Effect of mortgage debt on health

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Abstract

Using six waves of the Health and Retirement Survey (HRS), we examined the effect of mortgage debt on a number of health outcomes: overall well being, high blood pressure, obesity, and emotional stress. Results show the use of housing finance, measured by mortgage payment to income and loan to value, is correlated negative health outcomes. Through fixed effects, a falsification test (cancer as the health outcome), and instrumental variables we establish causality running from higher debt to poorer health. We employ the decline in home values post 2006 as an exogenous shock to further identify the effect of loan to value on health. These findings have important implications for government policy, which currently subsidizes leveraged housing debt, and also highlight the need for improved financial literacy in the United States.

Author Keywords: Homeownership,mortgage debt, leverage, health, instrumental variables

JEL classification codes:

1 Introduction

Owner-occupied housing is a major asset on U.S. households' balance sheet, accounting for over 31 percent of total assets (Bucks et al. (2006)). A number of social benefits are associated with homeownership. Homeownership lengthens housing tenure by increasing the cost of relocating and reducing household mobility. Longer housing tenure promotes family stability and better child outcomes. Longer housing tenure is also associated with better self-reported health (Dietz and Haurin (2003), Pollack et al. (2004)). Homeowners have an incentive to improve housing structures and participate in political and social activities. Though homeowners bear the cost of capital reinvestments and community engagement, neighboring homeowners benefit as well through higher home valuations[1] (Dietz and Haurin (2003), Glaeser and Shapiro (2003)).

Since home purchases require a great deal more capital than households typically have on hand, most home sales are financed. So while homes constitute a large share of household assets, home mortgages constitute a large share of household liabilities. U.S. policy encourages homeownership but little is understood about the ramifications of the concomitant debt. In fact, the government's subsidy of mortgage financing[2] encourages leverage over equity in home purchases and greater consumption of housing than households would have chosen if these subsidies did not exist (Glaeser and Shapiro (2003)). In 2008, 93 percent of homes purchased involved financing, though in 2010, this declined to 91 percent (Hale (2009, 2010)). The prevalence of house financing is also affected by the interaction between policy and economic conditions. During periods of mortgage credit expansion, riskier homebuyers can also qualify for mortgages, thereby increasing the prevalence of mortgage finance in home sales (Mian and Sufi (2009), Keys et al. (2010)).

While homeownership is associated with positive social outcomes, mortgage indebtedness

[1] The externality works in the opposite direction since a foreclosure lowers neighboring home values.

[2] The cost of borrowing is subsidized by allowing interest paid on mortgages to be deducted from income (Rosen (1985)) and through government guarantees which reduce the credit risk of mortgage loans, essentially lowering the interest rate.

is associated with negative health outcomes. Indebted homeowners precommit to timely payment of principal and interest for up to thirty years regardless of prevailing economic conditions. As a result, indebted homeowners are more likely to experience financial stress. Stress can lead to unhealthy behaviors such as drinking, smoking, or substance abuse, or may cause sleep problems and eating disorders (Neil Schneiderman (2008)). Homeowners also face higher relocation costs which makes it more costly to adjust housing consumption (Dietz and Haurin (2003)). As a result, indebted homeowners are more likely to reduce non-housing consumption in response to economic downturns due to the transaction cost of adjusting housing consumption. Theoretically, the link between debt and health can be direct, through financial stress, or indirect, through the derived demand for medical care[3].

Given the potential negative relationship between debt and health, policies that promote homeownership through financing may have unintended consequence of impairing health, especially during economic downturns. Prior studies on debt and health consider individuals near or at foreclosure. However, the share of mortgagors that default is small compared to the share of homeowners with mortgage debt outstanding and the negative impact of debt on health applies to all mortgagors regardless of whether they are foreclosed upon. To our knowledge, this is the only study to use household mortgage loan to value and payment-to-income ratios to measure the effect of the intensity of mortgage indebtedness on mental and physical health among a nationally representative sample of adults over the age of 50 in the U.S.

We show that higher mortgage indebtedness is associated with depression, obesity, high blood pressure, poor health, decline in health, and mortality. Since mortgage indebtedness and health may be endogenous, the estimated effect may be biased. Furthermore, if there is an omitted variable in the specification, say initial health capital,or risk tolerance or time preference, that both causes poor health and higher mortgage loan to value and payment-

[3]For example, Keese and Schmitz (2010) using longitudinal data for Germany found that individuals with debt are more likely to visit a doctor. Since Germany has universal healthcare, the indirect effect of debt on health is likely smaller. Currie and Tekin (2011) using foreclosure data for four states in the U.S. found that greater foreclosures is associated with more hospital visits and less preventative medical visits.

to-income ratios, the estimated effect would be biased as well. We argue that the housing decline serves as a natural experiment by exogenously varying the mortgage debt to home value ratio by state and year. We use the change in house prices to instrument for mortgage indebtedness. Since the change in housing prices varied by state over time, we also used a difference-in-difference framework to estimate the effect of debt on health for states that experienced large negative shocks to home prices relative to those that experienced smaller negative shocks.

2 Literature Review

A few studies have established a link between foreclosure and worsening health. Pollack and Lynch (2009) examined the health of participants undergoing foreclosure, who were recruited by a mortgage counseling agency, compared to a community sample for the 2008 Southeastern Pennsylvania Household Health Survey. The foreclosed were significantly more likely to have hypertension and heart diseases and to have a clinically diagnosed psychiatric condition than the control group, with 36.7 percent meeting the screening criteria for major depression. The foreclosed reported smoking more and drinking more in the past month. Cost related medical nonadherence was quite high and more than half of the sample reported skipping or delaying a meal because of cost. However, given the cross-sectional nature of this study, a causal relationship was not established. More recently, Currie and Tekin (2011) showed an association between foreclosures and hospital visits by zip code for four states, with the impact highest for those aged 20 to 49. Again, their work is cross sectional.

For the UK, Taylor et al. (2006) using data from the British Household Panel Survey (BHPS) from 1991 to 2003 found psychological effects of being past due on housing debt for men, after controlling for financial conditions and other personal traits. The psychological impact increases along with the probability of losing one's home. Women suffer from longer term, continuous problems making housing payments, Nettleton and Burrows (1998) use the

Survey of English Housing, which is a secondary analysis of the British Household Panel Survey (BHPS), and consists of households headed by younger people, single parents, single male parents, divorced and separated, divorced and inactive. They examine two transitions: 1991 to 1992 and 1994 to 1995. In the first, the housing recession was at its deepest; by the second, the recession was beginning to end. A weighted sample was constructed of individuals who had a mortgage but reported having no problems paying it in the first year. In the first transition: 15 percent of the 3,700 sampled were having trouble by the second year. In the second transition, 10 percent of 3,500 were in trouble. GHQ12 scores, ranging from zero for excellent to 36 for very poor, were used to measure mental wellbeing. For men, mortgage problems led to a 1.64 increase in GHQ12; for women it led to a 2.51 increase.

While these previous studies in the US and UK complement our work, they are relevant to a much smaller segment of the population, individuals in or near foreclosure, as opposed to all mortgagors. On the other side, a number of researchers have studied a less specific question: the effect of financial distress in general on health. Individuals experiencing financial difficulties were found to be more likely to exhibit depression (Skapinakis et al. (2006), Bridges and Disney (2010)). Skapinakis et al. (2006) used longitudinal data from two periods, thereby establishing a case for causality. Both O'Neill et al. (2005) and Lyons and Yilmazer (2005) found a positive correlation between self-reported financial stress and worse self-reported health. However, Lyons and Yilmazer (2005) found causality from health to financial strain but not the reverse through a 2-stage probit using cross sectional data. While the correlation between financial stress and worse self-reported health lend support to our study, studying financial stress does not lend itself to specific policies: stress could be from a multiple of sources. Mortgage debt, on the other hand, is an identifiable condition controllable by individuals, lending institutions and government.

Literature examining the effect of personal debt on health is surprisingly sparse. A link between wealth, as opposed to debt, to health has long been recognized, starting with Grossman (1972). In general, research has shown the causality running from wealth to health,

especially once the sample is restricted to developed countries. Drentea and Lavrakas (2000) found a link between credit card debt-to-income and physical impairment in one study, then in a follow up study, Drentea (2000) used multivariate analysis to show that higher credit card debt-to-income increases anxiety. Similarly, Brown et al. (2005) find that higher unsecured household debt reduces the probability of scoring the maximum on a test that measures mental health, and though they do not get statistically significant results when they examine the effect of mortgage debt, they do find that higher credit lines negatively effect mental health. While longitudinal in nature, their study uses only 2 waves of the British Household Panel Survey (BHPS), 1995 and 2000.

Keese and Schmitz (2010) is the closest attempt to establishing causality running from debt to poor health. Using the German Socioeconomic Panel (GSOEP) dataset, this working paper measured the effects of consumer debt to income, housing debt to income and over-indebtedness on health satisfaction, mental health, and probability of being obese. The OLS results showed a clear link between more debt and worse mental health and higher incidences of obesity, though the obesity result only occurs with unsecured debt. To establish causality they ran a fixed effects model with the same dependent and independent variables on the full sample and a subsample of those always employed. They also incorporated a lagged version. While the coefficients are smaller in most of the fixed effects runs, their results are highly significant for both mental health and health satisfaction, with mortgage debt affecting mental health more strongly. Causality between high levels of debt and obesity was not established in any of the fixed effects modeling. The results for the subsample of constantly employed individuals were stable for all variables, and actually more pronounced for mental health. The difference between Keese and Schmitz (2010) and our study is that they did not focus on mortgage debt, nor did Germany have the kind of regional housing market downturns that the US experienced, so housing prices would most likely not be a relevant instrument in their study.

That a financial shock such as the decline in home values which have occurred in the

past few years could have an effect on health is supported by Gardner and Oswald (2006)'s study of how medium-sized lottery wins affect mental wellbeing, using the GHQ 12 score as a measure of mental health (with a higher score indicating worse mental state). They found that those with lottery wins greater than $1000 exhibited score decreases of 1.22 on average while the control group had increases of 0.18, yielding a difference in differences of 1.4. They measured GHQ at t-2 and t+2, thereby ensuring that the effect is not just short term euphoria over winning the lottery.

3 Data

Individual level data on health, housing, financial situation, and other socioeconomic factors were obtained from the University of Michigan Health and Retirement Survey (HRS). The HRS is a nationally representative survey of adults over the age of 50 conducted every two years. Since young adults also purchase homes using finance, excluding these individuals is a limitation of the data. On the other hand, older adults are more likely to be homeowners and less likely to transition in or out of homeownership which can potentially complicate the estimation[4].

Six waves of the HRS from 1998 to 2008 were chosen to overlap with the housing boom and bust cycle. Individuals living in a multifamily home, nursing home, farm, or ranch were excluded. Treating each wave as a cross-section, all 6 waves were pooled to create a dataset with 100,579 observations. The pooled dataset was used in the ols estimations. Since for the 2SLS estimations, we are using negative external shocks to house value to identify the effect of higher LTV on health, we limit the sample to homeowners in the last three waves of the HRS: 2004, 2006, 2008. When pooled, this still provides us with 36,522 observations. An unbalanced panel dataset was constructed again using the 6 waves but excluding individuals who died between 1998 and 2008. The unbalanced panel dataset was used in the fixed effects

[4]The participation rate of homeownership stabilizes at around 70 percent after age 45 (Poterba and Samwick, 2001).

and first differencing estimations, while for the difference-in-differences we compare 2008 (post) to 2006 (pre).

The HRS housing module contains extensive information on housing-related items such as homeownership, housing structure, home purchase price, current house price, and housing debt outstanding. The HRS dataset was merged to an index of house prices by metropolitan statistical area (MSA) and, separately, by state. Home price index data was obtained from Freddie Mac[5] which publishes the Freddie Mac House Price Index (FMHPI). The FMHPI is constructed using repeat transactions on single-family detached or townhome properties which serve as collateral for mortgage loans purchased by either Freddie Mac or Fannie Mae. The FMHPI closely tracks other constant-quality home prices indices such as Standard and Poor's Case-Shiller and Federal Housing Finance Agency.

3.1 Variable definitions

Health variables related to financial stress include poor overall health, negative changes to health, high blood pressure, obesity,and depression. HRS measures overall wellbeing as a categorical variable where 1 indicates excellent health, 2 indicates very good health, 3 indicates good health, 4 indicates fair health, and 5 indicates poor health. Poor overall health was constructed as a dichotomous variable where one indicates fair or poor overall wellbeing. High blood pressure is a self-reported dichotomous variable where one indicates presence of high blood pressure. Obesity was constructed as a dichotomous variable where one indicates a body-mass index of 30 or greater. The HRS measures depression with a modified version of the Center for Epidemiologic Studies Depression (CESD) scale. The CESD score is the sum of six indicators for the presence of depressive symptoms (depression, everything is an effort, sleep is restless, felt alone, felt sad, and could not get going) minus two indicators for the presence of non-depressive symptoms (felt happy and enjoyed life). CESD scores range from 1 to 8, with 8 representing those exhibiting the most depressive symptoms. We converted

[5]Freddie Mac is a former government sponsored entity now under a conservatorship directed by the Federal Housing Finance Agency (FHFA).

this measure of depression into a dichotomous variable with 0 representing those who scored 1 , and 1 representing respondents with scores greater than 1. Presence of cancer(1 versus 0, no presence) was used as a falsification test, assuming it is unrelated to financial stress, in the IV and DD estimations.

Households experience financial stress when the burden of mortgage indebtedness becomes excessive relative to household income or home price. We consider two housing leverage ratios to approximate the burden of mortgage indebtedness. The first is a balance sheet measure of leverage known as the loan to value ratio (LTV). The LTV is calculated as the ratio of the amount of mortgage debt outstanding to the current home price[6]. When home prices decline, homeowners with high LTVs cannot reduce housing consumption accordingly and even if they manage to sell the home, they are more likely incur a financial loss due to lower prices and transaction fees. The second is a measure of household liquidity calculated as the ratio of annual mortgage payment to annual household income, hereafter referred to as the payment-to-income ratio (PTI). Homeowners with high PTIs are more likely to experience financial stress of maintaining payments[7]. A small number of respondents had LTVs and PTIs that far exceeded average values. LTVs and PTIs were topcoded at their respective 99 percentile values. For homeowners without mortgage debt, the mortgage debt outstanding was set to a tenth of a cent so that the natural log of the LTVs and PTIs can be calculated for values.

3.2 Summary statistics

Table 1 shows the mean values of the socioeconomic, health, and housing finance variables for the entire sample, homeowners, mortgagors, and distressed mortgagors[8]. As expected, due to the age limitations of the HRS, the share of homeowners in the sample is larger than

[6]The Rand version of HRS home value and mortgage debt variables were used instead of the raw HRS variable since it had fewer missing values. All housing variables refer to the respondent's primary residence.

[7]Homeowners with high PTIs and precautionary savings are less likely to experience financial stress. However, given the low savings rate in the U.S. from 1998 to 2008, it is an unlikely that homeowners with high PTIs fall in this category.

[8]Distressed mortgagors have LTV greater than 90 percent or PTI greater than or equal to 1.

that for U.S. households, 77 percent compared to 67.5 percent as of 2008 (*Current Population Survey/Housing Vacancy Survey*, 2011). On average, mortgagors have better overall health, lower incidence of depression, lower incidence of high blood pressure compared to the average for the entire sample. This could be because mortgagors tend to be younger, 61 versus 66 years for the entire sample. In contrast, the incidence of obesity is higher among mortgagors. Table 2 shows the housing finance variables for the entire sample, homeowners, and mortgagors over the ten years covered by the six HRS waves. Among mortgagors, the payments to income ratio increases slightly in this period while the loan to value remained roughly unchanged. Table 3 shows the time trend for health outcomes for the entire sample, homeowners, and mortgagors from 1998 to 2008. Concentrating on the subset of interest, mortgagors, we see the prevalence of obesity, high blood pressure, and diabetes, as well as negative changes in heath, increase over this period while the prevalence of poor health, depressive symptoms and cancer remains relatively stable.

4 Estimation strategy

The reduced form model for health as a function of mortgage loan characteristics and socioeconomic factors is given by

$$H_{it} = \beta_0 + \beta_1 \text{mtg pmt}_{it} + \beta_2 \text{income}_{it} + \beta_3 \text{loan amt}_{it} + \beta_4 \text{home price}_{it} + \mathbf{x}_{it}\theta + \epsilon_{it} \qquad (1)$$

where H is an health variable, mtg pmt_{it} is mortgage payment, loan amt_{it} is the amount of mortgage loan outstanding, X_{it} is a vector of socioeconomic variables for individual i in wave t, Θ is a vector of parameters for the effects of the socioeconomic factors. Mortgage payments and mortgage loan amount vary across individuals based on preferences and budget constraints. Since mortgagors have the option to refinance, mortgage payments can vary over time. Mortgage loan amounts may also vary over time due to the amortization structure of mortgage loans. The natural logs of mortgage payment, income, mortgage loan amount, and

home price were used in the estimations.

In the baseline model, parameters β_1 to β_4 are unrestricted to examine the effect of each mortgage loan characteristic on health. Restrictions are imposed on two of the parameters in the other two specifications of the baseline model to estimate the effect of housing leverage. The effect of mortgage payment to income (PTI) ratio, β_{PTI}, is estimated by restricting $\beta_1 = -\beta_2$. The effect of mortgage loan to home value (LTV) ratio, β_{LTV}, is estimated by restricting $\beta_3 = -\beta_4$. The restricted PTI and LTV models are given by

$$H_{it} = \beta_0 + \beta_{PTI}\left(\frac{\text{mtg pmt}}{\text{income}}\right)_{it} + \beta_3 \text{loan amt}_{it} + \beta_4 \text{home price}_{it} + \mathbf{x}_{it}\theta + \epsilon_{it} \tag{2}$$

$$H_{it} = \beta_0 + \beta_1 \text{mtg pmt}_{it} + \beta_2 \text{income}_{it} + \beta_{LTV}\left(\frac{\text{loan amt}}{\text{home price}}\right)_{it} + \mathbf{x}_{it}\theta + \epsilon_{it} \tag{3}$$

The effect of the housing leverage ratios on health status is captured by β_{PTI} and β_{LTV}. Payments to income measures how comfortably household income covers mortgage payments each year. Our hypothesis is that the higher the payments to income ratio, the greater the probability of financial stress and poor health. Loan to value measures the amount of leverage used to finance housing, which in general should decline over time as loans are amortized. However, if housing values decline or mortgagors refinance taking out equity, the equity in housing is reduced or may even become negative. The higher the loan to value, the greater the probability of financial stress and poor health.

For the six dichotomous health variables, equations 1 – 3 are estimated as linear probability models using pooled ordinary least squares[9]. However, these OLS estimates may suffer from omitted variable bias. We examine two different unobserved omitted variables – health capital endowment and health shock.

An unobserved, low health endowment[10] could lead to both a higher housing leverage

[9]Equations 1 – 3 were also estimated using maximum likelihood estimations as probit models with comparable results. Probit estimates are available by request.

[10]Grossman (1972a, 1972b) describes a model of demand for health in which health can be analyzed as a capital good that depreciates over time and consumers can make investments by producing health capital using health care, income, and time as inputs.

ratio and worse health because more of the individual's wealth is spent on medical services and less is spent on housing. This health endowment could be correlated with some of our other independent variables, such as income and education. Alternatively, individuals who have higher risk tolerance and/or time preferences which value the present over the future may both take on more debt and less care of their health. If these unobserved traits are constant over time (or at least in the ten year period of our study, which is a less restrictive assumption), estimating equations 2 and 3 as fixed effects models controls for the omitted variable bias. The fixed effects models are given by

$$H_{it} = \beta_{PTI}\left(\frac{\text{mtg pmt}}{\text{income}}\right)_{it} + \beta_3 \text{loan amt}_{it} + \beta_4 \text{home price}_{it} + \mathbf{x}_{it}\theta + \alpha_i + \epsilon_{it} \tag{4}$$

$$H_{it} = \beta_1 \text{mtg pmt}_{it} + \beta_2 \text{income}_{it} + \beta_{LTV}\left(\frac{\text{loan amt}}{\text{home price}}\right)_{it} + \mathbf{x}_{it}\theta + \alpha_i + \epsilon_{it} \tag{5}$$

If the unobserved health endowment (or any of the independent variables), varies with time but is correlated over time, estimating equations 2 and 3 as first difference models better controls for the omitted variable bias (correlation among the error terms across periods). The first difference models are given by

$$\Delta H_{it} = \beta_{PTI}\Delta\left(\frac{\text{mtg pmt}}{\text{income}}\right)_{it} + \beta_3 \Delta\text{loan amt}_{it} + \Delta\beta_4 \text{home price}_{it} + \Delta\mathbf{x}_{it}\theta + \Delta\epsilon_{it} \tag{6}$$

$$\Delta H_{it} = \beta_1 \Delta\text{mtg pmt}_{it} + \beta_2 \Delta\text{income}_{it} + \beta_{LTV}\Delta\left(\frac{\text{loan amt}}{\text{home price}}\right)_{it} + \Delta\mathbf{x}_{it}\theta + \Delta\epsilon_{it} \tag{7}$$

An unobserved negative health shock could also lead to both higher housing leverage ratio and poor health. To address the endogeneity between housing leverage and health in this case, we use two quasi-experimental techniques based on the variation in home prices[11]. The first is to use a difference-in-differences (DD) model to determine whether individuals in states that experienced greater price declines (treated states) between 2006 (pre) and

[11] We have the option of using self-reported house values from the HRS or Freddie MAC House Price Index (FMHPI) in the estimation.

2008 (post) also experienced a higher prevalence of poor health compared to individuals in states that did not experience the same magnitude of price declines (control states). We argue that the price decline is an exogenous shock caused by unforeseen economic conditions. Precedence for using the state of the housing market to identify the effect of mortgage debt on health can be found in Nettleton and Burrows (1998). The DD model is given by

$$H_i = \beta_0 + \beta_1 \text{treated states}_i + \beta_2 \text{post}_i + \beta_3 \text{treated states}_i \times \text{post}_i + \epsilon_i \tag{8}$$

and the DDD model is given by

$$\begin{aligned} H_i = \beta_0 + \beta_1 \text{treated states}_i + \beta_2 \text{distressed}_{i1} + \beta_3 \text{treated states}_i \times \text{distressed}_{i1} \\ + \delta_0 \text{post}_i + \delta_1 \text{post}_i \times \text{treated states}_i + \delta_2 \text{post}_i \times \text{distressed}_{i1} \\ + \delta_4 \text{post}_i \times \text{treated states}_i \times \text{distressed}_{i1} + \epsilon_i \end{aligned} \tag{9}$$

The second approach is to use the arguably exogenous variation in home prices to instrument for housing leverage. Assuming that home prices affect health only through its effect on housing leverage, then the causal effect of housing leverage on health can be identified. Equations 2 and 3 can be estimated using 2sls with home prices as the instrument[12]

5 Results

5.1 Pooled OLS

Table 4 reports OLS results of mortgage finance on six health outcomes for HRS respondents who are homeowners (Table 7 reports the same for mortgagors only.). The main independent variables of interest are the log of annual mortgage payment and the log of amount owed on

[12]Home price indices have been used previously to instrument for home values, to correct for measurement error in self-reported home values. Self-reported home values are generally overestimated in the range of 10% (Engelhardt (2003)).

mortgage; we are testing whether higher payments or larger loan amounts adversely affect homeowners' health. We control for both home value and income, employ a rich set of covariates, and include year and state fixed effects. Higher payments are correlated with poorer overall self-reported health, but the result is not statistically significant. In fact, the signs on the coefficients of the other five health outcomes are the opposite of what might be expected: higher payments are negatively correlated with worse outcomes, though only obesity (5%) and high blood pressure (10% level), are significant. However, when we look at our main control variables, household income and home value, we see this negative relationship repeated, and with much higher levels of significance for all six outcomes. We therefore think the correlation between payment size and health is an indirect relationship, and is really picking up the known positive correlation between income and heath; higher income allows a respondent to carry a higher annual mortage payment. Our second variable of interest, the log of amount owed on mortgages, does have the expected positive correlation with worse health outcomes for homeowners, and is significant at the 10% level for obesity, high blood pressure, and depressive symptons. Since education is an important variable in the production of health (Grossman (1972)), we control for education as well as sex, age, age squared, race, marital status, employment in our OLS modeling. The signs on the coefficients for these other socioeconomic control variables are mainly as expected. Women are more likely to be healthier, which is expected in this age group.

The negative correlation between some health outcomes and mortgage payments discussed above lends credence to our hypothesis that it is not absolute levels of debt which matter, but payments and debt relative to income and home value, respectively. Tables 5 and 6 show the results for the effect of the log of mortgage payment to income (PTI) and log of loan amount to self-reported home value on health among homeowners. We found that higher PTI significantly increases the likelihood of homeowners self-reporting poor health, being obese, having diabetes and more depressive symptoms (1% significance level), and experiencing negative health changes (5% significance level). When our main right hand side variable is

the log of the ratio of loan to house value (LTV), we find significant positive correlations with all outcome variables for homeowners.

When we further restrict the sample to mortgagors only (Tables 8 and 9), the coefficients on the effect of PTI on our health outcomes become larger, while in general maintaining similar levels of significance. The coefficients on LTV are also larger for mortgagors versus all homeowners, and for this smaller sample, the statistical significance is at 1% for all outcomes.

5.2 Fixed effects and First difference

Since our predominant hypothesis deals with the effect of mortgage debt on health, in this section we will focus on mortgagors. When we employ fixed effects to control for endogeneity between the error terms and the explanatory variables due to unobserved characteristics of the respondents, we get the expected positive signs on the coefficients for PTI for all health outcomes except high blood pressure, though only the coefficient on poor health is significant. Mortgagors with higher log of loan to self-reported home value are more likely to report being in worse health, be obese, and have high blood pressure, but none of the effects are statistically significant (Tables 12 and 13). We did expect that, in sweeping away the between effects, our results would lose some significance, especially since these indicator variables do not exhibit much movement around the mean.

As explained above, since there may be some autocorrelation among the error terms, we also first difference the data. When we employ logit, larger PTI has a highly significant effect on worse health and probability of suffering from high blood pressure for mortgagors, but appears to decrease the likelihood of being obese and having diabetes. These latter results may be a function of income: lower income people are more likely to be obese and suffer from diabetes as well as have lower PTI. LTV is positively correlated with all our measures of worse health in our logit runs, and conversely to the PTI findings, has a significant effect on diabetes, and when we cluster the standard errors, on obesity also. (This could be linked

to subprime lending and is an area that warrants further research.)

5.3 IV

Tables 15 and 17 show the results using 2sls estimation (Tables 14 and 16 show the results using OLS for the same time period) for homeowners and mortgagors, respectively. When we instrument for self-reported home values with the FMHPI by state in stage one then regress this estimated LTV and all independent variables on the six health outcomes plus cancer, after pooling waves for 2004, 2006, and 2008 for homeowners, the coefficient on LTV is significant at the 1% level for obesity and high blood pressure, and at the 10% level for diabetes. Our second health measure has the wrong sign, but is very small. When we further limit the sample to mortgagors, results are siginficant for obesity and hghg blood pressure, and LTV is negatively related to cancer, validating the robustness of these results.

5.4 Difference in Differences

Tables 18 and 19 show results using difference-in-differences estimation for homeowners and mortgagors, respectively. When we compare the health of respondents residing in states with 20% or greater housing value declines between 2006 and 2008 to those living in states without declines of this magnitude, we see that the former are signifcantly more likely to report poor health than the latter in 2008, for the whole sample, homeowners, and mortgagors. For this specification, we feel that the full sample is most relevant, since we are identifying the effect of home value shocks on health.

6 Conclusion

Our findings show that higher debt payments as a percentage of income are positively related to self-reported health (where a higher number means worse health),negative changes in health, higher incidents of obesity and diabetes, and reporting of depressive symptoms. We

also show a highly significant correlation between LTV and all six health outcomes. The coefficients on LTV increase when we focus on the three HRS waves which track the housing boom and bust: 2004, 2006, 2008. We employ individual fixed effects and also first difference to control for baseline heterogeneity in our sample. As is to be expected, the results are not as strong, but are supportive of our hypothesis that higher housing leverage has a negative effect on the health of homeowners and mortgagors. The difference-in-difference we employ shows the negative effect of housing value declines of 20% or more on the self-reported health of our entire sample and therefore goes a long way towards establishing causality. The lack of correlation between LTV and cancer also supports causality. Housing values have continued to decline, and we therefore hypothesize that this effect will be stronger once the 2010 wave of the HRS becomes available.

A limitation of our work arises from the fact that the HRS only queries people over fifty years of age. Since Currie and Tekin (2011) found the most pronounced effects on those between 20 and 49 years of age, our results may be understated: in fact, they may provide a lower bound. An area for further research then would be to use a dataset that may not be as rich in information or as representative of the US population, but contains younger homeowners.

From a policy perspective, our results highlight the danger of promoting leverage in financing of households' largest asset, especially when that asset is subject to volatility in value. We might also want to think further about the efficacy of 30 year mortgage loans in a labor market which is characterized by much less stability, with most workers no longer employed by the same company for long periods of time, and periods of unemployment are more common.

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Table 1: Summary statistics (HRS 1998-2008 pooled)

	All	Homeowners	Mortgagors	Distressed
female	0.55	0.54	0.49	0.52
age	66.06	65.50	60.75	60.00
years of schooling	12.60	12.96	13.54	12.81
black	0.09	0.07	0.08	0.14
hispanic	0.07	0.05	0.06	0.09
other	0.04	0.04	0.05	0.06
married	0.64	0.73	0.79	0.70
in labor force	0.43	0.47	0.66	0.63
unemployed	0.01	0.01	0.01	0.02
has health insurance	0.84	0.84	0.79	0.75
bluecollar	0.53	0.48	0.40	0.50
homeowner	0.77	1.00	1.00	1.00
mortgagor	0.32	0.41	1.00	1.00
home value	166,592.53	213,071.36	253,516.81	191,288.66
mortgage loan amount	30,258.40	39,112.78	95,148.06	138,442.17
loan to value	0.15	0.19	0.46	0.90
household income	65,565.65	74,326.26	91,181.53	61,220.71
annual mortgage payment	3,560.75	4,602.72	11,196.85	15,445.32
payment to income	0.07	0.09	0.21	0.49
poor health	0.27	0.23	0.20	0.28
negative change in health	0.23	0.21	0.18	0.21
obesity	0.26	0.25	0.29	0.37
high blood pressure	0.51	0.49	0.45	0.50
diabetes	0.17	0.15	0.15	0.19
died between 1998-2008	0.13	0.11	0.06	0.07
depressive symptoms	0.32	0.28	0.27	0.34
cancer	0.13	0.13	0.10	0.09
smokes	0.16	0.13	0.16	0.19
drinks	0.52	0.55	0.62	0.55
exercises vigorously	0.20	0.21	0.20	0.17
no preventative care	0.47	0.46	0.44	0.43
observations	99,276	76,030	28,872	3,918

Sample-weighted means. Mortgage loans on primary residence.

Distressed mortgagors have PTI ≥ 1 or LTV > 0.90.

Obesity defined as BMI>30. Depressive symptoms defined as CESD>1.

Table 2: Homeownership and mortgage indebtedness time trends, 1998-2008.

	1998	2000	2002	2004	2006	2008
	All					
payment to income	0.06	0.06	0.06	0.07	0.08	0.08
loan to value	0.14	0.14	0.13	0.16	0.15	0.15
Freddie Mac Home Price Index	87.83	100.00	114.91	137.92	153.75	129.60
homeowner	0.77	0.78	0.78	0.77	0.77	0.77
mortgagor	0.30	0.30	0.28	0.34	0.34	0.32
	Homeowner					
payment to income	0.07	0.08	0.08	0.09	0.10	0.10
loan to value	0.18	0.18	0.16	0.21	0.20	0.20
	Mortgagor					
payment to income	0.19	0.19	0.21	0.21	0.22	0.23
loan to value	0.46	0.45	0.45	0.47	0.45	0.47
observations	18,608	16,978	15,752	17,374	15,717	14,847

Sample-weighted means.

Natural logs of PTI and LTV with zero values were replaced with the ln(0.001).

Table 3: Health time trends, 1998-2008.

	1998	2000	2002	2004	2006	2008
	All					
poor health	0.29	0.26	0.27	0.27	0.27	0.28
negative change in health	0.18	0.24	0.26	0.21	0.25	0.26
obesity	0.22	0.23	0.24	0.26	0.29	0.31
high blood pressure	0.45	0.48	0.52	0.51	0.54	0.58
diabetes	0.13	0.14	0.17	0.17	0.18	0.21
depressive symptoms	0.34	0.33	0.31	0.31	0.32	0.30
cancer	0.11	0.12	0.14	0.12	0.13	0.15
observations	18,608	16,978	15,752	17,374	15,717	14,847
	Homeowners					
poor health	0.25	0.22	0.22	0.22	0.22	0.23
negative change in health	0.16	0.22	0.24	0.20	0.23	0.23
obesity	0.22	0.22	0.24	0.25	0.28	0.30
high blood pressure	0.43	0.46	0.50	0.49	0.52	0.56
diabetes	0.12	0.13	0.16	0.15	0.17	0.19
depressive symptoms	0.31	0.30	0.28	0.27	0.29	0.26
cancer	0.11	0.12	0.14	0.12	0.13	0.15
observations	14,253	13,120	12,135	13,243	11,942	11,337
	Mortgagors					
poor health	0.21	0.19	0.20	0.19	0.18	0.21
negative change in health	0.12	0.19	0.22	0.16	0.20	0.21
obesity	0.25	0.26	0.29	0.29	0.32	0.34
high blood pressure	0.39	0.43	0.47	0.44	0.47	0.53
diabetes	0.11	0.12	0.15	0.14	0.16	0.19
depressive symptoms	0.29	0.29	0.27	0.26	0.28	0.25
cancer	0.09	0.09	0.11	0.09	0.10	0.12
observations	5,362	4,936	4,219	5,305	4,721	4,329

Sample-weighted means.

Obesity defined as BMI>30. Depressive symptoms defined as CESD>1.

Table 4: OLS: Effect of mortgage housing finance on the likelihood of each health status among homeowners, 1998-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms
log(payment)	0.000315	-0.000841	-0.0135**	-0.00905*	-0.00411	-0.00888
	(0.00554)	(0.00481)	(0.00575)	(0.00471)	(0.00424)	(0.00546)
log(income)	-0.0160***	-0.00698***	-0.00455***	-0.00645***	-0.00587***	-0.0108***
	(0.00163)	(0.00122)	(0.00138)	(0.00116)	(0.00109)	(0.00153)
log(amount owed)	0.00177	0.00218	0.0140**	0.00932**	0.00537	0.00975**
	(0.00486)	(0.00429)	(0.00530)	(0.00431)	(0.00380)	(0.00473)
log(house price)	-0.0389***	-0.0173***	-0.0311***	-0.0259***	-0.0213***	-0.0291***
	(0.00422)	(0.00228)	(0.00339)	(0.00334)	(0.00311)	(0.00337)
female	-0.0359***	-0.000264	-0.0123*	0.00284	-0.0441***	0.0606***
	(0.00360)	(0.00366)	(0.00628)	(0.00879)	(0.00413)	(0.00388)
age	-0.0109***	-0.00663***	0.0146***	0.0406***	0.0232***	-0.0175***
	(0.00228)	(0.00196)	(0.00245)	(0.00219)	(0.00143)	(0.00246)
age squared/100	0.00852***	0.00784***	-0.0162***	-0.0254***	-0.0171***	0.0112***
	(0.00171)	(0.00148)	(0.00180)	(0.00166)	(0.00111)	(0.00193)
years of schooling	-0.0201***	-0.00630***	-0.00556***	-0.00290***	-0.00473***	-0.0113***
	(0.00120)	(0.000952)	(0.00115)	(0.000894)	(0.00100)	(0.00110)
black	0.0662***	-0.0233***	0.108***	0.146***	0.0885***	0.0107
	(0.00884)	(0.00766)	(0.00596)	(0.0119)	(0.0111)	(0.00975)
hispanic	0.0808***	-0.00238	0.0238	0.0128	0.0657***	0.0295***
	(0.0161)	(0.0134)	(0.0155)	(0.0141)	(0.0149)	(0.0102)
other	0.0269***	-0.00839	-0.0350*	-0.0109	0.0348**	0.00229
	(0.00997)	(0.0117)	(0.0201)	(0.0173)	(0.0154)	(0.0153)
married	-0.00775	0.00299	-0.00428	0.00374	0.00540	-0.115***
	(0.00643)	(0.00503)	(0.00655)	(0.00778)	(0.00434)	(0.00658)
labor	-0.147***	-0.0872***	-0.0234***	-0.0573***	-0.0597***	-0.0917***
	(0.00589)	(0.00524)	(0.00742)	(0.00706)	(0.00574)	(0.00497)
unemployed	0.0516***	0.0403**	0.000382	0.0579**	0.00659	0.168***
	(0.0190)	(0.0200)	(0.0253)	(0.0219)	(0.0198)	(0.0212)
insured	0.0236***	0.0110*	0.0201***	0.0414***	0.0188***	0.00436
	(0.00509)	(0.00615)	(0.00650)	(0.00920)	(0.00489)	(0.00502)
blue collar	0.0271***	0.000988	0.00983	0.00980	0.00582	0.0365***
	(0.00373)	(0.00476)	(0.00615)	(0.00650)	(0.00514)	(0.00530)
Observations	76030	76030	76030	76030	76030	76030
R^2	0.129	0.047	0.055	0.071	0.046	0.071

All specifications include state and year fixed effects.

Robust errors clustered by state.

Table 5: OLS: Effect of mortgage payment to income (PTI) on the likelihood of each health status among homeowners, 1998-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms
log(PTI)	0.0260***	0.0101**	0.0152***	0.00695	0.0119***	0.0232***
	(0.00418)	(0.00414)	(0.00440)	(0.00539)	(0.00389)	(0.00373)
log(amount owed)	-0.00543***	-0.00150	-0.00229*	-0.000760	-0.00169	-0.00481***
	(0.00109)	(0.00113)	(0.00133)	(0.00174)	(0.00116)	(0.00106)
log(house price)	-0.0418***	-0.0186***	-0.0314***	-0.0269***	-0.0222***	-0.0307***
	(0.00433)	(0.00227)	(0.00334)	(0.00331)	(0.00315)	(0.00352)
Flag for PTI > 1.71	-0.0169	0.0175	-0.0761***	-0.00943	-0.0506**	-0.0430*
	(0.0250)	(0.0258)	(0.0197)	(0.0263)	(0.0222)	(0.0235)
female	-0.0359***	-0.000237	-0.0126**	0.00283	-0.0442***	0.0604***
	(0.00360)	(0.00366)	(0.00626)	(0.00879)	(0.00418)	(0.00385)
age	-0.0118***	-0.00695***	0.0139***	0.0404***	0.0228***	-0.0184***
	(0.00224)	(0.00194)	(0.00246)	(0.00225)	(0.00146)	(0.00245)
age squared/100	0.00912***	0.00807***	-0.0157***	-0.0252***	-0.0168***	0.0119***
	(0.00168)	(0.00147)	(0.00181)	(0.00168)	(0.00114)	(0.00192)
years of schooling	-0.0208***	-0.00662***	-0.00561***	-0.00324***	-0.00495***	-0.0117***
	(0.00118)	(0.000941)	(0.00115)	(0.000851)	(0.000996)	(0.00112)
black	0.0668***	-0.0230***	0.106***	0.146***	0.0883***	0.00994
	(0.00882)	(0.00770)	(0.00599)	(0.0121)	(0.0112)	(0.00974)
hispanic	0.0835***	-0.00122	0.0234	0.0142	0.0665***	0.0304***
	(0.0170)	(0.0137)	(0.0162)	(0.0145)	(0.0154)	(0.0102)
other	0.0261**	-0.00866	-0.0359*	-0.0111	0.0343**	0.00135
	(0.00981)	(0.0116)	(0.0200)	(0.0174)	(0.0155)	(0.0151)
married	-0.0158**	-0.000467	-0.00613	-0.000249	0.00234	-0.120***
	(0.00644)	(0.00494)	(0.00639)	(0.00746)	(0.00392)	(0.00669)
labor	-0.151***	-0.0890***	-0.0240***	-0.0596***	-0.0612***	-0.0939***
	(0.00604)	(0.00522)	(0.00744)	(0.00709)	(0.00582)	(0.00495)
unemployed	0.0554***	0.0417**	0.00245	0.0605***	0.00872	0.171***
	(0.0188)	(0.0198)	(0.0253)	(0.0218)	(0.0199)	(0.0208)
insured	0.0206***	0.00979	0.0189***	0.0401***	0.0174***	0.00217
	(0.00485)	(0.00598)	(0.00650)	(0.00916)	(0.00480)	(0.00500)
blue collar	0.0280***	0.00142	0.00984	0.0103	0.00611	0.0369***
	(0.00376)	(0.00474)	(0.00606)	(0.00657)	(0.00516)	(0.00538)
Observations	76030	76030	76030	76030	76030	76030
R^2	0.127	0.047	0.054	0.070	0.045	0.070

All specifications include state and year fixed effects.

Robust errors clustered by state.

Table 6: OLS: Effect of mortgage loan to value (LTV) on the likelihood of each health status among homeowners, 1998-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms
log(payment)	-0.00447***	-0.00157	-0.0105***	-0.00870***	-0.00484***	-0.00640***
	(0.00151)	(0.00128)	(0.00170)	(0.00200)	(0.000877)	(0.00123)
log(income)	-0.0190***	-0.00831***	-0.00669***	-0.00826***	-0.00742***	-0.0129***
	(0.00178)	(0.00125)	(0.00137)	(0.00129)	(0.00118)	(0.00166)
log(LTV)	0.0177***	0.00838**	0.0340***	0.0270***	0.0180***	0.0224***
	(0.00388)	(0.00336)	(0.00479)	(0.00551)	(0.00242)	(0.00334)
Flag for LTV > 1.8	0.0185	-0.0369	0.0127	-0.0482	-0.0168	0.0510
	(0.0244)	(0.0304)	(0.0304)	(0.0383)	(0.0220)	(0.0382)
female	-0.0349***	0.000165	-0.0115*	0.00353	-0.0435***	0.0613***
	(0.00366)	(0.00364)	(0.00620)	(0.00875)	(0.00419)	(0.00383)
age	-0.0112***	-0.00675***	0.0147***	0.0408***	0.0233***	-0.0176***
	(0.00244)	(0.00195)	(0.00254)	(0.00220)	(0.00138)	(0.00261)
age squared/100	0.00877***	0.00794***	-0.0162***	-0.0254***	-0.0170***	0.0114***
	(0.00183)	(0.00148)	(0.00186)	(0.00166)	(0.00108)	(0.00204)
years of schooling	-0.0223***	-0.00730***	-0.00718***	-0.00428***	-0.00589***	-0.0129***
	(0.00122)	(0.000952)	(0.00106)	(0.000858)	(0.000945)	(0.00110)
black	0.0795***	-0.0175**	0.117***	0.154***	0.0953***	0.0198**
	(0.00841)	(0.00780)	(0.00664)	(0.0115)	(0.0111)	(0.00935)
hispanic	0.0852***	-0.000340	0.0271	0.0159	0.0682***	0.0325***
	(0.0156)	(0.0132)	(0.0172)	(0.0136)	(0.0163)	(0.0108)
other	0.0293***	-0.00712	-0.0333	-0.00917	0.0362**	0.00381
	(0.0103)	(0.0120)	(0.0208)	(0.0172)	(0.0151)	(0.0161)
married	-0.0143**	0.0000535	-0.00896	-0.000241	0.00203	-0.119***
	(0.00668)	(0.00496)	(0.00666)	(0.00788)	(0.00429)	(0.00648)
labor	-0.146***	-0.0869***	-0.0229***	-0.0569***	-0.0593***	-0.0912***
	(0.00589)	(0.00523)	(0.00751)	(0.00715)	(0.00575)	(0.00507)
unemployed	0.0524***	0.0411**	0.000180	0.0582***	0.00685	0.168***
	(0.0191)	(0.0199)	(0.0256)	(0.0216)	(0.0201)	(0.0212)
insured	0.0238***	0.0110*	0.0198***	0.0411***	0.0187***	0.00437
	(0.00518)	(0.00616)	(0.00650)	(0.00923)	(0.00495)	(0.00505)
blue collar	0.0323***	0.00331	0.0132**	0.0128**	0.00839	0.0400***
	(0.00394)	(0.00481)	(0.00624)	(0.00631)	(0.00508)	(0.00551)
Observations	76030	76030	76030	76030	76030	76030
R^2	0.124	0.046	0.053	0.070	0.044	0.069

All specifications include state and year fixed effects.

Robust errors clustered by state.

Table 7: OLS: Effect of mortgage housing finance on the likelihood of each health status among mortgagors, 1998-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms
log(payment)	-0.00471	-0.0107	-0.0136	-0.0215***	-0.00346	-0.0104
	(0.00719)	(0.00779)	(0.00881)	(0.00759)	(0.00736)	(0.00894)
log(income)	-0.0143***	-0.00649***	-0.00367*	-0.00586***	-0.00430**	-0.0107***
	(0.00305)	(0.00205)	(0.00217)	(0.00182)	(0.00182)	(0.00212)
log(amount owed)	0.00306	0.00317	0.0177***	0.0124**	0.00796**	0.0120**
	(0.00493)	(0.00453)	(0.00488)	(0.00487)	(0.00324)	(0.00476)
log(house price)	-0.0580***	-0.0228***	-0.0620***	-0.0463***	-0.0434***	-0.0480***
	(0.00681)	(0.00539)	(0.00872)	(0.00797)	(0.00586)	(0.00830)
female	-0.0238***	0.00591	-0.0284***	-0.0264**	-0.0431***	0.0632***
	(0.00631)	(0.00460)	(0.00939)	(0.0105)	(0.00834)	(0.00568)
age	-0.000780	0.00210	0.0113***	0.0387***	0.0161***	-0.00932**
	(0.00407)	(0.00287)	(0.00357)	(0.00403)	(0.00304)	(0.00395)
age squared/100	0.000477	0.000969	-0.0134***	-0.0240***	-0.0111***	0.00485
	(0.00344)	(0.00231)	(0.00266)	(0.00318)	(0.00247)	(0.00314)
years of schooling	-0.0187***	-0.00570***	-0.00513***	-0.00313**	-0.00302*	-0.0101***
	(0.00151)	(0.00112)	(0.00191)	(0.00146)	(0.00167)	(0.000967)
black	0.0288**	-0.0407***	0.106***	0.139***	0.0754***	0.00644
	(0.0113)	(0.00853)	(0.0145)	(0.0165)	(0.0128)	(0.0126)
hispanic	0.0432***	-0.0111	0.00544	-0.0150	0.0424***	0.0188
	(0.0159)	(0.0125)	(0.0136)	(0.0186)	(0.0120)	(0.0174)
other	0.0280	-0.0185*	-0.0304	0.00701	0.0403***	0.0279
	(0.0179)	(0.0108)	(0.0277)	(0.0179)	(0.0134)	(0.0294)
married	0.00108	0.0128*	-0.00483	0.0124	0.0262**	-0.0931***
	(0.00911)	(0.00638)	(0.0102)	(0.0110)	(0.0110)	(0.0115)
labor	-0.176***	-0.104***	-0.0285**	-0.0580***	-0.0714***	-0.108***
	(0.00956)	(0.00809)	(0.0114)	(0.00680)	(0.00857)	(0.00776)
unemployed	0.0548**	0.0375*	0.0128	0.0806***	0.000401	0.185***
	(0.0230)	(0.0197)	(0.0275)	(0.0249)	(0.0315)	(0.0322)
insured	0.0267***	0.0148**	0.0188**	0.0310***	0.0235***	0.0116*
	(0.00688)	(0.00638)	(0.00918)	(0.00930)	(0.00818)	(0.00684)
blue collar	0.0334***	0.00224	0.00143	-0.00541	-0.00819	0.0445***
	(0.00736)	(0.00642)	(0.0101)	(0.0119)	(0.00729)	(0.00760)
Observations	28872	28872	28872	28872	28872	28872
R^2	0.148	0.054	0.044	0.086	0.057	0.073

All specifications include state and year fixed effects.

Robust errors clustered by state.

Table 8: OLS: Effect of mortgage payment to income (PTI) on the likelihood of each health status among mortgagors, 1998-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms
log(PTI)	0.0299***	0.0102**	0.0141***	0.0103	0.0181***	0.0247***
	(0.00435)	(0.00429)	(0.00519)	(0.00615)	(0.00396)	(0.00368)
log(amount owed)	-0.00697	-0.00334	0.00969**	0.00251	0.00206	0.00178
	(0.00421)	(0.00439)	(0.00424)	(0.00520)	(0.00259)	(0.00372)
log(house price)	-0.0622***	-0.0271***	-0.0657***	-0.0529***	-0.0447***	-0.0526***
	(0.00770)	(0.00542)	(0.00814)	(0.00868)	(0.00592)	(0.00844)
Flag for PTI > 1.71	-0.00834	0.0232	-0.0700***	-0.00994	-0.0451*	-0.0396*
	(0.0254)	(0.0245)	(0.0208)	(0.0265)	(0.0237)	(0.0220)
female	-0.0248***	0.00586	-0.0290***	-0.0264**	-0.0439***	0.0623***
	(0.00637)	(0.00453)	(0.00928)	(0.0106)	(0.00856)	(0.00561)
age	-0.000783	0.00209	0.0114***	0.0387***	0.0160***	-0.00928**
	(0.00407)	(0.00285)	(0.00355)	(0.00405)	(0.00306)	(0.00395)
age squared/100	0.000452	0.00104	-0.0134***	-0.0240***	-0.0111***	0.00480
	(0.00345)	(0.00229)	(0.00267)	(0.00319)	(0.00251)	(0.00313)
years of schooling	-0.0182***	-0.00567***	-0.00483**	-0.00319**	-0.00243	-0.00969***
	(0.00146)	(0.00115)	(0.00195)	(0.00143)	(0.00161)	(0.00103)
black	0.0244**	-0.0430***	0.103***	0.136***	0.0722***	0.00225
	(0.0112)	(0.00908)	(0.0145)	(0.0166)	(0.0130)	(0.0126)
hispanic	0.0393**	-0.0129	0.00262	-0.0174	0.0390***	0.0152
	(0.0158)	(0.0124)	(0.0134)	(0.0194)	(0.0119)	(0.0174)
other	0.0256	-0.0195*	-0.0322	0.00562	0.0385***	0.0256
	(0.0172)	(0.0106)	(0.0274)	(0.0181)	(0.0135)	(0.0288)
married	0.00585	0.0135**	-0.00312	0.0118	0.0311***	-0.0898***
	(0.00854)	(0.00666)	(0.0108)	(0.0109)	(0.0104)	(0.0125)
labor	-0.172***	-0.103***	-0.0272**	-0.0583***	-0.0682***	-0.105***
	(0.00937)	(0.00788)	(0.0111)	(0.00657)	(0.00830)	(0.00770)
unemployed	0.0533**	0.0370*	0.0135	0.0813***	-0.000790	0.185***
	(0.0226)	(0.0193)	(0.0275)	(0.0247)	(0.0317)	(0.0321)
insured	0.0256***	0.0146**	0.0179*	0.0305***	0.0228***	0.0105
	(0.00677)	(0.00629)	(0.00917)	(0.00923)	(0.00810)	(0.00667)
blue collar	0.0323***	0.00210	0.000979	-0.00532	-0.00920	0.0437***
	(0.00746)	(0.00642)	(0.0100)	(0.0118)	(0.00742)	(0.00763)
Observations	28872	28872	28872	28872	28872	28872
R^2	0.148	0.054	0.044	0.086	0.058	0.074

All specifications include state and year fixed effects.

Robust errors clustered by state.

Table 9: OLS: Effect of mortgage loan to value (LTV) on the likelihood of each health status among mortgagors, 1998-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms
log(payment)	-0.0439***	-0.0254***	-0.0462***	-0.0471***	-0.0289***	-0.0359***
	(0.00807)	(0.00637)	(0.00683)	(0.00895)	(0.00580)	(0.00674)
log(income)	-0.0161***	-0.00709***	-0.00506**	-0.00689***	-0.00546***	-0.0119***
	(0.00325)	(0.00221)	(0.00215)	(0.00179)	(0.00179)	(0.00241)
log(LTV)	0.0239***	0.0123***	0.0367***	0.0284***	0.0217***	0.0253***
	(0.00435)	(0.00349)	(0.00478)	(0.00588)	(0.00274)	(0.00333)
Flag for LTV > 1.8	0.0174	-0.0377	0.00880	-0.0428	-0.0139	0.0464
	(0.0244)	(0.0306)	(0.0305)	(0.0376)	(0.0218)	(0.0376)
female	-0.0230***	0.00626	-0.0276***	-0.0258**	-0.0425***	0.0637***
	(0.00641)	(0.00465)	(0.00947)	(0.0106)	(0.00840)	(0.00577)
age	-0.000864	0.00210	0.0113***	0.0387***	0.0160***	-0.00940**
	(0.00423)	(0.00288)	(0.00364)	(0.00400)	(0.00304)	(0.00409)
age squared/100	0.000443	0.000942	-0.0134***	-0.0241***	-0.0111***	0.00484
	(0.00357)	(0.00231)	(0.00272)	(0.00317)	(0.00248)	(0.00324)
years of schooling	-0.0204***	-0.00629***	-0.00645***	-0.00414***	-0.00412**	-0.0112***
	(0.00139)	(0.00103)	(0.00184)	(0.00144)	(0.00164)	(0.00114)
black	0.0391***	-0.0371***	0.114***	0.145***	0.0820***	0.0132
	(0.0111)	(0.00845)	(0.0143)	(0.0154)	(0.0121)	(0.0125)
hispanic	0.0463***	-0.00960	0.00818	-0.0125	0.0446***	0.0207
	(0.0148)	(0.0125)	(0.0143)	(0.0180)	(0.0123)	(0.0176)
other	0.0306	-0.0172	-0.0283	0.00908	0.0422***	0.0294
	(0.0192)	(0.0111)	(0.0290)	(0.0171)	(0.0131)	(0.0308)
married	-0.00360	0.0111*	-0.00837	0.00974	0.0231**	-0.0961***
	(0.00896)	(0.00649)	(0.0104)	(0.0111)	(0.0109)	(0.0107)
labor	-0.175***	-0.104***	-0.0279**	-0.0576***	-0.0708***	-0.107***
	(0.00967)	(0.00807)	(0.0114)	(0.00681)	(0.00855)	(0.00774)
unemployed	0.0541**	0.0376*	0.0120	0.0804***	0.000195	0.184***
	(0.0230)	(0.0198)	(0.0278)	(0.0248)	(0.0317)	(0.0324)
insured	0.0271***	0.0148**	0.0189**	0.0309***	0.0236***	0.0119*
	(0.00706)	(0.00640)	(0.00932)	(0.00933)	(0.00833)	(0.00705)
blue collar	0.0391***	0.00424	0.00589	-0.00200	-0.00447	0.0482***
	(0.00766)	(0.00685)	(0.0107)	(0.0118)	(0.00690)	(0.00817)
Observations	28872	28872	28872	28872	28872	28872
R^2	0.143	0.054	0.042	0.085	0.055	0.072

All specifications include state and year fixed effects.

Robust errors clustered by state.

Table 10: Effect of payment to income (PTI) on the likelihood of each health status among homeowners, 1998-2008.

	poor health	neg chg in health	obesity	high blood pressure	diabetes	depressive symptoms	observations
ols, robust	0.0260***	0.0101***	0.0152***	0.0070*	0.0119***	0.0232***	76,030
	(0.00310)	(0.00317)	(0.00347)	(0.00373)	(0.00287)	(0.00345)	
ols, cluster	0.0260***	0.0101***	0.0152***	0.0070	0.0119***	0.0232***	76,030
	(0.00418)	(0.00414)	(0.00440)	(0.00539)	(0.00389)	(0.00373)	
logit, robust	0.1917***	0.0697***	0.0717***	0.0271*	0.0823***	0.1200***	76,025
	(0.02101)	(0.02025)	(0.01798)	(0.01637)	(0.02162)	(0.01845)	
logit, cluster	0.1917***	0.0697***	0.0717***	0.0271	0.0823***	0.1200***	76,025
	(0.02831)	(0.02550)	(0.02295)	(0.02353)	(0.03196)	(0.02006)	
fe, robust	-0.0017	0.0049	0.0009	-0.0002	-0.0001	-0.0044	76,030
	(0.00342)	(0.00418)	(0.00288)	(0.00302)	(0.00216)	(0.00419)	
fe, logit	-0.0049	0.0380	0.0208	-0.0219	-0.0021	-0.0370	36,269
	(0.04171)	(0.03286)	(0.04770)	(0.05943)	(0.09345)	(0.03200)	
fd, robust	0.0025	0.0025	-0.0047*	0.0022	-0.0014	-0.0058	54,745
	(0.00311)	(0.00408)	(0.00264)	(0.00222)	(0.00149)	(0.00414)	
fd, cluster	0.0025	0.0025	-0.0047	0.0022	-0.0014	-0.0058*	54,745
	(0.00300)	(0.00542)	(0.00345)	(0.00202)	(0.00174)	(0.00328)	
fd logit, robust	0.0426**	-0.0030	-0.0233	0.0659**	-0.0113	-0.0132	54,745
	(0.02128)	(0.01897)	(0.03190)	(0.03124)	(0.04246)	(0.01960)	
fd logit, cluster	0.0426***	-0.0030	-0.0233	0.0659**	-0.0113	-0.0132	54,745
	(0.01666)	(0.01504)	(0.02823)	(0.03083)	(0.05304)	(0.01552)	

Pooled specifications include controls for gender, age, education, race/ethnicity, state and year fixed effects.
Panel specifications include controls for age, marital status, labor force status, and health insurance status.

Table 11: Effect of loan to value (LTV) on the likelihood of each health status among homeowners, 1998-2008.

	poor health	neg chg in health	obesity	high blood pressure	diabetes	depressive symptoms	observations
ols, robust	0.0177***	0.0084***	0.0340***	0.0270***	0.0180***	0.0224***	76,030
	(0.00283)	(0.00286)	(0.00317)	(0.00345)	(0.00261)	(0.00312)	
ols, cluster	0.0177***	0.0084***	0.0340***	0.0270***	0.0180***	0.0224***	76,030
	(0.00388)	(0.00336)	(0.00479)	(0.00551)	(0.00242)	(0.00334)	
logit, robust	0.1428***	0.0603***	0.1782***	0.1171***	0.1434***	0.1262***	76,025
	(0.02005)	(0.01907)	(0.01793)	(0.01521)	(0.02160)	(0.01758)	
logit, cluster	0.1428***	0.0603***	0.1782***	0.1171***	0.1434***	0.1262***	76,025
	(0.02876)	(0.02215)	(0.02690)	(0.02438)	(0.02032)	(0.01926)	
fe, robust	0.0069**	0.0039	0.0025	-0.0019	0.0018	0.0056	76,030
	(0.00302)	(0.00363)	(0.00273)	(0.00289)	(0.00201)	(0.00374)	
fe, logit	0.0639*	0.0268	0.0432	-0.0729	0.0866	0.0398	36,269
	(0.03705)	(0.03050)	(0.04348)	(0.05320)	(0.08682)	(0.02946)	
fd, robust	0.0070**	0.0056	0.0038	-0.0008	0.0017	0.0074*	54,745
	(0.00317)	(0.00391)	(0.00255)	(0.00222)	(0.00135)	(0.00401)	
fd, cluster	0.0070	0.0056	0.0038	-0.0008	0.0017	0.0074**	54,745
	(0.00485)	(0.00526)	(0.00243)	(0.00178)	(0.00163)	(0.00362)	
fd logit, robust	0.0212	0.0113	0.0242	0.0376	0.0308	0.0174	54,745
	(0.02181)	(0.01835)	(0.03078)	(0.03127)	(0.03836)	(0.01924)	
fd logit, cluster	0.0212	0.0113	0.0242	0.0376	0.0308	0.0174	54,745
	(0.01718)	(0.01271)	(0.02032)	(0.02396)	(0.03595)	(0.01105)	

Pooled specifications include controls for gender, age, education, race/ethnicity, state and year fixed effects.
Panel specifications include controls for age, marital status, labor force status, and health insurance status.

Table 12: Effect of payment to income (PTI) on the likelihood of each health status among mortgagors, 1998-2008.

	poor health	neg chg in health	obesity	high blood pressure	diabetes	depressive symptoms	observations
ols, robust	0.0299***	0.0102***	0.0141***	0.0103***	0.0181***	0.0247***	28,872
	(0.00343)	(0.00352)	(0.00390)	(0.00420)	(0.00317)	(0.00384)	
ols, cluster	0.0299***	0.0102***	0.0141***	0.0103*	0.0181***	0.0247***	28,872
	(0.00435)	(0.00429)	(0.00519)	(0.00615)	(0.00396)	(0.00368)	
logit, robust	0.2101***	0.0684***	0.0743***	0.0432***	0.1438***	0.1309***	28,866
	(0.02407)	(0.02350)	(0.02030)	(0.01843)	(0.02510)	(0.02087)	
logit, cluster	0.2101***	0.0684***	0.0743***	0.0432	0.1438***	0.1309***	28,866
	(0.03094)	(0.02794)	(0.02671)	(0.02677)	(0.03258)	(0.02050)	
fe, robust	0.0026	0.0012	0.0023	0.0043	0.0013	-0.0053	28,872
	(0.00408)	(0.00509)	(0.00337)	(0.00359)	(0.00263)	(0.00508)	
fe, logit	0.0282	-0.0016	0.0470	0.0804	-0.0630	-0.0373	11,532
	(0.05254)	(0.04108)	(0.06064)	(0.07783)	(0.11602)	(0.04014)	
fd, robust	0.0045	0.0018	-0.0049	0.0018	-0.0021	-0.0099**	19,806
	(0.00357)	(0.00466)	(0.00299)	(0.00252)	(0.00170)	(0.00470)	
fd, cluster	0.0045	0.0018	-0.0049*	0.0018	-0.0021	-0.0099***	19,806
	(0.00343)	(0.00626)	(0.00288)	(0.00201)	(0.00171)	(0.00341)	
fd logit, robust	0.1347***	0.0288	-0.0121	0.0879***	-0.0153	0.0330	19,806
	(0.02602)	(0.02242)	(0.03189)	(0.03634)	(0.04668)	(0.02212)	
fd logit, cluster	0.1347***	0.0288*	-0.0121	0.0879***	-0.0153	0.0330**	19,806
	(0.01886)	(0.01688)	(0.03156)	(0.03224)	(0.05691)	(0.01625)	

Pooled specifications include controls for gender, age, education, race/ethnicity, state and year fixed effects.
Panel specifications include controls for age, marital status, labor force status, and health insurance status.

Table 13: Effect of loan to value (LTV) on the likelihood of each health status among mortgagors, 1998-2008.

	poor health	neg chg in health	obesity	high blood pressure	diabetes	depressive symptoms	observations
ols, robust	0.0239***	0.0123***	0.0367***	0.0284***	0.0217***	0.0253***	28,872
	(0.00292)	(0.00293)	(0.00327)	(0.00352)	(0.00268)	(0.00321)	
ols, cluster	0.0239***	0.0123***	0.0367***	0.0284***	0.0217***	0.0253***	28,872
	(0.00435)	(0.00349)	(0.00478)	(0.00588)	(0.00274)	(0.00333)	
logit, robust	0.1741***	0.0820***	0.1923***	0.1253***	0.1671***	0.1397***	28,866
	(0.02064)	(0.01962)	(0.01820)	(0.01563)	(0.02195)	(0.01797)	
logit, cluster	0.1741***	0.0820***	0.1923***	0.1253***	0.1671***	0.1397***	28,866
	(0.03125)	(0.02332)	(0.02628)	(0.02603)	(0.02216)	(0.01922)	
fe, robust	0.0033	0.0015	0.0042	-0.0011	0.0068***	0.0062	28,872
	(0.00372)	(0.00448)	(0.00335)	(0.00351)	(0.00260)	(0.00462)	
fe, logit	0.0345	0.0112	0.0411	-0.0373	0.0697	0.0461	11,532
	(0.04803)	(0.03931)	(0.05567)	(0.07062)	(0.11437)	(0.03704)	
fd, robust	0.0062	0.0063	0.0038	0.0015	0.0039***	0.0079	19,806
	(0.00401)	(0.00488)	(0.00320)	(0.00277)	(0.00162)	(0.00494)	
fd, cluster	0.0062	0.0063	0.0038	0.0015	0.0039**	0.0079*	19,806
	(0.00540)	(0.00598)	(0.00251)	(0.00232)	(0.00171)	(0.00442)	
fd logit, robust	0.0394	0.0268	0.0542	0.0511	0.1155***	0.0121	19,806
	(0.02918)	(0.02365)	(0.03422)	(0.04100)	(0.04473)	(0.02329)	
fd logit, cluster	0.0394	0.0268	0.0542**	0.0511	0.1155***	0.0121	19,806
	(0.02455)	(0.01744)	(0.02661)	(0.03997)	(0.04267)	(0.01771)	

Pooled specifications include controls for gender, age, education, race/ethnicity, state and year fixed effects.
Panel specifications include controls for age, marital status, labor force status, and health insurance status.

Table 14: OLS: Effect of mortgage loan to value (LTV) on the likelihood of each health status among homeowners, 2004-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms	(7) cancer
log(LTV)	0.0264***	0.0137**	0.0444***	0.0306***	0.0252***	0.0297***	-0.00176
	(0.00551)	(0.00571)	(0.00669)	(0.00749)	(0.00347)	(0.00543)	(0.00570)
log(payment)	-0.00825***	-0.00345	-0.0142***	-0.0102***	-0.00723***	-0.00920***	0.000358
	(0.00229)	(0.00217)	(0.00240)	(0.00280)	(0.00136)	(0.00205)	(0.00193)
log(income)	-0.0202***	-0.00844***	-0.00462***	-0.00876***	-0.00682***	-0.0123***	0.00384**
	(0.00246)	(0.00130)	(0.00153)	(0.00159)	(0.00156)	(0.00245)	(0.00145)
Flag for LTV > 1.8	0.00317	-0.0943***	-0.0142	-0.0569	0.00322	0.0379	-0.0202
	(0.0357)	(0.0349)	(0.0417)	(0.0414)	(0.0411)	(0.0396)	(0.0236)
female	-0.0363***	0.00551	-0.00477	0.00612	-0.0458***	0.0503***	-0.0185**
	(0.00517)	(0.00469)	(0.00753)	(0.0107)	(0.00492)	(0.00405)	(0.00770)
age	-0.00840***	0.00173	0.0192***	0.0478***	0.0305***	-0.0207***	0.00813***
	(0.00282)	(0.00228)	(0.00359)	(0.00326)	(0.00205)	(0.00320)	(0.00225)
age squared/100	0.00643***	0.00185	-0.0194***	-0.0297***	-0.0220***	0.0133***	-0.00266*
	(0.00215)	(0.00171)	(0.00252)	(0.00245)	(0.00154)	(0.00248)	(0.00157)
years of schooling	-0.0239***	-0.00698***	-0.00986***	-0.00516***	-0.00709***	-0.0138***	0.00202**
	(0.00140)	(0.00142)	(0.00132)	(0.00122)	(0.00101)	(0.00103)	(0.000873)
black	0.0821***	-0.0305***	0.123***	0.159***	0.107***	0.00459	-0.0225***
	(0.0112)	(0.0112)	(0.00946)	(0.0109)	(0.0118)	(0.0123)	(0.00759)
hispanic	0.116***	-0.00583	0.000126	-0.00350	0.0657***	0.0255**	-0.0378***
	(0.0269)	(0.0163)	(0.0152)	(0.0130)	(0.0165)	(0.0121)	(0.00787)
other	0.0135	-0.0157	-0.0287	-0.00328	0.0363**	0.0151	-0.0173**
	(0.0103)	(0.0113)	(0.0235)	(0.0150)	(0.0141)	(0.0169)	(0.00846)
married	-0.0215**	-0.00432	0.00202	-0.00307	0.00294	-0.114***	-0.00557
	(0.00877)	(0.00600)	(0.00753)	(0.00911)	(0.00659)	(0.00727)	(0.00765)
labor	-0.139***	-0.0921***	-0.0271**	-0.0567***	-0.0623***	-0.0999***	-0.0377***
	(0.00597)	(0.00686)	(0.0105)	(0.00774)	(0.00701)	(0.00743)	(0.00499)
unemployed	0.0626**	0.0159	0.00568	0.0582**	0.0171	0.158***	0.0149
	(0.0256)	(0.0217)	(0.0358)	(0.0289)	(0.0224)	(0.0327)	(0.0229)
insured	0.0262***	0.0206**	0.0270***	0.0457***	0.0251***	-0.00192	0.00245
	(0.00596)	(0.00805)	(0.00918)	(0.0107)	(0.00826)	(0.00680)	(0.00729)
blue collar	0.0296***	0.00325	0.00908	0.0150**	0.0111	0.0428***	-0.0149**
	(0.00548)	(0.00505)	(0.00614)	(0.00667)	(0.00670)	(0.00632)	(0.00601)
Constant	1.189***	0.295***	0.226*	-1.034***	-0.568***	1.568***	-0.311***
	(0.101)	(0.0851)	(0.123)	(0.116)	(0.0707)	(0.108)	(0.0732)
Observations	36522	36522	36522	36522	36522	36522	36522
R^2	0.121	0.045	0.047	0.070	0.042	0.065	0.033

Robust errors clustered by state.

Table 15: IV: Effect of mortgage loan to value (LTV) on the likelihood of each health status among homeowners, 2004-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms	(7) cancer
log(LTV)	0.0921	-0.000289	0.274***	0.225***	0.0986*	0.0414	-0.0426
	(0.0622)	(0.0562)	(0.0959)	(0.0724)	(0.0517)	(0.0519)	(0.0366)
log(payment)	-0.0322	0.00165	-0.0977***	-0.0808***	-0.0339*	-0.0135	0.0152
	(0.0230)	(0.0207)	(0.0348)	(0.0262)	(0.0189)	(0.0191)	(0.0134)
log(income)	-0.0191***	-0.00868***	-0.000724	-0.00547***	-0.00557***	-0.0121***	0.00315**
	(0.00267)	(0.00153)	(0.00244)	(0.00183)	(0.00182)	(0.00264)	(0.00149)
Flag for LTV > 1.8	-0.106	-0.0711	-0.394**	-0.378***	-0.118	0.0185	0.0474
	(0.113)	(0.0878)	(0.157)	(0.123)	(0.0977)	(0.103)	(0.0543)
female	-0.0359***	0.00544	-0.00355	0.00714	-0.0454***	0.0504***	-0.0187**
	(0.00509)	(0.00465)	(0.00732)	(0.0104)	(0.00482)	(0.00398)	(0.00763)
age	-0.00704**	0.00143	0.0239***	0.0518***	0.0320***	-0.0205***	0.00728***
	(0.00291)	(0.00256)	(0.00413)	(0.00373)	(0.00227)	(0.00347)	(0.00202)
age squared/100	0.00564***	0.00202	-0.0222***	-0.0320***	-0.0229***	0.0131***	-0.00217
	(0.00215)	(0.00185)	(0.00269)	(0.00266)	(0.00163)	(0.00264)	(0.00144)
years of schooling	-0.0233***	-0.00711***	-0.00767***	-0.00331***	-0.00639***	-0.0137***	0.00163
	(0.00133)	(0.00131)	(0.00178)	(0.00123)	(0.00122)	(0.00107)	(0.00103)
black	0.0798***	-0.0300***	0.115***	0.152***	0.104***	0.00418	-0.0210***
	(0.0119)	(0.0113)	(0.00716)	(0.00912)	(0.0114)	(0.0124)	(0.00722)
hispanic	0.120***	-0.00666	0.0138	0.00803	0.0700***	0.0262**	-0.0402***
	(0.0270)	(0.0151)	(0.0158)	(0.0133)	(0.0156)	(0.0118)	(0.00771)
other	0.0145	-0.0160	-0.0249	-0.0000866	0.0376***	0.0153	-0.0180**
	(0.00924)	(0.0109)	(0.0190)	(0.0158)	(0.0146)	(0.0165)	(0.00801)
married	-0.0203**	-0.00458	0.00630	0.000540	0.00431	-0.114***	-0.00633
	(0.00821)	(0.00598)	(0.00721)	(0.00893)	(0.00644)	(0.00721)	(0.00763)
labor	-0.140***	-0.0919***	-0.0299***	-0.0590***	-0.0632***	-0.100***	-0.0372***
	(0.00592)	(0.00670)	(0.0115)	(0.00804)	(0.00669)	(0.00742)	(0.00487)
unemployed	0.0593**	0.0166	-0.00588	0.0484	0.0134	0.158***	0.0169
	(0.0251)	(0.0223)	(0.0388)	(0.0299)	(0.0247)	(0.0322)	(0.0231)
insured	0.0251***	0.0208**	0.0230**	0.0423***	0.0238***	-0.00212	0.00316
	(0.00620)	(0.00809)	(0.0103)	(0.0106)	(0.00823)	(0.00657)	(0.00700)
blue collar	0.0277***	0.00364	0.00262	0.00952	0.00899	0.0424***	-0.0137**
	(0.00553)	(0.00553)	(0.00712)	(0.00725)	(0.00669)	(0.00609)	(0.00590)
Constant	1.403***	0.250	0.975***	-0.402	-0.328*	1.606***	-0.444***
	(0.240)	(0.212)	(0.335)	(0.274)	(0.192)	(0.191)	(0.157)
Observations	36522	36522	36522	36522	36522	36522	36522
R^2	0.115	0.045	.	0.030	0.033	0.064	0.029
First-stage F-stat	19.76	19.76	19.76	19.76	19.76	19.76	19.76

Robust errors clustered by state.

Table 16: OLS: Effect of mortgage loan to value (LTV) on the likelihood of each health status among mortgagors, 2004-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms	(7) cancer
log(LTV)	0.0278***	0.0141**	0.0439***	0.0295***	0.0265***	0.0298***	-0.00344
	(0.00574)	(0.00589)	(0.00640)	(0.00713)	(0.00380)	(0.00550)	(0.00594)
log(payment)	-0.0336***	-0.0204***	-0.0506***	-0.0467***	-0.0320***	-0.0305***	0.00277
	(0.00886)	(0.00648)	(0.00765)	(0.0102)	(0.00635)	(0.00669)	(0.00433)
log(income)	-0.0144***	-0.00704***	-0.00357*	-0.00571**	-0.00220	-0.0113***	0.000547
	(0.00397)	(0.00211)	(0.00203)	(0.00268)	(0.00175)	(0.00377)	(0.00185)
Flag for LTV > 1.8	0.0125	-0.0930**	-0.00937	-0.0490	0.0101	0.0387	-0.0246
	(0.0354)	(0.0353)	(0.0422)	(0.0402)	(0.0406)	(0.0392)	(0.0239)
female	-0.0277***	0.0111*	-0.0138	-0.0217	-0.0385***	0.0511***	0.000122
	(0.00900)	(0.00636)	(0.0118)	(0.0137)	(0.0102)	(0.00697)	(0.00842)
age	0.00444	0.0101***	0.0153***	0.0458***	0.0268***	-0.0121**	0.000230
	(0.00468)	(0.00349)	(0.00475)	(0.00506)	(0.00401)	(0.00497)	(0.00360)
age squared/100	-0.00362	-0.00449	-0.0160***	-0.0284***	-0.0187***	0.00660*	0.00337
	(0.00376)	(0.00278)	(0.00366)	(0.00383)	(0.00324)	(0.00393)	(0.00309)
years of schooling	-0.0233***	-0.00679***	-0.00745***	-0.00405**	-0.00615***	-0.0120***	0.000409
	(0.00158)	(0.00179)	(0.00193)	(0.00182)	(0.00202)	(0.00125)	(0.00133)
black	0.0269	-0.0522***	0.121***	0.150***	0.0806***	-0.0109	-0.0222*
	(0.0188)	(0.0114)	(0.0196)	(0.0142)	(0.0176)	(0.0167)	(0.0129)
hispanic	0.0522***	-0.0141	-0.0185	-0.0255	0.0321**	0.0297	-0.0366***
	(0.0158)	(0.0143)	(0.0182)	(0.0172)	(0.0155)	(0.0232)	(0.00746)
other	0.0343*	-0.0131	-0.0209	0.00104	0.0399***	0.0321	-0.00705
	(0.0201)	(0.0133)	(0.0323)	(0.0178)	(0.0139)	(0.0316)	(0.0107)
married	-0.0189*	0.00567	0.0145	0.00711	0.0231*	-0.101***	0.00257
	(0.0105)	(0.00956)	(0.0124)	(0.0145)	(0.0118)	(0.0101)	(0.00859)
labor	-0.164***	-0.106***	-0.0303**	-0.0553***	-0.0677***	-0.111***	-0.0337***
	(0.0109)	(0.00875)	(0.0143)	(0.00725)	(0.00793)	(0.00997)	(0.00773)
unemployed	0.0464	0.0224	0.0224	0.0626*	0.00166	0.143***	0.0165
	(0.0354)	(0.0316)	(0.0434)	(0.0367)	(0.0342)	(0.0444)	(0.0256)
insured	0.0263***	0.0222***	0.0237*	0.0345**	0.0299**	0.00481	0.0123*
	(0.00871)	(0.00741)	(0.0136)	(0.0144)	(0.0124)	(0.0102)	(0.00731)
blue collar	0.0297***	0.00193	0.00172	0.00200	0.00527	0.0499***	-0.00679
	(0.00904)	(0.00814)	(0.0134)	(0.0121)	(0.00873)	(0.0104)	(0.00690)
Constant	0.969***	0.165	0.621***	-0.658***	-0.315**	1.439***	-0.0549
	(0.150)	(0.121)	(0.181)	(0.210)	(0.150)	(0.186)	(0.113)
Observations	14355	14355	14355	14355	14355	14355	14355
R^2	0.132	0.056	0.031	0.083	0.050	0.068	0.028

Robust errors clustered by state.

Table 17: IV: Effect of mortgage loan to value (LTV) on the likelihood of each health status among mortgagors, 2004-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms	(7) cancer
log(LTV)	0.00924	0.00483	0.0882*	0.107**	0.0142	0.0138	-0.00178
	(0.0323)	(0.0401)	(0.0466)	(0.0468)	(0.0361)	(0.0346)	(0.0220)
log(payment)	-0.0284***	-0.0177*	-0.0631***	-0.0686***	-0.0285**	-0.0260**	0.00229
	(0.0109)	(0.0105)	(0.0160)	(0.0158)	(0.0123)	(0.0122)	(0.00788)
log(income)	-0.0151***	-0.00739***	-0.00190	-0.00278	-0.00266	-0.0119***	0.000610
	(0.00383)	(0.00259)	(0.00257)	(0.00339)	(0.00258)	(0.00425)	(0.00202)
Flag for LTV > 1.8	0.0425	-0.0780	-0.0807	-0.174**	0.0298	0.0644	-0.0273
	(0.0729)	(0.0546)	(0.0822)	(0.0844)	(0.0737)	(0.0719)	(0.0308)
female	-0.0281***	0.0109*	-0.0128	-0.0200	-0.0388***	0.0508***	0.000157
	(0.00926)	(0.00615)	(0.0115)	(0.0132)	(0.00985)	(0.00710)	(0.00844)
age	0.00431	0.00999***	0.0157***	0.0464***	0.0267***	-0.0122**	0.000242
	(0.00461)	(0.00343)	(0.00454)	(0.00525)	(0.00398)	(0.00502)	(0.00362)
age squared/100	-0.00371	-0.00454	-0.0158***	-0.0280***	-0.0188***	0.00652*	0.00338
	(0.00379)	(0.00278)	(0.00358)	(0.00412)	(0.00326)	(0.00393)	(0.00301)
years of schooling	-0.0238***	-0.00701***	-0.00641***	-0.00224	-0.00643***	-0.0124***	0.000448
	(0.00181)	(0.00140)	(0.00247)	(0.00201)	(0.00219)	(0.00144)	(0.00165)
black	0.0288	-0.0513***	0.116***	0.142***	0.0819***	-0.00928	-0.0223*
	(0.0189)	(0.0111)	(0.0196)	(0.0132)	(0.0176)	(0.0164)	(0.0121)
hispanic	0.0503***	-0.0151	-0.0141	-0.0178	0.0309*	0.0281	-0.0365***
	(0.0171)	(0.0123)	(0.0224)	(0.0157)	(0.0164)	(0.0233)	(0.00813)
other	0.0338*	-0.0133	-0.0198	0.00307	0.0395***	0.0317	-0.00701
	(0.0201)	(0.0131)	(0.0302)	(0.0183)	(0.0136)	(0.0315)	(0.0105)
married	-0.0200*	0.00513	0.0170	0.0116	0.0224**	-0.101***	0.00267
	(0.0112)	(0.00934)	(0.0130)	(0.0145)	(0.0110)	(0.0102)	(0.00852)
labor	-0.163***	-0.106***	-0.0320**	-0.0582***	-0.0673***	-0.110***	-0.0338***
	(0.0106)	(0.00794)	(0.0148)	(0.00762)	(0.00769)	(0.00957)	(0.00782)
unemployed	0.0474	0.0229	0.0200	0.0585	0.00230	0.143***	0.0165
	(0.0360)	(0.0313)	(0.0427)	(0.0376)	(0.0340)	(0.0433)	(0.0251)
insured	0.0266***	0.0224***	0.0229*	0.0332**	0.0301**	0.00508	0.0122*
	(0.00881)	(0.00745)	(0.0135)	(0.0143)	(0.0125)	(0.0101)	(0.00718)
blue collar	0.0307***	0.00241	-0.000596	-0.00206	0.00591	0.0508***	-0.00688
	(0.00911)	(0.00934)	(0.0131)	(0.0123)	(0.00907)	(0.0110)	(0.00657)
Constant	0.926***	0.144	0.722***	-0.481*	-0.343*	1.403***	-0.0511
	(0.175)	(0.156)	(0.210)	(0.273)	(0.177)	(0.198)	(0.103)
Observations	14355	14355	14355	14355	14355	14355	14355
R^2	0.131	0.055	0.025	0.067	0.050	0.067	0.028
First-stage F-stat	27.18	27.18	27.18	27.18	27.18	27.18	27.18

Robust errors clustered by state.

Table 18: Difference-in-Differences: Effect of home price decline on the likelihood of each health status among homeowners, 2006-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms	(7) cancer
post	0.00235	-0.00547	0.0238***	0.0218***	0.0176***	-0.0185***	0.00550*
	(0.00400)	(0.00511)	(0.00322)	(0.00449)	(0.00298)	(0.00463)	(0.00299)
treated	-0.0241**	-0.0232***	0.00158	-0.0278*	0.00165	-0.00295	-0.00295
	(0.0111)	(0.00747)	(0.0181)	(0.0160)	(0.0108)	(0.0106)	(0.00420)
post×treated	0.0151**	0.00699	-0.00471	0.00254	-0.0101***	-0.00933	-0.00204
	(0.00571)	(0.00913)	(0.00769)	(0.0105)	(0.00369)	(0.00812)	(0.00415)
female	-0.0347***	-0.00115	-0.00988	0.000384	-0.0489***	0.0458***	-0.0247***
	(0.00603)	(0.00517)	(0.00845)	(0.0116)	(0.00573)	(0.00595)	(0.00876)
age	-0.0111***	-0.0120***	0.0140***	0.0451***	0.0305***	-0.0229***	0.00888***
	(0.00397)	(0.00329)	(0.00411)	(0.00370)	(0.00252)	(0.00518)	(0.00247)
age squared/100	0.00817***	0.0104***	-0.0165***	-0.0282***	-0.0225***	0.0143***	-0.00309*
	(0.00295)	(0.00239)	(0.00282)	(0.00269)	(0.00183)	(0.00384)	(0.00175)
years of schooling	-0.0261***	-0.00796***	-0.0107***	-0.00677***	-0.00854***	-0.0167***	0.00184*
	(0.00128)	(0.00142)	(0.00139)	(0.00124)	(0.000991)	(0.00140)	(0.00101)
black	0.0861***	-0.0269**	0.137***	0.163***	0.116***	-0.0000977	-0.0251***
	(0.0144)	(0.0131)	(0.0108)	(0.0109)	(0.0134)	(0.0140)	(0.00855)
hispanic	0.126***	-0.00551	-0.00697	0.00838	0.0696***	0.0285**	-0.0394***
	(0.0265)	(0.0160)	(0.0181)	(0.0139)	(0.0178)	(0.0139)	(0.00891)
other	0.0214*	-0.00559	-0.0272	0.00515	0.0407**	0.0170	-0.0229**
	(0.0118)	(0.0129)	(0.0238)	(0.0164)	(0.0169)	(0.0203)	(0.00866)
married	-0.0362***	-0.0214***	-0.00578	-0.0131	-0.00609	-0.127***	-0.00425
	(0.0100)	(0.00754)	(0.00876)	(0.00974)	(0.00737)	(0.00766)	(0.00836)
labor	-0.148***	-0.105***	-0.0345***	-0.0659***	-0.0651***	-0.104***	-0.0395***
	(0.00810)	(0.00768)	(0.0122)	(0.00803)	(0.00834)	(0.00860)	(0.00637)
unemployed	0.0795**	0.0347	0.00151	0.0364	0.00893	0.171***	0.0132
	(0.0362)	(0.0292)	(0.0427)	(0.0359)	(0.0257)	(0.0492)	(0.0260)
insured	0.0159*	0.0112	0.0253***	0.0434***	0.0225**	-0.00930	-0.00170
	(0.00863)	(0.0110)	(0.00936)	(0.0120)	(0.00915)	(0.00710)	(0.00771)
blue collar	0.0272***	-0.000649	0.00498	0.0168**	0.0124	0.0414***	-0.0172***
	(0.00638)	(0.00544)	(0.00690)	(0.00782)	(0.00753)	(0.00660)	(0.00556)
Constant	1.008***	0.734***	0.223	-1.113***	-0.700***	1.482***	-0.280***
	(0.130)	(0.113)	(0.147)	(0.132)	(0.0943)	(0.168)	(0.0791)
Observations	23279	23279	23279	23279	23279	23279	23279
R^2	0.115	0.034	0.045	0.066	0.040	0.064	0.033

Robust errors clustered by state.

Treated is an indicator for states with greater than 20 percent decline in home prices from 2006 to 2008.

Table 19: Difference-in-Differences: Effect of home price decline on the likelihood of each health status among mortgagors, 2006-2008.

	(1) poor health	(2) neg chg in health	(3) obesity	(4) high blood pressure	(5) diabetes	(6) depressive symptoms	(7) cancer
post	0.0117	-0.00440	0.0193**	0.0223***	0.00833	-0.0238***	0.00875
	(0.00800)	(0.0100)	(0.00748)	(0.00735)	(0.00568)	(0.00871)	(0.00550)
treated	-0.0140	-0.0248*	-0.00723	-0.0470**	-0.00927	0.00110	-0.0108
	(0.00848)	(0.0135)	(0.0249)	(0.0216)	(0.0153)	(0.0176)	(0.00682)
post×treated	0.0166*	0.0123	-0.00308	-0.00627	-0.0116	0.00888	-0.000522
	(0.00880)	(0.0199)	(0.0155)	(0.00939)	(0.00821)	(0.0185)	(0.00595)
female	-0.0267**	0.00393	-0.0219*	-0.0212	-0.0414***	0.0467***	-0.00871
	(0.0111)	(0.00838)	(0.0130)	(0.0145)	(0.0134)	(0.00904)	(0.0105)
age	0.00372	-0.00621	0.00904	0.0456***	0.0297***	-0.00796	-0.00154
	(0.00641)	(0.00480)	(0.00608)	(0.00584)	(0.00532)	(0.00736)	(0.00437)
age squared/100	-0.00296	0.00617*	-0.0114**	-0.0282***	-0.0209***	0.00315	0.00485
	(0.00508)	(0.00365)	(0.00471)	(0.00433)	(0.00428)	(0.00563)	(0.00365)
years of schooling	-0.0273***	-0.00886***	-0.0116***	-0.00797***	-0.0103***	-0.0164***	0.000740
	(0.00162)	(0.00196)	(0.00219)	(0.00176)	(0.00211)	(0.00192)	(0.00163)
black	0.0215	-0.0540***	0.129***	0.143***	0.0885***	-0.0222	-0.0239*
	(0.0207)	(0.0145)	(0.0226)	(0.0143)	(0.0223)	(0.0196)	(0.0134)
hispanic	0.0608***	-0.00992	-0.0397	-0.0151	0.0260	0.0289	-0.0292***
	(0.0188)	(0.0137)	(0.0247)	(0.0200)	(0.0186)	(0.0198)	(0.00709)
other	0.0270	-0.0164	-0.01000	0.00513	0.0460**	0.0307	-0.0131
	(0.0268)	(0.0172)	(0.0375)	(0.0208)	(0.0185)	(0.0362)	(0.0113)
married	-0.0351***	-0.0128	-0.0110	-0.0106	0.00602	-0.121***	0.00303
	(0.0121)	(0.0123)	(0.0159)	(0.0182)	(0.0105)	(0.0110)	(0.00964)
labor	-0.171***	-0.125***	-0.0471***	-0.0711***	-0.0741***	-0.111***	-0.0348***
	(0.0118)	(0.00912)	(0.0159)	(0.00770)	(0.00928)	(0.0114)	(0.0113)
unemployed	0.0501	0.0504	0.0588	0.0534	-0.0115	0.184***	0.00850
	(0.0461)	(0.0468)	(0.0562)	(0.0470)	(0.0374)	(0.0650)	(0.0332)
insured	0.0188	0.0208**	0.0185	0.0331**	0.0282*	-0.00142	0.0106
	(0.0131)	(0.00996)	(0.0137)	(0.0154)	(0.0146)	(0.0101)	(0.00815)
blue collar	0.0319***	-0.00585	-0.00675	0.0142	0.00975	0.0586***	-0.00927
	(0.0102)	(0.0107)	(0.0160)	(0.0133)	(0.0106)	(0.0108)	(0.00864)
Constant	0.566***	0.559***	0.396**	-1.080***	-0.667***	0.981***	0.0352
	(0.182)	(0.153)	(0.192)	(0.206)	(0.161)	(0.236)	(0.136)
Observations	9050	9050	9050	9050	9050	9050	9050
R^2	0.121	0.040	0.021	0.076	0.047	0.063	0.029

Robust errors clustered by state.

Treated is an indicator for states with greater than 20 percent decline in home prices from 2006 to 2008.