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ABSTRACT

This paper examines the effect of a decline in health on the savings and portfolio choice of young, working individuals and the differences between insured and uninsured cohorts using the 2001 Survey of Income and Program Participation. We find that insured individuals are significantly likely to divest from risky asset holdings in response to a decline in health, controlling for variables such as income, age, and out-of-pocket medical expenses. Unlike many previous papers, which dismiss health and portfolio choice associations among retired individuals on the basis of unobserved heterogeneity, we find that our results for working individuals are robust when using fixed effects models in a three-year longitudinal panel. Consistent with an overall theory of risk, we find that the relationship between an onset of poor health and an increased aversion to risky assets among the insured is strongest (only apparent) among married-couple households.

1. Introduction and overview

The economic consequences of a decline in health, particularly for those who are without

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health insurance, are a subject of interest to researchers and policy-makers alike. Close to half of personal bankruptcies in the U.S. are found to be associated with medical problems that trigger both out-of-pocket payments and loss of income (Himmelstein, et al, 2005).[2] A negative change in health is known to correspond to declines in several measures of economic outcomes including consumption, labor market participation, income, and wealth (Smith, 1999). Serious and unpredictable illnesses can have devastating effects, particularly among more vulnerable households, those who are not covered by health insurance and who are in the bottom income quartile. As Poor health curtail a household labor, while increasing medical expenses, this could lead to lower savings, an essential element of wealth accumulation (Smith, 1999; Edwards, 2008). Those who are without coverage should therefore be even more vulnerable to idiosyncratic health shocks. The cross-sectional statistics of the data utilized in this study, the 2001 Survey of Income Dynamics (SIPP) confirm that a substantial portion of working-age households do not have health insurance across several demographics. For instance, 10.3 percent of non-Hispanic Whites were not covered by any health insurance, while 19.3 percent of Blacks were not covered by any health insurance. In addition, 33.7 percent of Hispanics in our sample were not covered by any health insurance.[3] Individuals who reported a household income below the poverty income threshold were 17.1 percent less likely to be covered by health insurance.

Our main objective in this paper is to assess how households' savings may be affected by health problem. We are also interested in assessing whether the probability that households would close their accounts, at the extensive margin, as a result of a health problem is dependent on health insurance coverage. We also want to examine changes in their portfolio at the intensive

[2] This result is based on a survey of 1,771 bankruptcy filers in 5 of the total 7 federal judicial districts in 2001, and subsequently detailed follow-up interviews with 931 of them.

[3] We do not know from the data immigrant or legal status for the Hispanics in the sample.

margin, as a result of experiencing deterioration in health. We focus on the working-age population, defined between ages 25 and 54. The examination of the younger working households is of specific interest to the growing literature since much less is known on the economic consequence of a health shock for this group. Most studies use data from surveys which are done specifically to understand health issues and their effects on the older population, 55 and over, particularly, those sampled in the longitudinal Health and Retirement Survey (HRS) and in the Assets and Health Dynamics among the Oldest Old (AHEAD) survey, which covers those who are 70 and above.

How this paper on the working population could easily differ from previous studies of older population is threefold. Older individuals who are retired have no labor income, and hence their consumption patterns and portfolio allocation should differ from working individuals in response to any exogenous shock, including changes in health. Second, with publicly provisioned health insurance programs such as Medicare, which covers those 65 and above, it is understandable that variations in insurance coverage have been found to have no impact on the portfolio choice of the old (Rosen and Wu, 2004). This may not be necessarily the case in an analysis of younger cohorts. Third, relative to the young, the association between savings and health of the old may be more subject to 3rd factors, such as impending bequests.

The effect of health shocks for the working-age group warrants particular attention for several additional reasons. The working-age group should still be engaging in active savings to ensure a safety net for their older years. Savings and risk diversification is therefore unique among workers in the process of wealth accumulation. By directly reducing labor supply, health shocks result in greater fluctuations and uncertainty in income sources, as well as inhibit the ability to save, possibly leading to risk hedging and reduction of asset holdings. This could have

long-term financial repercussions. Indeed, the correlation between health and income has been found to be much higher for those who are working than those who have retired, suggesting that income shifts would be more sensitive to health shocks for those who are working (Deaton and Paxton, 1998; Smith and Kington, 1997).

We use the Survey of Income Dynamics (SIPP) to examine the relationship between self-reported health status and asset holdings subdivided by risk classes. The immediate benefit of the SIPP for our purpose is that it allows us to conduct longitudinal analysis on individuals not confined to the aging population, which is nationally representative when using their weights. As importantly, we are able to exploit the panel structure of the SIPP and perform an "event study" on the effect of health changes across waves for an understudied age group in the population. The compact panel data should correct for endogeneity issues between health status and socioeconomic status, since changes in income across a small span of time as small as four months are unlikely to cause a change in health status.

It is well known that the cross-sectional correlations between health and asset or portfolio choice may be driven by unobserved individual characteristics. We compare random-effect models, which fall short of controlling for unobserved individual characteristics or individual heterogeneity with fixed-effects models where these characteristics are netted out, assuming they are time-constant (McFadden 1980, Greene, 2001). Also, particularly since our panel begins during a recession (in 2001), which likely may have had an effect on initial asset ownership, we want to ensure that we observe only changes in asset ownership, which may be explained by an observed change in health. The fixed-effects model also offers a solution to deal with any possible omitted variable problem.

It is clearly important to control for the impact of income as well as out-of-pocket

medical expenses. We do this in all the regression estimates. In addition, we take into account the magnitude of a particular health shock, that is, how severe a deterioration in health status the individual experiences, by examining changes across time in their self-reported health on a 1-5 scale.

The main results of the paper are as follows: Without taking into account heterogeneity in the random-effect framework, we find that poorer health is negatively associated with financial assets across all risk classes held by households, whether single or married, insured or uninsured. Most of these associations disappear in the fixed-effects model, implying an influential role for heterogeneity. However, robust to the fixed-effect estimates, we find adverse health events discourage risky asset holdings (mutual funds, stock, etc.) among individuals in married-couple households, and interestingly, in particular among those who are insured. We also find that married individuals who are uninsured are significantly more likely to close safe asset (checking, savings, etc) accounts. The later result stands in contrast to previous finding for the old, whom understandably, with publicly provisioned insurance, such as Medicaid, variations in coverage do not affect their asset allocation (Rosen and Wu, 2004).

The plan for the remainder of the paper is as follows: in the next section we briefly review the relevant literature, as well as discuss issues involved in measuring and identifying health impact, and the way we will address them in the paper. As a starting point for our investigation, we conduct a descriptive analysis of the data depicting the cross-sectional relationship between health and socioeconomic status and asset ownership. Then we turn to the longitudinal analysis, exploiting the panel structure of the data, to assess the impact of change in health on asset holding, using comparatively random-effects and fixed-effects models. We conclude with a summary of the findings and implications for additional research.

II. Literature and Issues of Health Estimation

While much of the past literature has focused on the broad economic consequences of health, in terms of income, wealth, and labor market outcomes, a large and growing literature has started to focus on the impact of health status on portfolio choice and particular savings. The research is fairly unanimous, in that, negative health shocks correspond to reductions in income and wealth. Smith (1999) based on data from the HRS for those over 55, reports that negative health shocks lead to a sizable reduction in net worth. Specifically, the onset of a minor illness results in a decrease in wealth accumulation averaging $3,620 over a four-year period. A major illness resulted in a $17,000 reduction in wealth accumulation over that period.

Health shocks effect on wealth is in part due to the out-of-pocket medical expenses (Wu, 2003; Smith, 1999). Based on Smith's calculation, the reduction in wealth, mentioned, coincides with an increase in out-of-pocket health expenditure of $635 for minor health shocks and $2,266 for major health shocks.

Another conduit for health shocks' impacts on income is through a reduction in labor supply. Smith (1999) finds that a health event leads to a reduction of 4 hours per week of work and a 15-percentage point decline in the probability of remaining in the labor force. Levy (2002) also finds that there is a reduction in labor supply as a result of a negative health event, but not a reduction in hours worked, once labor market participation is controlled for.

As argued, identifying the pathway of savings through which the health-income gradient may operate is particularly relevant for the working-age population. The socio-economic health gradient literature, argues that if poor health substitutes for labor supply, increases medical consumption or out-of-pocket spending, savings could fall (Smith, 1999; Edwards, 2008).

However, following the broader literature on savings motives across the life cycle, the effect of health on savings is theoretically ambiguous (Hubbard, Skinner and Zeldes, 1994; Lillard and Weiss, 1997; Palumbo, 1999; Dynan, Skinner and Zeldes, 2004). Within the framework of life cycle models, a health shock can affect savings via several (positive or negative) channels, depending on how the health shock alters the marginal utility of consumption and thus household's valuation of risk. The literature identifies the risk of future health spending as a crucial trigger of precautionary saving. Attitude toward risk is also central to the savings behavior. If people are risk adverse, when they are sick, they adjust their expectation of their future health risk, and as a result accumulate wealth to deal with future problems and expenses. Savings (safe asset holding as opposed to riskier assets) then could rise if the prospect of poor health increases (Rosen and Wu, 2004).

The health shock effect on saving decisions also depends on whether these shocks increase or decrease the marginal utility to consume (Love and Smith, 2007). If marginal utility of consumption is a declining function of poor health (i.e., you are not interested in going on a vacation when you are sick), then individuals will tend to want to consume more (and save less) when they are healthy, then to wait for later years when they may become sick (e.g., Lillard and Weiss, 1997); Viscusi and Evans, 1990. Mortality risks would have a similar time preference, moving consumption more toward present than future (Idler and Benyamini, 1997).[4]

Empirical work has examined the effect of health on savings at both the extensive margin (whether the household own a saving accounts or other assets) and at the intensive margin (the share of their financial asset held in each risk class). The seminal study of asset allocation of the

[4] Time preference would be mitigated by bequest motives (Hurd, 2002). Other factors that may alter time preference include consideration for future income, such as annuitized social security income for a surviving spouse (Idler and Benyamini,1997), and tax treatment of income generated by various asset (Poterba, 2001).

older population in the literature is the Rosen and Wu (2004) paper, which is based on the HRS. Using random-effects models, this study finds that the sick tend to reinvest in safer assets, both at the extensive and intensive margins (asset ownership and asset fractions).[5] One possible reason for this, as they suggest is that the sick people are less able to absorb low asset returns by adjusting labor supply and therefore shift toward safer portfolio allocation, in a logic similar to Bodie et al (1992). Rosen and Wu also consider some of the potential mechanisms for the health effects including, including bequest motives, planning horizon, and risk aversion.

The life-cycle theory predicts that health would reflect time preference and risk, among other factors, which would have an impact on the amount and type of assets one holds at the intensive margin. The theory is less clear about what should cause a person who is sick to make a decision at the extensive, that is to completely close a safe account or completely get out of the stock market. To that effect, Love and Smith (2007) make an interesting observation, regarding older retiring individuals, as they note that there is no reason to believe that when people are sick they would completely get out of the stock market, or when they become healthy, the older person would choose to buy stock. For poor health to cause people to withdraw, they would have to be "close to the extensive margin prior to the health shock".

What other additional factor could cause households to completely divest? A few studies have provided some explanations of factors other than life-cycle/time-preference that may explain variations at the extensive margin. In the case of risky assets, such as stock ownership, Vissing-Jorgensen (2002) explains that even small fixed costs of holding stocks could explain large amounts of non-participation. Other explanations for non-participation in stock ownership

[5] Edward (2008) finds similar results as Rosen and Wu (2004) using similar random effect Tobit models, but for households in the Aging and Health Dynamics (AHEAD) survey. Christelis et al (2005) use a Heckman selection model, also find negative and statistically significant correlation between poor health and risky asset (Stock) ownership and shares for older households in a cross-sectional data set covering 10 European countries.

have been found in social interactions and communal effects for some individuals. In the case of savings and checking account (safe assets), a similar literature speaks to barriers, such as cultural differences and information asymmetry, that may keep from having a relationship with formal banking institutions for some individuals, which may explain in part why some individuals may not hold such accounts (Rhine et al, 2006). For these reasons, it is important to control for various other factors, including family backgrounds, etc…, (Rosen and Wu, 2004).

Regardless of the channel through which a health event impact savings, from an empirical perspective, there are important identification issues that must be faced in trying to estimate consistently the effect of health. First, there is the potential for measurement errors. This could happen because self-assessed variables may not be completely reliable. This is exemplified in Crossley and Kennedy (2002) who report that self-assessed health status may fluctuate when asked the same question twice in the same survey. Self-assessed responses could also be distorted by mood (Schmidt et al., 1996). Also, perception about health may be influenced by socioeconomic characteristics, including education, availability of health insurance etc… This would render measurement errors associated with self-assessed health status correlated with other independent variables in the model. As Rosen and Wu (2004) argues, there is however ample evidence to suggest that self-reported health assessment is still a valid measure of health condition. For example, poor self-reported health is found to correlate highly with mortality (Idler and Benyamini, 1997). Also, studies have used in addition to self-reported health, other more "objective" measure of health, such as specific medical conditions, and have found results that are qualitatively not different than when they use self-reported health (Smith, 1999; Rosen and Wu, 2004). Based on the SIPP data, as in previous studies, we will use self-reported health status from 1 to 5. Looking at the emergence of a self-reported "new health condition" within the

same households across the panel should mitigate some of the potential time-invariant measurement errors.

Second, there is the well-known problem of endogeneity with health status. Wealth, understandably could affect health. Wealthier individuals can afford better health insurance plans and higher quality care, giving them a comparative advantage in maintaining good health. At the same time, having poor health make people subject to absenteeism, they may be in general not as good and productive workers as those who are healthy, they have a statistical tendency to reduce their labor supply, which could lead to having less wealth (Smith, 1999). In our case, as we seek to estimate the effect of health on savings, if it happens that savings in fact affect health, this would lead to spurious results. To isolate the effect of a change in health, we would need to have variables that affect the savings outcome only through their effects on health. The use of an instrument, such as a health care cost shock would be a likely candidate. Such an instrument is not appropriate using U.S., data, since there is private and public health insurance (Smith, 1999). Fortunately, we believe that there is no compelling argument to suggest that our analysis will be subject to this issue. The compact panel data we utilize in this study addresses the endogeneity issues between health status and socioeconomic status, since changes in income across a small span of time as small as four months are unlikely to cause a change in health status.

Third, "unobserved" individual heterogeneity is a substantial issue that must be dealt with. This constitutes a greater concern for us. If unobserved random factors are omitted and correlated with observed variables, this would cause spurious effects of health on the economic outcomes of interest. For example, if we consider the case of risky assets, like stock ownership, poor health may directly cause a reduction in stock holding. However, it is possible that unobserved "third factors" such as preference and attitude toward risk, correlated with poor

health could also be correlated with lower stock holding. It is also possible that people' backgrounds might be a factor. For instance, if they grew up in poor neighborhoods and have not learned as much on good health practices they may also not have learned about the importance of savings. If such is the case the relationship between poor health and thesaving or portfolio decisions would be biased. Rosen and Wu (2004) exploit the extensive information on family background and on occupations of respondents to control for such potential additional "third factors" in their random-effect estimators.

Subsequent to Rosen and Wu paper, some studies have used fixed-effect models in an attempt to account for unobserved individual heterogeneity and unobserved differences across households.[6] Following the literature, our empirical strategy is going to consist of comparing random-effects models to estimate the effect of a negative change in health status on asset holding with conditional fixed-effects models that estimates the effect of these changes, netting out unobserved heterogeneity and omitted variables in the panel.

III. Data and Cross-Sectional Analysis of Health Status

The analysis is undertaken using the 9 waves of the 2001 panel of the Survey of Income and Program Participation (SIPP). The SIPP is a longitudinal dataset that surveys 36,700 households every four months. The nine waves of the 2001 SIPP allow us to look at a condensed three-year period, and look at monthly household income as well as asset ownership status and

[6] The results of these studies have been more or less supportive of Rosen and Wu (2004). For example, Coile and Milligan (2006) using HRS confirm the results of Rosen and Wu based on fixed-effects models, in that they find a negative effect of a chronic shock on the probability of holding risky asset, but no effect on the marginal share. Love and Smith (2008) use the HRS, however, they attribute the health-wealth correlations to unobserved heterogeneity based on fixed-effects logit (for asset ownership) and fixed-effects tobit (for asset fractions) in their analysis of individuals over 70. On the other hand, they do observe portfolio adjustment to safer assets among younger cohorts between 51 and 70. Fan and Zhao (2009) attribute wealth-health correlations to unobserved heterogeneity, when looking at health variables such as improper physical functioning, chronic conditions, acute impairment, and work-related health limitations in wave 1 and 2 of the US New Beneficiary Survey (NBS) both in 1982 and 1991, which surveys those exclusively over age 60. They found results consistent with Rosen and Wu based OLS and random-effects models, but the correlations disappeared once fixed-effects are used.

asset holdings across several waves. We classify asset ownership in various classes based upon risk that is consistent with the portfolio choice literature. This paper follows Carroll (2002) and Hurd (2002) in categorizing assets by three classes of risk, namely safe assets (checking accounts, savings accounts, treasuries, CDOs, etc.), medium risk assets (retirement securities and bonds), and high risk assets (mutual funds and stocks). In the spirit of Rosen and Wu (2004), we define our asset fractions as the proportion of a particular class of asset of that individual's net worth. Unlike their study, which decomposed medium risk assets into retirement and bonds in order to account for variation between these types of vehicles for retired individuals, we group both retirement and bonds as one medium risk asset class. Our sample includes individuals who are between the ages of 25 to 54, one of the standard definitions of working-age. We also drop any early retirees because those who choose to retire early often have radically different savings and portfolio decisions compared with their working counterparts.

Table 1 provides a number of cross-sectional statistics that are averaged across the panel. Averages are shown for both married and single individuals as well as for the entire sample. Health status is based on the respondent's answer to how they would rate their health on a five-point scale, a 1 referring to excellent health, while a 5 reports poor health. In this table, we define as healthy, those with a score of 1 to 3 and as sick, those with a score of 4 or 5.

Singles are on average younger than individual heads of married couple households. Blacks make up 18 percent of single headed households compared to 8 percent in married households. While singles tend to report being sick to a similar degree as those who are married (on average 11 percent), they are almost twice more likely to have no health insurance than married individuals. Twenty-one percent of singles had no health insurance, compared to 11 percent of married couples.

A substantial number of single headed households have no financial asset. Only forty-four percent of singles compared to 73 percent of married couples have a positive amount of any financial assets. The percentages of the financial assets held across different class categories are also all much smaller for singles. Only 9 percent hold medium risk assets, compared to 25 percent of married. And only 12 percent hold risky assets, compared to 30 percent of married individuals.

Conditional on having financial wealth, the great majority of it is held in medium risk assets. The younger households in our sample hold about 67 percent of their reported financial wealth in retirement or bonds, a fraction much higher than that found in studies that examine retired individuals (Rosen and Wu, 2004; Hurd, 2002). This is understandable since we drop early retirees and look exclusively at those who have yet to unwind any holdings retirement savings such as Keogh or 401(k) accounts. Interestingly, couples appear to be somewhat more risk averse than singles, once we condition on asset ownership, in term of the proportion of their wealth held in risky asset class. Couples hold about 5 percent less of their net worth in risky assets than singles.

In Table 2, we present additional cross-sectional averages showing how the proportion of different types of households based on marital status and insurance coverage, owing various assets, varies by health status. Again here in this table, we define as healthy, those with a score of 1 to 3 and as sick, those with a score of 4 or 5. The results suggest that in general sick working-age individuals are less likely to have any asset holdings than the healthy. For example, 61 percent of healthy people own safe assets. The analogous figure is 35 percent for sick people. For medium risk asset, the numbers are 20 percent for healthy people and 8 percent for sick. And for risky assets, the numbers are 23 percent for healthy people and 10 percent for sick people. As

one would expect with the well-known negative correlations between health insurance coverage and net worth (Smith, 1999), between only 3 to 5 percent of those who are without health insurance have medium or risky asset type, irrespective of whether or not they are sick.

Table 3 compares account closings between those with and without health insurance, conditional on having had an account in an initial period. We subdivide individuals into those who become sick and those whose health either improves or remains unchanged from waves 3 to wave 6 as well as from wave 6 to wave 9, reflecting one year time intervals. Becoming sick is defined here as having had any deterioration in reported health's score over the period. Account closing is defined as any negative change in the asset ownership indicator, conditional on ownership in the initial period. Individuals who have closed all accounts in one particular asset class are those who held some amount of assets in the previous period and reported no asset ownership in the next.

Between waves 3 and 6, when looking at the difference-in-differences among singles and closing of risky asset holding, of those who do have health insurance, 13 percent who remain healthy close their risky asset accounts, while 24 percent who report a decline in health close their respective risky asset accounts. The uninsured are much more likely to close their account, irrespective of their health status, as 32 percent, of those who remain healthy, and 33 percent of those who get sick drop their risky asset accounts.

Among couples who are insured, 14 percent individuals who remain healthy close their risky asset accounts, while 21 percent who report a decline in health close their respective accounts. In contrast, 37 percent of the uninsured who remain healthy drop their risky asset accounts while interestingly, a smaller proportion of 29 percent of those who are sick close their accounts.

With respect to the differences for risky asset closing between waves 6 and 9, among singles, of those with health insurance, 13 percent who remain healthy close their risky asset accounts, while 21 percent who report a decline in health close their respective accounts. In contrast, with the uninsured, 25 percent who remain healthy drop their risky asset accounts while only 20 percent of those who get sick close their accounts between waves.

Among insured couples, between waves 6 and 9, 13 percent of individuals who remain healthy close their risky asset accounts, while 15 percent who report a decline in health close their respective accounts. On the other hand, with the uninsured, the percentage of those who close their risky asset accounts is the same (33 percent) for both those who stay healthy and those who experience a health shock. Uninsured couples without health insurance who became sick tapped quite heavily into their medium risk assets, relative to those who remain healthy.

The main observations to draw from the figures in Table 3 are as follows: They appear to be a suggestive (negative) relationship between health and (especially risky) asset holding for married couples. This rings particularly true for those who are insured. We also note that married couples who became sick drew heavily on their medium risk asset (bonds and retirement accounts). By contrast, in general households were less likely to close safe accounts, whether or not they were healthy or became sick. Variations in health and closing of safe accounts are therefore fairly subdued. The patterns of the account closings and health status for uninsured singles were more unclear.

IV Empirical Results

A. Random-Effects Analysis

We begin our regression analysis by conducting an examination of asset ownership

across the entire three-year panel, controlling for several factors. As a baseline of comparison with previous studies we consider a random effects model of asset ownership with health and other relevant household characteristics, followed by estimating the same model for both uninsured and insured individuals. The random-effect model is as follows:

$$Asset\ Ownership_{it} = \Phi(\eta Health\ Status_{it} + X_{it}\beta + \mu_i + \varepsilon_{it}) \qquad (1)$$

Where, *Health Status* is our self-reported health variable on a 1 to 5 scale. In light of Kennedy and Crossley (2002), we therefore reduce the effect of an inconsistent one point difference in health status across waves by using the entire 5 point scale as our health status regressor. Thus, any increase in their health status variable for an individual is an indication of a negative change in health. X_{it} is a vector of time-variant and invariant exogenous explanatory variables, μ_i is unobserved time-invariant individual-specific effect that follows an independent normal distribution, and ε_{it} is idiosyncratic error following its own independent normal distribution.

The explanatory variables include a health insurance indicator, giving a 1 if an individual is uninsured and a 0, if they are insured by either a government program or by a public insurance program. We also include the number of annual visits to the doctor, as a proxy for out-of-pocket medical expenses, as has been previously done. In addition we include dummy variables for education, household income during the month in which the individual reported a change in health status, and also net worth, age, gender and race. Gender is giving a 1 if female, and race is giving a 1 if black.

Table 4A and 4B (left-hand side panels) reports the marginal effects of the random-effect probit model of asset ownership for singles and married, respectively, by the characterization of

the asset class. Considering asset holdings without accounting for unobserved heterogeneity, the random-effects estimates suggest that poorer health exerts a negative and statistically significant effect on the probability of owning assets in any class. Having no health insurance also exerts a statistically significant negative effect on the probability of holding any asset.[7] Because the significance of these health correlations is susceptible to heterogeneity, we turn next to a fixed-effect analysis.

B. Fixed-Effects Analysis

As mentioned, the benefit of the SIPP panel data is that it allows us to examine the immediate consequences of a health event and the ensuing short-term asset ownership changes for a given individual. In doing so, we want to control for unobserved individual heterogeneity. Also particularly since our panel begins during a recession (in 2001), which likely may have had an effect on initial asset ownership we want to ensure that we observe only changes in asset ownership, which may be explained by an observed change in health. Thus we further use a conditional fixed-effects logit model (McFadden 1980, Greene, 2001) to estimate the longitudinal binary choice of asset ownership as a solution to dealing with potential heterogeneity and any possible omitted variable problem. The conditional fixed-effects logit model is as follows:

$$Asset\ Ownership_{it} = \Lambda(\alpha_{i+} \eta' Health\ Status_{it} + X'_{it}\beta' + \varepsilon_{it}) \qquad (2)$$

[7] The results of the other covariates are as expected. Married couples who visit their doctor more frequently (who tend to be economically better off) are more likely to hold some kind of risky assets. Considering age, the older the individual, the more likely he is to own some kind of assets in each class. Higher household income is significant and positively related to asset ownership and net worth is significant and positively related to asset ownership. Also, those with more educational attainment are significantly more likely to own assets. This is true across each category. Blacks are significantly less likely to own any kind of assets and married females are significantly less likely to hold safe and medium assets.

where Λ is the cdf for the logistic distribution (Chamberlain, 1980; Greene 2001).

Table 4A and 4B (right-hand side panels) reports the results for the conditional fixed-effects logit estimates, for singles and married, respectively. Recall that any increase in the health status variable for an individual is an indication of a negative change in health. Hence, negative fixed-effects coefficients for this covariate reflect a greater tendency to drop assets and close accounts than open new account if the individual experience a negative change in health status.

In Table 4A (right hand side panel) the association between the health variables and any types of asset for singles disappear in the fixed effects estimates, in contrast to the random effects, implying an influential role for heterogeneity in the singles sample.

In Table 4B (right hand side panel), first, we note that married couples who are without health insurance are significantly more likely to close their checking, CDO and other low-risk or more liquid accounts, with a fixed-effects estimate of -0.410. Focusing on the health status effect, unlike the previous studies, which found that health status increases significantly the probability for the old to own safe assets, we find that for those at a working-age, health status does not affect safe asset holdings on the extensive margin.[8] Also, the cross sectional correlations that were noted with married couples and closing of medium assets do not necessarily imply causality, as this association also vanishes in the fixed effects estimate. There are heavy costs and penalty for withdrawing retirement accounts, before being retired, which could also explain why working households would be reluctant to go into these types of medium assets.

By contrast, for the pooled sample of married individuals, the result shows that health status is a significant predictor of not holding any risky assets, (with a fixed-effect estimate of -

[8] It would be of interest to know how much is held in those accounts. If the dollar value held is low, it is possible that they are inconsequential in the decision to response to health and high medical costs that may entail.

0.097). Interestingly, in Table 5, after we ran, further, separate fixed-effects regressions for risky asset holding, respectively, for those with and without health insurance coverage, we find that our fixed-effects result of a significant effect of health on risky asset is true only among married individuals who are insured (with a t-statistic of -2.52). A likely explanation for this is that married individuals (especially those who choose to purchase insurance) are generally risk averse across discrete choice scenarios. When they are hit by a negative change in their health they demonstrate risk aversion by having a greater tendency to drop their high-risk assets.

Another alternative explanation could also be in order. According to risk and risk management models, in general households should be able to use savings (and other formal and informal means of insurance such as networks) to smooth out consumption (including medical expenditures) in the face of idiosyncratic shocks (Dercon, 2002; Townsend, 1995). In the context of health shocks, this suggests that health insurance should mitigate households' risks. In practice, however, Smith (1999, 2003) and Levy (2002) find that while health insurance reduces out-of-pocket payments, operating on the expenditure side, it does not fully protect households against income risk. Following Smith and Levy findings, it is possible that insured married households in our sample, to the extent that they were not fully protected, drew upon their risky assets, which are likely to be of more substantial amounts, as a result of a negative change in health, to cover medical costs. This argument is reinforced by the fact that arguably, the doctor visits variable that we use as a proxy for out-of-pocket medical expenses is a poor proxy for actual out-of-pocket medical expenses that households may be facing. Income, although we control for it, may also be subject to some measurement errors. The potential channels of medical costs and labor income shocks merit further investigation.

Given that they were so few people without health insurance and so few singles who held

risky assets, it is possible that the results for these groups are subject to sample size errors. But it is also possible that the correlations for these groups are more complex than for insured married households, as we noted in the beginning that their socioeconomic and demographic characteristics vary widely. Additional analysis of the younger uninsured and single headed households is needed to further our understanding of these groups' savings behavior in relation to health shocks.

IV. Asset Proportions in Financial Net Worth And Insurance Coverage

A. Average Changes in Asset Fractions

We now turn to a (descriptive) analysis of asset fractions or portfolio decisions. Table 7 compares the changes in asset fractions between those with and without health insurance and how they differ when they experience a decline in health. Between waves 3 and waves 6, uninsured singles that stay healthy decrease their asset fraction by 0.16 while the uninsured who get sick decrease their asset fraction by 0.19. This 0.03 difference in how the uninsured reallocate on the intensive is a much smaller difference compared to the insured whose average change in risky asset fraction is 0.28 lower for those who get sick.

The same effect is observed over the next year. For those singles who experience a decline in health between waves 6 and 9, the uninsured sick actually *increase* their portfolio shares 0.16 more than their healthy counterparts. Simultaneously, the insured with declining health demonstrate risk aversion by decreasing their risky asset portfolio share by 0.03 more than the insured singles who remained healthy.

For couples between these same waves, uninsured individuals who get sick *increase* their portfolio shares in financial wealth by 2 percent relative to those who stay healthy, a jump

understandably smaller than that demonstrated by uninsured singles. Insured couples display risk aversion again, as those who become sick between these years decrease their risky portfolio shares by 14 percent relative to the healthy.

B. Random-Effects and Fixed-effects Analysis of Assets Proportions Fractions

We computed random-effects tobit estimates of asset reallocation conditional on ownership (not reported on a Table). The wealth fractions were defined as the amount of asset holdings within a specific class divided by the individual's net worth, being applied to each asset class. In doing so, these estimates report the effect of health status on the fraction of asset holding to wealth without taking into account unobserved heterogeneity. These tobit estimates were censored at both zero and one.[9] With respect to the health variables, having health insurance has a significant effect on the asset fraction to wealth, across all classes. Becoming sick has significantly smaller safe, medium risk, and risky asset fractions. Hence the random-effect analysis of the SIPP is suggestive of a relationship between health and (dissaving) behaviors across the board. The literature based on older households (Rosen and Wu, 2004) has found evidence of reallocation, but not necessarily complete divestment. This is an indication that the younger working age households may be behaving intrinsically different from the older retired households with respect to risk hedging in the context of a health shock.

To replicate our fixed-effects analysis for asset reallocation within ownership status we use a fixed-effects semiparametric tobit model censored at 0 and 1 put forth by Honore (1992):

[9] The control variables results were as expected. Age is positively correlated with asset fractions. HH Income and net worth are both positively correlated with all asset fractions. This result is consistent with, Dynan, et al (2004) who assert that the rich save more. Those who are more educated are more likely to hold more assets of any class as households with more education have better information about various investment opportunities (King and Leape, 1998). Blacks have significantly lower asset fractions. Married couples have significantly greater medium and risky asset fractions than singles, though with safe asset fractions, the relationship is unclear. Those who visit the doctor more have significantly greater asset fractions across all classes. This is consistent with the fact that those who visit their doctors and have higher health service utilization tend to be economically better off (Bhandari, S., 2006).

$$y_{it}^{*} = a_i + \eta'' Health\ Status_{it} + X''_{it}\beta'' + \varepsilon_{it} \qquad (3)$$

$$y_{it} = \begin{cases} 0 \text{ if } y_{it}^{*} \leq 0 \\ y_{it}^{*} \text{ if } 0 < y_{it}^{*} < 1 \\ 1 \text{ if } y_{it}^{*} \geq 1 \end{cases}$$

Where y_{it}^{*} is an asset fraction of total financial net worth, X'' is a vector of covariates.

The (preliminary) fixed-effects tobit results (not reported on a table) suggest that this observed decrease in risky asset holding in response to a decline in health observed in the data may also be evident even within asset portfolio adjustment.

V. Conclusion

Our findings show that a decline in health status among insured married couples leads to a significant reduction in their risky asset holdings across the three-year panel of the 2001 Survey of Income and Program Participation. We find that these results are consistent across both, account closings and asset reallocation within portfolios, the latter on a preliminary basis. We confirm that the result on health and risky asset is not due to any form of unobserved heterogeneity by using fixed-effects models for both intensive and extensive margins. We suggest that these results are ultimately supported by a general theory of risk, that is, individuals who demonstrate risk aversion in their purchase of health insurance also demonstrate risk aversion in divesting their risky asset holdings. This finding is also suggestive of the possibility that these insured households may not be fully protected against income and medical costs shocks.

The results for the uninsured households and single households did not share as much

light on their savings behavior. The correlations for these more vulnerable groups are likely too complex and as such the scope of this analysis may not have fully captured them. Further research focusing on the sample of uninsured and single headed households and in particular on the family structure, such as single parent headed households with children, with no insurance, is warranted as these groups are also of special interest from a public policy perspective.

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Table 1. Health and Savings Measures Summary

Variable	All	Singles	Married
Demographics			
Average age	36.9	31.7	42.4
Average years of education	13.9	13.2	14.6
Non-Hispanic White	0.76	0.70	0.81
Black	0.13	0.18	0.08
Hispanic	0.12	0.12	0.11
Female	0.52	0.53	0.52
Health Measures			
% Sick	0.11	0.12	0.10
No health insurance	0.17	0.21	0.11
Median Doctor Visits Per Year	2	1	2
Become Sick Within Survey			
w6-w3	4.8%	4.9%	4.7%
w9-w6	4.6%	5.1%	4.3%
Dependent Children	0.93	0.71	1.20
Any Financial Assets	0.57	0.44	0.73
Any Safe Assets	0.55	0.43	0.70
Any Medium Risk Assets	0.17	0.09	0.25
Any Risky Assets	0.21	0.12	0.30
Asset Fractions (*cond. on owning*)			
Fraction in Safe Assets	0.201	0.281	0.202
Fraction in Medium Risk	0.672	0.573	0.696
Fraction in Risky	0.128	0.146	0.102
N	62091	20331	41760

Source: Authors' calculations based on 2001 Survey of Income and Program Participitation Data Provided By NBER and CEPR.
Note: The self-perceived health status question is asked once every 3 waves (once a year). It also reports statistics for wealth and asset ownership. Asset ownership for each type is reported every wave (every four months). We define "becoming sick between survey" as any negative deterioration in health status reported from the initial period.

Table 2: Probability of Holding Assets

N=36700	Safe Assets		Medium Risk Assets		High Risk Assets	
Characteristics	Healthy	Sick	Healthy	Sick	Healthy	Sick
All People	0.61	0.35	0.20	0.08	0.23	0.10
Marital Status						
Single	0.45	0.29	0.10	0.05	0.13	0.06
Couples	0.72	0.51	0.27	0.14	0.32	0.17
Insurance Coverage						
Uninsured	0.29	0.21	0.04	0.03	0.05	0.03
Insured	0.67	0.44	0.23	0.11	0.28	0.12
Racial/ethnicity						
Non-hispanic White	0.68	0.42	0.24	0.11	0.28	0.12
Black	0.41	0.22	0.06	0.02	0.09	0.04
Hispanic	0.41	0.23	0.06	0.03	0.07	0.05
Poverty Status						
Poor	0.28	0.20	0.05	0.01	0.05	0.02
Non-Poor	0.65	0.41	0.21	0.10	0.27	0.13
Age Category						
25-34	0.59	0.39	0.14	0.08	0.20	0.11
35-44	0.67	0.44	0.23	0.11	0.29	0.14
45-54	0.72	0.42	0.30	0.12	0.33	0.13

Table 3. Account Closings Between Years

	Safe Assets		Medium Risk		Risky Assets	
	w6-w3	**w9-w6**	**w6-w3**	**w9-w6**	**w6-w3**	**w9-w6**
Singles						
All	0.06	0.11	0.10	0.11	0.16	0.15
Become Sick	0.06	0.13	0.07	0.10	0.25	0.20
Remain Healthy	0.06	0.10	0.10	0.10	0.16	0.15
Uninsured						
Become Sick	0.08	0.22	0.20	0.25	0.33	0.20
Remain Healthy	0.07	0.21	0.20	0.25	0.32	0.25
Insured						
Become Sick	0.05	0.12	0.03	0.06	0.24	0.21
Remain Healthy	0.05	0.08	0.09	0.08	0.13	0.13
Couples						
All	0.05	0.06	0.09	0.09	0.15	0.14
Become Sick	0.07	0.10	0.16	0.05	0.22	0.16
Remain Healthy	0.05	0.06	0.09	0.09	0.15	0.13
Uninsured						
Become Sick	0.10	0.28	0.38	0.15	0.29	0.33
Remain Healthy	0.07	0.2	0.21	0.18	0.37	0.33
Insured						
Become Sick	0.06	0.07	0.14	0.05	0.21	0.15
Remain Healthy	0.04	0.05	0.09	0.09	0.14	0.13
N (those starting w/ acct)	17567	17523	5900	6008	7606	7169

Notes: we define uninsured as not having health insurance either in wave 3 or wave 6 and insured as having coverage in either period.

Table 4A. Asset Ownership Probabilities – Singles						
	Random Effects Probit			Fixed Effects Logit		
	Safe Assets	**Medium Risk**	**Risky Assets**	**Safe Assets**	**Medium Risk**	**Risky Assets**
Health Status	**-0.165** **(0.024)**	**-0.165** **(0.040)**	**-.1665818** **.0369384**	-.0105808 .0477641	.0299743 .0902793	-.0366339 .0869843
Health Insurance Coverage	**-.6346877** **.0609898**	**-.3267141** **.1059194**	**-.7146474** **.1040156**	-.1726038 .1191827	.3274893 .24752	-.4395371 .232341
Doctor Visits	-.0028657 .00241	-.0012262 .0042478	.0017752 .0033466	.000657 .0051945	-.0011626 .0120796	-.0024066 .0075199
Age	**.0272577** **.0047551**	**.0771288** **.007191**	**.0332247** **.0061584**	**-.119858** **.0351**	.1139951 .0618975	**-.5863645** **.0603873**
HH Income / 10^4	**.5272739** **.0713638**	**.4520709** **.0932055**	**.5083972** **.0859157**	**.5013502** **.14461**	.3139352 .1966504	.3177046 .1732148
Net Worth / 10^6	**.7026986** **.1417071**	**.0867457** **.0413255**	**.1237001** **.0462095**	.5013502 .14461	.6400971 .4139058	**.7036836** **.3263158**
Some High School	**-4.240042** **.1890667**	**-8.366257** **.3914207**	**-8.633813** **.3955256**	-	-	-
High School	**-2.941766** **.1683443**	**-3.778582** **.2792486**	**-3.624917** **.2780555**	-	-	-
Some College	**-1.933102** **.167936**	**-2.842388** **.2596293**	**-2.79044** **.2745789**	-	-	-
College	**-.8186332** **.1608338**	**-1.559547** **.2468926**	**-1.619219** **.2721671**	-	-	-
Female	-.013188 .0836037	-.1587918 .109646	**-.5008479** **.1060432**	-	-	-
Black	**-1.257787** **.1044219**	**-1.993055** **.2986761**	**-1.224896** **.1603058**	-	-	-
Constant	**2.734901** **.2775957**	**-2.708832** **.4303128**	**-1.179205** **.3904328**	-	-	-

Table 4B. Asset Ownership Probabilities – Couples						
	Random Effects Probit			Fixed Effects Logit		
	Safe Assets	**Medium Risk**	**Risky Assets**	**Safe Assets**	**Medium Risk**	**Risky Assets**
Health Status	**-.1353741**	**-.1221098**	**-.1751293**	-.0243108	.0051686	**-.0972224**
	.0183941	**.02531**	**.0213645**	.036688	.05475	**.045152**
No Health Insurance Coverage	**-.948224**	**-.7489051**	**-.8104819**	**-.4104154**	-.3164659	-.016102
	.0584703	**.1053535**	**.0879167**	**.1099903**	.2316082	.1943851
Doctor Visits	.0033158	.0036158	**.0041497**	.0021624	.0055355	.0011735
	.0017584	.0022915	**.0020808**	.0032245	.0049821	.0042815
Age	**.0232059**	**.0873116**	**.0206914**	-.0417162	.0200205	**.1321979**
	.003456	**.0048743**	**.0039827**	.0261243	.0356518	**.0698877**
HH Income / 10^4	**.6171337**	**.3989883**	**.3671401**	**.2275291**	.1554216	1.249489
	.0446246	**.046248**	**.0385772**	**.0828736**	.0832583	.1658523
Net Worth / 10^6	.0040487	.0297185	**1.960188**	**.5571901**	**1.117627**	**-.3841326**
	.0066701	.0157049	**.0819453**	**.1810576**	**.2021125**	**.0300945**
Some High School	**-3.771187**	**-7.467209**	**-4.834449**	-	-	-
	.1324491	**.2273891**	**.2187476**			
High School	**-1.969636**	**-3.397423**	**-3.005456**	-	-	-
	.1012658	**.1610623**	**.1197767**			
Some College	**-1.12053**	**-2.673464**	**-2.20321**	-	-	-
	.1019915	**.1586567**	**.1223711**			
College	**-.3573149**	**-1.214815**	**-.8437637**	-	-	-
	.0961873	**.1532899**	**.117424**			
Female	**-.0391892**	**-.2326484**	**-.284099**	-	-	-
	.0556664	**.0709582**	**.0638285**			
Black	**-1.307117**	**-2.277444**	**-1.335311**	-	-	-
	.1054811	**.231482**	**.1233934**			
Constant	**3.596617**	**-2.19647**	**.6053248**	-	-	-
	.2050559	**.3097939**	**.2370535**			

Table 5: Risky Asset Ownership Probability By Insurance Coverage						
	Couples Fixed Effects Logits			Single Fixed Effects Logits		
		With no health insurance	**With health insurance**		**With no health insurance**	**With health insurance**
Health Status		.4234878	**-.1188505**		-.3845923	-.0059195
		.2986886	**.0471522**		.3363519	.0996732
Doctor Visits		.0546645	.0001437		.1481996	-.0054894
		.0753656	.0042727		.158763	.0097917
Age		-.1067825	**-.3915483**		-.2468056	**-.6206377**
		.2072237	**.0311885**		.2250529	**.06705**
HH Income / 10^4		**2.625374**	.1267184		-.4819855	.2698379
		1.270746	.0716465		1.367904	.1836166
Net Worth / 10^6		1.045299	**1.221431**		1.828157	.7318851
		1.626687	**.1677375**		2.777693	.3495841

Table 6. Average Asset Fraction Changes Between Years

	Safe Assets		Medium Risk		Risky Assets	
	w6-w3	**w9-w6**	**w6-w3**	**w9-w6**	**w6-w3**	**w9-w6**
Singles	.116	-.085	.308	.062	.069	-.003
All						
Become Sick	.044	.019	.235	.045	-.191	-.005
Remain Healthy	.139	-.083	.331	.065	.083	-.003
Uninsured						
Become Sick	-.032	-.043	-.027	-.282	-.190	.204
Remain Healthy	-.175	.028	.032	-.236	-.157	.044
Insured						
Become Sick	.070	.031	.312	.103	-.191	-.042
Remain Healthy	.200	-.105	.363	.100	.108	-.009
Couples	-.017	-.007	.187	-.122	.160	-.015
All						
Become Sick	-.016	.014	-.142	-.103	-.049	-.013
Remain Healthy	-.020	-.008	.186	-.121	.077	-.015
Uninsured						
Become Sick	-.043	.036	-.044	-.344	-.393	.243
Remain Healthy	-.018	-.014	-.082	.040	3.36	-.033
Insured						
Become Sick	-.026	.010	-.150	-.090	-.044	-.029
Remain Healthy	-.020	-.008	.192	-.126	-.013	-.015
N (those starting w/ acct)	52438	52406	17684	18008	22785	21490

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