimates of the alcohol demand function and the price elasticity have also abstracted from important person-specific differences in personality traits such as attitudes towards risk. At worst, these individual-level differences are not accounted for at all, and at best, they are purged through individual fixed effects. No prior study has specifically incorporated the economist's concept of risk tolerance into the empirical demand function. Accounting for risk can partially explain some persisting demographic variations previously attributed to tastes or culture. For instance, drinking prevalence is partly higher among males due to a higher tolerance towards risk. Similarly, a higher degree of risk aversion among Blacks and married individuals can also partially explain why these individuals are less likely to consume alcohol. Future research may benefit from considering the confounding effects of risk tolerance on other risky health behaviors, particularly smoking.

Since risk-tolerant individuals are found to participate more in drinking and have a higher level of consumption, it is also important to determine whether their alcohol use responds to tax policy. This group, through their higher consumption, also bears a greater share of the responsibility of the societal costs of alcohol abuse. There are some indications that while overall drinking prevalence remained stable over the past decade, problem drinking may be trending upwards. Data from the Behavioral Risk Factor Surveillance System (BRFSS) show that the median prevalence of binge drinking has increased from 14.4 percent (1992) to 16.1 percent (2002). Similarly, chronic drinking has also increased from 3.0

to 5.9 percent over this period.[29] Since the majority of drinkers consume alcohol safely with little external harm, the rationale for higher taxes falls on whether high-participation groups curb their consumption in response to higher costs. There is a tradeoff in terms of the social gains from making heavy users face higher prices that reflect the full social costs of their drinking versus the burden of higher prices on moderate drinkers (Manning et al., 2005). If, for instance, risk-tolerant individuals are not price-sensitive then increasing taxes may have a greater proportional effect on light or moderate drinkers and would not be effective in reducing alcohol-related harms. Estimates from this study, however, suggest that this is not the case; risk-tolerant individuals are just as responsive to excise taxes relative to risk-averse individuals, if not more. These results therefore strengthen the rationale for raising alcohol excise taxes as a policy tool for deterring use among groups likely to over-consume alcohol.

[29] Binge drinking in the BRFSS is defined as having 5 or more drinks on a single occasion, at least once in the past month. Chronic drinking is defined as consuming more than two drinks daily for males and more than one drink daily for females. These rates correspond to individuals 18 years of age and older.

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Table 1
Weighted Sample Means
PSID and HRS

Variable	Definition	PSID: Ages 21 – 54			HRS: Ages 55 and older		
		All	Risk Averse	Risk Tolerant	All	Risk Averse	Risk Tolerant
Alcohol Participation	Dichotomous indicator for currently drinker	0.6607 (0.4735)	0.6421*** (0.4795)	0.7528 (0.4315)	0.3508 (0.4772)	0.3590*** (0.4797)	0.4131 (0.4924)
Drinks	Average number of drinks consumed daily	–	–	–	0.3466 (0.7569)	0.3537*** (0.7713)	0.4304 (0.8321)
Real Beer Tax	State excise tax on beer, adjusted by the consumer price index, in dollars per gallon	0.1286 (0.0911)	0.1355*** (0.0966)	0.1276 (0.0925)	0.1301 (0.0843)	0.1315*** (0.0876)	0.1257 (0.0819)
Risk Averse	Dichotomous indicator for high degree of risk aversion	0.4293 (0.4950)	–	–	0.6388 (0.4803)	–	–
Age	Age of respondent	39.599 (9.2743)	41.834*** (8.2736)	40.706 (8.1738)	67.857 (9.8728)	63.256*** (6.5705)	62.5130 (6.4683)
Male	Dichotomous indicator for male	0.4707 (0.4992)	0.4537*** (0.4979)	0.5647 (0.4959)	0.4453 (0.4970)	0.4442*** (0.4969)	0.4988 (0.5000)
Black	Dichotomous indicator for Black	0.1204 (0.3254)	0.1512*** (0.3583)	0.0977 (0.2970)	0.0912 (0.2879)	0.0990*** (0.2986)	0.0873 (0.2823)
Other Race	PSID: Dichotomous indicator for race other than Black, White or Hispanic HRS: Dichotomous indicator for race other than Black or White	0.0400 (0.1959)	0.0165* (0.1275)	0.0245 (0.1545)	0.0319 (0.1758)	0.0349 (0.1835)	0.0376 (0.1902)
Hispanic	Dichotomous indicator for Hispanic	0.0690 (0.2534)	0.0140 (0.1174)	0.0171 (0.1297)	0.0586 (0.2348)	0.0631 (0.2431)	0.0656 (0.2475)
High School [1]	Dichotomous indicator for highest level of school completed being high school	0.0753 (0.2639)	0.0465* (0.2105)	0.0373 (0.1896)	0.3599 (0.4800)	0.3914*** (0.4881)	0.3299 (0.4702)
Some College [1]	Dichotomous indicator for highest level of school completed being some college	0.0719 (0.2583)	0.0341 (0.1816)	0.0336 (0.1802)	0.1947 (0.3960)	0.1986*** (0.3989)	0.2315 (0.4218)
College [1]	Dichotomous indicator for highest level of school completed being college	0.0992 (0.2990)	0.0433* (0.2035)	0.0543 (0.2266)	0.1853 (0.3885)	0.1890*** (0.3915)	0.2555 (0.4361)
Education Missing	PSID: Dichotomous indicator for respondents whose education level is missing	0.7321 (0.4429)	0.8657 (0.3410)	0.8691 (0.3373)	–	–	–
Real Income	Income from all sources, adjusted by the consumer price index, in thousands of dollars	40.549 (45.3307)	42.831*** (48.7359)	47.200 (44.7324)	13.068 (22.8338)	14.242*** (22.8532)	16.034 (24.2785)
Married	Dichotomous indicator for married	0.6402 (0.4800)	0.6400 (0.4801)	0.6265 (0.4838)	0.6256 (0.4840)	0.6843*** (0.4648)	0.6724 (0.4693)
Working	Dichotomous indicator for full-time or part-time work	0.8149 (0.3884)	0.8927 (0.3096)	0.8916 (0.3110)	0.3811 (0.4857)	0.4756*** (0.4994)	0.5207 (0.4996)
Unemployed	Dichotomous indicator for unemployed	0.0400 (0.1961)	0.0272 (0.1627)	0.0346 (0.1827)	0.0080 (0.0889)	0.0099*** (0.0989)	0.0131 (0.1139)
Retired	Dichotomous indicator for complete retirement	0.0106 (0.1024)	0.0137** (0.1163)	0.0076 (0.0868)	0.4762 (0.4994)	0.3910*** (0.4880)	0.3477 (0.4762)
Household Size	Number of members residing in the household	2.9389 (1.4876)	2.8248 (1.4072)	2.7918 (1.3977)	2.1433 (1.1061)	2.2593 (1.1260)	2.2457 (1.1292)
Parental Education	PSID: Dichotomous indicator for whether mother or father is a college graduate HRS: Dichotomous indicator for whether mother and father have completed at least 8 years of schooling	0.2516 (0.4339)	0.1901*** (0.3925)	0.3214 (0.4671)	0.5153 (0.4998)	0.5566*** (0.4968)	0.6133 (0.4870)

Functional Difficulties	PSID: Count of the difficulties associated with: 1) bathing, 2) dressing, 3) eating, 4) walking, 5) getting outside HRS: Count of the difficulties associated with: 1) walking 1 block, 2) walking several blocks, 3) walking across a room, 4) climbing 1 flight of stairs, 5) climbing several flights of stairs	0.0404 (0.2749)	0.0202*** (0.1757)	0.0298 (0.2168)	0.9945 (1.4179)	0.8650*** (1.3234)	0.8047 (1.2751)
Hypertension	Dichotomous indicator for whether respondent has been diagnosed with high blood pressure	0.1517 (0.3587)	0.1667** (0.3728)	0.1420 (0.3491)	0.4745 (0.4994)	0.4598*** (0.4984)	0.4384 (0.4962)
Diabetes	Dichotomous indicator for whether respondent has been diagnosed with diabetes	0.0494 (0.2166)	0.0527 (0.2234)	0.0443 (0.2058)	0.1431 (0.3501)	0.1448** (0.3519)	0.1383 (0.3452)
Heart Disease	Dichotomous indicator for whether respondent has been diagnosed with heart disease	0.0289 (0.1676)	0.0269 (0.1617)	0.0205 (0.1417)	0.2315 (0.4218)	0.1909*** (0.3930)	0.1800 (0.3842)
Stroke	Dichotomous indicator for whether respondent has ever had a stroke	0.0097 (0.0981)	0.0117 (0.1074)	0.0076 (0.0868)	0.0738 (0.2614)	0.0527 (0.2234)	0.0499 (0.2176)
Depression	PSID: Number of depression-related symptoms in the past month: 1) sad, 2) nervous, 3) restless, 4) hopeless HRS: Center for Epidemiologic Studies Depression Scale; Sum of mental health symptoms in the past week: 1) depressed, 2) everything an effort, 3) restless sleep, 4) not happy, 5) lonely, 6) sad, 7) could not get going, 8) did not enjoy life	0.5247 (0.9900)	0.4572*** (0.9191)	0.5500 (0.9675)	1.4394 (1.9073)	1.3232*** (1.8755)	1.3770 (1.9079)
BAC 08	Dichotomous indicator for whether the state has an effective 0.08 BAC per se law in the given interview period	0.4812 (0.4997)	0.4379 (0.4962)	0.4525 (0.4978)	0.4778 (0.4995)	0.5000*** (0.5000)	0.5311 (0.4990)
Percent Dry	Percent of state population residing in dry counties in the given period	0.0429 (0.0934)	0.0578*** (0.1094)	0.0394 (0.0893)	0.0299 (0.0698)	0.0309*** (0.0692)	0.0284 (0.0685)
Monopoly State	Dichotomous indicator for whether the state controls the sale of distilled spirits	0.3152 (0.4646)	0.3706*** (0.4831)	0.3317 (0.4709)	0.2956 (0.4563)	0.3086*** (0.4619)	0.2909 (0.4542)
Planning Horizon 5-10 years	Dichotomous indicator for whether the respondent's relevant financial planning horizon is the next 5-10 years	–	–	–	0.2751 (0.4466)	0.2851*** (0.4515)	0.3141 (0.4642)
Planning Horizon 10+ years	Dichotomous indicator for whether the respondent's relevant financial planning horizon is longer than 10 years	–	–	–	0.0789 (0.2696)	0.0879*** (0.2832)	0.0971 (0.2961)
Observations		27,531	4,430	5,280	101,477	43,487	23,449

Notes: Means are weighted by the sampling weights. Standard deviations are in parentheses. Number of observations listed represents the maximum number. For some variables, the actual sample size is less due to missing information. Asterisks denote that the difference in means between the Risk Averse and Risk Tolerant samples is statistically significant as follows: *** significant at the one-percent level, ** significant at the five-percent level, * significant at the ten-percent level.

1 Due to a large number of missing observations for education in the PSID, a separate category for missing information is created. Thus, the appropriate means for high school, some college, and college should be interpreted with respect to the percent of non-missing observations.

Table 2
Alcohol Participation
PSID and HRS

Sample	Ages 21 - 54			Ages 55 and older		
Dataset	PSID	PSID	PSID	HRS	HRS	PSID
Variable	1	2	3	4	5	6
Real Beer Tax	-0.1588*** (0.0445) [ε = -0.037]	-0.2198 (0.2200) [ε = -0.050]	-0.1877*** (0.0735) [ε = -0.042]	-0.5308*** (0.1247) [ε = -0.224]	-0.4525*** (0.1618) [ε = -0.173]	-0.5721*** (0.1826) [-0.130]
Risk Averse	–	–	-0.0583*** (0.0147)	–	-0.0329*** (0.0074)	-0.0574* (0.0340)
Male	0.1681*** (0.0084)	0.1692*** (0.0084)	0.1453*** (0.0152)	0.1594*** (0.0057)	0.1677*** (0.0075)	0.1720*** (0.0368)
Black	-0.1595*** (0.0108)	-0.1420*** (0.0119)	-0.1495*** (0.0184)	-0.1088*** (0.0072)	-0.0812*** (0.0104)	-0.1242** (0.0493)
Other Race	-0.1769*** (0.0225)	-0.1767*** (0.0228)	-0.1340*** (0.0519)	-0.1298*** (0.0124)	-0.1302*** (0.0166)	-0.4996*** (0.0738)
Hispanic	-0.1982*** (0.0194)	-0.2019*** (0.0207)	-0.0330 (0.0687	-0.0746*** (0.0102)	-0.0417*** (0.0142)	0.0160 (0.2487)
High School	0.0124 (0.0137)	0.0129 (0.0138)	0.0134 (0.0312)	0.0909*** (0.0073)	0.0583*** (0.0102)	-0.1750* (0.1023)
Some College	0.0278** (0.0139)	0.0241* (0.0140)	0.0557* (0.0282)	0.1718*** (0.0091)	0.1201*** (0.0121)	0.0093 (0.1276)
College	0.0850*** (0.0140)	0.0808*** (0.0141)	0.0666** (0.0293)	0.2405*** (0.0098)	0.1806*** (0.0130)	-0.1612 (0.1195)
Real Income	0.0021*** (0.0002)	0.0019*** (0.0002)	0.0019*** (0.0003)	0.0010*** (0.0002)	0.0008*** (0.0002)	0.0022*** (0.0005)
Married	-0.1567*** (0.0093)	-0.1539*** (0.0093)	-0.1222*** (0.0171)	0.0090 (0.0056)	0.0068 (0.0080)	-0.0541 (0.0432)
Age 26-30	-0.0078 (0.0139)	-0.0116 (0.0140)	-0.0324 (0.0385)	–	–	–
Age 31-35	-0.0182 (0.0156)	-0.0253 (0.0157)	-0.0274 (0.0406)	–	–	–
Age 36-40	-0.0230 (0.0155)	-0.0321** (0.0156)	-0.0424 (0.0405)	–	–	–
Age 41-45	-0.0518*** (0.0160)	-0.0620*** (0.0160)	-0.0606 (0.0407)	–	–	–
Age 46-50	-0.0612*** (0.0167)	-0.0717*** (0.0168)	-0.0697* (0.0415)	–	–	–
Age 51-55	-0.0779*** (0.0183)	-0.0897*** (0.0184)	-0.1025** (0.0440)	–	–	–
Age 61-65	–	–	–	-0.0195*** (0.0045)	-0.0175*** (0.0054)	-0.0193 (0.0338)
Age 66-70	–	–	–	-0.0390*** (0.0062)	-0.0452*** (0.0082)	-0.0250 (0.0451)
Age 71-75	–	–	–	-0.0568*** (0.0066)	-0.0537*** (0.0102)	-0.0058 (0.0556)
Age 76-80	–	–	–	-0.1240*** (0.0063)	-0.0765*** (0.0146)	-0.1091 (0.0820)
Employed	–	–	0.1044*** (0.0247)	–	0.0416*** (0.0105)	0.1348** (0.0650)
Unemployed	–	–	0.1289*** (0.0304)	–	0.0358 (0.0235)	0.1057 (0.1105)
Retired	–	–	0.1423** (0.0544)	–	0.0565*** (0.0101)	0.1249* (0.0629)

Household Size	–	–	-0.0219*** (0.0057)	–	-0.0182*** (0.0029)	-0.0109 (0.0206)
Parental Education	–	–	0.0358* (0.0186)	–	0.0340*** (0.0078)	0.0890 (0.0534)
Functional Difficulties	–	–	-0.0399 (0.0248)	–	-0.0294*** (0.0026)	-0.0447** (0.0228)
Hypertension	–	–	0.0118 (0.0178)	–	-0.0094 (0.0069)	-0.0381 (0.0329)
Diabetes	–	–	-0.0229 (0.0330)	–	-0.1372*** (0.0084)	-0.1061** (0.0477)
Heart Disease	–	–	-0.0242 (0.0369)	–	-0.0371*** (0.0087)	-0.0056 (0.0432)
Stroke	–	–	0.0144 (0.0582)	–	-0.0672*** (0.0146)	-0.0863 (0.0795)
Depression	–	–	0.0108 (0.0074)	–	-0.0040** (0.0016)	0.0187 (0.0174)
BAC 08	-0.0218*** (0.0083)	–	-0.0143 (0.0141)	–	–	-0.0423 (0.0319)
Percent Dry	-0.4052*** (0.0466)	–	-0.3725*** (0.0744)	–	–	-0.0905 (0.1683)
Monopoly State	0.0443*** (0.0092)	–	0.0515*** (0.0150)	–	–	0.0146 (0.0334)
Year Indicators	Yes***	Yes**	Yes***	Yes***	Yes***	Yes
State Indicators	No	Yes***	No	Yes***	Yes***	No
Pseudo R^2	0.077	0.089	0.089	0.135	0.145	0.117
Percent Correctly Classified	0.625	0.634	0.657	0.672	0.680	0.672
Observations	26,762	26,762	9,545	107,509	66,374	1,935

Notes: Specifications are estimated via Probit, and marginal effects are reported. Standard errors in parentheses are clustered robust. Tax elasticities, evaluated at the sample means, are reported in brackets. Significance is denoted as follows: *** significant at the one-percent level ** significant at the five-percent level * significant at the ten-percent level. Significance of the tax effect is based on a one-tailed test. Percent correctly classified is calculated using a cutoff based on the observed mean prevalence of alcohol participation for each corresponding sample.

Table 3
Alcohol Participation
Stratified by Risk Preference

Sample	PSID: Ages 21 - 54		HRS: Ages 55 and older	
	Risk Averse	Risk Tolerant	Risk Averse	Risk Tolerant
Variable	1	2	3	4
Real Beer Tax	-0.2157** (0.1094) [ε = -0.056]	-0.1822** (0.0977) [ε = -0.037]	-0.3863** (0.1942) [ε = -0.159]	-0.5987** (0.2902) [ε = -0.205]
Male	0.1988*** (0.0227)	0.0875*** (0.0203)	0.1641*** (0.0094)	0.1729*** (0.0126)
Black	-0.1056*** (0.0264)	-0.1918*** (0.0257)	-0.0750*** (0.0126)	-0.0904*** (0.0181)
Other Race	-0.1006 (0.0826)	-0.1775*** (0.0671)	-0.1211*** (0.0205)	-0.1367*** (0.0286)
Hispanic	-0.0417 (0.1095)	-0.0349 (0.0843)	-0.0613*** (0.0169)	0.0012 (0.0257)
High School	0.0294 (0.0428)	-0.0054 (0.0455)	0.0586*** (0.0123)	0.0575*** (0.0181)
Some College	0.1176*** (0.0402)	-0.0107 (0.0401)	0.1252*** (0.0151)	0.1159*** (0.0203)
College	0.1401*** (0.0411)	-0.0029 (0.0404)	0.1573*** (0.0164)	0.2200*** (0.0213)
Real Income	0.0013*** (0.0004)	0.0026*** (0.0004)	0.0007*** (0.0002)	0.0007** (0.0003)
Married	-0.1390*** (0.0260)	-0.1139*** (0.0219)	0.0094 (0.0099)	0.0046 (0.0135)
Employed	0.1146*** (0.0361)	0.0881*** (0.0323)	0.0443*** (0.0129)	0.0365** (0.0178)
Unemployed	0.1549*** (0.0483)	0.1108*** (0.0372)	0.0447 (0.0311)	0.0220 (0.0362)
Retired	0.1927** (0.0696)	0.0769 (0.0942)	0.0562*** (0.0124)	0.0577*** (0.0173)
Household Size	-0.0167** (0.0085)	-0.0262*** (0.0075)	-0.0173*** (0.0036)	-0.0193*** (0.0049)
Parental Education	0.0561* (0.0302)	0.0157 (0.0231)	0.0316*** (0.0095)	0.0404*** (0.0135)
Functional Difficulties	-0.0466 (0.0343)	-0.0373 (0.0360)	-0.0280*** (0.0032)	-0.0329*** (0.0045)
Hypertension	-0.0008 (0.0266)	0.0210 (0.0235)	-0.0097 (0.0084)	-0.0089 (0.0119)
Diabetes	-0.0498 (0.0465)	-0.0002 (0.0461)	-0.1401*** (0.0101)	-0.1278*** (0.0149)
Heart Disease	-0.0423 (0.0532)	0.0002 (0.0491)	-0.0258** (0.0107)	-0.0620*** (0.0149)
Stroke	0.0949 (0.0787)	-0.0924 (0.0836)	-0.0503*** (0.0181)	-0.0990*** (0.0246)
Depression	0.0023 (0.0114)	0.0180* (0.0096)	-0.0022 (0.0020)	-0.0066*** (0.0028)
BAC 08	-0.0127 (0.0211)	-0.0130 (0.0186)	–	–
Percent Dry	-0.3604*** (0.1066)	-0.3651*** (0.1055)	–	–
Monopoly State	0.0585** (0.0228)	0.0412** (0.0196)	–	–
Age Indicators	Yes	Yes**	Yes***	Yes***
Year Indicators	Yes**	Yes	Yes***	Yes***

State Indicators	No	No	Yes***	Yes***
Pseudo R^2	0.077	0.100	0.143	0.153
Percent Correctly Classified	0.636	0.664	0.675	0.686
Observations	4,355	5,190	43,181	23,183

Notes: See Table 2

Table 4
HRS: Older Adults
Specification Checks

Sample	Intensive Margin				Ever Drinkers		Time Preference		
					Current Price Effect	Current & Lagged Price Effects	All	Risk Averse	Risk Tolerant
Dependent Variable	Log Drinks	Log Drinks	Chronic Consumption	Chronic Consumption	Alcohol Participation	Alcohol Participation	Alcohol Participation	Alcohol Participation	Alcohol Participation
Specification	1	2	3	4	5	6	7	8	9
Real Beer Tax	-0.6243* (0.4064) [ε = -0.086]	-0.8929** (0.4281) [ε = -0.109]	-0.2023* (0.1330) [ε = -0.278]	-0.1909* (0.1374) [ε = -0.265]	-0.3921** (0.2040) [ε = -0.100]	P_t: -0.3431 (0.4908) P_{t-1}: -0.0496 (0.4656)	-0.5717*** (0.1739) [ε = -0.216]	-0.5355*** (0.2085) [ε = -0.215]	-0.6031** (0.3094) [ε = -0.208]
Risk Averse	-0.0549*** (0.0193)	-0.0864*** (0.0337)	-0.0063 (0.0057)	-0.0041 (0.0100)	-0.0212** (0.0085)	-0.0212** (0.0085)	-0.0322*** (0.0086)	–	–
Real Beer Tax * Risk Averse	–	0.2298 (0.1987)	–	-0.0156 (0.0575)	–	–	–	–	–
Planning Horizon 5-10 years	–	–	–	–	–	–	0.0402** (0.0094)	0.0386*** (0.0117)	0.0425*** (0.0159)
Planning Horizon 10+ years	–	–	–	–	–	–	0.0571** (0.0156)	0.0406** (0.0194)	0.0822*** (0.0263)
Year Indicators	Yes**	Yes**	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
State Indicators	Yes	Yes	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
R^2 / Pseudo R^2	0.080	0.080	0.083	0.083	0.141	0.141	0.130	0.131	0.135
Percent Correctly Classified	-	-	0.610	0.609	0.674	0.674	0.675	0.673	0.670
Observations	24,635	24,635	24,612	24,612	46,212	46,212	54,237	35,423	18,796

Notes: See Table 2. Each column represents a separate regression model. All specifications include the extended set of covariates listed in Table 2.

Table 5
HRS: Older Adults
Sample Attrition

Sample	Sample Attrition					
	Balanced Sample			Inverse Probability Weighting [1]		
	All	Risk Averse	Risk Tolerant	All	Risk Averse	Risk Tolerant
Dependent Variable	Alcohol Participation	Alcohol Participation	Alcohol Participation	Alcohol Participation	Alcohol Participation	Alcohol Participation
Specification	1	2	3	4	5	6
Real Beer Tax	-0.5871*** (0.1998) [ε = -0.219]	-0.5446** (0.2398) [ε = -0.217]	-0.6751** (0.3621) [ε = -0.224]	-0.3671** (0.1797) [ε = -0.147]	-0.2902* (0.2115) [ε = -0.125]	-0.5451* (0.3331) [ε = -0.185]
Year Indicators	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
State Indicators	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
R^2 / Pseudo R^2	0.151	0.153	0.130	0.137	0.134	0.146
Percent Correctly Classified	0.684	0.684	0.686	0.676	0.676	0.677
Observations	40,599	26,544	14,036	55,137	35,740	19378

Notes: See Table 2. Each column represents a separate regression model. All models include the extended set of covariates listed in Table 2.

1 Inverse probability weights are predicted using baseline characteristics (gender, race, ethnicity, education, parental education, religion, and native-born) along with other time-varying factors (age indicators, wave indicators, census division indicators), lagged covariates (income, marital status, health insurance), and health status and alcohol consumption in the prior wave.

Figure 1

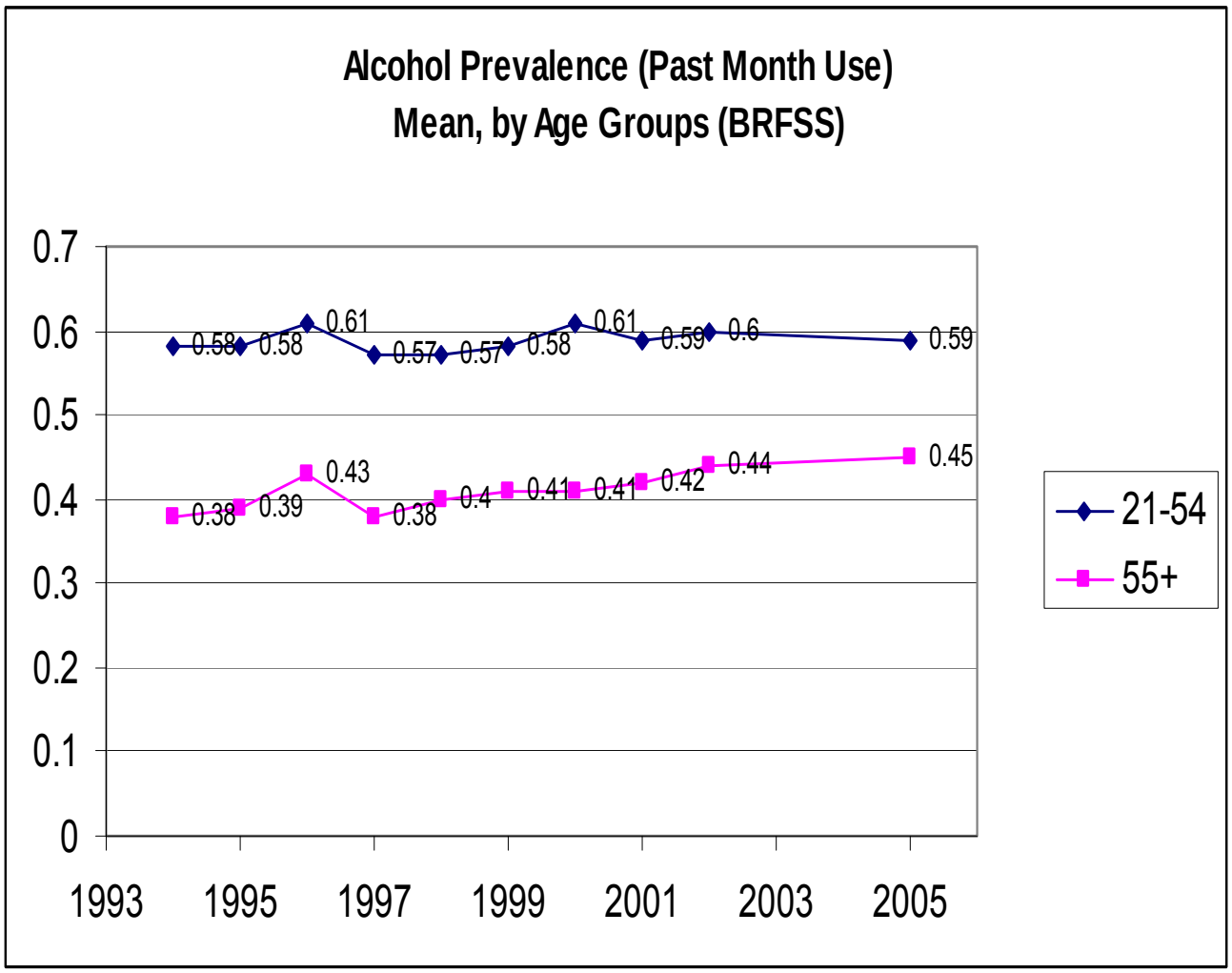

Alcohol Prevalence (Past Month Use)
Mean, by Age Groups (BRFSS)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1993
1995
1997
1999
2001
2003
2005
0.58
0.58
0.61
0.57
0.57
0.58
0.61
0.59
0.6
0.59
0.38
0.39
0.43
0.38
0.4
0.41
0.41
0.42
0.44
0.45
21-54
55+

Figure 2

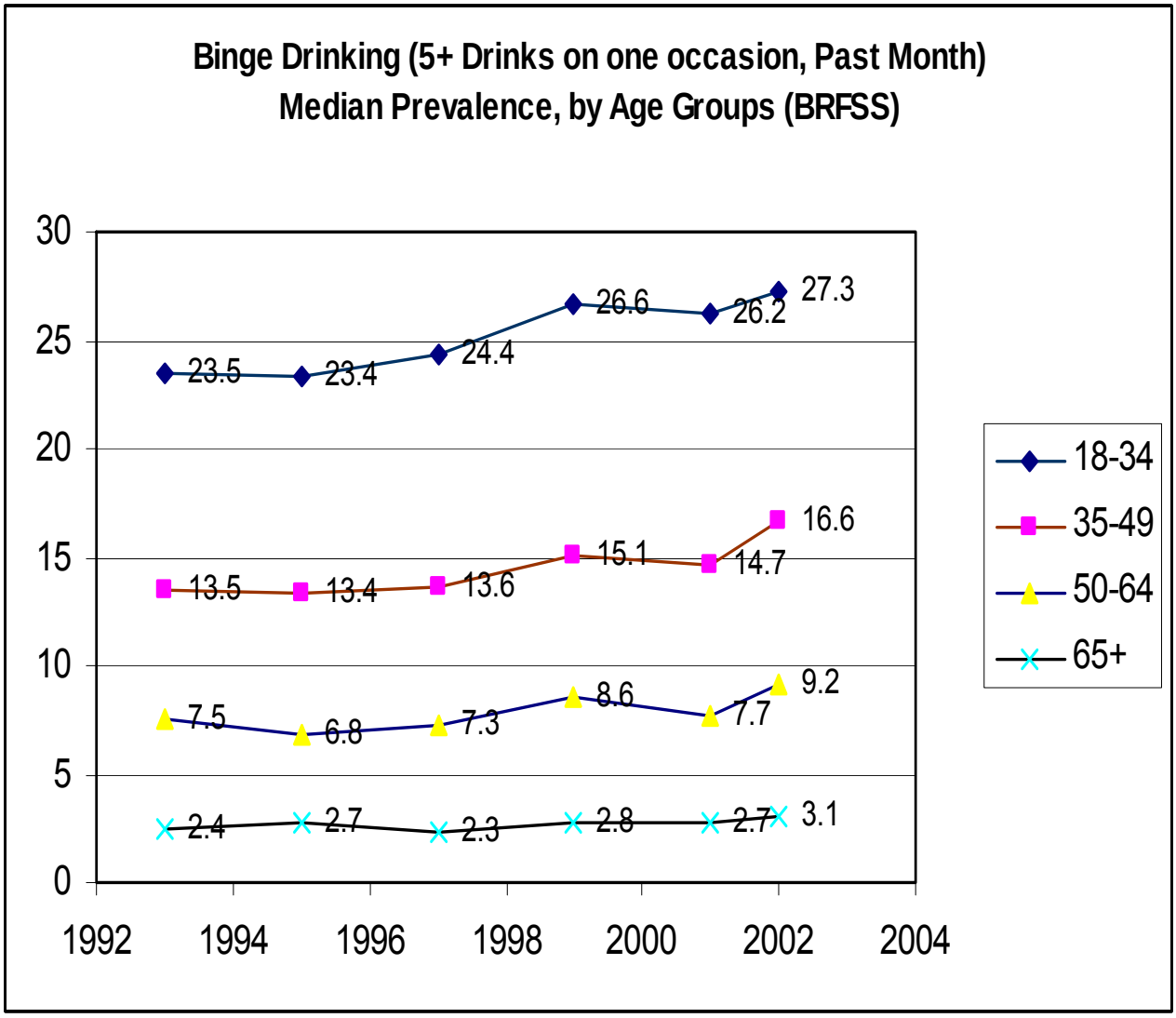
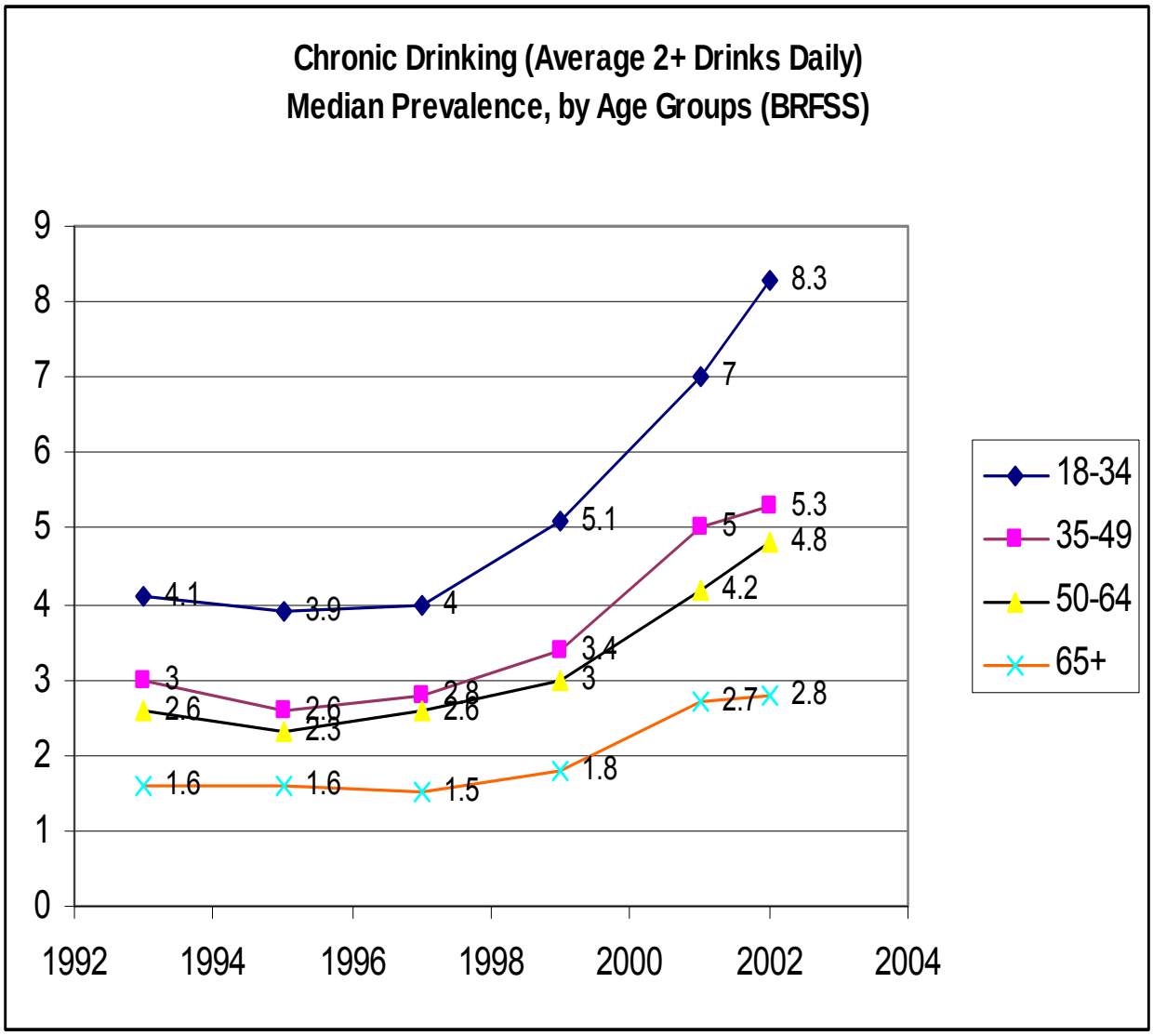

Binge Drinking (5+ Drinks on one occasion, Past Month)
Median Prevalence, by Age Groups (BRFSS)
30
25
20
15
10
5
0
1992
1994
1996
1998
2000
2002
2004
23.5
23.4
24.4
26.6
26.2
27.3
13.5
13.4
13.6
15.1
14.7
16.6
7.5
6.8
7.3
8.6
7.7
9.2
2.4
2.7
2.3
2.8
2.7
3.1
18-34
35-49
50-64
65+

Figure 3


Chronic Drinking (Average 2+ Drinks Daily)
Median Prevalence, by Age Groups (BRFSS)
9
8
7
6
5
4
3
2
1
0
1992
1994
1996
1998
2000
2002
2004
8.3
7
5.1
4.1
3.9
4
5.3
5
4.8
4.2
3.4
3
3
2.6
2.6
2.8
2.6
2.3
2.8
2.7
1.6
1.6
1.5
1.8
18-34
35-49
50-64
65+

Appendix 1
Risk Tolerance Module

Classification of individuals into four ordinal categories of risk tolerance is derived from the following questions asked in the HRS and the PSID modules.

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 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 to the first question is "Yes," then the interviewer continues to another hypothetical scenario that increases the amount of income loss from a third to ha half.

2) 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?

If the answer to the first question is "No," then the interviewer presents another scenario similar to (1) but with a lower income loss (from a third to 20 percent).

3) 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 then take the new job?

The most risk-averse individuals answer "No" to questions (1) and (3), rejecting both the one-third and one-fifth income loss scenarios. The second most risk-averse group of individuals answers "No" to question (1) and "Yes" to question (3); they reject the income loss of one-third but accept the scenario with an income loss of one-fifth. The third group (with a lower degree of risk aversion) answers "Yes" to question (1), accepting the one-third income loss, but answers "No" to question (2), rejecting the one-half income loss. The fourth group comprising of the most risk-tolerant individuals answer "Yes" to both questions (1) and (2), accepting both the one-third and one-half income loss scenarios.

In the PSID, the module includes these three scenarios along with two others that probe with higher and lower income losses relative to (2) and (3) respectively. If the individual answers "Yes" to question (2) willing to accept the risk of a one-half income loss, then he/she is asked about a scenario with a three-fourths income loss:

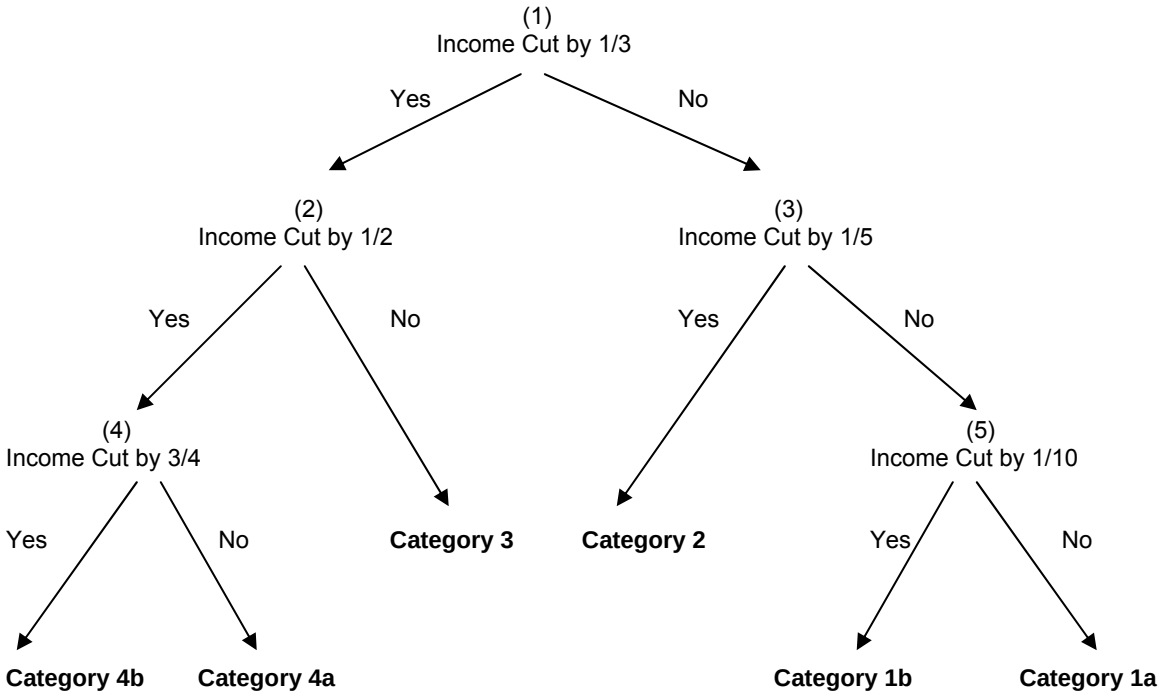
4) Now, suppose that the chances were 50-50 that the new job would double [your/your family] income, and 50-50 that it would cut it by 75 percent. Would you still take the new job?

If the individual answers "No" to question (3), unwilling to accept an income loss of one-fifth, then he/she is asked about a scenario with a potential income loss of ten percent.

5) Now, suppose that the chances were 50-50 that the new job would double [your/your family] income, and 50-50 that it would cut it by 10 percent. Then, would you take the new job?

Thus, in the PSID, individuals can be divided into six ordinal categories of risk aversion; the two extra categories separate out the most risk-averse and the most risk-tolerant (categories 1 and 4) further. However, to ensure consistency with the four-category classification employed in the HRS, questions (4) and (5) are not utilized here. The following decision tree summarizes the full module.

Figure A1



Category 1a represents the most risk-averse individuals, and Category 4b represents the most risk-tolerant individuals. For this study, a dichotomous indicator is defined for risk-averse individuals who fall

in Category 1, relative to all others. The distinction between 1a versus 1b, and 4a versus 4b can only be made in the PSID. The following distribution of individuals results across the four divisions in the PSID and the HRS.

Table A1

Distribution of Risk Aversion		
Risk Classification	PSID (Ages 21-54)	HRS (Ages 55+)
Category 1 (Most Risk-Averse)	42.9	63.9
Category 2	15.4	13.1
Category 3	18.6	10.3
Category 4 (Most Risk-Tolerant)	23.0	12.7
Observations	9,710	118,902

Note: Frequencies are weighted by the sampling weight.