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Essays on impact of risk preference on health and occupational choice

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ESSAYS ON IMPACT OF RISK PREFERENCE ON HEALTH AND OCCUPATIONAL CHOICE

by

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DEDICATION

I dedicate this dissertation to my mother Shashi Beri whose values, honesty, dedication and hard-working attitude has always guided me during my dissertation. Mom, your principles will always be there with me, guiding me all the time.

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Chapter 1. Introduction:

This dissertation is a compilation of three essays related with investigation of the impact of risk preference on occupational choice, health and happiness. The motivation behind my work are two fundamental questions – what are human beings aiming at (on an average) in their lives and whether our life outcomes are affected by our preferences or not. Recent surveys/studies find that people are looking for simple things in life like - health, wealth and happiness.[1] To answer the second question this dissertation investigates the impact of risk preference on health, wealth and happiness. I adopt a holistic approach towards risk attitude/ preference by studying its impact in financial front as well as in health and happiness front. Given heterogeneous risk and time preferences of individuals, this dissertation investigates the impact of those preferences on sorting into occupations on one front and heterogeneity in health state dependence of utility (using happiness as the utility proxy) on the other front. Contingent upon the results of existence of racial-ethnic and gender heterogeneity in health dependence of utility, this dissertation identifies the contribution of observed factors behind the heterogeneity using nonlinear Blinder-Oaxaca decomposition.

The findings of this study are important because the risk attitude plays a significant role not only in the occupational choice but also in the health state dependence of utility and happiness level. What makes this study all the more relevant for labor economics and health demography/ health economics literature is the finding that people have behavioral inconsistency for health risk as compared to that of financial risk. Based on this finding, this

[1] Gallup poll (January, 2004) conducted on teens aged between 13 to 17 also suggests that we aim at simple things in life like healthy family, good job and happiness.

dissertation advises against the use of risk preference measures based on financial risk questions to make inferences about health risk attitude and vice-versa.

Other than above mentioned, what makes this study stand out from the literature is that the literature addresses either the impact of risk preference or that of the time preference separately on the occupations but to the best of my knowledge, none of the existing studies address the impact of the two preferences jointly on occupations. Moreover, literature addresses the issue of health state dependence of utility but does not address the existence of racial, ethnic and gender heterogeneity in health state dependence of utility and well-being and it does not study the factors contributing to this heterogeneity. This dissertation addresses these two caveats of literature.

Following are some of the other inadequacies of the literature, which this dissertation addresses:

1. Does not examine the issue of the possibility of people thinking differently about income risk versus health risk.
2. Concentrates mostly on fatal and non fatal injury/illness incidence risk and ignores the possibility of various other dimensions of occupational risk.
3. Mostly occupational risk analysis is done on occupations or industries independently, resulting in the same risk rank to all the occupations in the same industry and vice versa with an exception of Viscusi's 2004 paper, however it takes into account only the fatal injuries.
4. Studies (Finkelstein et al., 2010) on health dependence of utility do not investigate how racial, ethnic and gender differences impact the preferences which in-turn might lead to racial-ethnic and gender heterogeneity in state dependence of utility.

1.1. This dissertation fills these gaps in the literature:

The current study fills these gaps in the literature by analyzing:

First, how the risk and time preference jointly affect the occupational choice by ranking occupation-industry cells jointly on three risk dimensions - fatal injury/illness incidence risk, nonfatal injury/illness incidence risk, and income variability risk.

Secondly, it examines the behavioral inconsistency among people towards income risk from that of health risk and finds out that this distinction is relevant for future studies.

Thirdly, this study also examines whether there exists the racial, ethnic and gender heterogeneity in the health dependence of utility.

Last but not least, contingent upon the findings of presence of heterogeneity in health dependence of utility, this dissertation examines the factors contributing it and addresses the question whether risk preference plays any role in shaping the outcomes of life.

2. Research Question:

2.1 General Research Question:

How risk attitude affects the occupational choice, health and happiness?

2.2 Specific Research Questions:

1. Whether risk averse and more future oriented subjects get selected into the occupations which are comparatively safer and vice versa.
2. Whether (and if yes, then to what extent) the relation between risk and time preference and occupational choice differ in case of income variability risk than from the case of fatal and nonfatal incidence risk.
3. Whether there exist racial, ethnic and gender heterogeneity in health state dependence of utility.

4. If yes, what factors contribute to this heterogeneity in health dependence of utility? Is risk attitude a significant factor?

3. Research Material:

This dissertation uses Health and Retirement Study (HRS) data as the main data source for empirical analyses. Along with HRS, I also use Bureau of labor statistics (BLS) fatal and non-fatal injury data and 5% census data from IPUMS as subsidiary datasets. HRS is a nationally representative longitudinal survey started in 1992 and collects data every alternate year. This study uses several waves of HRS in order to capture the last recorded risk preference variables for each individual starting from 1998 up to 2004. This study excludes the AHEAD cohort because of their lower response rates on the current occupational questions due to older age; hence much higher rates of their being retired. For health dependence of utility, this study uses all the waves of HRS from 1998 to 2008.

- For occupational risk ranking – BLS data for fatal and non-fatal injury risk and PUMS 5% Census data for income variability risk.
- For employment and fatal and non-fatal injury data – BLS data.
- For gender, racial and ethnic comparisons – HRS data
- For health conditions – HRS data
- For utility (happiness and Center of Epidemiology Study-Depression (CES-D) score) – HRS data.

4. Hypothesis:

Based on the research questions, this dissertation tests the following four hypotheses:

1. More risk averse and more future oriented subjects select into less risky occupation.
2. Hypothesis-1 is applicable for both income risk and health risk.

3. Health state dependence of utility varies over race, ethnicity and gender.
4. Risk attitude affects the health state dependence of the marginal utility and happiness.

Brief Outline of Three Essays:

Essay 1: Risk Preference, Time Preference and Occupational Choice

First essay (Chapter -2) investigates the impact of risk and time preference on occupational choice by ranking occupation-industry cells on three risk dimensions - fatal injury/illness incidence risk, nonfatal injury/illness incidence risk, and income variability risk. Two different risk preference measures have been created in this study – one based on financial risk and the other on health risk with the aim to examine whether people behave the same way with respect to income risk and health risk. This study also estimates the validity of often used proxy for risk (smoking).

Findings of Essay-1

Occupational risk ranking by cross categorizing jobs on occupation and industry verifies our intuition that this joint ranking is important. The most standout contribution of this dissertation is the finding that people behave differently with regards to income risk as compared to that of health risk. Thereby this study advises against the use of smoking as a proxy for pure financial domain based risk analyses and vice-versa. The other finding of this essay is that both of the preferences – risk preference as well as time preference play role in occupational choice.

Essay 2: Health State Dependence of Utility – Are there Gender Differences? An Application of Non-linear Blinder-Oaxaca Decomposition

The second essay examines (Chater-3) whether health state dependence of utility varies over gender. If yes, this can have important implications for spending, saving, and portfolio allocation decisions, which can then affect wealth and welfare of household members over the remaining years of life. Contingent on the results of presence of gender difference, we also study what factors explain this difference by using non-linear Blinder-Oaxaca (B-O) decomposition. This dissertation investigates the role of risk attitude in explaining the gender gap in utility. For health states, this study not only uses seven objective health conditions separately, but also its composite measure. Other than that, this study also uses functional limitations as health measures. For utility proxy, it uses happiness as well as CES-D score from HRS data.

Findings of Essay-2

Gender heterogeneity in health dependence of utility does prevail not only when we use happiness as utility proxy but also when we use CES-D score; not only in seven objective health conditions but also in functional limitations. However, in functional limitations results are varying in some cases and more research is needed. Non-linear Blinder-Oaxaca (B-O) decomposition unfolds that the risk attitudes along with marital status, log adjusted income, and age are the significant contributors to gender heterogeneity in utility. This study affirms Hallidays' (2008) claims that though improvements in medical care lead to modest improvements in health, there may be larger potential gains to identifying as well as targeting factors that influence individual heterogeneity since the state dependence is mostly driven by individual characteristics.

Essay 3: Health State Dependence of Utility – Racial and Ethnic Differences?

The third essay (Chater-4) examines whether health state dependence of utility varies over race and ethnicity. If yes, this can have important implications for spending, saving, and portfolio allocation decisions, which can then affect wealth and welfare of household members over the remaining years of life. Contingent on the results of existence of racial-ethnic heterogeneity, this study thereby examines what factors explain this difference by using non-linear Blinder-Oaxaca (B-O) decomposition. For health states this study not only uses seven objective health conditions separately, but also its composite measure – number of diseases. Other than that, this study also uses functional limitations as health measures. For utility proxy, it uses happiness as well as CES-D score.

Findings of Essay-3

Racial and ethnic heterogeneity in health dependence of utility does prevail not only when we use happiness as utility proxy but also when we use CES-D score; not only in seven objective health conditions but also in functional limitations. However, in functional limitations results are varying in some cases and more research is needed. Non-linear Blinder-Oaxaca (B-O) decomposition unfolds that the risk attitudes along with marital status, log adjusted income, and age are the significant contributors to the racial-ethnic heterogeneity in utility. This study affirms Hallidays' (2008) claims that though improvements in medical care leads to modest improvements in health, there may be larger potential gains to identifying as well as targeting factors that influence individual heterogeneity since the state dependence is mostly driven by individual characteristics.

In the nutshell, this dissertation has the holistic approach towards the impact of risk attitude in monetary front as well as health and happiness front. Its findings about behavioral inconsistency towards income and health risk as well as about racial-ethnic and gender heterogeneity in health dependence of utility are significant contributions for the future studies and for the policy makers.

Chapter-2: Risk Preference, Time Preference and Occupational Choice

Abstract

Given heterogeneous risk and time preferences of individuals, we investigate the impact of those preferences on sorting into occupations and industries using various measures of job risk. We construct three measures of risk across jobs, cross-categorized by occupation and industry: a fatal injury rate, non-fatal injury and illness rate, and a measure of inter-person income variability. Using these measures, we analyze how risk and time preference of an individual affects his occupational choice. We find that there are different domains of risk and that individuals do not think of these in the same way. Using Health and Retirement Study data, we find behavioral inconsistency in health risks versus income risk. Based on our results, we recommend against using health-based risk proxies (e.g., smoking behavior) for financial risk analyses and vice versa.

I. Introduction

This chapter investigates the impact of risk and time preference on individual occupation and industry choice. This study cross classifies jobs by occupation and industry and construct three different measures of risk for each occupation-industry category. We then use survey data that includes measures of risk tolerance and proxy measures of time preference, along with occupation and industry of the individual's current job, to examine individual selection into these occupation-industry categories. Our primary question is, given the heterogeneity of risk across occupation-industry categories of jobs and the heterogeneity of risk tolerance across individuals, whether individuals sort into jobs in ways we would expect with respect to risk tolerance and time preference.

This question is not new, and we will shortly discuss some literature on the topic. Our unique contributions in this chapter are the following: (1) We are able to examine riskiness of jobs and risk tolerance of individuals in two distinct domains of risk: health and injury risk and income risk. We find strong evidence that the distinction is important. (2) We construct riskiness measures of jobs for classification of jobs by both occupation and industry. To our knowledge this has previously been done only for the fatality risk of jobs by Viscusi (2004) in his work on the value of a life. We claim that the variation in other risks (health, income) across industries within occupation categories is potentially large and important. (3) We are using survey data on a sample of workers who are near the end of their work-life. By the end of the work-life, workers have arguably had more opportunity to attain their ideal choice in occupation and industry, as well as having had more opportunity to become informed about the risks. Further, using this older sample allows us to treat educational attainment as pre-determined, rather than a decision that is taken jointly with the choice of occupation and industry.[2] (4) Finally, we address whether controlling for time preference impacts the estimated effect of risk tolerance on the riskiness of the job category chosen.

We construct three measures of risk across jobs cross-categorized by occupation and industry: a fatal injury rate, non-fatal injury and illness rate, and a measure of income variability. Using these measures, we analyze how risk and time preference of an individual affect his occupation-industry choice. Given existing risk premiums in labor markets for risk in various occupations and industries, individuals with higher risk tolerance should sort into riskier jobs in order to capture those premiums.

Our three risk measures of jobs represent two different domains of risk: health and injury risk and income risk. We also have survey data measures that allow us to separately examine attitudes about risk in these two separate domains. We use questions specifically designed to elicit risk tolerance with respect to income, and use several proxy measures of risk attitudes regarding health (smoking behavior and other health related behaviors). We examine these different domains and find evidence that individuals' preferences regarding these two domains are distinct. Thus we caution against using measures of preference regarding one domain of risk to predict behavior regarding a different domain of risk.

The remainder of the chapter proceeds as follows: Section Two discusses previous literature. Section Three presents our theoretical arguments and assumptions and hypotheses we will examine. In Section Four we describe the data and methods used. This includes both the data and methods used to construct our risk measures for jobs and the survey data and empirical model used for the main analysis, and how we construct our variables from that

[2] We recognize there may be endogeneity regardless of the time order and will return to this point in our literature review and in our discussion of shortcomings and direction for further work.

data. Section Five presents the empirical results from our analysis, including some robustness checks. In Section Six we conclude and discuss directions for further work.

II. Previous Literature and Background

Here we discuss some relevant previous literature, both in economics and psychology, in order to provide some background for the present study. Most of this literature falls into three categories: work focusing on heterogeneity in risk across jobs, those focusing on heterogeneity in risk and/or time preference across individuals, and those focused on measuring preferences.

Weiss (1972) documents variations in incomes within a narrowly defined occupation -- that of scientist -- and within age, education, and type of employment group among scientists. He interprets this variation as income risk that individuals must consider when choosing an occupation. King (1974) shows that income risk varies across occupations, and establishes that there is a wage premium associated with occupations with higher levels of income risk. He also shows that individuals with higher parental wealth choose occupations with higher income risk.

A different line of literature addresses how a subject's time preference affects occupational choice. The story is a well-known one: individuals with high discount rates care a lot about present consumption and little about future values and will therefore be unwilling to make investments in human capital that require an up-front cost and pay a return in the future. Therefore, those with high discount rates will choose occupations that require lower levels of human capital. Munasinghe and Sicherman (2006) use smoking behavior as a proxy for time preference. They find lower entry wages and lower wage growth among smokers than among non-smokers in National Longitudinal Surveys of Youth data.

Leigh (1986a) considers both risk and time preference in a recursive model of preference formation, human capital investment, and occupational choice. His aim is to investigate the disproportionately high share of blacks in risky occupations. He finds that risk and time preferences are not sufficient to explain the high prevalence of blacks in jobs with high health risks.

Other authors find, in other contexts, that it is important to consider both risk and time preferences simultaneously. Several recent studies (Andersen et al. 2008, Benjamin et al. 2010, Tanaka et al. 2010) find that the estimates of time discount rates are significantly lower in the case of joint elicitation of risk and time preference than in the case where time discounting is estimated assuming risk neutrality. In the present study, we take care to control for time preference in our estimates of the impact of risk preference on occupational choice.

The occupational risk studies of which we are aware each focus on a single measure of occupational risk — either health and/or mortality risk (Leigh 1986a) or income risk (King 1974, Evans and Weinstein 1982). We want to think about both types of risks inherent in job choice, and address whether behavior of individuals is consistent with respect to these two different types of risk. We will analyze three different measures of occupational risk and draw a comparison among them.

We first construct those three risk measures — the fatal injury rate, non-fatal injury and illness rate, and a measure of income variability for job categories cross-classified by occupation and industry — and then examine how risk and time preferences (measured through survey questions on risk and time horizon of planning) relate to the riskiness of the chosen occupation-industry category. We test whether more risk-averse individuals select into less risky jobs, controlling for their time preference along with other demographic controls.

Viscusi (2004) uses fatality rates within occupation-industry categories. By cross-classifying jobs, he captures a lot more variation in risk across jobs than is captured when classifying jobs by industry or occupation alone. For example, a mid-level manager in the financial sector faces quite different risks than the same occupation in the mining industry. Similarly, an administrative assistant in the construction industry faces quite different risks than a steel worker in the same industry.

Some previous literature posits that risk and time preferences are determined by factors like race, family background (Leigh 1986a), income status of the family (Green et al.1996, Viscusi 1978), and social identity (Benjamin et al. 2010) in the early years of one's life. We will take preferences as given, but we will control for some of these additional factors in case they have additional effects on occupation other than through preference formation.

III. Theoretical Framework

Dolton, et al. (1989) estimates a simultaneous model of human capital investment and occupational choice, accounting for costs and benefits of various jobs, including non-pecuniary factors, in this case "occupational status." In our theoretical model, we think of risk associated with the job as a non-pecuniary factor.

We examine job choice on the basis of riskiness of the job of individuals observed relatively late in the work-life. We assume that individual preferences are fixed over time.

This is a standard assumption in economics. That risk and time preferences are fixed after adolescence is also supported empirically in both the psychology and economics literature (Gardner and Steinberg 2005, Albert and Steinberg 2011, Leigh 1986b).

We assume that equilibrium variations in market wages exist to compensate for both negative and positive non-pecuniary characteristics of jobs. These include wage premia associated with risk, as well as both positive and negative variation in wages associated with other non-pecuniary job characteristics. We assume that the risk wage premium is constant within an occupation-industry category over space and time, at least over the relatively short span of time reflected in our survey data responses.

We assume that older workers choose their current job given their educational attainment, which is pre-determined. Agents choose a job in an occupation-industry category to maximize utility over the remaining lifetime:

$$\max E\left[U = \int_0^T e^{-\rho t} u(c_t, l_t) dt\right] \tag{1}$$

given the set of wages and job characteristics in the market, where c_t represents time t consumption and l_t time t leisure in quality-adjusted units. Leisure at each time point is a random draw from a known distribution for the occupation-industry category of the job. Jobs with high health risks have a higher probability of a low draw for quality-adjusted leisure units. Agents die at time T. T is uncertain and is a random draw from a known distribution for individuals in the occupation-industry category. Health and fatality risks of the job therefore affect lifetime utility negatively through lower expected values of T and lower expected quality of leisure. However, the higher wages due to the risk premium positively affects lifetime utility through higher per-period consumption.

We do not make assumptions about relative risk aversion (RRA) or absolute risk aversion in the form of the utility function, $u(c_t, l_t)$. Our empirical model is a reduced form model, and we will discuss the implications of the particular form of the utility function when we present the empirical model. The time discount rate is represented by □. Choice of occupation-industry category may be affected both by risk preferences and time preferences. Holding risk tolerance constant, individuals with higher discount rates will place higher value on immediate (certain) per period consumption and less value on the risk of early death and the increased probability of reduced leisure quality in the future. Thus, individuals with high discount rates may behave similarly to individuals with high risk tolerance.

IV. Data

Several data sources are used to construct variables required for the analysis. We will first discuss the sources of data for, and the construction of, the three measures of risk across occupation-industry categories. Then we will proceed to present information on the Health and Retirement Survey (HRS) data used for the analysis.

IV.1 Job Riskiness Measures

We use three different measures of riskiness of job categories, cross-classified by occupation and industry. We use Bureau of Labor Statistics (BLS) data for the non-fatal illness and injury incidence rate. Our fatality incidence rates are calculated from those of Viscusi (2004). For calculation of income variability, we use 5% U.S. Census data, acquired from Integrated Public Use Microdata Series (IPUMS).

We use Viscusi's (2004) fatality incidence rates, which he constructed using BLS data on job-related fatalities over the period 1992-97.[3]. For compatibility with HRS occupation and industry codes, we combined some of the industries and occupation categories.[4] Similarly, we calculate the rate for job-related non-fatal injuries and illnesses in each occupation-industry category using 2004 BLS data[5] as follows:

$$NF\ Rate = (\text{Number of Non-fatal Incidents / Employment}) * 100{,}000$$

(2)

Viscusi (2004) uses fatalities over the period 1992-1997 for calculating the fatalily rates. Because job-related fatalities are relatively rare events, using data over a shorter time period will result in a lot of zeroes in relatively low-risk job categories. This is not a problem with non-fatal injuries. Rates of non-fatal occupational injuries and illnesses are much more prevalent and include, for example, many cases of carpal tunnel syndrome among office workers, who would be extremely unlikely to die on the job.

Wages and earnings are random variables containing an element of risk. We use the standard deviation of logarithms (SDL)[6] to capture the variability in income within occupation-industry cells using data from the 5% sample of the 2000 U.S. Census, which we obtained from IPUMS. The crosswalk available from IPUMS has been used to convert the

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[3] This time period differs from the one used for our non-fatal illness and injury rates. We assume that the relative rates across occupation-industry cells is constant over time. We have requested data from BLS and will re-calculate the fatality rates for a period that matches our other data more closely

We have presently used relative employment in each category in 1997 in order to scale the rates for combining them. Detailed information on the matching is available on request.

[5]The data used for non-fatal rates is available from the BLS website as "TABLE R44. Number of nonfatal occupational injuries and illnesses involving days away from work by occupation and industry sector, 2004".

[6] SDL is logarithmic form of standard deviation and deviations are taken from logged geometric mean.

$$SDL = \sqrt{1/n \sum_{i=1}^{n} (\log y_i - \log \bar{y}_G)^2}$$

industry and occupation codes into the ones which are compatible with HRS data (1980 Census codes).[7] Self-employment has been classified as a separate occupation.

The entire variation in income does not represent risk. Variation in income within an occupation-industry category can be attributed to a number of factors, such as differences in experience, education, extent of self-employment in each occupation, regional earnings differences, and random, unexplained differences. It is the random unexplained variation in earnings that generates the income risk within an occupation. In order to capture that random variation, we first regress log wages within each occupation-industry category on education, experience, experience squared, region and marital status using the 5% Census sample restricted to males aged 20-64. We then use the residuals and constant from this regression, and take the SDL within each occupation-industry category to measure the income variability due to riskiness. Note that we use a much broader age range here than the sample in our survey data used for the primary analysis. King (1974) finds that mean and standard deviation ranking measures of income across occupations are stable across age cohorts.

Table 1 shows the occupation-industry risk rates measured from the income variability using SDL. The occupation of Professional Specialty Operations and Technical Support comes out to be least risky in the income domain across all the industries on the average, whereas self-employment comes out to be the most risky occupation across most of the industries.

(Table 1 insert here)

Table 2A shows the nonfatal injury and illness and Table 2B the fatal injury rates across occupation-industry cells. Again the occupation of Professional specialty operations

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[7] Occupation Crosswalk -- OCC and OCCSOC 2000 Census Samples, http://usa.ipums.org/usa/volii/census_occtooccsoc.shtml

and technical support comes out to be least risky across all industries on the average. Note that we do not have fatality and injury/illness data for self-employed persons, so we have excluded that occupation from both of these risk measures.

(Table 2 insert here)

IV.2 HRS Survey Data

For the analyses we use data on individuals from the Health and Retirement Survey (HRS). [8] This is a longitudinal survey started in 1992 that is representative for targeted birth cohorts, which we will discuss below. The core survey is administered every other year, with some additional information collected by mail in some of the off-years.

The primary information we need for our analysis is occupation and industry of the individual's current job and measures of risk and time preference. HRS provides this and much more. We are using males who have answered the risk preference questions and have provided the occupation and industry of their current job in at least one of the waves from 1998 to 2004, inclusive. We exclude the Assets and Health Dynamics (AHEAD) cohort, born 1890-1923, due to their older age and therefore lower probability of reporting a current occupation as compared to the other HRS cohorts. We include individuals from the original HRS cohort (born in 1931-41), the Children of the Depression Age (CODA) sample (born 1924-30), the War Baby (WB) sample (born 1942-47), and the Early Baby Boomer (EBB) sample (born 1948-53). The CODA and WB samples were added in 1998 and the EBB sample in 2004. The CODA sample will have been sufficiently old that they are unlikely to be working by 1998, which is the first year of the data we are using. Nevertheless, we will

[8] HRS has a multi stage probability sample design with four distinct selection stages. We use respondent level weights for most analyses in this paper.

include individuals who do report a job and meet our other criteria at that time. Spouses and unmarried partners of individuals who were age-eligible were also included in the HRS, and we also include those individuals in our sample for analysis, regardless of age, if they meet our criteria for inclusion.

We use data on both the reported occupation and industry of the respondent's current job and place that job into a category cross-categorized by occupation and industry.

We exclude females from our analysis due to their lower rate of labor force participation, especially in the older cohorts in the HRS data. The selection into the labor force is a complex issue that we do not wish to address in the current chapter. Selection into the labor force may be correlated with risk and time preferences, and we would not be able to convincingly identify the effects on selection into the labor force separately from those on occupational choice. Further, there may be barriers to entry into some occupations or industries for women in these cohorts that we cannot adequately control for.

Though HRS data are longitudinal, we construct a cross-section analysis sample using data from 1998–2004. We capture the last recorded risk preference, time preference, occupation, and industry for each individual during that period. Prior to 1998, the risk preference questions were potentially tainted by status-quo bias. The questions were changed beginning in 1998 to eliminate this concern, and were constant over the 1998-2004 period. We would ideally take all of the variables we need for our analysis from the 2004 survey. However, the risk preference questions were asked at the beginning of the panel (i.e., in 1992) and were then re-asked of a random subsample of respondents in later years. New entrants to the survey were asked the risk preference questions when they joined the survey. New entrants can join the survey via a new marriage to an HRS respondent, or (primarily) as a member of added cohorts in 1998 and 2004.

The set of questions designed to elicit risk preferences ask individuals to consider a series of choices about jobs. They are told they must move due to allergies, and must choose between two jobs in the new location – one with a certain income equal to their current job and the other with a risky income. With equal probability, the risky job will double the lifetime income or cut it by certain fraction. Several subsequent questions are asked, varying the downside risk in order to narrow down the range of the risk aversion of the respondent. The exact wording of the questions and a table showing the various fractions given for the downside risk, along with the implied ranges of risk tolerance, are shown in Appendix A.

Following the expected utility (EU) theory that an individual will accept a gamble only when the EU of the gamble exceeds the EU of the certain outcome, six relative risk aversion ranges can be constructed from the data. We then collapse those six categories into three for our analysis – least risk averse, medium risk averse and most risk averse.[9]

We want to examine behavior in response to both income risk and health risk. If risk preference regarding these domains is different, then we should be careful to control for time preference regarding the two domains separately as well. In constructing control variables to capture time preference, we divide time preference measures into two broad categories: financial and health. The length of the financial planning horizon has been used as time preference indicator. The wording of the HRS question about the financial planning horizon is shown in Appendix A.

[9] Our results are qualitatively unaffected by instead using the six categories.

We use a health index as an indicator of time discounting in the health domain. The health index includes the following questions:

- Frequency of moderate activity[10]
- Whether the respondent had a prostrate exam since the previous wave

We calculate a binary indicator equal to zero if the individual did not get a prostrate exam and never does moderate activity. Otherwise the value is one.

We estimate a linear model for each of the three risk measures. We regress the risk measure of one's job on our measures of risk preference, time preference, and individual characteristics that may capture constraints in the opportunity set, such as age, race, education, family background variables and marital status. We test the hypothesis that individuals with high risk aversion and lower time discount rates select into occupation-industry categories with lower risk. King (1974) found that those with higher family wealth in childhood choose occupations with higher income risk, and will test whether this also holds in our data.

Family financial background represents the family's affluence level during respondent's childhood. Another reason to include this variable is the following: We do not make any assumption about relative or absolute risk aversion in the utility function. Some forms would imply independence of marginal risk taking wealth or lifetime income, others would not. Wealth and income are endogenously determined jointly with occupation but family financial background is a proxy measure that would be correlated with one's own wealth or lifetime income, but unaffected by own risk preference and occupational choice.

[10] Survey question: "How often do you take part in sports or activities that are moderately energetic such as, gardening, cleaning the car, walking at a moderate pace, dancing, floor or stretching exercises: more than once a week, once a week, one to three times a month, or hardly ever or never?

Kimball (2007) notes that survey-based risk preference measures are likely to be subject to measurement error which can cause attenuation bias. However, the design of our analysis, in which we divide individuals into three relative levels of risk aversion, aims to minimize concern about this issue. If there is attenuation bias, it should affect all three groups and thus inferences about relative levels of risk aversion should be unaffected by attenuation bias.

The dependent variables are log-transformed and survey weights have been used for the analysis. Table 3 presents the summary statistics.

(Table 3 insert here)

V. Results

Results of our primary analysis are shown in Table 4. In income variability risk, more risk aversion is associated with lower income variability of the job (column 1). Those with medium and high risk aversion are in jobs with significantly less income variability than those with the lowest levels of risk aversion, and these effects are significant at the 1% level. The coefficient for "most risk averse" is larger than that for the middle risk aversion group, but these two are not significantly different from one another.

(Table 4 insert here)

The time preference "effects" are interpreted as relative to the least forward looking, as the omitted category is those who indicated they are planning for "the next few months." Controlling for risk preference, those who are more forward looking (planning for the "next few years" or longer), tend to be in jobs with lower income risk than those who are more myopic, as we predicated.

Wealth in one's family of origin is also significant and with the expected sign. Those with lower childhood family wealth are in jobs with lower risk than those with higher family wealth (the omitted group). Thus, higher family wealth is associated with a willingness to take higher income risks. If we have adequately measured risk preference, then this variable is operating through another mechanism. It may proxy for higher financial resources, such as own wealth or family wealth. Thus, this may indicate a willingness, given risk preference, to take more risk at the margin if you have greater resources. Age is also positive and significant. This may also indicate a willingness to take greater risks at the margin given that, the older one is, the more of lifetime income that is predetermined.

It is also possible that the positive coefficient on age may result from constraints on the opportunity set due to discrimination in the labor market. We also find that blacks, relative to whites, tend to be in jobs with riskier income, after controlling for other factors. If we have adequately measured preferences, then this result may indicate occupational segregation in the labor market. We do not see any significant differences across education groups.

For non-fatal injury and illness risk (column 2), the middle risk aversion group is not significantly different from the least risk averse (omitted) group, but the most risk averse are in jobs with significantly higher health/injury risk (significant at 5%) Recall that the survey questions we are using to measure risk preference relate to lifetime income. We take these results as an indication that there are multiple domains of risk, and that individuals think about those different types of risk differently.

In this estimate we again find that individuals with higher rates of time discounting tend to select into jobs with higher risk. Those who are planning for the "next few years" or "next 5 or 10 years" are in job categories with significantly lower health and injury risk than those who indicate they are planning only for the "next few months". Given the very different measures used to measure riskiness of jobs in terms of income risk versus health risk, we cannot directly compare the coefficients across models, but the time preference results are qualitatively similar in the two estimates.

Again, we find that blacks tend to be in jobs with higher risk than whites. There is no significant difference by age here. However, we do find significant differences across education groups that are consistent with the idea that those with high time discount rates are less willing to invest in human capital and trade risk for this investment. Less than high school is the omitted education category. Those with increasingly higher education have lower rates of health risk in their jobs.

We also find that those who were previously married (to include both divorced and widowed, but not currently married) are in riskier jobs than their married counterparts (the omitted group). There are various stories one might tell about this result and we will leave interpretation to the reader.

In Column 3, we show results from estimating the job-related fatality rate of the current job. We do not find risk aversion to be a significant predictor of this type of risk of the job. In fact, the only thing that is significant in this estimate is education. These results are very similar to those for non-fatal health risk of the job – those with more education are in jobs with lower fatality rates.

(Table 5 insert here)

In Table 5 Column 1, we re-estimate the income variability model using a more complete set of occupation-industry categories than for which we have the risk measures for the health and fatality risk. This allows us, for example, to include self-employment as an occupation, and to include the agriculture industry, which were omitted from the estimates in Table 4 for comparability across the models. We get very similar estimates to those in Table 4, except that we now find that those with graduate education have higher levels of lower income risk than those with less than a high school education.

Recall that we previously mentioned literature that finds that controlling for risk aversion is important in studies estimating the time discount rate (Andersen et al. 2008, Benjamin et al. 2010, Tanaka et al. 2010). We thus consider the possibility that estimates of the effect of risk preference on some choice variable might also differ based on whether one controls for time preference. We do find significant relationships between job risk and time preference. Therefore, to check whether our risk preference estimates would differ if we were unable to control for time preference, we re-estimate the income variability model without the time preference measure. This is shown in Table 5 Column 2. It appears that some of the variation in time preference then gets picked up by education, in that the college group is now significantly different from the less than high school group – the former's job has less income variability compared to the latter. However, other coefficients and significant levels remain remarkably stable.

Our results indicate inconsistency in behavior regarding different measures of job risk – people react differently to income risk than to health risk. As robustness check, we also estimate the models from Table 4 Columns 1 and 2 using smoking behavior as a proxy for risk aversion, in place of our income-based risk preference measures. We also substitute a different measure of time preference here based on two measures of preventive behavior related to health. These results are shown in Table 6. We find that non-smokers, whom we assume to be more risk averse, are in jobs with significantly higher income risk, but that the health risk of the jobs is not significantly different between the two groups. We also find that the health index is not significantly related to riskiness of the job by either risk measure. However, again we see that education appears to be more significantly related to riskiness of the job, in both estimates, than was the case previously when we controlled for time preference using the time horizon of planning measure, which is more financial in nature than the health measure we use here. Further investigation is needed here, but our point that people think about health risk differently than income risk seems supported by these estimates.

(Table 6 insert here)

We do one further robustness check, which is to check whether we would get different results if we did not use survey weights in our estimates, but instead clustered the standard errors. Clustered standard errors address the potential problem due to our independent variables having clustered values since we have far fewer occupation-industry categories than individuals in our data. Therefore our independent variable does not have any variation among the individuals in the same occupation- industry cell. The results, reported in Appendix Table B1, are qualitatively similar to those in Table 4, except that education is much more strongly related to both health and fatality risk of the job than we found when using survey weights..

VI . Conclusion and Discussion

We find a behavioral inconsistency for different domains of risk. We find that more risk averse people do get selected into jobs with less risk if we use both a job riskiness measure and a risk preference measure based on income risk. However, health risk seems to be different from income risk. We might think that we can translate health risks into income equivalents, but it does not appear that individuals think of health risk in that way. Another way in which we see this difference between the two domains of risk is that those with higher childhood family wealth take higher income risks in their job choice, but take lower health risks.

We believe this distinction between different domains of risk has wider potential application than just job choice. We advise care in thinking about what kinds of risk preference measures researchers use to predict which kinds of risk taking behavior.

Important other contributions of our study include using both occupation and industry to classify jobs, as suggested by Viscusi (2004). We have also contributed newly calculated risk measures, both for health and injury risk across jobs by occupation-industry categories, and income variability across those job categories. We would encourage use of these measures by other researchers, and will be happy to provide calculation details or Stata code to anyone wishing to repeat the exercise, say for a different time period.

This study is also relevant for individuals in making their choices about jobs. The information we have provided in Tables 1 and 2 may be of use to them in evaluating job riskiness in a given industry-occupation cell.

Further work is needed to clarify which types of measures best capture risk preference regarding health. Our proxy measure based on smoking behavior is quite crude and may also be thought of as a proxy for time preference, for which it has been used in prior work (Munasinghe andSicherman 2006).

Chapter – 3 Health State Dependence of Utility – Are there Gender Differences? An Application of Non-linear Blinder-Oaxaca Decomposition

Abstract:

This study examines Health and Retirement Study (HRS) data in order to ascertain whether there is a gender difference in the marginal utility over different health states and contingent upon the findings of health state dependence of utility I further investigate the factors contributing to the gender difference in utility. I begin with theoretical and empirical models used by Finkelstein, et al. (2010) relaxing the assumptions of those models to allow for differential effects by gender. I estimate fixed-effects ordinary least square as well as logistic models using nationally representative longitudinal data from the Health and Retirement Study (HRS). Consistent with prior literature, we run our models with the sample which is above age 50 and not in labor force and has medical insurance. This study examines various measures of health - objective reports of seven health conditions, ADLs and IADLs. We use subjective well-being and Center of Epidemiology Studies –Depression Scale (CES-D) score to measure utility from nine waves of HRS data (1992 – 2008). The nonlinear Blinder-Oaxaca decomposition was used to identify the contribution of each predisposing (age, race, ethnicity, risk attitude, region) and need factors (self perception of health and physician's judgment about health) in explaining the gender differences in utility and to estimate the residual unexplained disparity. Coefficients of health indicators, income, risk attitude, marital status and ethnicity turn out to be significant in explaining utility gap among men and women.

Using happiness as a utility proxy and objective health measures in our baseline model, we find that health dependence is mostly negative in both men and women except

when we use ADLs as a health indicator in which case it is positive for men. This might be due to higher self-reporting of diseases by women. However, more research is needed before we can make any conclusion here.

Introduction:

The Epidemiology literature has several empirical evidences (Grant, Hicks, Taylor et al. 2009; Levy 2005; Nohria, Vaccarino and Krumholz 1998; Chin and Goldman 1998) that diseases impact the two genders differently due to biological and social construction. Contingent upon the findings of Epidemiology literature, the study of gender differences is becoming important, not only in the occurrence of health conditions, but also in the impact, treatments and outcomes of diseases. There exists gender difference not only in the impact of disease but also in the quality of life after disease, efficacy of medications for the treatment of diseases, comorbidity of various diseases, as well as mortality rate of various chronic diseases. In the presence of gender differences in the above mentioned areas, the relation between health status and utility might also vary over gender. This calls for a new research area of heterogeneity in health state dependence of utility. Recent Economics literature (Halliday 2008) also supports that state dependence is driven by individual characteristics, and there are larger potential gains to identifying as well as targeting factors that influence individual heterogeneity rather than just focusing on improvement of health status.

The objectives of this study are: (1) to examine gender heterogeneity in health state dependence of utility, and (2) contingent upon results of the first objective, to identify the contribution of observed factors behind gender difference in health state dependence of utility using the nonlinear Blinder-Oaxaca decomposition.[11]

[11] We used Stata-11 for non-linear Blinder-Oaxaca decomposition. Its non-linear version was included in Stata on 08/25/2011 which allows us to do the decomposition with logit .

This study uses Health and Retirement Study (HRS) data in order to ascertain whether there exists a gender gap in variation of marginal utility over the health states. We use both the objective (objective reports of seven health conditions) and the subjective measures of health. However, in the literature, women have been found to report more on the subjective health measures (ADLs and IADLs) as compared to men. More self-reporting of diseases by females might bias our results if we use the self-reported health measures. Therefore, we also use seven objective health measures. However, this study provides an opportunity to draw a comparison between the results of objective and subjective health measures. The health state dependence of utility might also be different for women because of difference in labor market participation, wage gap, and occupational segregation over gender which will thereby impact the health state dependence of consumption. Therefore, following the literature, our study uses a sample which is out of labor force and has health insurance. This is a critical issue since if we use the sample which is still in the labor force, it might bias our results even more because of the existence of gender wage gap , though we agree that we cannot get rid of this bias completely since gender wage-gap leads to gender wealth-gap also. By using a sample which is out of labor force, we can reduce the severity of bias but we cannot get rid of it completely. This study uses happiness as a proxy of utility. As an alternative, we also use Center of Epidemiology Studies – Depression Scale (CES-D) score in place of happiness.

The remainder of the chapter proceeds as follows: Section Two discusses previous literature. Section Three presents our theoretical arguments and assumptions and hypotheses we will examine. In Section Four we describe the data, methods and empirical model used for the main analysis, and how we construct our variables from that data. Section Five presents the empirical results from our analysis, including some robustness checks. In Section Six we conclude and discuss directions for further work.

II. Previous Literature and Background

We divide the literature for this study into two categories: (1) utility and health literature; and (2) gender difference literature.

In utility and health literature, seminary work has been done by Richard J. Zeckhauser (1970, 1973), Kenneth J. Arrow (1974), Viscusi and Evans (1990, 1991a, 1991b) followed by Halliday (2008) and Finkelstein et al. (2009, 2011). In early 1970s Richard J. Zeckhauser (1970, 1973), Kenneth J. Arrow (1974) had developed the models of health care in which utility functions in the good and the poor health states assumed quite different shapes. Later in the 1990s Viscusi and Evans (1990) using the chemical worker survey (1982)[12] ascertain the findings of Zeckhauser and Arrow. Viscusi and Evans find that the marginal utility of income depends on the health state. They elicit the fallacy of monetary equivalence for a job injury. The logic behind monetary equivalence is that death means fall in income, and thereby an increase in marginal utility of income, however an injury not leading to death has a different impact. Their study finds that MU of income/money falls with the onset of job illness/injury. They find that less than full insurance is one of the most appropriate and significant implications of decline in marginal utility of income/wealth in ill health state.

Halliday (2008) studies the heterogeneity in health state dependence using Panel Study of Income Dynamics (PSID) data from 1984-1997 on self reported health status. For

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[12] 1982 Chemical worker survey is the subsample of workers analyzed in Section III. of Viscusi and O'Connor (1984)

half of the population he finds modest degree of state dependence whereas for the other half he finds degree of health state dependence to be near one but their health status mostly does not change over the life span. Author holds that though improvements in medical care leads to modest improvements in health, there may be larger potential gains to identifying as well as targeting factors that influence individual heterogeneity since the state dependence is mostly driven by individual characteristics.

Finkelstein et al. (2009) discuss various approaches/methods of measuring health dependence of marginal utility of consumption. Finkelstein et al. (2011) find that marginal utility of consumption depends on health states. Using empirical analysis based on Health and Retirement Study (HRS) data they find 10 to 25 % decline in the marginal utility of consumption due to one standard deviation increase in chronic health condition. This has impact on optimal health insurance levels and life cycle savings.

The second category of literature (which is more of a medical field literature) deals with gender differences in the impact of various diseases, in the quality of life after disease, efficacy of medications for treatment of the disease, comorbidity of various diseases, as well as mortality rate of various chronic diseases. The following studies provide the evidence of gender differences in health conditions, treatment, impact, mortality, and longevity which further substantiates our argument regarding the need to study heterogeneity in health state dependence.

Grant, Hicks, Taylor et al (2009) using the data from a sub-population with diabetes from 4060 adults aged18 years and over living in South Australia found that men and women face different challenges in the management of diabetes. They also found that the effect of body weight, chronic stressors, psychological resources and life events was stronger in women as compared to men.

Chin and Goldman (1998), using a dataset on 435 patients admitted nonelectively in an urban university hospital during 1993-1994 find that there exists a gender differences in one year survival and self-reported quality of life (health related) among the patients admitted with heart failure even after adjusting for clinical and socioeconomic variables. They also find that women had less improvement in physical health status and perceived their quality of care to be lower.

Nohria, Vaccarino and Krumholz (1998) in their study on myocardial infarction using the medline database from 1966 to 1997 find that women fare worse as compared to men. Women sustaining a myocardial infarction have a higher crude, short-term mortality rates than men in their study. Other than age the authors identified several other factors like an increased incidence of cardiac risk factors, decreased efficacy of therapeutic modalities (thrombolytics and aspirin), and a tendency toward the underuse of these treatments in women relative to men, that might also contribute toward the worse prognosis of women.

In the field of health and aging research it is well known by now that women outlive men on an average (Jennifer Ward-Batts, 2001; Case and Deaton, 2002). Women also differ in self-reporting of their health than men. There are evidences that women report lower subjective well-being as well as lower health-related quality of life (HRQOL) than men (Chin and Goldman 1998).

Gender difference also exists in mortality in coronary artery bypass surgery (Hannan et al. 1992). Gender comes out to be a significant predictor of mortality in the study done by Hannan et al. in 1992 using a state-wide data base containing clinical risk factors for cardiac surgery. The crude mortality rates for coronary artery bypass surgery for men was 3.08% and for women were 5.43% in New York State in 1989. Risk-adjusted (indirectly standardized) mortality rates were 3.33% and 4.45% for men and women, respectively. The risk-adjusted odds ratio of women to men experiencing in-hospital death was 1.52.

There are gender differences in comorbidity as well as psychological comorbidity (Levy 2005, Hesselbrock, Mayer, Keener 1985). Levy (2005) examines gender differences in attention-deficit hyperactivity disorder (ADHD) symptom comorbidity with oppositional defiant disorder, conduct disorder, separation anxiety disorder, generalized anxiety disorder, speech therapy, and remedial reading in children. Study finds that internalizing disorders are more common in females.

Verbrugge (1989) finds gender differences in HRQOL. Verbrugge (1989) points out some theoretical explanations for women's reduced HRQOL which includes hormonal differences, lifestyle differences, variations in perception of illness, variation in the ways men and women convey symptoms, and differences in the care each sex receives for illness. He finds that though women outlive men however, they report lower subjective well-being as well as lower health-related quality of life (HRQOL) than men (Chin and Goldman 1998).

Intuition behind our study:

Combining the two categories of literature, this study tests the hypothesis that there are gender differences in the health state dependence of marginal utility. Our intuition is that the relation between health state and utility varies over gender. However, the health state dependence of utility might also be different for females because of difference in labor force participation, wage gap, and occupational segregation over gender, which will inturn impact the health state dependence of consumption. Following the literature, to avoid the impact of gender gap in labor market, we include only those subjects who are retired from the labor market.

III. Theoretical Framework

Basic theoretical framework is based on Goddeeris state dependence model and Finkelstein's model of health state dependence of marginal utility which has been revised to allow for difference by gender.

Life time Utility is the sum of:

1. Current period non-health consumption
2. Current period health consumption
3. Expected utility from next period consumption

$$U = \sum_{t=0}^{T}[(1/1-\gamma)(1+ \emptyset_{CS}\ S)C_t^{1-\theta} + (1/1-\gamma)(1+ \emptyset_{HS}\ S)H_t^{1-\theta}]^{1-\gamma/1-\theta} + \sum_{t=0}^{T-1}[(1/1-\gamma)(1/1+\delta)E_t(U_{t+1})^{1-\theta/1-\gamma}]^{1-\gamma/1-\theta} \quad (1)$$

Where Ø = Coefficient of level of sickness

δ = Discount rate

θ = Elasticity of intertemporal substitution

γ = Coefficient of relative risk aversion

S = Level of sickness

C= non-health consumption

H = Out of pocket Health Consumption

Assumptions:

1. We assume health status/degree of sickness to be in continuum.
2. We adopt Epstein-Zin (1989) and Weil (1990) formulation of preferences to allow intertemporal elasticity of substitution and relative risk aversion to vary independently.
3. Wealth in the sick state is pre-determined i.e. health shocks do not change wealth. Therefore, in empirical analysis we include only those individuals who are no longer in labor market to exclude the first order effect of health shock on income.
4. Impact of labor market gender gap is minimal (in empirical analysis we include only those individuals who are no longer in labor market). However, it could have an impact through wealth variable. We can only minimize the bias by taking HH wealth variable but cannot get rid of it completely.
5. Both healthy and sick individuals derive utility from health expenditure. Healthy individuals derive utility from precautionary health expenditure.
6. All have health insurance which finances fraction b of health expenditure. It is financed by tax rate on permanent income.

Simplified Two Period Model:

Suppose an individual lives only two periods.

Period-1 utility is given by:

$$U_1 = [(1/1-\gamma)(1+ \emptyset_{CS}\ S)C_1^{1-\theta} + (1/1-\gamma)(1+ \emptyset_{HS}\ S)H_1^{1-\theta}]^{1-\gamma/1-\theta} + [(1/1-\gamma)(1/1+\delta)E_1(U_2)^{1-\theta/1-\gamma}]^{1-\gamma/1-\theta} \quad (2)$$

Period-2 utility is given by:

$$U_2 = (1/1-\gamma)(1+ \emptyset_{CS}\ S)C_2^{1-\theta} + (1/1-\gamma)(1+ \emptyset_{HS}\ S)H_2^{1-\theta}]^{1-\gamma/1-\theta} \quad (3)$$

Subject to inter temporal budget constraint:

$$Y(1-\tau) = C_1 + (1-b)H_1 + \left(\frac{1}{1+r}\right)[C_2 + (1-b)H_2] \qquad (4)$$

Where τ is the tax rate on permanent income , r is the real interest rate.

$$[C_2 + (1-b)H_2] = W \qquad (5)$$

W is the second period wealth.

Therefore,

$$W = (1+r)(Y(1-\tau) - (C_1 + (1-b)H_1)) \qquad (6)$$

Solving the model backwards:

$$\text{Max } U_2(C_2, H_2) = \text{Max}_{C_2,H_2}[(1/1-\gamma)(1+ \emptyset_{CS}\ S)C_2 + (1/1-\gamma)(1+ \emptyset_{HS}\ S)H_2]^{1-\gamma} \qquad (7)$$

Subject to :

$$W = C_2 + (1-b)H_2 \qquad (8)$$

Therefore, the optimal non-health consumption expenditure and health consumption expenditure in second period will be:

$$C_2 = \frac{W}{1+(1-b)^{1-1/\gamma}(1+\emptyset_{CS}S/1+\emptyset_{HS}S)^{-1/\gamma}} \qquad (9)$$

$$H_2 = \frac{W\,((1-b)^{-1/\gamma}(1+\emptyset_{CS}S/1+\emptyset_{HS}S)^{-1/\gamma})}{1+(1-b)^{1-1/\gamma}(1+\emptyset_{CS}S/1+\emptyset_{HS}S)^{-1/\gamma}} \qquad (10)$$

By plugging C_2 and H_2 back in the second period utility we will calculate period-2 utility for all sickness levels, starting from 0 to the highest level of sickness prevailing in the population. Thus, now the second period utility will be a function of second period wealth corresponding to all sickness levels.

$$U_{2,S=1,2,3....} = \frac{1}{1-\gamma}(1+\emptyset_{CS}S)W^{1-\gamma}[1+(1-b)^{1-1/\gamma}\left(\frac{1+\emptyset_{CS}S}{1+\emptyset_{HS}S}\right)^{-1/\gamma}]^{\gamma} \tag{11}$$

$$U_{2,S=0} = \frac{1}{1-\gamma}W^{1-\gamma} \tag{12}$$

To calculate expected second period utility, we will take weighted average of second period utilities corresponding to all sickness levels, with weights being equal to probability 'p' of sickness level zero and '1- p' for all other non-zero sickness levels combined.(We are assuming additive utility). Then, we calculate C_1 from life time utility function and inter-temporal budget constraint in terms of Y and H_1.

Parameters in terms of proportionality of Income:

$$E_1(U_2) = \frac{p}{1-\gamma} + (1-p)\sum_{S=1,2,3...}\left(\frac{1+\emptyset_{CS}S}{1-\gamma}\right)[1+(1-b)^{1-1/\gamma}\left(\frac{1+\emptyset_{CS}S}{1+\emptyset_{HS}S}\right)^{-1/\gamma}]^{\gamma}W^{1-\gamma} \tag{13}$$

We can rewrite this as:

$$E_1(U_2) = kW^{1-\gamma} \tag{14}$$

where,

$$k = \frac{p}{1-\gamma} + (1-p)\sum_{S=1,2,3...}\left(\frac{1+\emptyset_{CS}S}{1-\gamma}\right)[1+(1-b)^{1-1/\gamma}\left(\frac{1+\emptyset_{CS}S}{1+\emptyset_{HS}S}\right)^{-1/\gamma}]^{\gamma} \tag{15}$$

Now we use inter-temporal budget constraint to express expected second period utility as a function of first period consumption.

Inter-temporal budget constraint is:

$$W = (1 + r)(Y(1 - \tau) - (C_1 + (1 - b)H_1)) \quad (16)$$

$$E_1(U_2) = k[(1 + r)(Y(1 - \tau) - (C_1 + (1 - b)H_1))]^{1-\gamma} \quad (17)$$

Substituting this into first period utility:

$$U_1 = [(1 + \emptyset_{CS}\ S)(^1/_{1-\gamma})C_1^{\ 1-\theta} + (1 + \emptyset_{HS}\ S)\left(^1/_{1-\gamma}\right)H_1^{\ 1-\theta}]^{1-\gamma/1-\theta} + \left(\frac{1}{1+\delta}\right)\left(\frac{1}{1-\gamma}\right)k[(1 + r)(Y(1 - \tau) - (C_1 + (1 - b)H_1))]^{1-\gamma} \quad (18)$$

By taking derivative of U_1 w.r.t . C_1 and H_1 respectively and equating them to zero, we can express C_1 and H_1 in terms of Y such that:

$$C_1 = c_1 Y \quad (19)$$

$$H_1 = h_1 Y \quad (20)$$

Hence,

$$W = wY \quad (21)$$

Where $w = (1 + r)((1 - \tau) - (C_1 + (1 - b)H_1))$ (22)

Deriving Indirect Utility Functions:

We can derive indirect utility function $v(Y, S)$ by substituting $W = wY$ into second period utility equations.

Indirect Utility function for S=0:

$$v(Y, S = 0) = \frac{1}{1-\gamma}(wY)^{1-\gamma} \quad (23)$$

Indirect Utility function for S being non-zero:

$$v(Y, S) = \frac{1}{1-\gamma}(1 + \emptyset_{CS}S)(wY)^{1-\gamma}[1 + (1 - b)^{1-1/\gamma}\left(\frac{1+\emptyset_{CS}S}{1+\emptyset_{HS}\ S}\right)^{-1/\gamma}]^{\gamma} \quad (24)$$

Based on these indirect utility functions, the non-linear regression form will be:

$$v = \beta_{1s} S\, Y^{\beta_2} + \beta_3\, Y^{\beta_2} + \mu \tag{25}$$

Where β_{1s} is the income gradient of utility in different non-zero sickness levels relative to zero sickness level (β_3). Therefore,

$$\beta_{1s} = \frac{w^{1-\gamma}}{1-\gamma}(1 + \emptyset_{CS} S)[1 + (1-b)^{1-1/\gamma} (\frac{1+\emptyset_{CS} S}{1+\emptyset_{HS}\, S})^{-1/\gamma}]^{\gamma} - \frac{w^{1-\gamma}}{1-\gamma} \tag{26}$$

$$\beta_2 = 1-\gamma \tag{27}$$

$$\beta_3 = \frac{w^{1-\gamma}}{1-\gamma} \tag{28}$$

By dividing equation (26) by (28) and by plugging in the value derived from dividing equation (9) by equation (10) we can calculate the parameter of health dependent marginal utility of consumption ($\emptyset_{CS}$).

$$(1 + \emptyset_{CS} S) = \frac{\beta_{1s}/\beta_3 + 1}{[1+\frac{H_2}{C_2}(1-b)]^{\gamma}} \tag{29}$$

Thus, the ratio between β_{1s} and β_3 gives us state dependence. Thus, the estimate of β_{1s} provides us direct test of sign of state dependence. If β_{1s} is negative, it implies marginal utility (in case of happiness as a proxy of utility) declines as the health deteriorates and vice versa if we are using CES-D as a proxy of utility. Magnitude of state dependence is measured by $\emptyset_{CS}$ which depends on the ratio of estimated coefficients of β_{1s} and β_3. Since the denominator of equation – (29) is weakly greater than the one if there is no full-insurance, therefore the true magnitude of state dependence will be smaller than the ratio of estimated coefficients of β_{1s} and β_3.

Non-linear Blinder-Oaxaca Decomposition:

Subsequent to the findings of our first hypothesis where we test whether health dependence of marginal utility varies over gender (and we find the strong evidence of existence of gender variation), the next objective is to tease out which variable causes gender gap in health dependence of utility, if any. We use non-linear Blinder-Oaxaca (B-O) decomposition. The B-O decomposition teases out the outcome variables between two groups – (1) a part that is explained by differences in observed characteristics, and (2). that part which is attributable to the difference in coefficients of these characteristics in the regression equation (in other words, difference in returns to these characteristics). Oaxaca-Blinder linear decomposition has been widely used in labor literature but if the outcome variable is non-linear, the standard Oaxaca-Blinder linear decomposition is not applicable. Fairlie (1999, 2003) developed decomposition method for binary dependent variables. Recently work has been done on non-linear decomposition by Sinning, Hahn and Bauer (2008). We apply non-linear B-O decomposition by first estimating the logistic regressions separately for males and females (see equations 30 and 31) and then decomposing the difference between the two into explained and unexplained components.

$$Y_m = f(X_m \tilde{\beta}_m) \qquad (30)$$

$$Y_f = f(X_f \tilde{\beta}_f) \qquad (31)$$

Where the subscript f refers to females and m refers to males.

The difference between equations (30) and (31) is decomposed by rewriting the conventional decomposition equation in conditional expectation form:

$$\overline{Y}_m - \overline{Y}_f = [E_{\beta f}(Y_{im}|X_{im}) - E_{\beta f}(Y_{if}|X_{if})] +$$

$$[E_{\beta m}(Y_{if}|X_{if}) - E_{\beta f}(Y_{if}|X_{if})] +$$

$$\left[E_{\beta m}(Y_{im}|X_{im}) - E_{\beta f}(Y_{im}|X_{im})\right] + \left[E_{\beta m}(Y_{if}|X_{if}) - E_{\beta f}(Y_{im}|X_{im})\right] \quad (32)$$

IV. Data

For the analyses we use data on individuals from the Health and Retirement Survey (HRS). This is a longitudinal survey started in 1992 that is representative for targeted birth cohorts, which we will discuss below. The core survey is administered every other year, with some additional information collected by mail in some of the off-years.

The primary information we need for our analysis is household income, household wealth, occurrence of health shock, out of pocket medical expenditure, and demographics. HRS provides this and much more. We are using all the nine waves (1992 - 2008) of HRS data from RAND HRS and Tracker files for our main analysis. We use a sample with age 50+, who have health insurance and who are either retired or not working (in order to avoid the impact of gender gap in labor market on one hand and the impact of labor market income on consumption on the other hand). We include individuals from the original HRS cohort (born in 1931-41), the Children of the Depression Age (CODA) sample (born 1924-30), the War Baby (WB) sample (born 1942-47), and the Early Baby Boomer (EBB) sample (born 1948-53). The CODA and WB samples were added in 1998 and the EBB sample in 2004. The CODA sample will have been sufficiently old that they are unlikely to be working by 1998, which is the first year of the data we are using logged transformation of HH income (Average of HH income over all waves) + 5% current HH wealth adjusted for HH composition (divided by 1.7 if coupled and by 1 if single).

Corresponding with the literature, we do the analyses for seven diseases hypertension, stroke, arthritis, cancer, diabetes, chronic lung disease, and heart disease as well as the composite measure of number of diseases. For robustness check, we repeat the analyses using Activities of Daily Living (ADLs) and IADLs from wave 2 onwards (1994—2008)[13]. Details on cross-wave difference of ADL and IADL questions can be found in appendix – 3A.

For utility measures we use Subjective well-being (SWB) measures' questions on happiness. As an alternative, we use CES-D score which is the sum of feelings like depression, sadness, loneliness etc. Details can be found in Appendix-3A. Higher the score, more negative the respondent's feelings are in the past week.

Permanent Income is average of HH income (adjusted for HH composition)[14] across waves 1992 to 2008. We have taken annual HH Income adjusted for HH composition. We also add 5% of current HH wealth (excluding housing and automobile) to it. Permanent Income includes wages and salary, business income, dividend, interest income, other asset income, pension, government transfers, other sources. Details on construction of permanent income measure can be found in appendix – B. Household Wealth includes: Net values of stock, MF, investment trusts , checking A/c, Saving A/c, Money markets, CD, T-bill, other savings and assets minus non-housing and non - automobile debts. Average HH wealth is average of wealth over all waves whenever HH enters. Details on construction of wealth measure can be found in appendix – 3B.

[13] We exclude wave – 1 for ADL and iADL based analyses because of inconsistency in the way questions were asked in wave – 1 in the survey.

[14] We use OECD adjustment for HH size: Divide total HH income by 1.7 if respondent is married and living with spouse in same HH in that wave and divide by 1 if single.

V. Results

We regress subjective happiness (proxy of utility) on health/sickness level, permanent income and interaction term of health/sickness level and permanent income.

Our sample has 26,300 (person years) observations for women (See Table 3.1 for summary statistics) and 25,100 for men (age over 50, not in labor market and have health insurance). We use probability weights for the analyses. The data is tested for heteroskedasticity (using ado file xttest3). Since heteroskedasticity was present, we use robust standard errors to correct it. We do not care about serial correlation since it is a micropanel (only 9 waves) and serial correlation is a problem only for long panels (over 20 years). Sample was tested for multicollinearity by using stata user written Collin command. We include wave fixed effects in our regression since we failed to reject the null of time dummies not jointly significant using testparm command.

Equation (24) is empirically calculated by the running the following fixed effects regression:

$$U_{it} = f(\beta_1 S_{it} \times \overline{Y}_i^{\beta_2} + \beta_4 S_{it} + \overrightarrow{A} X_{it} + \alpha_i) \qquad (33)$$

The effect of permanent income on utility gets absorbed by individual fixed effects (α_i), in order to capture that, we run the auxiliary regression of the following type to get the coefficient of permanent income:

$$\hat{\alpha}_i = \beta_3 \overline{Y}_i^{\beta_2} + \overrightarrow{A_1} X_{it} + \varepsilon_{it} \qquad (34)$$

In our baseline model (Table-3.2), we regress utility proxy on the variable 'number of diseases' which is the sum of seven health conditions (hypertension, stroke, arthritis, cancer, diabetes, chronic lung disease, and heart disease), interaction between permanent income and number of diseases along with other control variables (age, wave fixed effects, individual fixed effects). The estimates of individual fixed effects derived from this regression are regressed on race, ethnicity, dummy for gender, permanent income (adjusted for HH composition). To estimate the parameter of state dependence, the coefficient of interaction term of diseases and log permanent income are divided by the coefficient of permanent income (adjusted for HH composition). Analyses of all the diseases separately(Table-3.3) also shows that health dependence of utility varies over gender. For stroke, lung and cancer the health state dependence is negative for males whereas positive for females.

However, when we use ADL and IADL as measures of health, we got contradictory results. Coefficient of state dependence of utility among females is higher negative (as compared to men) in the case of instrumental health (Table3.6 and 3.7). In subjective report of diseases (ADLs as well as ADL wide) females have been found to have negative state dependence (Table3.4 and 3.5) whereas state dependence is positive for men.

One possible explanation is that the females do more of the instrumental activities in households like preparing meals, attending phone calls etc. which might lead to women reporting more on IADLS and biasing our results for state -- dependence. However, mean of ADLs is also higher among females.

Now, since the results tell us that there is gender heterogeneity in health dependence of utility, it is important for us to identify the contribution of observed factors behind gender gap in utility. We use the nonlinear Blinder-Oaxaca decomposition for the same. The geometric means of utility proxy (Happiness) is 2.44 for men and 2.37 for women which amounts to a difference of 2.8 percent. Adjusting women's endowment levels to that of men would increase women's utility by 2.2%. Approximately 79 percent of the utility gap is explained by the endowment effect. A gap of 0.6% remains unexplained. The significant contributors towards the explained gap are marital status, number of diseases, log adjusted income, risk attitudes and ethnicity.

Taking CES-D score as utility proxy, we find that the means of CES-D is 1.37 for men and 1.76 for women yielding a score gap of 0.39. Adjusting women's endowment levels to that of men would lead to mean decline of 0.21 in CES-D score. Thus, 54 percent of the score gap is explained by endowment levels.

Robustness Checks:

Robustness checks have been done using alternative specification logit and by using CES-D as an alternative utility proxy. However, a piece of caution is that we lose lot of information in panel data fixed effect logit since the fixed-effects models are looking at the determinants of within-subject variability. If there is no variability within a subject, there will be nothing left to examine. In other words, if happiness status is something that hardly ever changed across time, there wouldn't be many cases left for a fixed effects logit analysis. Other techniques, like xtreg, fe, do not cost us so many cases (Paul D. Allison 2009).

The results with logit stand our baseline model results for most of the diseases. Results with CES-D score as a disutility proxy (opposite to happiness) also stand our baseline results that health dependence of utility varies over gender. Results of regressions of CES-D on alternative health measures like ADLs, IADLs and number of diseases have been reported in appendix-3C.

VI. Conclusion and Discussion

We find gender differences in health state dependence of utility. Using happiness as a utility proxy and seven objective health measures in our baseline model, we find that for stroke, lung and cancer the health state dependence is negative for males whereas positive for females. Coefficient of state dependence of utility among females is higher negative (as compared to men) in the case of instrumental health. In subjective report of diseases (ADLs as well as ADL wide) females have been found to have negative state dependence.

One of the possible explanations is behavioral gender difference. Females self-report the diseases to be worse as compared to men. The other possible explanation is gender difference in preferences. Females who are comparatively more risk averse, care about their health more and self report the functional limitations more. Another possible explanation is that the females do more of the instrumental activities in households like preparing meals, attending phone calls etc. which might lead to women reporting more on IADLS and biasing our results for state dependence. Mean of ADLs is also higher among women in our dataset also. Since, health state dependence is being measured as a ratio between the interaction term of self-reported health × permanent income and permanent income, the higher self-report of diseases bias the results for health state dependence.

The non-linear B-O decomposition of utility unfolds that the significant contributors towards the explained gender gap in utility are marital status, number of diseases, log adjusted income, risk attitudes and ethnicity. The geometric means of utility proxy (Happiness) is 2.44 for men and 2.37 for women (Mean of happiness is 0.865 for women and 0.892 for men) which amounts to a difference of 2.8 percent. Adjusting women's endowment levels to that of men would increase women's utility by 2.2%. Approximately 79 percent of the utility gap is explained by the endowment effect.

This study affirms Hallidays' (2008) claims that though improvements in medical care leads to modest improvements in health, there may be larger potential gains to identifying as well as targeting factors that influence individual heterogeneity since the state dependence is mostly driven by individual characteristics.

Chapter – 4 Health State Dependence of Utility – Racial and Ethnic Differences?

Abstract:

This study re-examines Health and Retirement Study (HRS) data in order to ascertain whether there is heterogeneity in the health dependence of marginal utility over race and ethnicity. This study begins with theoretical and empirical models used by Finkelstein, et al. (2010) relaxing the assumptions of those models to allow for differential effects by race, and ethnicity. I estimate fixed-effects models using the sample which is above age 50 and not in labor force and has medical insurance. I use objective reports of seven health conditions (hypertension, stroke, arthritis, cancer, diabetes, chronic lung disease, and heart disease). I use subjective well-being and a composite well-being measure (mental health index) developed by Center for Epidemiologic Studies Depression scale (CES-D) (which is the 'sum of six negative indicators' minus 'two positive indicators') as a proxy measure of utility. The nonlinear Blinder-Oaxaca decomposition was used to identify the contribution of each predisposing (age, gender, risk attitude, region) and need factors (self perception of health and physician's judgment about health) in explaining the race and ethnicity differences in utility and to estimate the residual unexplained difference. Coefficients of health indicators, income, risk attitude, marital status and age turn out to be significant in explaining utility gap among race and ethnicities.

Using happiness as a utility proxy and objective health measures in our baseline model, I find heterogeneity of health state dependence of utility among hispanic and non-hispanic and whites, and black in the case of all the seven diseases. Since, there is heterogeneity in the health dependence of utility, the policies like Medicare, Medicaid and

Social Security would have varying impact on people depending upon race, and ethnicity. This study has important implications for portfolio allocation, spending, saving, bequests, welfare of elderly women and men of varying race and ethnicities, and Social Security and Medicare policy.

Introduction:

Health differences as well as health disparity over race and ethnicity are amongst the major concerns in the U.S. health care nowadays especially after Institute of Medicine report[15]. A disparity connotes an unfair difference across racial/ethnic groups. For instance, an unfair difference in health care utilization, quality of care, or access to care is a disparity. The epidemiology literature shows that different diseases impact different races, and ethnicities differently. The differences exist not only in the impact of disease but also in the quality of life after disease, efficacy of medications for treatment of the disease, comorbidity of various diseases, as well as mortality rate of various chronic diseases. In the presence of the above mentioned differences, the relationship between health state and utility might also vary over race, and ethnicity. This study aims at testing the hypothesis of presence of heterogeneity in the health state dependence of utility. I use Health and Retirement Study (HRS) data in order to ascertain whether there is a race, and ethnicity difference in the variation of marginal utility of consumption over different health states. I use both objective and subjective measures of health.

Moreover, my study also provides an opportunity to draw a comparison between the results of objective and subjective health measures. This study uses happiness as a proxy of utility. As an alternative I also use Center for Epidemiologic Studies Depression scale (CES-D) in place of happiness. CES-D is a composite well-being measure (mental health index) which is the 'sum of six negative indicators' minus 'two positive indicators'. The negative

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[15] "Disparities in the health care delivered to racial and ethnic minorities are real and are associated with worse outcomes in many cases, which is unacceptable."
-- Alan Nelson, chair of the committee that wrote the Institute of Medicine report, Unequal Treatment: Confronting Racial and Disparities in Health Care.

indicators measure whether the respondent experienced the following six sentiments all or most of the time: depression, everything is an effort, sleep is restless, felt alone, felt sad, and could not get going. The positive indicators measure whether the respondent felt happy and enjoyed life, all or most of the time.

The remainder of the chapter proceeds as follows: Section Two presents the intuition and purpose behind this study. Section Three discusses previous literature. Section Four presents our theoretical arguments and assumptions and hypotheses which this study is going to examine. Section Five describes the data, methods and empirical model used for the main analysis, and how I construct my variables from that data. Section Six presents the empirical results from my analysis, including some robustness checks. Section Seven concludes and discusses the directions for further work.

II. Purpose:

Based on the two categories of literature (health disparity literature and the health dependence of utility literature, which is discussed in section three):

1. There exist race, and ethnicity differences not only in the impact of disease but also in the quality of life after disease, efficacy of medications for treatment of the disease, comorbidity of various diseases, as well as mortality rate of various chronic diseases.
2. There exists health state dependence of marginal utility which can be negative as well as positive.

What makes this study different from the previous studies is that this study combines the above mentioned two literatures. Our hypothesis is that there is heterogeneity in the health state dependence of marginal utility over race, and ethnicity. In other words, the relationship between health state and marginal utility also varies over race, and ethnicity. If there is heterogeneity in the marginal utility among different health states over race and ethnicity, the policies like Medicare, Medicaid and Social Security would have varying impact on people depending upon their race, and ethnicity. Therefore, this study has important implications for portfolio allocation, spending, saving, bequests, welfare of elderly women and men, and Social Security and Medicare policy.

III. Previous Literature and Background

I divide the literature for this study into two categories: first is the utility and health literature, and the other is race, and ethnicity literature.

In utility and health literature seminary work has been done by Richard J. Zeckhauser (1970, 1973), Kenneth J. Arrow (1974), Viscusi and Evans (1990, 1991a, 1991b) followed by Halliday (2008) and Finkelstein et al. (2009, 2011). In early 1970s Richard J. Zeckhauser (1970, 1973), Kenneth J. Arrow (1974) had developed the models of health care in which utility functions in the good and the poor health states assumed quite different shapes. Later in the 1990s Viscusi and Evans (1990) using the chemical worker survey (1982)[16] ascertain the findings of Zeckhauser and Arrow. Viscusi and Evans find that the marginal utility of income depends on the health state. They elicit the fallacy of monetary equivalence for a job injury. The logic behind monetary equivalence is that the death means fall in income, and thereby an increase in marginal utility of income. Their study finds that MU of

[16] 1982 Chemical worker survey is the subsample of workers analyzed in Section III. of Viscusi and O'Connor (1984)

income/money falls with the onset of job illness/injury. They find that less than full insurance is one of the most appropriate and significant implications of decline in marginal utility of income/wealth in ill health state.

Halliday (2008) studies the heterogeneity in health state dependence using Panel Study of Income Dynamics (PSID) data from 1984-1997 on self reported health status. He uses this state wide data set containing information on clinical risk factors for cardiac surgery. For half of the population he finds modest degree of state dependence whereas for the other half he finds degree of health state dependence to be near one but their health status mostly does not change over the life span. Author holds that though improvements in medical care leads to modest improvements in health, there may be larger potential gains to identifying as well as targeting factors that influence individual heterogeneity since the state dependence is mostly driven by individual characteristics.

Finkelstein et al. (2009) discuss various approaches/methods of measuring health dependence of marginal utility of consumption. Finkelstein et al. (2011) find that marginal utility of consumption depends on health states. Using empirical analysis based on Health and Retirement Study (HRS) data they find 10 to 25 % decline in the marginal utility of consumption due to one standard deviation increase in chronic health condition. This has impact on optimal health insurance levels and life cycle savings.

The second category of literature (which is more of a medical field literature) is related to race, and ethnicity differences in the impact of various diseases, in the quality of life after disease, efficacy of medications for treatment of the disease, comorbidity of various diseases, as well as mortality rate of various chronic diseases.

Ioannidis et al. (2004) test whether race influences the impact of gene variant on the disease risk by examining the genetic effects for 43 gene-disease associations across 697 study populations of various racial groups. The frequencies of the genetic marker of interest in the control populations (58%) showed large heterogeneity across races. However, they also found that though gene-disease associations vary in frequency across populations, but their biological impact on the risk for common diseases may usually be consistent across race.

Ward et. al (2004) using the data from the Surveillance, Epidemiology, and End Results (SEER), (SEER provides data not only on cancer incidence, stage of cancer at diagnosis, and mortality, but also on survival for Whites, African Americans, Hispanic/Latino, American Indian/Alaskan Native, and Asian/Pacific Islander population) as well as using census data on county find the presence of disparities in cancer incidence, mortality, and survival in relation to race/ethnicity. Even when census tract poverty rate is accounted for, African American, American Indian/Alaskan Native, and Asian/Pacific Islander men and African American and American Indian/Alaskan Native women have lower five-year survival than non-Hispanic Whites. They find that the death rate from cancer among African American males is 1.4 times higher than that among White males; for African American females it is 1.2 times higher. The more detailed analyses of selected cancers also show even larger variations in cancer survival by race and ethnicity.

IV. Theoretical Framework

Basic theoretical framework is based on Goddeeris state dependence model and Finkelstein's model of health state dependence of marginal utility which has been relaxed to allow for difference by race and ethnicity.

Life time Utility is the sum of:

1. Current period non-health consumption
2. Current period health consumption
3. Expected utility from next period consumption

$$U = \sum_{t=0}^{T}[(1/1-\gamma)(1+ \emptyset_{CS}\ S)C_t^{1-\theta} + (1/1-\gamma)(1+ \emptyset_{HS}\ S)H_t^{1-\theta}]^{1-\gamma/1-\theta} + \sum_{t=0}^{T-1}[(1/1-\gamma)(1/1+\delta)E_t(U_{t+1})^{1-\theta/1-\gamma}]^{1-\gamma/1-\theta} \quad (1)$$

Where Ø = Coefficient of level of sickness

δ = Discount rate

θ = Elasticity of intertemporal substitution

γ = Coefficient of relative risk aversion

S = Level of sickness

C= Non-health consumption

H = Out of pocket Health Consumption

Assumptions:

1. We assume health status/degree of sickness to be in continuum.
2. We adopt Epstein-Zin (1989) and Weil (1990) formulation of preferences to allow intertemporal elasticity of substitution and relative risk aversion to vary independently.
3. Wealth in the sick state is pre-determined i.e. health shocks do not change wealth. Therefore, in empirical analysis we include only those individuals who are no longer in labor market to exclude the first order effect of health shock on income.

Both healthy and sick individuals derive utility from health expenditure. Healthy individuals derive utility from precautionary health expenditure.

4. All have health insurance which finances fraction b of health expenditure. It is financed by tax rate on permanent income.

Simplified Two Period Model:

Suppose an individual lives only two periods.

Period-1 utility is given by:

$$U_1 = [(1/1-\gamma)(1+ \emptyset_{CS}\ S)C_1^{1-\theta} + (1/1-\gamma)(1+ \emptyset_{HS}\ S)H_1^{1-\theta}]^{1-\gamma/1-\theta} + [(1/1-\gamma)(1/1+\delta)E_1(U_2)^{1-\theta/1-\gamma}]^{1-\gamma/1-\theta} \quad (2)$$

Period-2 utility is given by:

$$U_2 = (1/1-\gamma)(1+ \emptyset_{CS}\ S)C_2^{1-\theta} + (1/1-\gamma)(1+ \emptyset_{HS}\ S)H_2^{1-\theta}]^{1-\gamma/1-\theta} \quad (3)$$

Subject to inter temporal budget constraint:

$$Y(1-\tau) = C_1 + (1-b)H_1 + \left(\frac{1}{1+r}\right)[C_2 + (1-b)H_2] \quad (4)$$

Where r is the real interest rate.

$$[C_2 + (1-b)H_2] = W \quad (5)$$

W is the second period wealth.

Therefore,

$$W = (1+r)(Y(1-\tau) - (C_1 + (1-b)H_1)) \quad (6)$$

Solving the model backwards:

$$\text{Max } U_2(C_2, H_2) = \text{Max}_{C_2,H_2}[(1/1-\gamma)(1+ \emptyset_{CS}\ S)C_2 + (1/1-\gamma)(1+ \emptyset_{HS}\ S)H_2]^{1-\gamma} \quad (7)$$

Subject to :

$$W = C_2 + (1 - b)H_2 \tag{8}$$

Therefore, the optimal non-health consumption expenditure and health consumption expenditure in second period will be:

$$C_2 = \frac{W}{1+(1-b)^{1-1/\gamma}(1+\emptyset_{CS}S/1+\emptyset_{HS}S)^{-1/\gamma}} \tag{9}$$

$$H_2 = \frac{W\,((1-b)^{-1/\gamma}(1+\emptyset_{CS}S/1+\emptyset_{HS}S)^{-1/\gamma})}{1+(1-b)^{1-1/\gamma}(1+\emptyset_{CS}S/1+\emptyset_{HS}S)^{-1/\gamma}} \tag{10}$$

By plugging C_2 and H_2 back in the second period utility we will calculate period-2 utility for all sickness levels, starting from 0 to the highest level of sickness prevailing in the population. Thus, now the second period utility will be a function of second period wealth corresponding to all sickness levels.

$$U_{2,S=1,2,3....} = \frac{1}{1-\gamma}(1 + \emptyset_{CS}S)W^{1-\gamma}[1 + (1 - b)^{1-1/\gamma}\ (\frac{1+\emptyset_{CS}S}{1+\emptyset_{HS}\,S})^{-1/\gamma}]^{\gamma} \tag{11}$$

$$U_{2,S=0} = \frac{1}{1-\gamma}W^{1-\gamma} \tag{12}$$

To calculate expected second period utility, we will take weighted average of second period utilities corresponding to all sickness levels, with weights being equal to probability 'p' of sickness level zero and '1- p' for all other non-zero sickness levels combined.(We are assuming additive utility). Then, we calculate C_1 from life time utility function and inter-temporal budget constraint in terms of Y and H_1.

Parameters in terms of proportionality of Income:

$$E_1(U_2) = \frac{p}{1-\gamma} +$$

$$(1-p)\sum_{S=1,2,3\ldots}\left(\frac{1+\emptyset_{CS}\,S}{1-\gamma}\right)[1+(1-b)^{1-1/\gamma}\,(\frac{1+\emptyset_{CS}S}{1+\emptyset_{HS}\,S})^{-1/\gamma}]^{\gamma}W^{1-\gamma} \qquad (13)$$

We can rewrite this as:

$$E_1(U_2) = kW^{1-\gamma} \qquad (14)$$

where,

$$k = \frac{p}{1-\gamma} + (1-p)\sum_{S=1,2,3\ldots}\left(\frac{1+\emptyset_{CS}\,S}{1-\gamma}\right)[1+(1-b)^{1-1/\gamma}\,(\frac{1+\emptyset_{CS}S}{1+\emptyset_{HS}\,S})^{-1/\gamma}]^{\gamma} \qquad (15)$$

Now we use inter-temporal budget constraint to express expected second period utility as a function of first period consumption.

Inter-temporal budget constraint is:

$$W = (1+r)(Y(1-\tau)-(C_1+\,(1-b)H_1)) \qquad (16)$$

$$E_1(U_2) = k[(1+r)(Y(1-\tau)-(C_1+\,(1-b)H_1))]^{1-\gamma} \qquad (17)$$

Substituting this into first period utility:

$$U_1 = [(1+\emptyset_{CS}\,S)({}^{1}/_{1-\gamma})C_1{}^{1-\theta} + (1+\emptyset_{HS}\,S)\left({}^{1}/_{1-\gamma}\right)H_1{}^{1-\theta}]^{1-\gamma/1-\theta} + \left(\frac{1}{1+\delta}\right)\left(\frac{1}{1-\gamma}\right)k[(1+r)(Y(1-\tau)-(C_1+(1-b)H_1))]^{1-\gamma} \qquad (18)$$

By taking derivative of U_1 w.r.t . C_1 and H_1 respectively and equating them to zero, we can express C_1 and H_1 in terms of Y such that:

$$C_1 = c_1Y \qquad (19)$$

$$H_1 = h_1Y \qquad (20)$$

Hence,

$$W = wY \tag{21}$$

Where $w = (1+r)((1-\tau) - (C_1 + (1-b)H_1))$ (22)

Deriving Indirect Utility Functions:

We can derive indirect utility function $v(Y, S)$ by substituting $W = wY$ into second period utility equations.

Indirect Utility function for S=0:

$$v(Y, S = 0) = \frac{1}{1-\gamma}(wY)^{1-\gamma} \tag{23}$$

Indirect Utility function for S being non-zero:

$$v(Y, S) = \frac{1}{1-\gamma}(1 + \emptyset_{CS}S)(wY)^{1-\gamma}[1 + (1-b)^{1-1/\gamma} (\frac{1+\emptyset_{CS}S}{1+\emptyset_{HS}\,S})^{-1/\gamma}]^{\gamma} \tag{24}$$

Based on these indirect utility functions, the non-linear regression form will be:

$$v = \beta_{1s}S\,Y^{\beta_2} + \beta_3\,Y^{\beta_2} + \mu \tag{25}$$

Where β_{1s} is the income gradient of utility in different non-zero sickness levels relative to zero sickness level (β_3). Therefore,

$$\beta_{1s} = \frac{w^{1-\gamma}}{1-\gamma}(1 + \emptyset_{CS}S)[1 + (1-b)^{1-1/\gamma} (\frac{1+\emptyset_{CS}S}{1+\emptyset_{HS}\,S})^{-1/\gamma}]^{\gamma} - \frac{w^{1-\gamma}}{1-\gamma} \tag{26}$$

$$\beta_2 = 1 - \gamma \tag{27}$$

$$\beta_3 = \frac{w^{1-\gamma}}{1-\gamma} \tag{28}$$

By dividing equation (26) by (28) and by plugging in the value derived from dividing equation (9) by equation (10) we can calculate the parameter of health dependent marginal utility of consumption ($\emptyset_{CS}$).

$$(1 + \emptyset_{CS}S) = \frac{\beta_{1S}/\beta_3 + 1}{[1 + \frac{H_2}{C_2}(1-b)]^{\gamma}} \tag{29}$$

Thus, the ratio between β_{1s} and β_3 gives us state dependence. Thus, the estimate of β_{1s} provides us direct test of sign of state dependence. If β_{1s} is negative, it implies marginal utility (in case of happiness as a proxy of utility) declines as the health deteriorates and vice versa if we are using CES-D as a proxy of utility. Positive coefficient indicates positive state dependence, that is, the difference between marginal utility derived at good health and at the poor health is diminishing. Negative coefficient indicates that the difference between marginal utility derived at good health and at the poor health is increasing (See Figure 4.1). Magnitude of state dependence is measured by $\emptyset_{CS}$ which depends on the ratio of estimated coefficients of β_{1s} and β_3. Since the denominator of equation – (29) is weakly greater than the one if there is no full-insurance, therefore the true magnitude of state dependence will be smaller than the ratio of estimated coefficients of β_{1s} and β_3.

Non-linear Blinder-Oaxaca Decomposition:

Subsequent upon the findings of our first hypothesis where we test whether health dependence of marginal utility varies over race and ethnicity (and we find the strong evidence of existence of race and ethnicity heterogeneity), the next objective is to tease out which variable causes this heterogeneity in health dependence of utility. We use the non-linear Blinder-Oaxaca (B-O) decomposition to achieve this goal. The B-O decomposition teases out the outcome variables between two groups – (1) a part that is explained by differences in observed characteristics, and (2). that part which is attributable to the difference in coefficients of these characteristics in the regression equation (in other words, difference in returns to these characteristics). Oaxaca-Blinder linear decomposition has been widely used in labor literature but if the outcome variable is non-linear, the standard Oaxaca-Blinder linear decomposition is not applicable. Fairlie (1999, 2003) developed decomposition method for binary dependent variables. Recently work has been done on non-linear decomposition by Sinning, Hahn and Bauer (2008). We apply non-linear B-O decomposition by first estimating the logistic regressions separately for whites and blacks and Hispanics and non-hispanics (see equations 30 and 31) and then decomposing the difference between the two into explained and unexplained components.

$$Y_w = f(X_w \widetilde{\beta_w}) \qquad (30)$$

$$Y_b = f(X_b \widetilde{\beta_b}) \qquad (31)$$

Where the subscript w refers to whites and b refers to blacks. Similarly we estimate equation 30 and 31 for Hispanics and non-hispanics.

The difference between equations (30) and (31) is decomposed by rewriting the conventional decomposition equation in conditional expectation form:

$$\overline{Y}_b - \overline{Y}_w = [E_{\beta w}(Y_{ib}|X_{ib}) - E_{\beta w}(Y_{iw}|X_{iw})] +$$

$$[E_{\beta b}(Y_{iw}|X_{iw}) - E_{\beta w}(Y_{iw}|X_{iw})] +$$

$$[E_{\beta b}(Y_{ib}|X_{ib}) - E_{\beta w}(Y_{ib}|X_{ib})] + [E_{\beta b}(Y_{iw}|X_{iw}) - E_{\beta w}(Y_{ib}|X_{ib})] \qquad (32)$$

V. Data

For the analyses I use data on individuals from the Health and Retirement Survey (HRS). This is a longitudinal survey started in 1992 that is representative for targeted birth cohorts, which I will discuss below. The core survey is administered every other year, with some additional information collected by mail in some of the off-years.

The primary information I need for our analysis is household income, household wealth, occurrence of health shock, out of pocket medical expenditure. HRS provides this and much more. I are using all the nine waves (1992 - 2008) of HRS data from RAND HRS and Tracker files for our main analysis. I use a sample with age 50+, who have health insurance and who are either retired or not working (in order to avoid the impact of gender gap in labor market on one hand and the impact of labor market income on consumption on the other hand). I include individuals from the original HRS cohort (born in 1931-41), the Children of the Depression Age (CODA) sample (born 1924-30), the War Baby (WB) sample (born 1942-47), and the Early Baby Boomer (EBB) sample (born 1948-53). The CODA and WB samples were added in 1998 and the EBB sample in 2004. The CODA sample will have been sufficiently old that they are unlikely to be working by 1998, which is the first year of the data I are using logged transformation of HH income (Average of HH income over all waves) + 5% current HH wealth adjusted for HH composition (divided by 1.7 if coupled and by 1 if single).

Corresponding with the literature, I do the analyses for seven diseases hypertension, stroke, arthritis, cancer, diabetes, chronic lung disease, and heart disease. For robustness check, I repeat the analyses using Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs) from wave 2 onwards (1994—2008)[17]. Details on cross-wave difference of ADL and IADL questions can be found in appendix – A.

For utility measures this study uses the questions on happiness. As an alternative, I use CES-D score which is the sum of feelings like depression, sadness, loneliness etc. Details

[17] I exclude wave – 1 for ADL and IADL based analyses because of inconsistency in the way questions were asked in wave – 1 in the survey.

on CES-D score can be found in Appendix-4A. Higher the score, more negative the respondent's feelings are in the past week.

Permanent Income is average of HH income (adjusted for HH composition)[18] across waves 1992 to 2008. I have taken annual HH Income adjusted for HH composition. I also add 5% of current HH wealth (excluding housing and automobile) to it. Permanent Income includes wages and salary, business income, dividend, interest income, other asset income, pension, government transfers, other sources. Details on construction of permanent income measure can be found in appendix – B. Household Wealth includes: net values of stock, mutual fund, investment trusts , checking account, saving account, money markets, CD, T-bill, other savings and assets minus non-housing and non - automobile debts. Average HH wealth is average of wealth over all waves whenever HH enters. Details on construction of wealth measure can be found in appendix – 4B

VI. Results

I regress subjective happiness (proxy of utility) on health/sickness level, permanent income and interaction term of health/sickness level and permanent income.

Table -4.1 insert here

Our sample has approx. 40,000 (person years) observations for whites (age over 50, not in labor market and have health insurance) and approx. 7000 for blacks and approx. 3000 observations for hispanics. Sample statistics are given in (Table 4.1). The data is tested for heteroskedasticity (using ado file xttest3). Since heteroskedasticity was present, robust

[18] I use OECD adjustment for HH size: Divide total HH income by 1.7 if respondent is married and living with spouse in same HH in that wave and divide by 1 if single.

standard errors have been used. Sample was tested for multicollinearity by using stata user written Collin command. I include wave fixed effects in our regression since I failed to reject the null of time dummies not jointly significant using testparm command. We use probability weights for the analyses.

Equation (24) is empirically calculated by the running the following fixed effects regression:

$$U_{it} = f(\beta_1 S_{it} \times \overline{Y}_i^{\beta_2} + \beta_4 S_{it} + \overrightarrow{A} X_{it} + \alpha_i) \qquad (33)$$

The effect of permanent income on utility gets absorbed by individual fixed effects (α_i), in order to capture that, we run the auxiliary regression of the following type to get the coefficient of permanent income:

$$\hat{\alpha}_i = \beta_3 \overline{Y}_i^{\beta_2} + \overrightarrow{A_1} X_{it} + \varepsilon_{it} \qquad (34)$$

In our baseline model (Table-4.2), we regress utility proxy on the variable 'number of diseases' which is the sum of seven health conditions (hypertension, stroke, arthritis, cancer, diabetes, chronic lung disease, and heart disease), interaction between permanent income and number of diseases along with other control variables (age, wave fixed effects, individual fixed effects, marital status, risk attitude). The estimates of individual fixed effects derived from this regression are regressed on dummy for gender, permanent income (adjusted for HH composition), risk attitude, residency and marital status. To estimate the parameter of state dependence, the coefficient of interaction term of diseases and log permanent income are divided by the coefficient of permanent income (adjusted for HH composition). I find that there is heterogeneity in health state dependence of utility among different races, and ethnicities.

Table 4.2 insert here

I find that there is heterogeneity in health state dependence of utility among different races and ethnicities also. For lung disease, stroke and arthritis, the health state dependence is positive for whites whereas negative for blacks (table 4.2). For diabetes, stroke and heart disease, the health state dependence is positive for Hispanic whereas negative for Non-hispanic (see table 4.11).

I find that there is heterogeneity in health state dependence of utility among different ethnicities also. For diabetes, the health state dependence is negative for Hispanic whereas positive for Non-hispanic. For arthritis, health state dependence is positive for Hispanic whereas negative for non-hispanic (columns 7 and 8: table 4.2). As mentioned, in the theory section, these state dependence coefficients have been derived from the ratio of the interaction term of permanent income and health state and the coefficient of permanent income itself, the results of these regressions are given in tables-3,4,and 5 respectively.

Tables 4.3,4.4 and 4.5 insert here.

However, using ADLs and IADLs we find that the results are not consistent with that of objective disease results. One possible explanation is that ADLs and IADLs are subjective health measures and there is possible variation in self-reporting of functional limitations among races and ethnicities. In general, in the literature, African Americans and Hispanics have been found to be reporting worse functional health than whites (Kington and Smith 1997). More research is needed in this area before we are able to arrive at any conclusion.

B-O Decomposition:

Now, since the results tell us that there is racial-ethnic heterogeneity in health dependence of utility, it is important for us to identify the contribution of observed factors behind racial-ethnic heterogeneity in utility. We use the nonlinear Blinder-Oaxaca decomposition for the same (See table 4.6). The geometric means of utility proxy (Happiness) is 2.41 for whites and 2.33 for blacks which amounts to a difference of 3.6 percent. Adjusting black's endowment levels to that of whites would increase black's utility by 3.7%. One hundred percent of the utility gap is explained by the endowment effect. The significant contributors towards the explained gap are marital status, number of diseases, log adjusted income, risk attitudes , age gender and ethnicity. We find similar results for B-O decomposition based on ethnicity also(See table 4.13).

(Table 4.6 and 4.13 insert here)

Taking CES-D score as utility proxy, we find that the means of CES-D is 1.51 for whites and 2.00 for blacks yielding a score gap of 0.49 (See table 4.7). Adjusting black's endowment levels to that of whites would lead to mean decline of 0.47 in CES-D score. Thus, 96 percent of the score gap is explained by endowment levels. We find similar results for B-O decomposition based on ethnicity also (See table 4.14).

(Table 4.7 and 4.14 insert here)

Robustness Checks:

Robustness checks have been done using alternative specification logit and by using CES-D as an alternative utility proxy (Tables – 4.8 and columns 4 and 5 of tables 4.2 to 4.5). The results with logit stand our baseline model results. Results with CES-D score as a disutility proxy (opposite to happiness) also stand our baseline results that health state-dependence of utility varies over race and ethnicity. Results of regressions of CES-D on alternative health measures like ADLs, IADLs and number of diseases have been reported in appendix-4C.

Tables – 4.8 insert here.

VII. Conclusion and Discussion

Using happiness as a utility proxy and seven objective health measures separately as well as combined measure as sum total of these seven conditions in our baseline model, we find racial-ethnic differences in health dependence of utility. By B-O decomposition of utility we find out that the significant contributors to the racial-ethnic utility gap are marital status, number of diseases, log adjusted income, risk attitudes , age and gender.

However when we use self-reported health (IADLs) as a measure of health status, the results are not consistent to the baseline model results where we used objective health condition reports. One of the possible explanations is behavioral difference among race and ethnicities in self reporting of functional health. African-Americans and Hispanics self-report the functionality hindrances more. Since, health state dependence is being measured as a ratio between the interaction term of self-reported health × permanent income and permanent income, the higher self-report of diseases bias the results for health state dependence.

The existence of race, and ethnicity differences in health state dependence of utility has important implications for portfolio allocation, spending, saving, bequests, welfare of elderly women and men, and Social Security and Medicare policy. It also has implications for health insurance. Our study confirms the findings of Halliday (2008) that there may be larger potential gains to identifying as well as targeting factors that influence individual heterogeneity since the health state dependence is mostly driven by individual characteristics, as has been found to be the case in B-O decomposition of utility in the current study.

Chapter 5. Contributions to the Literature:

This dissertation is compilation of chapters on the impact of risk attitude on occupational choice on one hand and health dependence of utility on the other hand. Risk attitude has been found to be a significant contributor in gender, racial and ethnic heterogeneity in marginal utility as well as a major factor in occupational choice. This dissertation makes following contributions to the literature:

Contribution in Occupational Choice Literature:

1) It examines riskiness of jobs and risk tolerance of individuals in two distinct domains of risk: health and injury risk and income risk. Strong evidence is found that the distinction is important.
2) It constructs riskiness measures of jobs for classification of jobs by both occupation and industry. To our knowledge this has previously been done only for the fatality risk of jobs by Viscusi (2004) in his work on the value of a life. This study claims that the variation in other risks (health, income) across industries within occupation categories is potentially large and important.
3) This dissertation is using survey data on a sample of workers who are near the end of their work-life. By the end of the work-life, workers have arguably had more opportunity to attain their ideal choice in occupation and industry, as well as having had more opportunity to become informed about the risks. Further, using this older sample allows us to treat educational attainment as pre-determined, rather than a decision that is taken jointly with the choice of occupation and industry.
4) Finally, this study addresses whether controlling for time preference impacts the estimated effect of risk tolerance on the riskiness of the job category chosen.

5) The impact of a subject's magnitude of risk and time preference (as well as the changes in risk and time preference over the gender and age) on the magnitude and sign of the state dependent relationship between health shock and marginal utility of consumption can have immense implications for retirement consumption behavior.

Furthermore, this study makes following general contributions to the risk and time preference literature:

- Provides a measure of riskiness of occupations to the job market candidates.
- The comprehensive and careful construction of proxies for risk and time preference (financial as well as general domain).
- Estimates the validity of often used proxy for risk and Advice against the use of smoking as a proxy for pure financial domain based risk analysis.

Contribution in Health Dependence of Utility Literature:

1) This dissertation is the first attempt to investigate the presence of heterogeneity in health dependence of utility over gender, race and ethnicity.
2) This dissertation not only investigates the presence of heterogeneity in health dependence of utility over gender, race and ethnicity but also is an attempt to find out the factors contributing to the heterogeneity.
3) The finding that risk attitude is a significant contributor to racial-ethnic and gender disparity in marginal utility using both happiness as well as CES-D scores as utility proxy, is another important contribution of this study in the risk literature as well as health demography literature.

4) This dissertation confirms the findings of Halliday (2008) that there may be larger potential gains to identifying as well as targeting factors that influence individual heterogeneity since the health state dependence is mostly driven by individual characteristics, as has been found to be the case in B-O decomposition of utility in the current study.

5) Since, there is heterogeneity in the variation of utility among different health states, the policies like Medicare, Medicaid and Social Security would have varying impact on people depending upon race, ethnicity and gender. This study has important implications for portfolio allocation, spending, saving, bequests, welfare of elderly women and men, and Social Security and Medicare policy.

Chapter 6. Appendices:

6.1 Appendices to Chapter-2

Appendix 2A : Preference Measurement

1. **Measurement of Risk Preference**

For the financial risk preference measures, we use the questions based on the risk of variation in income.

Wording of HRS question, from 1998:

> "Suppose that you are the only income earner in the family. Your doctor recommends that you move because of allergies, and you have to choose between two possible jobs. The first would guarantee your current total family income for life.
>
> The second is possibly better paying, but the income is also less certain. There is a 50-50 chance the second job would double your total lifetime income and a 50-50 chance that it would cut it by X. Which job would you take – the first job or the second job?"

The question sequence begins with X = 1/3 and varies thereafter contingent on responses in order to ascertain into which of the 6 ranges the respondent fits. These six ranges are given in table 2A.1.

Framework of Time Horizon

Wording of time horizon question in HRS for 2004:

"In planning your (family's) saving and spending, which of the following time periods is most important to you (and your) (husband\wife\partner), the next few months, the next year, the next few years, the next 5-10 years, or longer than 10 years?"

For the analyses, the next few months has been taken as the reference category.

6.2 Appendices to Chapter-3

Appendix 3A : Cross Wave Differences in Activities of Daily Living (ADL)
Source: RAND HRS Data Documentation, Version K

Two Activities of Daily Living (ADL) summaries were derived beginning in Wave 2. One uses the ADLs proposed by Wallace and Herzog in their paper (Wallace and Herzog, 1995) to define an ADL summary (ADLWA): bathe, dress, and eat. The second includes these and adds getting in/out of bed and walking across a room (ADLA). In all waves the "some difficulty" versions of the individual measures are used to construct these measures, i.e., walk, bed, bath, dress, and eat. Each limitation adds one to the summary measure, that is:

ADLWA = sum (bath, dress, and eat)

ADLA = sum (walk, bed, bath, dress, and eat)

Please see "Activities of Daily Living (ADLs): Recodes for Comparison to Wallace and Herzog" for a description of how these 0/1 variables ([adl]W) are constructed. Note that the Wallace and Herzog variables result in more limitation than the 0/1 recodes for other waves (Rw[adl]A) solely due to measurement differences in the raw data. The R1ADLWW and R1ADLWA variables are not appropriate for comparison to the RwADLA and RwADLWA variables in other waves.

There are other cross wave differences in the way HRS presented these questions in Wave 2H and 2A and the later waves, that may introduce measurement errors in these variables. In addition the criteria used for skipping some questions changed between Wave 3 and later waves, which may also influence the consistency of measurement before Wave 4 for all ADLs except dressing.

CES-D Score:

CES-D is the sum of feeling depressed, everything is an effort, sleep restless, feel lonely, feel sad, feel cannot get going, (1 - you were happy) and (1 - enjoy life). Thus the higher the score, the more negative the respondent's feelings in the past week.

Cross Wave Differences in Original HRS Data

Please see "Cross Wave Differences in Original HRS Data" for the "Activities of daily living (ADLs): Some difficulty

Appendix 3B : Construction of Permanent Income and Household Wealth Measures
Source: RAND HRS Data Documentation, Version K

Preparing Income data:

1. Permanent Income is average of HH income (adjusted for HH composition)[19] from waves 1992 to 2008.
2. Annual HH Income includes: Wages and salary, Business income, Dividend, Interest income, Other asset income, Pension, Government transfers and welfare income, income from other sources.

Then I add 5% of HH current financial wealth. This is total HH wealth excluding housing.

Income = wage, salary + tip, bonus and commission income + second job income +professional practice and trade income + Business income + Rental income + Dividend income + Bonds income + CDs, Saving bonds, T-bills income + Checking, Saving account income + Other household income which is income from other assets + Any other HH income + Lump sum income for last calendar year from last calendar year from insurance, pension or inheritance + Lump sum income #2 for last calendar year from insurance, pension or inheritance + Lump sum income #3 for last calendar year from insurance, pension or inheritance + Pension # 1 (largest income) + Pension # 2 (2nd largest income) + Pension # 3 (rest income) + Annuity # 1 (largest income) + Annuity # 2 (2nd largest income) + Annuity # 3 (rest income) + Welfare Income If not + Food Stamps + Veteran's Benefits + Respondent or spouse Social Security retirement or survivor's income, set to SS. + Respondent or spouse

[19] OECD adjustment criterion of dividing total HH income by 1.7 if R is living with spouse in same HH in that wave and divide by 1 if single has been used.

Social Security disability income and Supplemental Security Income + Unemployment income + Worker's compensation income

HH Wealth includes:

Net values of stock, MF, investment trusts , checking A/c, Saving AC, Money markets, CD, T-bill, other savings and assets minus non-housing and non - automobile debts.

Total non-housing assets less debt

= Other Real estate + Transportation + Business +Individual Retirement Accounts + Stocks, MF + Checking and Saving Account + CDs, Savings Bonds, Treasury Bills + Bonds + Other savings, Assets – Debts

6.3 Appendices to Chapter-4

Appendix A : Cross Wave Differences in Activities of Daily Living (ADL)
Source: RAND HRS Data Documentation, Version K

Two Activities of Daily Living (ADL) summaries were derived beginning in Wave 2. One uses the ADLs proposed Wallace and Herzog in their paper (Wallace and Herzog, 1995) to define an ADL summary (ADLWA): bathe, dress, and eat. The second includes these and adds getting in/out of bed and walking across a room (ADLA). In all waves the "some difficulty" versions of the individual measures are used to construct these measures, i.e., walk, bed, bath, dress, and eat. Each limitation adds one to the summary measure, that is:

ADLWA = sum (bath, dress, and eat)

ADLA = sum (walk, bed, bath, dress, and eat)

Please see "Activities of Daily Living (ADLs): Recodes for Comparison to Wallace and Herzog" for a description of how these 0/1 variables ([adl]W) are constructed. Note that the Wallace and Herzog variables result in more limitation than the 0/1 recodes for other waves (Rw[adl]A) solely due to measurement differences in the raw data. The R1ADLWW and R1ADLWA variables are not appropriate for comparison to the RwADLA and RwADLWA variables in other waves.

There are other cross wave differences in the way HRS presented these questions in Wave 2H and 2A and the later waves, that may introduce measurement errors in these variables. In addition the criteria used for skipping some questions changed between Wave 3 and later waves, which may also influence the consistency of measurement before Wave 4 for all ADLs except dressing.

CES-D Score:

CES-D is the sum of feeling depressed, everything is an effort, sleep restless, feel lonely, feel sad, feel cannot get going, (1 - you were happy) and (1 - enjoy life). Thus the higher the score, the more negative the respondent's feelings in the past week.

Cross Wave Differences in Original HRS Data

Please see "Cross Wave Differences in Original HRS Data" for the "Activities of daily living (ADLs): Some difficulty

Appendix B : Construction of Permanent Income and Household Wealth Measures

Source: RAND HRS Data Documentation, Version K

Preparing Income data:

1. Permanent Income is average of HH income (adjusted for HH composition)[20] from waves 1992 to 2008.
2. Annual HH Income includes: Wages and salary, Business income, Dividend, Interest income, Other asset income, Pension, Government transfers and welfare income, income from other sources.

Then I add 5% of HH current financial wealth. This is total HH wealth excluding housing.

Income = wage, salary + tip, bonus and commission income + second job income +professional practice and trade income + Business income + Rental income + Dividend income + Bonds income + CDs, Saving bonds, T-bills income + Checking, Saving account income + Other household income which is income from other assets + Any other HH income + Lump sum income for last calendar year from last calendar year from insurance, pension or inheritance + Lump sum income #2 for last calendar year from insurance, pension or inheritance + Lump sum income #3 for last calendar year from insurance, pension or inheritance + Pension # 1 (largest income) + Pension # 2 (2nd largest income) + Pension # 3 (rest income) + Annuity # 1 (largest income) + Annuity # 2 (2nd largest income) + Annuity # 3 (rest income) + Welfare Income If not + Food Stamps + Veteran's Benefits + Respondent or spouse Social Security retirement or survivor's income, set to SS. + Respondent or spouse

[20] OECD adjustment criterion of dividing total HH income by 1.7 if R is living with spouse in same HH in that wave and divide by 1 if single has been used.

Social Security disability income and Supplemental Security Income + Unemployment income + Worker's compensation income

HH Wealth includes:

Net values of stock, MF, investment trusts , checking A/c, Saving AC, Money markets, CD, T-bill, other savings and assets minus non-housing and non - automobile debts.

Total non-housing assets less debt

= Other Real estate + Transportation + Business +Individual Retirement Accounts + Stocks, MF + Checking and Saving Account + CDs, Savings Bonds, Treasury Bills + Bonds + Other savings, Assets – Debts

Tables from Chapter-2

Table 2.1: Income Variability by Occupation and Industry

	Industry								
Occupation	Agri Forestry Fishing	Mining Const.	Manufac	Transport Wholesale Retail	Finance Insurance Real Est.	Personal Business Repair Services	Entertain Recreation	Prof. Related Service	Public Adm.
Managerial specialty operation	69	54	50	55	71	61	65	62	50
Prof specialty operation,tech support	44	44	36	53	59	60	115	79	43
Sales	63	58	56	71	94	64	106	101	48
Clerical, administrative support	71	63	45	64	69	90	84	102	86
Service: pvt household,clean,build	89	87	61	95	73	122	91	81	113
Service: protection	55	92	64	67	72	85	101	85	34
Service: food preparation	198	81	106	93	64	111	89	93	156
Health services	30	17	43	85	61	104	106	82	75
Personal services	80	123	118	66	93	100	106	104	74
Farming, forestry, fishing	82	97	66	75	101	163	71	99	54
Mechanics and repair	47	46	36	42	52	56	60	50	35
Construction trade and extractors	83	59	44	52	62	68	64	64	44
Precision production	67	49	46	55	60	71	75	105	58
Operators: machine, transport, handler	72	51	52	66	91	93	102	107	63
Self-employed	205	137	83	125	144	148	158	135	64

Source: Authors' calculations using IPUMS 5% census data. The crosswalk available at IPUMS has been used to convert the industries and occupational codes into the ones which are compatible with HRS data (1980 Census codes) for the analyses.

Table 2.2: Nonfatal and Fatal Injury and Illness Rate (per 100,000 employees) by Occupation and Industry

Table 2A. Nonfatal Injury Illness Rate

	INDUSTRY					
OCCUPATION	Agri Forestry Fishing	Mining Constrction	Manufac.	Transport Wholsale Retail	Finance Insurance Real Estate	Personal Business Repair Services
Managerial specialty operation	631	612	149	267	237	302
Prof specialty operation,technical support	283	229	169	236	204	365
Sales	882	365	184	665	344	304
Clerical, administrative support	63	234	441	731	262	361
Service: pvt household,cleaning,building services	140	1547	2760	1651	2662	2426
Service: protection	2185		2802	4162	358	10520
Service: food preparation	3225		2477	159	874	1438
Health services	16		5319	825	1427	19594
Personal services	37		3636	2654	362	1507
Farming, forestry, fishing	5795		912	1040		23843
Mechanics and repair	4427	4068	1897	1963	2032	570
Construction trade and extractors	2486	5683	2323	3517	1865	1835
Precision production	2566	2367	1572	1853	6290	545
Operators: machine, transport, handlers	2437		2647	3187	16186	1375

Table 2B. Fatal Injury Rate

	INDUSTRY				
OCCUPATION	Mining Constrction	Manufac.	Transport Wholsale Retail	Finance Insurance Real Estate	Personal Business Repair Services
Managerial specialty operation	5.98	1.73	2.93	1.52	1.48
Prof specialty operation,technical support	5.51	0.98	2.32	0.33	1.09
Sales	1.90	3.82	3.21	1.15	1.24
Clerical, administrative support	0.22	0.59	0.85	0.40	0.39
Service: pvt household,cleaning,building services	2.34	2.24	4.30	4.56	1.59
Service: protection	2.34	2.24	4.30	4.56	1.59
Service: food preparation	2.34	2.24	4.30	4.56	1.59
Health services	2.34	2.24	4.30	4.56	1.59
Personal services	2.34	2.24	4.30	4.56	1.59
Precision production	13.29	4.27	6.73	3.98	5.06
Operators: machine, transport, handlers	33.92	3.92	10.98	7.41	2.82

Table 2A source: authors' calculations using BLS non-fatal injury illness incident data from “TABLE R44. Number of nonfatal occupational injuries and illnesses involving days away from work by occupation and industry sector, 2004”. Table-2B source: Table 1, Viscusi’s (2004) Some industries and occupations have been recoded from Viscusi’s original categories to make them compatible with those in HRS data. We have presently used relative employment in each category in 1997 in order to scale the rates for combining them.

Table 2.3A: Summary Statistics: Means and Proportions

Risk Aversion	Medium Risk Averse	0.31
	Most Risk Averse	0.55
Education	High School	0.26
	College	0.11
	Graduate	0.06
	Unknown	0.006
Race	Black	0.07
	Other	0.05
Time horizon	One Year	0.12
	Next few years	0.27
	Next 5- 10 years	0.37
	More than 10 years	0.12
Marital Status	Previously married	0.17
	Never Married	0.05
Family wealth	Average	0.65
	Poor	0.25
	Varied	0.01
No Smoking		0.42
Age		57.9 (6.11)
Fatal Risk		4.07 (3.52)
Nonfatal Risk		1,506 (2,100)
Income Variability		62,973 (15,177)
Observations (1,756)		

Note: Survey weights used. Std. dev. in parentheses.

Table 2.3B: Description of Variables

Variable	Description
Risk Preference	Least risk averse, medium risk averse and most risk averse; least risk averse is the reference category.
Time Horizon	Next few months, next year, next few years, next 5-10 years, more than 10 years; next few months is the reference category.
Race	White, black and other with white as the reference category.
Marital Status	Married, never married and previously married with married as the reference category.
Education	Less than high school, high school, college, graduate, unknown; less than high school is the reference category
Family Wealth	Rich, poor, average, varied; rich is the reference category

Table 2.4: Regression Estimates of Three Measures of Job Risk

Category		Income Variability	Nonfatal Rate	Fatal Rate
Risk Aversion	**Medium**	-0.056***	-0.074	-0.063
		(0.021)	(0.075)	(0.055)
	Most	-0.064***	0.175**	0.078
		(0.019)	(0.073)	(0.050)
Race	**Black**	0.081***	0.289***	0.033
		(0.029)	(0.088)	(0.065)
	Unknown	0.021	0.137	0.078
		(0.029)	(0.143)	(0.113)
Degree	**High School**	-0.001	-0.759***	-0.545***
		(0.014)	(0.065)	(0.064)
	College	-0.017	-1.114***	-0.801***
		(0.013)	(0.067)	(0.065)
	Graduate	-0.018	-1.147***	-1.114***
		(0.014)	(0.051)	(0.045)
	Other	-0.040	-1.241***	0.084
		(0.089)	(0.089)	(0.166)
Family Wealth	**Average**	-0.044*	0.097	0.083
		(0.023)	(0.097)	(0.088)
	Poor	-0.048*	0.023	0.0294
		(0.027)	(0.093)	(0.096)
	Varied	-0.010	0.360	0.204
		(0.068)	(0.317)	(0.198)
Time Horizon	**Next Year**	-0.036	-0.105	0.076
		(0.027)	(0.107)	(0.098)
	Next Few Years	-0.054**	-0.271***	-0.0004
		(0.024)	(0.084)	(0.077)
	Next 5-10 Years	-0.040*	-0.149*	0.013
		(0.022)	(0.083)	(0.074)
	Longer than 10 yrs	-0.053**	-0.140	0.092
		(0.026)	(0.101)	(0.075)
Age		0.003**	0.004	0.004
		(0.001)	(0.005)	(0.003)
Marital status	**Previously Married**	0.016	0.211**	0.110
		(0.018)	(0.086)	(0.067)
	Never Married	0.012	0.163	0.0477
		(0.026)	(0.113)	(0.105)
R^2		0.03	0.24	0.21
#Observations (Subpopulation)		1,756		

Notes: Survey weights used.
Jackknife Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

Table 2.5: Risk Aversion without Time Preference vs. with Time Preference

		Income Variability	
Risk Aversion	**Medium**	-0.056**	-0.056**
		(0.023)	(0.023)
	Most	-0.059***	-0.061***
		(0.020)	(0.021)
Degree	**High School**	-0.004	-0.009
		(0.014)	(0.014)
	College	-0.021	-0.028**
		(0.014)	(0.014)
	Graduate	-0.035**	-0.040***
		(0.014)	(0.014)
	Unknown	-0.024	-0.025
		(0.089)	(0.081)
Race	**Black**	0.070**	0.073**
		(0.028)	(0.030)
	Other	0.025	0.031
		(0.026)	(0.027)
Time Horizon	**Next Year**	-0.038	
		(0.026)	
	Next Few Years	-0.062***	
		(0.023)	
	Next 5-10 Years	-0.044**	
		(0.022)	
	Longer than 10 years	-0.053**	
		(0.026)	
Age		0.004***	0.004***
		(0.001)	(0.001)
Marital status	**Previously Married**	0.023	0.024
		(0.018)	(0.018)
	Never Married	0.027	0.040
		(0.028)	(0.034)
Family Wealth	**Average**	-0.046*	-0.044*
		(0.024)	(0.024)
	Poor	-0.059**	-0.056*
		(0.029)	(0.028)
	Varied	-0.025	-0.016
		(0.067)	(0.068)
Constant		4.037***	4.004***
		(0.080)	(0.078)

 # Observations (Subpopulation) 1,955

Notes: Survey weights used.

Jackknife Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

Table 2.6: Smoking as a Proxy for Risk Aversion: Income Variability vs. Nonfatal

Control Variables		income	nonfatal
No smoking		0.021**	-0.030
		(0.009)	(0.044)
Health Index		0.003	0.130
		(0.027)	(0.082)
Degree	**High School**	-0.011	-0.856***
		(0.012)	(0.054)
	College	-0.039***	-1.207***
		(0.012)	(0.060)
	Graduate	-0.037**	-1.269***
		(0.011)	(0.043)
	Unknown	-0.029	-1.436***
		(0.072)	(0.236)
Age		5.40e-05	0.0004
		(8.92e-05)	(0.0003)
Race	**Black**	0.063**	0.293***
		(0.024)	(0.072)
	Other	0.020	0.212**
		(0.022)	(0.104)
Marital status	**Previously Married**	0.024	0.164***
		(0.016)	(0.078)
	Never Married	0.035	0.186*
		(0.032)	(0.100)
Family Wealth	**Average**	-0.052**	0.150*
		(0.021)	(0.084)
	Poor	-0.060**	0.115
		(0.024)	(0.080)
	Varied	-0.069	0.201
		(0.062)	(0.285)
Constant		4.165***	6.951***
		(0.024)	(0.096)
# Observations (Subpopulation)		2,769	2,687

Notes: Survey weights used.
Jackknife Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

Tables from Chapter - 3

Table 3.1: Summary Statistics over Gender

	Female	Male
Number of Diseases	2.097 (1.319)	2.060 (1.356)
Hypertension	0.608 (0.488)	0.565 (0.496)
Diabetes	0.187 (0.390)	0.220 (0.414)
Cancer	0.154 (0.361)	0.169 (0.375)
Lung	0.124 (0.330)	0.123 (0.329)
Heart	0.266 (0.442)	0.346 (0.476)
Stroke	0.080 (0.271)	0.099 (0.299)
Arthritis	0.710 (0.454)	0.576 (0.494)
ADL Wide	0.489 (1.094)	0.390 (0.983)
ADL	0.290 (0.692)	0.245 (0.640)
IADL	0.181 (0.579)	0.185 (0.569)
IADL Wide	0.440 (1.052)	0.351 (0.954)
Log Permanent Income	10.130 (0.897)	10.258 (0.886)
Single	0.513 (0.500)	0.227 (0.419)
White	0.822 (0.382)	0.852 (0.355)
Age	71.644 (9.640)	71.356 (8.874)
Risk Attitude	0.122 (0.327)	0.142 (0.350)
Happiness	0.865 (0.342)	0.892 (0.310)
Observations	26,700	22,800

Table 3.2: Health State Dependence Heterogeneity of utility among male-female by WLS (Probability weights) : Dependent Variable – Number of Diseases

	Utility Proxy : Happiness		**Utility Proxy : CESD**	
Number of Diseases	**Female**	**Male**	**Female**	**Male**
Num_dis $\times$Log($\bar{Y}$) β_1	-0.004 (0.005)	0.001 (0.004)	-0.009 (0.021)	0.023 (0.021)
Log($\bar{Y}$) β_3	0.047*** (0.004)	0.023*** (0.004)	-0.479*** (0.023)	-0.490*** (0.023)
Implied State Dependence (β_1/β_3)				
Num_dis	-0.017 (0.128)	-0.130 (0.127)	-0.028 (0.029)	-0.042 (0.041)
Implied State Dependence (β_1/β_3) with Number of Diseases Detailed				
Num_dis 1	1.000*** (0.008)	0.992*** (0.007)	1.160*** (0.045)	1.143*** (0.040)
Num_dis 2	0.974*** (0.008)	0.976*** (0.007)	1.387*** (0.047)	1.343*** (0.041)
Num_dis 3	0.958*** (0.009)	0.959*** (0.008)	1.610*** (0.051)	1.560*** (0.045)
Num_dis 4	0.928*** (0.010)	0.934*** (0.009)	1.981*** (0.060)	1.878*** (0.053)
Num_dis 5	0.899*** (0.016)	0.903*** (0.014)	2.167*** (0.089)	2.168*** (0.076)
Num_dis 6	0.906*** (0.033)	0.844*** (0.027)	2.569*** (0.183)	2.619*** (0.148)
Num_dis 7	0.873*** (0.166)	0.862*** (0.075)	1.649* (0.864)	2.146*** (0.394)
N	26,677	22,721	26,053	22,009
R^2	0.121	0.089	0.084	0.165
Within Person Std Dev of Num_Dis			0.601	0.679
Ratio of margins $\sigma(\beta_1/\beta_3)$				
Num_dis	0.601*** (0.002)	0.678*** (0.002)	0.638*** (0.011)	0.751*** (0.010)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 3.3: Health State Dependence Heterogeneity of utility among male-female by WLS (Probability weights) : Dependent Variable – Seven Health Conditions

Health Issue	Utility Proxy : Happiness		Utility Proxy : CESD	
	Female	**Male**	**Female**	**Male**
Hypertension $\times Log(\bar{Y})\ \beta_1$	-0.023* (0.013)	0.031** (0.013)	-0.084 (0.052)	-0.155** (0.066)
Diabetes$\times Log(\bar{Y})\ \beta_1$	0.025 (0.017)	-0.029* (0.015)	0.278*** (0.078)	0.006 (0.070)
Cancer$\times Log(\bar{Y})\ \beta_1$	-0.006 (0.018)	-0.041** (0.019)	0.051 (0.076)	-0.189*** (0.070)
Lung$\times Log(\bar{Y})\ \beta_1$	-0.002 (0.0019)	0.002 (0.015)	0.313*** (0.116)	0.239** (0.096)
Heart$\times Log(\bar{Y})\ \beta_1$	-0.031** (0.013)	-0.024* (0.012)	-0.070 (0.061)	0.117** (0.059)
Stroke$\times Log(\bar{Y})\ \beta_1$	0.016 (0.017)	-0.011 (0.024)	-0.154 (0.124)	0.266 (0.180)
Arthritis$\times Log(\bar{Y})\ \beta_1$	0.018 (0.014)	0.013 (0.012)	0.042 (0.067)	0.046 (0.055)
$Log(\bar{Y})\ \beta_3$	0.046*** (0.004)	0.031*** (0.004)	-0.623*** (0.024)	-0.446*** (0.024)
N	25,259	21,763	24,652	20,389
R^2	0.085	0.498	0.197	0.081
Implied State Dependence ($\beta_{1/}\ \beta_3$)				
Hypertension	0.200 (1.376) [-2.50 to 2.90]	0.294 (8.440) [-16.25 to 16.83]	0.188 (0.148) [-0.10 to 0.47]	0.290 (0.153) [-0.01 to 0.59]
Diabetes	-0.741 (2.180) [-5.01 to 3.53]	-1.158 (2.415) [-5.89 to 3.57]	-0.678 (0.202) [-1.07 to -0.28]	-0.004 (0.178) [-0.35 to 0.34]
Cancer	0.170 (1.357) [-2.49 to 2.83]	-0.210 (0.625) [-1.44 to 1.01]	0.008 (0.200) [-0.38 to 0.40]	0.411 (0.183) [0.05 to 0.77]
Lung	0.211 (0.824) [-1.40 to 1.83]	-0.234 (3.041) [-6.19 to 5.72]	-0.273 (0.255) [-0.77 to 0.22]	-0.225 (0.231) [-0.68 to 0.23]
Heart	-0.534 (1.100) [-2.69 to 1.62]	-0.188 (0.526) [-1.22 to 0.84]	0.145 (0.169) [-0.19 to 0.48]	-0.270 (0.133) [-0.53 to -0.01]
Stroke	0.031 (0.851) [-1.64 to 1.70]	-0.493 (0.890) [-2.24 to 1.25]	0.171 (0.331) [-0.48 to 0.82]	-0.511 (0.331) [-1.16 to 0.14]
Arthritis	0.516 (0.891) [-1.23 to 2.26]	0.216 (1.928) [-3.56 to 3.99]	0.296 (0.211) [-0.12 to 0.71]	-0.085 (0.129) [-0.34 to 0.17]

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 3.4: Health State Dependence Heterogeneity of utility among male-female by WLS (Probability weights) : Dependent Variable – ADL Wide

	Utility Proxy : Happiness		Utility Proxy : CESD	
Health Indicator : ADL	**Female**	**Male**	**Female**	**Male**
adl ×Log(Ȳ) β_1	-0.023*** (0.006)	-0.001 (0.009)	0.004 (0.027)	-0.034 (0.042)
Log(Ȳ) β_3	0.040*** (0.004)	0.018*** (0.004)	-0.465*** (0.022)	-0.402*** (0.023)
Implied State Dependence (β_1/β_3)				
adl	-0.412 (0.164)	0.309 (0.417)	-0.083 (0.058)	0.101 (0.073)
Ratio of Margins with Number of Diseases Detailed				
adl 1	0.967*** (0.008)	0.969*** (0.009)	1.403*** (0.041)	1.384*** (0.039)
adl 2	0.932*** (0.013)	0.954*** (0.014)	1.719*** (0.062)	1.652*** (0.062)
adl 3	0.915*** (0.019)	0.942*** (0.019)	1.939*** (0.090)	1.839*** (0.088)
adl 4	0.851*** (0.024)	0.915*** (0.025)	2.173*** (0.118)	2.216*** (0.113)
adl 5	0.846*** (0.038)	0.791*** (0.041)	2.107*** (0.184)	2.669*** (0.184)
N	26,204	22,116	26,249	22,158
R^2	0.310	0.610	0.302	0.440
Within Person Std Dev	0.605	0.572		
Ratio of Margins $\sigma(\beta_1/\beta_3)$				
	0.586*** (0.002)	0.557*** (0.002)	0.789*** (0.011)	0.753*** (0.010)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 3.5: Health State Dependence Heterogeneity of utility among male-female by WLS (Probability weights) : Dependent Variable – IADL Wide

	Utility Proxy : Happiness		Utility Proxy : CESD	
Health Indicator : iADL wide	**Female**	**Male**	**Female**	**Male**
IADL ×Log(Ȳ) β_1	-0.031*** (0.007)	-0.015* (0.008)	0.109*** (0.035)	0.036 (0.034)
Log(Ȳ) β_3	0.050*** (0.004)	0.033*** (0.004)	-0.568*** (0.023)	-0.425*** (0.023)
Implied State Dependence (β_1/β_3)				
IADL	-0.484 (0.140)	-0.393 (0.233)	-0.197 (0.062)	-0.062 (0.097)
Ratio of margins with Number of Diseases Detailed				
IADL 1	0.969*** (0.009)	0.958*** (0.009)	1.342*** (0.046)	1.303*** (0.042)
IADL 2	0.912*** (0.013)	0.960*** (0.017)	1.609*** (0.065)	1.563*** (0.076)
IADL 3	0.943*** (0.023)	0.939*** (0.024)	1.678*** (0.111)	1.915*** (0.109)
IADL 4	0.919*** (0.032)	0.895*** (0.033)	2.106*** (0.158)	1.571*** (0.148)
IADL 5	0.936*** (0.038)	0.723*** (0.045)	1.542*** (0.187)	2.369*** (0.205)
N	25,413	21,007	25,458	21,045
R^2	0.385	0.566	0.302	0.440
Within Person Std Dev of IADL	0.604	0.573		
Ratio of Margins $\sigma(\beta_1/\beta_3)$				
	0.588*** (0.002)	0.554*** (0.002)	0.751*** (0.012)	0.719*** (0.012)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 3.6: Non-linear Blinder-Oaxaca Decomposition of Utility Heterogeneity among Men and Women using HRS 1992-2008.

Utility Proxy : Happiness	Male-female utility heterogeneity With number of diseases	Male-female utility heterogeneity With ADLs	Male-female utility heterogeneity With five ADLs	Male-female utility heterogeneity With IADLs	Male-female utility heterogeneity With five IADLs
Total Disparity	2.8*** (0.003)	2.7*** (0.003)	2.6*** (0.003)	2.6*** (0.003)	2.5*** (0.003)
Portion due to Difference in Coefficients	2.2*** (0.001)	2.1*** (0.001)	2.2*** (0.001)	1.8*** (0.001)	2.3*** (0.001)
Portion due to Difference in Endowments	0.55* (0.003)	0.47 (0.003)	0.34 (0.003)	0.71** (0.003)	0.15 (0.003)
Health Indicator	0.09*** (0.0002)	0.21*** (0.0003)	0.36*** (0.0003)	-0.09** (0.0001)	0.33*** (0.0003)
Log Income	0.34*** (0.0004)	0.31*** (0.0004)	0.29*** (0.0004)	0.36*** (0.0003)	0.34*** (0.0004)
Age	-0.01 (0.0001)	0.004 (0.0001)	0.003 (0.0001)	0.004 (0.0001)	0.03 (0.0002)
Race	-0.01 (0.0005)	-0.10 (0.00005)	-0.01 (0.0006)	-0.01 (0.0005)	-0.01 (0.00005)
Risk Attitude	-0.11*** (0.0001)	-0.11*** (0.0001)	-0.10*** (0.0001)	-0.11*** (0.0001)	-0.11*** (0.0001)
Region	0.001 (0.00002)	0.002 (0.00002)	0.002 (0.00002)	0.002 (0.00002)	0.003 (0.00003)
Marital Status	1.7*** (0.001)	1.7*** (0.001)	1.7*** (0.001)	1.6*** (0.001)	1.7*** (0.001)
Ethnicity	-0.10*** (0.0001)	-0.10*** (0.0001)	-0.10*** (0.0001)	-0.10*** (0.0008)	-0.10*** (0.0001)

Table 3.7 : Linear Blinder-Oaxaca Decomposition of Utility Heterogeneity among Men and Women using HRS 1992-2008.

Utility Proxy : CES-D	Male-female utility heterogeneity With number of diseases	Male-female utility heterogeneity With ADLs	Male-female utility heterogeneity With five ADLs	Male-female utility heterogeneity With IADLs	Male-female utility heterogeneity With five IADLs
Total Disparity	-0.393*** (0.018)	-0.393*** (0.018)	-0.394*** (0.018)	-0.394*** (0.018)	-0.391*** (0.018)
Portion due to Difference in Coefficients	-0.205*** (0.008)	-0.221*** (0.009)	-0.237*** (0.009)	-0.198*** (0.008)	-0.244*** (0.009)
Portion due to Difference in Endowments	-0.188*** (0.018)	-0.172*** (0.017)	-0.157*** (0.017)	-0.195*** (0.018)	-0.146*** (0.018)
Health Indicator	-0.011*** (0.003)	-0.032*** (0.004)	-0.057*** (0.053)	0.006*** (0.003)	-0.049*** (0.004)
Log Income	-0.063*** (0.004)	-0.061*** (0.003)	-0.057*** (0.003)	-0.068*** (0.004)	-0.064*** (0.004)
Age	-0.0003 (0.001)	-0.0003 (0.001)	-0.0003 (0.001)	-0.0003 (0.001)	-0.002 (0.001)
Race	-0.0004 (0.0003)	-0.0003 (0.0004)	-0.0002 (0.0004)	-0.0004 (0.0003)	-0.0002 (0.0003)
Risk Attitude	0.005*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)
Region	0.0003 (0.0002)	0.0003 (0.0002)	0.0002 (0.0002)	0.0002 (0.0002)	0.0003 (0.0002)
Marital Status	-0.143*** (0.006)	-0.134*** (0.006)	-0.123*** (0.006)	-0.143*** (0.006)	-0.135*** (0.006)
Ethnicity	0.002*** (0.0007)	0.001*** (0.0005)	0.001*** (0.0005)	0.001*** (0.0005)	0.001*** (0.0005)

Table 3.8: Heterogeneity of utility among male-female by Logit : Dependent Variable – Happiness

Health Indicator	Number of Diseases	ADL	IADL	ADL Wide	IADL Wide
Female					
Health State $\times Log(\bar{Y})\ \beta_1$	-0.032 (0.039)	-0.094 (0.064)	-0.091*** (0.087)	-0.109*** (0.045)	-0.130*** (0.051)
$Log(\bar{Y})\ \beta_3$	-0.066*** (0.0005)	0.011*** (0.002)	-0.005*** (0.001)	0.003 (0.003)	-0.028 (0.002)
Implied State Dependence (β_1/β_3)					
	1.967	6.216	6.400	6.936	9.121
Ratio of margins					
	0.998*** (0.042)	0.715*** (0.057)	0.814*** (0.074)	0.744*** (0.040)	0.785*** (0.045)
N	7,650	7,421	7,421	7,421	7,060
R^2	0.986	0.556	0.784	0.405	0.462
Within Person Std Dev	0.601	0.398	0.355	0.605	0.604
Male					
Health State $\times Log(\bar{Y})\ \beta_1$	-0.075** (0.040)	0.024*** (0.075)	-0.150*** (0.023)	0.046 (0.050)	-0.069 (0.061)
$Log(\bar{Y})\ \beta_3$	-0.139*** (0.001)	0.039*** (0.002)	0.003 (0.002)	0.068*** (0.003)	-0.028 (0.002)
Implied State Dependence (β_1/β_3)					
	2.552	-1.206	6.444	-2.113	2.987
Ratio of margins					
	0.928*** (0.048)	0.746*** (0.068)	0.650*** (0.087)	0.792*** (0.046)	0.706*** (0.056)
N	5,761	5,443	5,441	5,443	5,057
R^2	0.950	0.830	0.803	0.749	0.640
Within Person Std Dev	0.679	0.382	0.357	0.572	0.573

Notes:

1. Regression uses fixed effects logit in a panel setting and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, age, hh size, dummy for race, ethnicity, marital status were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression. Jackknife standard errors are reported in parenthesis.

3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Tables from Chapter-4:

Table 4.1: Summary Statistics over Race and Ethnicity: Mean and Standard Deviation

	Black	White
Number of Diseases	2.321 (1.330)	2.039 (1.332)
Hypertension	0.749 (0.434)	0.560 (0.385)
Diabetes	0.315 (0.464)	0.181 (0.410)
Cancer	0.123 (0.329)	0.169 (0.375)
Lung	0.098 (0.298)	0.129 (0.335)
Heart	0.282 (0.450)	0.308 (0.462)
Stroke	0.118 (0.323)	0.084 (0.277)
Arthritis	0.690 (0.462)	0.639 (0.480)
ADLA	0.672 (1.266)	0.401 (0.995)
ADLWA	0.406 (0.805)	0.244 (0.638)
IADLA	0.258 (0.673)	0.169 (0.553)
IADLZA	0.575 (1.197)	0.367 (0.968)
Log Permanent Income	9.645 (0.752)	10.297 (0.877)
Single	0.540 (0.498)	0.348 (0.476)
Hispanic	0.016 (0.125)	0.067 (0.251)
Risk Attitude	0.159 (0.365)	0.126 (0.332)
Observations	7,700	41, 000

Table 4.2: Health State Dependence Heterogeneity of utility among whites-blacks by WLS (Probability weights) : Dependent Variable – Number of Diseases

	Utility Proxy : Happiness		Utility Proxy : CESD	
Number of Diseases	**White**	**Black**	**White**	**Black**
Num_dis $\times$Log($\bar{Y}$) β_1	0.001 (0.003)	0.002 (0.010)	0.018 (0.015)	-0.014 (0.047)
Log($\bar{Y}$) β_3	0.026*** (0.003)	0.030*** (0.009)	-0.490*** (0.018)	-0.566*** (0.053)
Implied State Dependence ($\beta_{1/}$ β_3)				
	-0.048 (0.097)	-0.152 (2.920)	-0.019 (0.031)	-0.025 (0.078)
Ratio of Margins with Number of Diseases Detailed				
Num_dis 1	0.525 (2.378)	1.365*** (0.300)	0.084 (6.942)	1.183*** (0.215)
Num_dis 2	0.693*** (0.301)	1.305*** (0.258)	-0.587 (3.176)	1.119*** (0.240)
Num_dis 3	0.988*** (0.337)	-2.556 (28.11)	231.187 (220257)	0.838*** (0.197)
Num_dis 4	0.960* (0.524)	1.114*** (0.195)	0.269 (1.196)	0.842*** (0.166)
Num_dis 5	1.116 (1.046)	-	2.432 (3.403)	-
Num_dis 6	1.430*** (0.516)	-	1.322*** (0.101)	-
N	41,630	6,995	40,532	6,844
R^2	0.030	0.332	0.018	0.007
Within Person Std Dev	0.598	0.623		
Ratio of Margins $\sigma(\beta_{1/}$ β_3)				
Num_dis	0.605*** (0.003)	0.663*** (0.009)	0.633*** (0.015)	0.730*** (0.051)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 4.3: Health State Dependence Heterogeneity of utility among whites-blacks by WLS (Probability weights) : Dependent Variable – Seven Health Conditions

Health Issue	Utility Proxy : Happiness		Utility Proxy : CESD	
	White	Black	White	Black
Hypertension ×Log(Ȳ) β_1	0.004 (0.010)	0.0001 (0.027)	-0.070 (0.047)	0.072 (0.140)
Diabetes×Log(Ȳ) β_1	-0.0001 (0.012)	-0.100** (0.040)	0.069 (0.062)	0.717*** (0.180)
Cancer×Log(Ȳ) β_1	0.007 (0.017)	-0.005 (0.042)	-0.096* (0.056)	-0.741*** (0.275)
Lung×Log(Ȳ) β_1	0.003 (0.012)	-0.025 (0.038)	0.044 (0.078)	0.915** (0.338)
Heart×Log(Ȳ) β_1	-0.029*** (0.009)	0.027 (0.030)	0.012 (0.050)	-0.247 (0.191)
Stroke×Log(Ȳ) β_1	0.004 (0.019)	-0.187*** (0.054)	-0.086 (0.096)	0.369 (0.506)
Arthritis×Log(Ȳ) β_1	0.014 (0.010)	-0.042 (0.037)	-0.094* (0.053)	0.264 (0.161)
Log(Ȳ) β_3	0.021*** (0.003)	0.130*** (0.009)	-0.372*** (0.019)	-1.128*** (0.055)
N	38,912	6,628	38,398	6,374
R^2	0.167	0.160	0.074	0.233
Implied State Dependence (β_1/β_3)				
Hypertension	0.220 [-1.10 to 1.54]	0.492 [-8.42 to 9.41]	0.234 [-0.07 to 0.54]	0.370 [-0.99 to 1.73]
Diabetes	-0.644 [-5.14 to 3.85]	-1.345 [-37.42 to 34.72]	-0.249 [-0.60 to 0.10]	-1.031 [-1.68 to -0.38]
Cancer	-0.037 [-1.28 to 1.21]	1.115 [-496 to 499]	0.184 [-0.12 to 0.49]	1.108 [-0.48 to 2.70]
Lung	0.241 [-3.82 to 4.31]	-1.077 [-5.62 to 3.46]	-0.213 [-0.56 to 0.13]	-0.743 [-1.73 to 0.24]
Heart	-0.249 [-2.06 to 1.56]	0.114 [-5.94 to 6.17]	-0.071 [-0.30 to 0.16]	0.383 [-0.14 to 0.90]
Stroke	0.026 [-1.40 to 1.46]	-2.518 [-41 to 36]	-0.007 [-0.63 to 0.62]	-0.791 [-2.34 to 0.76]
Arthritis	0.302 [-7.24 to 7.85]	-0.037 [-5.34 to 5.27]	0.117 [-0.18 to 0.42]	0.090 [-0.49 to 0.67]

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 4.4: Health State Dependence Heterogeneity of utility among whites-blacks by WLS (Probability weights) : Dependent Variable – ADL

	Utility Proxy : Happiness		Utility Proxy : CESD	
ADL	**White**	**Black**	**White**	**Black**
adl ×Log($\bar{Y}$) β_1	-0.017*** (0.005)	-0.003*** (0.001)	-0.015 (0.024)	0.030 (0.046)
Log($\bar{Y}$) β_3	0.034*** (0.003)	0.045*** (0.009)	-0.428*** (0.018)	-0.652*** (0.051)
Implied State Dependence (β_1/β_3)				
	-0.310* (0.180)	-0.060 (0.047)	-0.011 (0.062)	-0.048 (0.082)
Ratio of Margins with Number of Diseases Detailed				
adl 1	-8.255 (134.288)	1.012 (2.184)	3.505*** (1.755)	11.103 (132.006)
adl 2	-10.897 (50.861)	0.956*** (0.149)	31.199 (199.153)	1.039*** (0.363)
adl 3	2.955 (2.695)	0.788*** (0.129)	9.976 (25.602)	-0.571 (1.463)
adl 4	2.671 (17.891)	1.038*** (0.147)	-8.989 (45.200)	1.387*** (0.184)
adl 5	1.334 (1.027)	1.324*** (0.100)	-0.482 (4.556)	1.674*** (0.243)
N	40,157	6,728	40,302	6,778
R^2	0.109	0.305	0.162	0.286
Within Person Std Dev (ADL)	0.581	0.724		
Ratio of Margins $\sigma(\beta_1/\beta_3)$				
	0.587*** (0.004)	0.564*** (0.008)	0.791*** (0.018)	0.750*** (0.047)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 4.5: Health State Dependence Heterogeneity of utility among whites-blacks by WLS (Probability weights) : Dependent Variable – IADL

	Utility Proxy : Happiness		Utility Proxy : CESD	
IADL wide	**White**	**Black**	**White**	**Black**
IADL ×Log(Ȳ) β_1	-0.013** (0.005)	0.011 (0.016)	0.025 (0.029)	0.187* (0.097)
Log(Ȳ) β_3	0.036*** (0.003)	0.035*** (0.009)	-0.430*** (0.018)	-0.798*** (0.052)
Implied State Dependence (β_1/β_3)				
	-0.563*** (0.135)	0.081 (0.628)	-0.134*** (0.055)	-0.224** (0.123)
Ratio of Margins with Number of Diseases Detailed				
IADL 1	-9.734 (46.229)	1.542 (1.828)	-0.381 (3.165)	5.069 (9.892)
IADL 2	-235.234 (44041)	0.999*** (0.226)	0.392 (1.951)	0.771*** (0.194)
IADL 3	2.417 (7.965)	0.731*** (0.138)	2.947 (2.838)	11.364 (70.849)
IADL 4	1.667*** (0.710)	1.696*** (0.023)	1.852* (0.993)	1.447** (0.760)
IADL 5	3.228*** (0.396)	0.301 (0.992)	13.420 (46.062)	1.673*** (0.236)
N	38,665	6,410	39,083	6,470
R^2	0.271	0.648	0.208	0.206
Within Person Std Dev IADL	0.590	0.679		
Ratio of Margins $\sigma(\beta_1/\beta_3)$				
	0.589*** (0.004)	-0.583*** (0.012)	0.751*** (0.018)	0.721*** (0.076)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 4.6: Non-linear Blinder-Oaxaca Decomposition of Utility Heterogeneity among Blacks and Whites using HRS 1992-2008.

Utility Proxy : Happiness	Black-White utility heterogeneity With number of diseases	Black-White utility heterogeneity With ADLs	Black-White utility heterogeneity With five ADLs	Black-White utility heterogeneity With IADLs	Black-White utility heterogeneity With five IADLs
Total Disparity	3.6*** (0.005)	3.8*** (0.005)	3.8*** (0.005)	3.8*** (0.005)	3.7*** (0.005)
Portion due to Difference in Coefficients	3.7*** (0.002)	4.0*** (0.002)	4.0*** (0.002)	3.6*** (0.002)	3.7*** (0.002)
Portion due to Difference in Endowments	-0.10 (0.005)	-0.10 (0.005)	-0.10 (0.005)	0.10 (0.005)	0.05 (0.005)
Health Indicator	0.60*** (0.0005)	0.86*** (0.0006)	1.1*** (0.0008)	0.31*** (0.004)	0.65*** (0.0006)
Log Income	1.5*** (0.001)	1.4*** (0.001)	1.3*** (0.001)	1.6*** (0.001)	1.4*** (0.001)
Age	0.37*** (0.0005)	0.36*** (0.0004)	0.36*** (0.0004)	0.37*** (0.0004)	0.38*** (0.0004)
Gender	0.03* (0.0002)	0.03 (0.0002)	0.02 (0.0003)	0.05*** (0.0002)	0.01 (0.0002)
Risk Attitude	0.11*** (0.0002)	0.11*** (0.0002)	0.10*** (0.0002)	0.09*** (0.0002)	0.09*** (0.0002)
Region	0.01 (0.0002)	0.02 (0.0002)	0.03* (0.0002)	0.02 (0.0002)	0.03* (0.0002)
Marital Status	1.2*** (0.0009)	1.3*** (0.0009)	1.3*** (0.0009)	1.3*** (0.0009)	1.3*** (0.0009)
Ethnicity	-0.10*** (0.0003)	-0.10*** (0.0004)	-0.10*** (0.0003)	-0.10*** (0.0003)	-0.10*** (0.0003)

Table 4.7: Linear Blinder-Oaxaca Decomposition of Utility Heterogeneity among Blacks and Whites using HRS 1992-2008.

Utility Proxy : CES-D	Black-White utility heterogeneity With number of diseases	Black-White utility heterogeneity With ADLs	Black-White utility heterogeneity With five ADLs	Black-White utility heterogeneity With IADLs	Black-White utility heterogeneity With five IADLs
Total Disparity	-0.492*** (0.027)	-0.492*** (0.027)	-0.492*** (0.027)	-0.492*** (0.027)	-0.478*** (0.028)
Portion due to Difference in Coefficients	-0.471*** (0.012)	-0.501*** (0.014)	-0.511*** (0.014)	-0.457*** (0.012)	-0.462*** (0.013)
Portion due to Difference in Endowments	-0.021 (0.027)	0.008 (0.027)	0.019 (0.026)	-0.035 (0.027)	-0.015 (0.027)
Health Indicator	-0.079*** (0.005)	-0.123*** (0.008)	-0.154*** (0.010)	-0.043*** (0.005)	-0.092*** (0.007)
Log Income	-0.259*** (0.008)	-0.250*** (0.008)	-0.234*** (0.008)	-0.277*** (0.008)	-0.243*** (0.008)
Age	-0.026*** (0.003)	-0.023*** (0.002)	-0.022*** (0.002)	-0.024*** (0.002)	-0.026*** (0.003)
Gender	-0.013* (0.002)	-0.012*** (0.002)	-0.011*** (0.002)	-0.014*** (0.002)	-0.010*** (0.002)
Risk Attitude	-0.010*** (0.001)	-0.009*** (0.002)	-0.008*** (0.001)	-0.008*** (0.002)	-0.007*** (0.001)
Region	0.003*** (0.001)	0.003*** (0.001)	0.002* (0.001)	0.003*** (0.001)	0.002*** (0.001)
Marital Status	-0.103*** (0.005)	-0.097*** (0.005)	-0.093*** (0.005)	-0.103*** (0.005)	-0.096*** (0.005)
Ethnicity	0.017*** (0.003)	0.010*** (0.002)	0.010*** (0.002)	0.010*** (0.002)	0.010*** (0.002)

Table 4.8: Heterogeneity of utility among black-white by Logit : Dependent Variable – Happiness

Health Indicator	Number of Diseases	ADL	IADL	ADL Wide	IADL Wide
White					
Health State $\times Log(\bar{Y})\ \beta_1$	-0.032 (0.039)	-0.094 (0.064)	-0.091*** (0.087)	-0.109*** (0.045)	-0.130*** (0.051)
$Log(\bar{Y})\ \beta_3$	-0.066*** (0.0005)	0.011*** (0.002)	-0.005*** (0.001)	0.003 (0.003)	-0.028 (0.002)
Implied State Dependence (β_1/β_3)					
	2.601	5.408	9.173	3.871	8.157
N	7,650	7,421	7,421	7,421	7,060
R^2	0.986	0.556	0.784	0.405	0.462
Within Person Std Dev	0.601	0.398	0.355	0.605	0.604
Black					
Health State $\times Log(\bar{Y})\ \beta_1$	-0.075** (0.040)	0.024*** (0.075)	-0.150*** (0.023)	0.046 (0.050)	-0.069 (0.061)
$Log(\bar{Y})\ \beta_3$	-0.139*** (0.001)	0.039*** (0.002)	0.003 (0.002)	0.068*** (0.003)	-0.028 (0.002)
Implied State Dependence (β_1/β_3)					
	0.208	-9.699	0.908	-4.525	-3.881
Ratio of Margins					
	0.928*** (0.048)	0.746*** (0.068)	0.650*** (0.087)	0.792*** (0.046)	0.706*** (0.056)
N	5,761	5,443	5,441	5,443	5,057
R^2	0.950	0.830	0.803	0.749	0.640
Within Person Std Dev	0.679	0.382	0.357	0.572	0.573

Table 4.9: Summary Statistics over Ethnicity

	Hispanic	Non Hispanic
Number of Diseases	1.923 (1.290)	2.090 (1.339)
Hypertension	0.591 (0.492)	0.588 (0.492)
Diabetes	0.307 (0.461)	0.196 (0.396)
Cancer	0.093 (0.290)	0.166 (0.372)
Lung	0.078 (0.268)	0.127 (0.333)
Heart	0.212 (0.409)	0.310 (0.462)
Stroke	0.071 (0.257)	0.090 (0.287)
Arthritis	0.606 (0.489)	0.649 (0.477)
ADL Wide	0.609 (1.226)	0.431 (1.030)
ADL	0.365 (0.772)	0.262 (0.660)
IADL	0.272 (0.693)	0.177 (0.564)
IADL Wide	0.517 (1.167)	0.391 (0.996)
Log Permanent Income	9.475 (0.755)	10.241 (0.881)
Single	0.375 (0.484)	0.378 (0.485)
White	0.869 (0.337)	0.834 (0.372)
Age	70.370 (8.585)	71.587 (9.328)
Risk Attitude	0.135 (0.342)	0.131 (0.338)
Happiness	0.815 (0.388)	0.882 (0.323)
Observations	3,200	45,600

Table 4.10: Health State Dependence Heterogeneity of utility among Hispanic-Nonhispanic by WLS (Probability weights) : Dependent Variable – Number of Diseases

	Utility Proxy : Happiness		Utility Proxy : CESD	
Number of Diseases	**Hispanic**	**Non-Hispanic**	**Hispanic**	**Non-Hispanic**
Num_dis ×Log($\bar{Y}$) β_1	-0.013 (0.014)	-0.004 (0.003)	-0.030 (0.084)	0.016 (0.015)
Log($\bar{Y}$) β_3	0.063*** (0.013)	0.041*** (0.003)	-0.546*** (0.086)	-0.524*** (0.017)
Implied State Dependence (β_1/β_3)				
	-0.237 (0.204)	-0.061 (0.082)	-0.040 (0.124)	-0.037 (0.028)
Implied State Dependence (β_1/β_3) with Number of Diseases Detailed				
Num_dis 1	0.940 (1.469)	-8.039 (65.620)	0.058 (4.613)	0.927*** (0.422)
Num_dis 2	0.560 (0.830)	17.891 (271.9)	-0.945 (5.625)	1.002*** (0.319)
Num_dis 3	0.945*** (0.183)	3.220 (4.011)	1.339 (0.908)	2.402 (3.960)
Num_dis 4	1.231 (1.160)	0.710*** (0.246)	0.201 (1.927)	1.753*** (0.367)
Num_dis 5	1.066 (0.676)	0.865*** (0.328)	1.654** (0.869)	2.567 (1.709)
Num_dis 6	1.243*** (0.325)	-0.273 (23.680)	1.357*** (0.089)	1.682*** (0.311)
Num_dis 7	-	0.581 (1.141)	-	-0.072 (2.305)
N	3,096	46,216	3,019	45,287
R^2	0.308	0.037	0.064	0.225
Within Person Std Dev	0.633	0.640		
State Dependence $\sigma(\beta_1/\beta_3)$				
Num_dis	0.639*** (0.013)	0.642*** (0.003)	0.701*** (0.077)	0.673*** (0.015)

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 4.11: Health State Dependence Heterogeneity of utility among Hispanic-Nonhispanic by WLS (Probability weights) : Dependent Variable – Seven Health Conditions

Health Issue	Utility Proxy : Happiness		Utility Proxy : CESD	
	Hispanic	Non-Hispanic	Hispanic	Non-Hispanic
Hypertension $\times Log(\bar{Y})\ \beta_1$	-0. 133*** (0.044)	0.012 (0.008)	0.303 (0.188)	-0.043 (0.041)
Diabetes$\times Log(\bar{Y})\ \beta_1$	0.071 (0.047)	-0.012 (0.010)	0.108 (0.272)	0.246*** (0.066)
Cancer$\times Log(\bar{Y})\ \beta_1$	0.050 (0.063)	0.022 (0.014)	-0.377 (0.256)	-0.086 (0.054)
Lung$\times Log(\bar{Y})\ \beta_1$	-0.120 (0.099)	-0.030** (0.015)	0.438 (0.777)	0.151** (0.068)
Heart$\times Log(\bar{Y})\ \beta_1$	0.103 (0.097)	-0.011 (0.009)	-0.241 (0.400)	-0.021 (0.040)
Stroke$\times Log(\bar{Y})\ \beta_1$	0.142** (0.062)	-0.007 (0.016)	0.073 (0.437)	0.014 (0.100)
Arthritis$\times Log(\bar{Y})\ \beta_1$	0.086* (0.050)	0.008 (0.008)	-0.200 (0.242)	-0.022 (0.042)
$Log(\bar{Y})\ \beta_3$	0.035** (0.014)	0.026*** (0.003)	-0.443*** (0.086)	-0.511*** (0.017)
N	2,983	44,127	2,834	42,788
R^2	0. 57	0.14	0.654	0.088
Implied State Dependence ($\beta_1/\ \beta_3$)				
Hypertension	-0.843 [-17 to 15]	0.485 [-0.77 to 1.74]	-0.181 [-1.50 to 1.14]	0.243 [0.01 to 0.47]
Diabetes	0.180 [-4.69 to 5.05]	-0.920 [-2.02 to 0.18]	0.264 [-8.32 to 8.85]	-0.386 [-0.68 to -0.09]
Cancer	-0.429 [-4.80 to 3.94]	0.053 [-1.13 to 1.23]	0.445 [-17 to 17]	0.215 [-0.06 to 0.49]
Lung	-0.906 [-41 to 39]	-0.105 [-1.44 to 1.23]	-0.366 [-5.77 to 5.04]	-0.328 [-0.68 to 0.03]
Heart	-0.449 [-10 to 9]	-0.405 [-1.24 to 0.43]	-0.640 [-5.27 to 3.99]	-0.015 [-0.22 to 0.19]
Stroke	0.703 [-11 to 13]	-0.413 [-2.09 to 1.26]	-0.242 [-31 to 30]	-0.089 [-0.59 to 0.41]
Arthritis	-0.036 [-2.50 to 2.42]	0.336 [-0.83 to 1.50]	0.410 [-3.98 to 4.80]	0.085 [-0.12 to 0.29]

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 4.12: Health State Dependence Heterogeneity of utility among Hispanic-Nonhispanic by WLS (Probability weights) : Dependent Variable – ADL

	Utility Proxy : Happiness		Utility Proxy : CESD	
ADL	Hispanic	Non-Hispanic	Hispanic	Non-Hispanic
adl ×Log(Ȳ) β_1	-0.017*** (0.005)	-0.003*** (0.001)	-0.030 (0.126)	0.009 (0.024)
Log(Ȳ) β_3	0.024* (0.013)	0.026*** (0.003)	-0.485*** (0.079)	-0.421*** (0.016)
Implied State Dependence (β_1/β_3)				
	-0.043 (53.842)	-0.101 (0.017)	-0.268 (0.216)	-0.017 (0.052)
Implied State Dependence (β_1/β_3) with Number of Diseases Detailed				
adl 1	-1.803 (9.185)	8.944 (9.061)	3.417*** (1.688)	35.069 (62.163)
adl 2	-39.150*** (752.9)	8.122 (7.118)	9.612*** (19.787)	60.568 (164.863)
adl 3	2.320 (1.471)	14.378 (27.499)	5.443*** (4.480)	-34.723 (65.070)
adl 4	6.984*** (504.8)	28.351 (80.468)	14.691*** (65.926)	-373.854 (7265.6)
adl 5	1.750 (1.616)	7.781* (4.549)	-0.811 (6.738)	47.759*** (154.455)
N	3,006	45,294	3,001	45,295
R^2	0.185	0.038	0.114	0.221
Within Person Std Dev of ADL	0.641	0.586		
State Dependence $\sigma(\beta_1/\beta_3)$				
	0.629*** (0.012)	0.567*** (0.003)	0.815*** (0.073)	0.766*** (0.017)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 4.12: Health State Dependence Heterogeneity of utility among Hispanic-Nonhispanic by WLS (Probability weights) : Dependent Variable – IADL

	Utility Proxy : Happiness		**Utility Proxy : CESD**	
IADL wide	**Hispanic**	**Non-Hispanic**	**Hispanic**	**Non-Hispanic**
IADL ×Log($\bar{Y}$) β_1	-0.013** (0.005)	0.011 (0.016)	0.120 (0.082)	0.104*** (0.027)
Log($\bar{Y}$) β_3	0.035*** (0.014)	0.033*** (0.003)	- 0.565*** (0.078)	-0.500*** (0.016)
Implied State Dependence (β_1/β_3)				
	-0.505 (1.406)	0.493 (0.152)	-0.311 (0.220)	-0.149** (0.043)
Implied State Dependence (β_1/β_3) with Number of Diseases Detailed				
IADL 1	-9.916 (19.483)	5.528*** (2.106)	41.956 (1700)	28.790 (42.392)
IADL 2	237.326 (40514)	8.208*** (4.055)	1.265 (1.063)	11.266*** (4.813)
IADL 3	1.768 (2.466)	371.423 (22571)	3.439 (2.248)	58.228 (225.628)
IADL 4	1.540*** (0.531)	3.381*** (1.127)	1.877*** (0.722)	7.674* (4.043)
IADL 5	3.130*** (0.869)	5.921** (3.042)	19.328 (177.778)	5.824*** (1.853)
N	2,905	43,407	2,945	43,698
R^2	0.843	0.160	0.393	0.175
Within Person Std Dev of IADL	0.641	0.586		
State Dependence $\sigma(\beta_1/\beta_3)$				
	0.629*** (0.011)	0.570*** (0.003)	0.718*** (0.076)	0.742*** (0.018)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

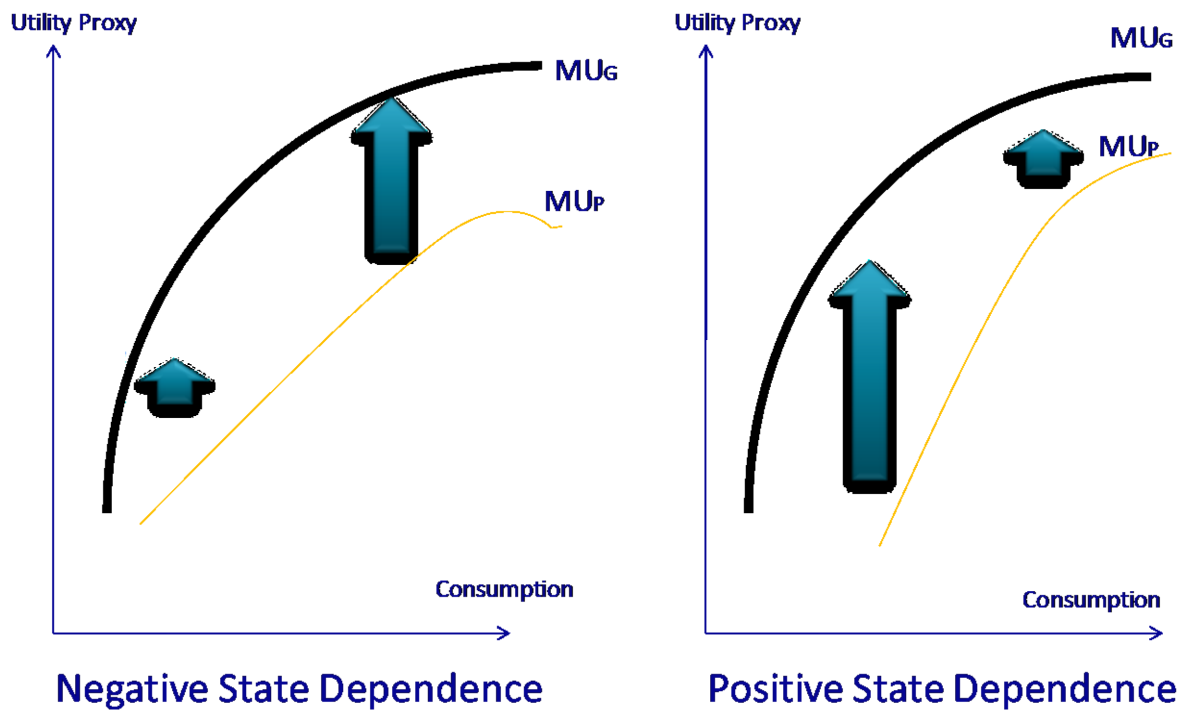
Table 4.13: Non-linear Blinder-Oaxaca Decomposition of Utility Heterogeneity among Hispanic and Non-Hispanic using HRS 1992-2008.

Utility Proxy : Happiness	Hispanic, Non-Hispanic utility heterogeneity With number of diseases	Hispanic, Non-Hispanic utility heterogeneity With ADLs	Hispanic, Non-Hispanic utility heterogeneity With five ADLs	Hispanic, Non-Hispanic utility heterogeneity With IADLs	Hispanic, Non-Hispanic utility heterogeneity With five IADLs
Total Disparity	1.09*** (0.011)	1.08*** (0.011)	1.08*** (0.011)	1.08*** (0.011)	1.08*** (0.011)
Portion due to Difference in Coefficients	1.02*** (0.003)	1.03*** (0.003)	1.03*** (0.003)	1.03*** (0.003)	1.03*** (0.003)
Portion due to Difference in Endowments	1.06*** (0.011)	1.05*** (0.011)	1.05*** (0.011)	1.05*** (0.011)	1.05*** (0.011)
Health Indicator	1.000*** (0.001)	1.01*** (0.001)	1.01*** (0.001)	1.00*** (0.0007)	1.01*** (0.001)
Log Income	1.02*** (0.002)	1.02*** (0.002)	1.02*** (0.002)	1.02*** (0.002)	1.02*** (0.002)
Age	1.003*** (0.007)	1.00*** (0.0007)	1.00*** (0.0007)	1.00*** (0.0007)	1.00*** (0.0007)
Race	1.000 (0.001)	-0.10 (0.001)	-0.10 (0.001)	1.000 (0.001)	-0.10 (0.001)
Risk Attitude	1.000*** (0.001)	-0.10*** (0.0003)	-0.10*** (0.0003)	1.000*** (0.0003)	-0.10*** (0.0003)
Region	1.000 (0.001)	-0.10 (0.001)	-0.10 (0.001)	1.000 (0.001)	-0.10 (0.001)
Marital Status	1.000* (0.0005)	1.00 (0.0005)	1.00 (0.0005)	1.001 (0.0006)	1.00 (0.0005)

Table 4.14: Linear Blinder-Oaxaca Decomposition of Utility Heterogeneity among Hispanic and Non-Hispanic using HRS 1992-2008.

Utility Proxy : Happiness	Hispanic, Non-Hispanic utility heterogeneity With number of diseases	Hispanic, Non-Hispanic utility heterogeneity With ADLs	Hispanic, Non-Hispanic utility heterogeneity With five ADLs	Hispanic, Non-Hispanic utility heterogeneity With IADLs	Hispanic, Non-Hispanic utility heterogeneity With five IADLs
Total Disparity	-0.649*** (0.062)	-0.649*** (0.062)	-0.649*** (0.062)	-0.649*** (0.062)	-0.632*** (0.063)
Portion due to Difference in Coefficients	-0.295*** (0.022)	-0.421*** (0.025)	-0.419*** (0.027)	-0.431*** (0.022)	-0.391*** (0.025)
Portion due to Difference in Endowments	-0.354*** (0.061)	-0.228*** (0.059)	-0.230*** (0.058)	-0.217*** (0.061)	-0.241*** (0.061)
Health Indicator	0.036*** (0.010)	-0.088*** (0.015)	-0.112*** (0.018)	-0.046*** (0.010)	-0.055*** (0.015)
Log Income	-0.299*** (0.014)	-0.299*** (0.013)	-0.278*** (0.013)	-0.345*** (0.015)	-0.300*** (0.014)
Age	-0.024*** (0.004)	-0.024*** (0.004)	-0.023*** (0.004)	-0.027*** (0.005)	-0.031*** (0.005)
Risk Attitude	0.009*** (0.002)	0.008*** (0.002)	0.008*** (0.002)	0.008*** (0.003)	0.007*** (0.002)
Region	-0.010 (0.006)	-0.007 (0.006)	-0.005 (0.006)	-0.007 (0.006)	-0.007 (0.006)
Marital Status	-0.007 (0.004)	-0.007* (0.004)	-0.007* (0.004)	-0.007* (0.004)	-0.006 (0.004)
Race	-0.002 (0.007)	-0.00006 (0.007)	-0.0008 (0.007)	-0.002 (0.007)	0.003 (0.006)

Figure 4.1: Negative vs. Positive State Dependence



Appendix Tables

Table 2A1: Risk Preference Categories:

Category	X Accepted	X Rejected	Risk tolerance range	Risk Aversion Range
1	None	1/10	0 to 0.13	∞ to 7.7
2	1/10	1/5	0.13 to 0.27	7.7 to 3.7
3	1/5	1/3	0.27 to 0.50	3.7 to 2
4	1/3	1/2	0.50 to 1.0	2 to 1
5	1/2	3/4	1.0 to 3.27	1 to 0.3
6	3/4	None	3.27 to □	0.3 to 0

Note: This categorization is also shown in Table 1 of Kimball, et al. (2008)
We collapse the above six categories into three: most risk averse (1, 2), middle risk averse (3, 4), and least risk averse (5, 6).

Appendix2 B. Robustness Checks

Table 2A2. OLS Estimates with Clustered Standard Errors

Variable	Category	Income Risk	Nonfatal	Fatal
Risk Aversion	**Medium**	-0.043**	-0.100	-0.069
		(0.018)	(0.072)	(0.056)
	Most	-0.039**	0.156**	0.062
		(0.017)	(0.069)	(0.052)
Race	**Black**	0.056***	0.342***	0.054
		(0.020)	(0.078)	(0.063)
	Other	0.030	0.184**	0.078
		(0.023)	(0.090)	(0.070)
Degree	**High School**	0.0002	-0.719***	-0.518***
		(0.014)	(0.060)	(0.045)
	College	-0.019	-1.087***	-0.802***
		(0.015)	(0.061)	(0.054)
	Graduate	-0.016	-1.138***	-1.071***
		(0.012)	(0.046)	(0.043)
	Other	0.005	-1.243***	-0.780***
		(0.066)	(0.121)	(0.144)
Family Wealth	**Average**	-0.041**	0.093	0.096
		(0.019)	(0.087)	(0.060)
	Poor	-0.0403*	0.069	0.094
		(0.021)	(0.096)	(0.068)
	Varied	-0.028	0.298	0.155
		(0.054)	(0.254)	(0.182)
Time Horizon	**Next Year**	-0.055**	-0.111	-0.007
		(0.023)	(0.096)	(0.077)
	Next Few Years	-0.064***	-0.202**	-0.009
		(0.019)	(0.083)	(0.065)
	Next 5-10 Years	-0.048**	-0.130*	0.0002
		(0.019)	(0.077)	(0.062)
	Longer than 10 yrs	-0.062***	-0.104	0.055
		(0.022)	(0.093)	(0.073)
Age		0.003***	0.004	-0.00003
		(0.0009)	(0.004)	(0.003)
Marital status	**Previously Married**	0.012	0.219***	0.137***
		(0.016)	(0.067)	(0.052)
	Never Married	0.053*	0.034	-0.119
		(0.029)	(0.114)	(0.087)
# Observations		1,873		

Notes: Clustered Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

Table 3A1: Health State Dependence Heterogeneity of utility among whites-blacks by WLS (Probability weights) : Dependent Variable – ADL

	Utility Proxy : Happiness		Utility Proxy : CESD	
ADLWA	**Female**	**Male**	**Female**	**Male**
adlw ×Log(Ȳ) β_1	-0.027*** (0.009)	0.006 (0.009)	-0.013 (0.045)	-0.038 (0.046)
Log(Ȳ) β_3	0.040*** (0.004)	0.022*** (0.004)	-0.512*** (0.023)	-0.437*** (0.023)
Implied State Dependence (β_1/β_3)				
adlw	-0.389 (0.283)	0.115 (0.365)	-0.048 (0.082)	0.117 (0.124)
Ratio of margins				
adlw	0.964*** (0.006)	0.969*** (0.006)	1.359*** (0.028)	1.375*** (0.026)
Ratio of margins with Number of Diseases Detailed				
adlw 1	0.961*** (0.009)	0.973*** (0.009)	1.445*** (0.044)	1.342*** (0.041)
adlw 2	0.925*** (0.015)	0.949*** (0.015)	1.723*** (0.073)	1.738*** (0.070)
adlw 3	0.896*** (0.029)	0.872*** (0.029)	1.842*** (0.140)	2.260*** (0.131)
N	26,204	22,116	26,249	22,158
R^2	0.432	0.739	0.408	0.554
Within Person Std Dev of ADLWA	0.398	0.382		
Ratio of margins $\sigma(\beta_1/\beta_3)$				
	0.384*** (0.002)	0.370*** (0.002)	0.541*** (0.011)	0.525*** (0.010)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 3A2: Health State Dependence Heterogeneity of utility among whites-blacks by WLS (Probability weights) : Dependent Variable – Number of Diseases

	Utility Proxy : Happiness		Utility Proxy : CESD	
IADL	**Female**	**Male**	**Female**	**Male**
iadl ×Log(Ȳ) β_1	-0.055*** (0.012)	-0.022* (0.012)	0.253*** (0.055)	0.061 (0.051)
Log(Ȳ) β_3	0.040*** (0.004)	0.025*** (0.004)	-0.545*** (0.023)	-0.433*** (0.024)
Implied State Dependence (β_1/β_3)				
iadl	-0.650 (0.274)	-0.752 (0.400)	-0.190 (0.113)	-0.044 (0.137)
Ratio of margins				
iadl	0.975*** (0.007)	0.962*** (0.007)	1.223*** (0.035)	1.275*** (0.032)
Implied State Dependence (β_1/β_3) with Number of Diseases Detailed				
iadl 1	0.958*** (0.011)	0.955*** (0.011)	1.368*** (0.058)	1.339*** (0.049)
iadl 2	0.984*** (0.022)	0.957*** (0.021)	1.340*** (0.108)	1.465*** (0.098)
iadl 3	0.919*** (0.035)	0.864*** (0.032)	1.474*** (0.172)	1.806*** (0.150)
N	26,204	22,115	26,249	22,157
R^2	0.678	0.764	0.698	0.728
Within Person Std Dev of Num_Dis	0.355	0.357		
State Dependence $\sigma(\beta_1/\beta_3)$				
	0.346*** (0.003)	0.344*** (0.002)	0.434*** (0.013)	0.455*** (0.011)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 4A1: Health State Dependence Heterogeneity of utility among whites-blacks by WLS (Probability weights) : Dependent Variable – ADL

	Utility Proxy : Happiness		Utility Proxy : CESD	
Health Indicator : ADLWA	**White**	**Black**	**White**	**Black**
adlw ×Log(Ȳ)	0.006 (0.007)	-0.001 (0.001)	-0.047 (0.035)	-0.071 (0.070)
Log(Ȳ) β_3	0.021*** (0.003)	0.043*** (0.009)	-0.410*** (0.018)	-0.589*** (0.049)
Implied State Dependence (β_1/β_3)				
	-0.370 (0.222)	-0.049 (0.046)	0.015 (0.078)	0.068 (0.125)
Ratio of Margins with Number of Diseases Detailed				
adlw 1	-2.403 (4.201)	0.697*** (0.278)	-13.600 (36.759)	0.757 (0.491)
adlw 2	6.345 (14.819)	0.877*** (0.385)	-7.933 (11.250)	203.139 (19038)
adlw 3	2.608*** (0.677)	1.562*** (0.280)	22.985 (212.610)	-1.089 (5.995)
N	40,667	6,773	40,734	6,787
R^2	0.660	0.220	0.534	0.223
Within Person Std Dev adlwa	0.382	0.478		
Ratio of Margins $\sigma(\beta_1/\beta_3)$				
	0.386*** (0.003)	0.382*** (0.007)	0.544*** (0.016)	0.481*** (0.038)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

Table 4A2: Health State Dependence Heterogeneity of utility among whites-blacks by WLS (Probability weights) : Dependent Variable – Number of Diseases

	Utility Proxy : Happiness		**Utility Proxy : CESD**	
Health Indicator : IADL	**White**	**Black**	**White**	**Black**
iadl ×Log(Ȳ)	-0.032*** (0.009)	-0.027 (0.040)	0.036 (0.042)	0.179 (0.129)
Log(Ȳ) β_3	0.033*** (0.003)	0.030*** (0.009)	-0.455*** (0.018)	-0.716*** (0.052)
Implied State Dependence (β_1/β_3)				
	-0.761*** (0.293)	-1.071* (0.614)	-0.125 (0.102)	-0.201 (0.262)
Ratio of Margins with Number of Diseases Detailed				
iadl 1	2.722 (2.909)	2.707 (1.758)	-3.482 (12.235)	3.870*** (1.037)
iadl 2	25.938 (135.324)	3.331*** (0.128)	1.653 (1.303)	2.811*** (0.118)
iadl 3	3.085*** (1.114)	4.290*** (0.814)	-6.821 (26.353)	4.212*** (0.232)
N	40,666	6,774	40,733	6,788
R^2	0.764	0.350	0.768	0.374
Within Person Std Dev iadl	0.344	0.412		
Ratio of Margins $\sigma(\beta_1/\beta_3)$				
	0.346*** (0.004)	0.361*** (0.013)	0.441*** (0.018)	0.417*** (0.093)

Notes:

1. Regression uses fixed effects OLS in a panel setting using weights and reports robust standard errors for diseases and interaction terms. Time and individual fixed effects, risk attitude, age, census region, marital status, dummy for race, and ethnicity were used as controls but not being reported here.
2. β_3 is estimated from fixed effects estimates of the previous regression.
3. State dependence is estimated from the ratio of interaction term (β_1) and coefficient of permanent income (β_3).

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ABSTRACT

ESSAYS ON IMPACT OF RISK PREFERENCE ON HEALTH AND OCCUPATIONAL CHOICE

by

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Advisor: Dr. Jennifer Louis Ward-Batts

Major: Economics

Degree: Doctor of Philosophy

This dissertation re-examines Health and Retirement Study (HRS) data in order to ascertain whether there exists behavioral heterogeneity among people regarding health risk as compared to that of financial risk as well as whether there exists racial-ethnic and gender heterogeneity in the health state dependence of marginal utility. Given heterogeneous risk and time preferences of individuals, this study investigates the impact of those preferences on sorting into occupations and industries using various measures of job risk. I construct three measures of risk across jobs, cross-categorized by occupation and industry: a fatal injury rate, non-fatal injury and illness rate, and a measure of inter-person income variability. Using these measures, I analyze how risk and time preference of an individual affects his occupational choice. This study finds that there are different domains of risk and that individuals do not think of these in the same way. Using Health and Retirement Study data, I find that there exists a behavioral inconsistency in health risks versus income risk. This dissertation advises against the use of health risk proxy for making inferences about financial risk.

This dissertation then examines the heterogeneity in health dependence of utility and contingent upon the findings of heterogeneity, it examines the factors contributing to utility heterogeneity. To examine this empirically, I begin with theoretical and empirical models used by Finkelstein, et al. (2011) relaxing the assumptions of those models to allow for differential effects by race, gender and ethnicity. Using happiness as a utility proxy and objective health measures in our baseline model, I find strong evidence of heterogeneity in health state dependence of utility among males and females, hispanic and non-hispanic and white, and black; not only in seven objective health conditions but also functionality limitations; not only by using happiness as a utility proxy but also with CES-D score. Since, there is slight evidence of heterogeneity in the health state dependence of utility among different health states, the policies like Medicare, and Medicaid would have varying impact on people depending upon race, ethnicity and gender.

The non-linear B-O decomposition of utility unfolds that the significant contributors towards the explained gender, racial and ethnic gap in utility proxy (happiness and CES-D Score) are: marital status, number of diseases, log adjusted income, risk attitudes and ethnicity. Approximately 80 percent of the gender utility gap and 100 percent race utility gap is explained by the endowment effect. Thus, this dissertation reaffirms the findings of Halliday (2008) that there may be larger potential gains to identifying as well as targeting factors that influence individual heterogeneity since the health state dependence of utility is mostly driven by individual characteristics, as has been found to be the case in B-O decomposition of utility in the current study.

AUTOBIOGRAPHICAL STATEMENT

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