The Effects of Medicare on Medical Expenditure Risk and Financial Strain*

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Abstract

Using data from the Medical Expenditure Panel Survey (MEPS) and the Health Tracking Household Survey (HTHS), we exploit the current discontinuity in Medicare coverage at age 65 to estimate the impact of Medicare on medical expenditure risk and health care-related financial strain, heretofore underexplored issues. Using 2007 to 2010 data, we find that at age 65 out-of-pocket expenditures drop by about 33% at the mean ($326) and 53% ($1730) among the top 5% of spenders. We also find large reductions in several measures of financial strain: problems paying medical bills, related collections agency contact, the amount owed in medical bills and borrowing or using savings to pay these bills all drop by about 30 to 35% at age 65. We find little evidence that these results are biased by the deferability of health care utilization. Our results suggest that Medicare offers the elderly significant protection against medical expenditure risk and financial strain. Based on a stylized expected utility framework we find that the gain from reducing out-of-pocket expenditures alone accounts for at least 12% of the social costs of financing the program. This calculation ignores both the stress-lowering benefits from reduced financial strain as well as any health improvements from access to Medicare. Using standard value of life estimates, for example, an extension of life by just one extra week would mean that the welfare gains from access to Medicare at age 65 fully balance the social costs.

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I. Introduction

A large and vibrant literature evaluates the impact of Medicare on health care utilization and health outcomes (Lichtenberg 2002; Decker and Rapaport 2002a; McWIlliams et al. 2003; McWilliams et al. 2007a; McWilliams et al. 2007b; Card et al. 2008; Finkelstein and McKnight 2008; Card et al. 2009; Polsky et al. 2009; Chay et al. 2010; Kadiyala and Strumpf 2012; Decker and Rapaport 2002b). Although this literature has documented important effects of Medicare on utilization, mortality and specific health conditions, it says less about another important role for health insurance and thus Medicare – the protection they offer against large, unexpected medical expenses.

Existing work suggests that the medical expenditure risk protection from health insurance can have important implications for financial well-being, even among relatively young populations. Medicaid expansions reduce personal bankruptcies, out-of-pocket medical spending, debt, and collections activity (Baicker et al 2013; Finkelstein et al 2012; Gross and Notowidigdo 2011). Insurance expansion under the Massachusetts Health Reform reduces the amount of debt and personal bankruptcies and improves credit scores (Mazumder and Miller 2013). Retiree health insurance lowers out-of-pocket spending by about 20% in the top 40% of the spending distribution (Strumpf 2010).

The few studies that focus on Medicare's risk-protection generally study its introduction in the 1960's or specific components of the program such as the Medicare Part-D prescription drug benefit. Importantly, Finkelstein and McKnight (2008) use a difference-in-differences (DID) strategy and show that within 5 years of its introduction, Medicare decreased out-of-pocket medical spending by 40% among those in the top quartile of spending. McWilliams et al. (2007b) use propensity score methods to compare expenditures for previously (before age 65) insured and uninsured beneficiaries and find that, as the previously uninsured gained Medicare coverage at age 65, they had a significant differential decrease in the odds of incurring high out-of-pocket medical spending, defined as the top decile of biennial spending by age-group. Using a dynamic random utility model of demand for health insurance in a life-cycle human capital framework, Khwaja (2010) concludes that the primary benefits of Medicare are insurance against medical expenditures with relatively smaller benefits in terms of improved health status and longevity. Finally, Englehardt and Gruber (2011) use a DID strategy coupled with Part-D introduction and find substantial reductions in prescription drug out-of-pocket spending, concentrated among a small group of beneficiaries. However, the role of Medicare in reducing exposure to catastrophic medical spending remains poorly understood generally and even more so for the elderly today, who have potentially much larger exposure to high medical spending due to advances in medical diagnostics and treatment that are increasingly expensive.

To fill the gap in our knowledge, we estimate the recent impact of Medicare on medical expenditure risk and related financial stress among the young elderly (ages 65-80) relative to the near elderly (ages 50-64). This comparison lends itself to a credible research design – a regression discontinuity (RD) exploiting age-based eligibility for Medicare.[1] Because Medicare provides nearly universal health insurance coverage for those ages 65 and over, it creates a discontinuity in insurance coverage and generates "as good as random" assignment of coverage for individuals near the age-eligibility threshold. For example, while less than 1% of the elderly are uninsured, almost 15% of the near elderly lacked insurance in 2010 (KFF 2011). Even though this age 65 RD strategy has been used in the past to estimate the effects of Medicare on health care utilization and health outcomes (Card et al. 2008 and 2009), its application to the context of medical expenditure risk and financial stress is novel.

The primary contribution of this paper is to combine (1) a highly credible regression discontinuity (RD) research design with (2) high quality data to analyze the current impact of Medicare on exposure to medical expenditure risk and related financial stress. We use 15 years (1996-2010) of the Medical Expenditure Panel Survey (MEPS), the highest quality nationally representative data containing information on health insurance coverage, health conditions, and total and out-of-pocket medical spending. Although we make use of the full 15 years of data, our primary interest is the more recent period (2007-2010), which allows us to compare the contemporary costs and benefits of the program. To operationalize expenditure risk, we analyze changes in

[1] To the best of our knowledge, the only other paper that uses a RD strategy to estimate the effect of health insurance on medical expenditure risk is Shigeoka (2012), which analyses the effect of a patient cost-sharing program in Japan.

the observed distribution of out-of-pocket spending (excluding premiums since this is a cost that occurs with certainty, i.e. involves no risk), which should provide individuals important information about their actual risk.

In order to investigate the impact of Medicare on financial well-being, we also use measures of financial strain related to medical expenditures. Specifically, we use data from 3 waves (2003, 2007 and 2010) of the Health Tracking Household Survey (HTHS), a nationally representative survey that captures information on medical-related financial strain such as difficulty paying medical bills, the amount owed in medical bills, contact with a collections agency as a result of these bills and whether respondents need to borrow or use savings to pay for medical bills.

Ultimately, the impact of Medicare on medical expenditure risk and financial strain is an empirical matter. On the one hand, by providing coverage for previously uninsured individuals, Medicare might decrease exposure to financial risk related to medical care. On the other hand, if doctors respond to health insurance by overproviding expensive, high-tech care (Wagstaff and Lindelow 2008), then medical expenditure risk could increase with coverage. In addition, the transition to Medicare might represent greater exposure to medical expenditure risk for individuals who previously had generous employer sponsored health insurance, particularly those who lack retiree or other wrap-around Medicare coverage. For example, while Card et al. (2008) find that education and ethnic disparities in the probability of any health insurance coverage narrow with Medicare eligibility, disparities in at least one indicator of the generosity of coverage actually widen. Therefore, we interpret our findings as capturing changes in medical-related financial risk due to both the increase in coverage at age 65 and the transition to a new benefits package, where no specific effect sign is predicted by economic theory.[2]

Using the 2007-2010 MEPS data, we find that the distribution of out-of pocket spending shifts significantly to the left at age 65. For example, out-of-pocket expenditures (all in 2010 dollars) drop by 32% ($326) at the mean and by 53% ($1730)

[2] Since 90% of Medicare beneficiaries have supplemental insurance (KFF 2010), however, we suspect that the increase in coverage at age 65 combined with the effective (if not the default) benefits package will reduce exposure to medical expenditure risk.

among the top 5% of medical spenders. The declines are smaller, but still significant, if we consider the 1996-2010 period: out-of-pocket spending at age 65 drops by almost 20% at both the mean ($209) and among the top 5% of medical spenders ($722).

One potential concern in comparing these outcomes for those just under versus just over age 65 is that individuals may delay medical care in anticipation of gaining Medicare coverage. If so, this would bias our results against finding reductions in out-of-pocket medical spending due to Medicare. Although we find little evidence of deferral in our data, something we show below, we also perform sensitivity analyses of spending that focus on individuals with non-deferrable conditions in order to separate the risk protective and utilization effects of insurance.[3] In this sample of individuals with non-deferrable conditions, which spans the 1996-2010 data, the declines in out-of-pocket spending at age 65 are 38%, both at the mean ($737) and among the top 5% of spenders ($2,523).

The implication from the MEPS analysis is that the Medicare program offers substantial protection against large out-of-pocket health expenses, particularly those associated with acute, unanticipated medical conditions. This view is supported by the HTHS analysis of self-reported medical bill problems. We find that the transition to Medicare at age 65 reduces the likelihood of reporting problems paying medical bills in the past 12 months by 35% (6 percentage points off a base of 17% reporting such problems prior to age 65) as well as the amount owed in medical bills (33% off a base of about $900 in medical bills prior to age 65). Likewise, the likelihood of being contacted by collections agency about medical bills declines by 28% and borrowing to pay these bills declines by 35%.

To better interpret the economic significance of our expenditure risk estimates, we perform a welfare analysis, similar to Feldstein and Gruber (1995) and Finkelstein and McKnight (2008), that combines a stylized expected utility framework with the RD estimates of changes in the distribution out-of-pocket health spending at age 65. We find that the out-of-pocket expenditure risk protection afforded by Medicare translates

[3] The non-deferrable conditions analysis is conducted in the MEPS only, because the HTHS has smaller sample sizes and limited measures of health. To the extent that deferred medical care increases the likelihood of bill problems, all else equal, the HTHS analysis provides an underestimate of Medicare's protection against medical-related financial strain.

into an average welfare gain that covers at least 12% of the program's social costs. This calculation does not include the stress benefits of reduced financial strain that we find in the HTHS or any health benefits associated with transitioning into Medicare at age 65 – two effects that have been shown to be important (see Dobbie and Song 2013; Card et al. 2009).

The rest of the paper is organized as follows. Section II describes the data used, the construction of measures of insurance coverage and generosity, and measures of medical expenditure risk and related financial stress. Section III describes the method used, regression discontinuity design, as well as the construction of the analytic sample and our sensitivity checks. Section IV presents the results. Section V describes the welfare analysis and section VI concludes.

II. Study Data

We use pooled data from the Medical Expenditure Panel Survey (MEPS), a nationally representative two-year rotating household panel containing information on health insurance coverage, health conditions, and total and out-of-pocket medical spending. While our primary focus is on the most recent, post Part-D data available, 2007-2010, we also make use of the full 15 years of available MEPS data (1996-2010). MEPS's main advantage is its high quality data on health care spending. The MEPS household survey gathers detailed information about health care visits, hospital stays, prescription drug fills, other medical services, out-of-pocket expenses and sources of other payments (Stanton and Rutherford 2006). In addition, a provider component obtains follow-up data on payments by private insurance, Medicaid, Medicare and other sources.[4] Sample sizes are relatively large – with about 7,000 to 9,000 individuals ages 50 to 80 in any given survey year. Finally, in the MEPS we can calculate age in quarters and thereby precisely estimate the age profiles of spending.

Unfortunately, because MEPS is a household survey, it misses extreme spending by individuals in institutional settings (Aizcorbe et al. 2010, Zuvekas and Olin

[4] Unfortunately, while the follow-up surveys supplement self-reported payment information, they do not update self-reported utilization figures (Zuvekas and Olin 2009). That is, the quantity of care from the household survey is taken as given and it is only expenditures that get updated/validated.

2009). Since institutional spending is relatively low for those near age 65 (Federal Interagency Forum on Aging-Related Statistics 2012), this omission may not be too problematic. Moreover, although the MEPS understates total health spending based on the National Health Expenditure Accounts (NHEA) by almost 18%, it understates out-of-pocket spending, our primary interest, by only about 5.5% relative to the NHEA (Bernard et al 2012).[5] Thus, the MEPS remains a good source of data for our purposes.

Our measure of financial risk based on the MEPS-- the distribution of out-of-pocket spending-- provides only limited insight into the medical-related financial stress faced by individuals. To gain additional insight into the financial well-being afforded by Medicare, we use restricted-access data from the Health Tracking Household Survey (HTHS), formerly the Community Tracking Survey, a nationally representative survey conducted by the Center for Studying Health System Changes. We use 3 waves of the HTHS -2003, 2007 and 2010 – that include information on health insurance, use of services and medical-related financial strain, such as difficulty paying medical bills and contact with a collection agency.[6] The restricted data allow us to analyze reports of the exact amount of medical bills owed (top-coded at $70,000).[7] Together these survey waves capture about 19,000 individuals ages 50-64 and 11,000 individuals ages 65-80. Unfortunately, the HTHS provides age only in years but even with this cruder measure of age, the visual analysis below shows rather striking changes in self-reported financial strain at age 65.

Insurance Coverage and Generosity

We investigate the relationship between Medicare eligibility and health insurance status in two main dimensions: coverage and generosity. Across both surveys, health insurance coverage is measured as an indicator for whether the respondent reported having any type of health insurance at any month during the year preceding the survey.

[5] These comparisons adjust the NHEA to account for the MEPS sample frame, i.e., non-institutionalized households. Still some dispute how well the MEPS captures the *distribution* of out-of-pocket medical spending, with Hurd and Rohwedder (2009) treating it as the gold-standard and Marshall, McGarry and Skinner (2010) suggesting that the Health and Retirement Survey, which shows higher out-of-pocket spending in the right tail of the distribution, is more accurate because it asks about more detailed cost categories and allows individuals to provide ranges for expenses of uncertain amounts.
[6] Earlier years of this survey do not ask directly about medical-related financial strain.
[7] The publicly available data categorizes the amounts into 4 bins, top-coded at $10,000.

Additionally, in the MEPS we follow the literature and measure health insurance generosity using an indicator for whether the respondent reported having two or more health insurance policies in the year preceding the survey (Card et al. 2008). This measure captures reported supplemental insurance coverage, which increases generosity by providing additional benefits and covering the relatively high cost-sharing in traditional Medicare.[8] Using the HTHS data, which enables us to categorize individuals as having traditional Medicare versus a Medicare HMO plan, Medicare and additional private coverage, or Medicare and another public source of coverage, we can better assess the extent to which individuals transition to a generous source of coverage at age 65.

Medical Expenditure Risk Measures

We measure expenditure risk based on the empirical distribution of out-of-pocket spending in the MEPS. Although risk is fundamentally an ex-ante concept, the distribution of expenditure realizations is one way for an individual to understand the likelihood of facing extreme out-of-pocket costs. We measure changes in the whole distribution of out-of-pocket spending at age 65, including the mean, different percentiles and the share of total expenditures that is paid out-of-pocket. Medical expenditures in the MEPS are defined as the sum of direct payments for care provided during the year, including out-of-pocket payments and payments by private insurance, Medicaid, Medicare, and other sources. Payments for health insurance premiums and over-the-counter drugs are not included in MEPS medical expenditures. All medical expenditures were corrected for inflation using the medical care services (MCS) component of the Consumer Price Index (CPI) and are expressed in 2010 dollars.[9] Results using the full CPI are quite similar. All age-specific means were calculated taking into account survey design.

While the distribution out-of-pocket spending across ages provides individuals with a reasonable estimate of their ex-ante exposure to medical expenditure risk, it

[8] Because it does not capture Medicare Advantage (MA), however, this measure is likely to underestimate the generosity of insurance benefits at age 65. In 2006, for example, the average net value of an MA plan exceeded traditional Medicare by $55 to $71 per month, depending on the plan type (fee-for-service or managed care). See Merlis (2008) for details.

[9] For details of the MCS, see http://www.bls.gov/cpi/cpifact4.htm

provides only limited insight into the medical-related financial stress faced by individuals. Therefore, we also analyze measures of financial strain described below.

Financial Strain Measures

We use the HTHS to get at subjective measures of financial strain. All 3 waves of the HTHS survey ask respondents about whether in the past 12 months they: 1) had any problems paying medical bills, 2) were contacted by a collections agency, 3) had to borrow because of problems paying medical bills or 4) have to take money out of savings because of these problems. In the last 2 survey waves, they also ask respondents about the amount owed in medical bills, the event that caused the reported medical bill problems (an illness, accident, medical test or surgical procedure, and so on) as well as whether the respondent filed for or thought about filing for bankruptcy in the past 12 months. In general, however, the rate of bankruptcy filing (or even thoughts of filing) is too low to provide meaningful information. Therefore we focus on items (1)-(4) above in addition to changes in the amount owed in medical bills.[10]

III. Empirical Strategy: Regression Discontinuity Design

Our research is motivated by an interest in understanding the impact of health insurance on medical expenditure risk and financial strain. In principle, we would like to estimate the following simple reduced-form equation:

$$m_i = \alpha + f(age_i; \lambda) + \beta I_i + X_i \delta + \varepsilon_i \qquad (1)$$

where m_i is a measure of medical-related financial exposure (e.g. out-of-pocket spending or difficulty paying medical bills) for individual i; X_i is a set of demographics characteristics of individual i; $f(age_i; \lambda)$ is a smooth function representing the age profile of outcome m_i; I_i is an indicator for whether individual i has health insurance coverage and ε_i is an unobserved error. A fundamental and well-known problem in interpreting β as the causal effect of health insurance on medical expenditure risk is that coverage is endogenous; it both affects and is affected by financial risk, confounding observational comparisons of people with different insurance status.

[10] In ongoing work, we are collecting primary data on individual perceptions of medical expenditure risk as well as reports of ability to make these expenditures.

To circumvent this well-known empirical problem, we exploit the age 65 threshold for Medicare eligibility as a credible source of exogenous variation in insurance status. We adopt a Regression Discontinuity (RD) design, that takes advantage of the fact that individuals on either side of the age 65 threshold (e.g., 64 or 66) are likely similar on observable and unobservable characteristics that affect medical expenditure risk – that is, these characteristics should have a smooth age profile. In other words, this strategy relies on the fact that in the absence of the Medicare program our outcomes of interest should not change discontinuously at age 65; therefore any estimated discontinuities can be attributed to Medicare. This age 65 Medicare RD offers a well-established research design, albeit one that has been used largely to understand the impact of Medicare on health care use, diagnoses, mortality, and even job lock (see, for example, Card et al. 2008; Card et al. 2009; Fairlie et al. 2012).

Using the MEPS, we show below that rates of insurance coverage rise discontinuously from about 87 to 99% at age 65. Likewise, the 2003, 2007 and 2010 HTHS show an 11 percentage point jump in coverage at age 65 but to 97% as opposed to 100% coverage. The discontinuous change in insurance coverage at age 65, which comes through Medicare, allows us to identify the effect of this program on financial risk. Because those who had health insurance prior to transitioning on to Medicare experience some change in their benefits package, the analysis described below will capture a weighted average effect of the change in medical expenditure risk due to the increase in insurance coverage at age 65 and the change due to the Medicare benefits package, which for those who previously had employer-sponsored insurance may in principle be less generous. In practice, however, because most Medicare beneficiaries (90%) have supplemental insurance (e.g., through a Medigap plan, a Medicare Advantage (MA) plan, a retiree health plan or Medicaid), the total package of health insurance at age 65 is likely to be quite generous (KFF 2010).

Formally, health insurance coverage can be summarized by the following equation:

$$I_i = \gamma + g(age_i;\mu) + \pi T_i + X_i\varphi + \upsilon_i \qquad (2)$$

where coverage depends on individual characteristics, a smooth function of age and an indicator T_i for age 65 or older, due to Medicare eligibility. Combining equation (2) with equation (1) the resulting reduced form model for outcome m_i is

$$m_i = \omega + h(age_i; \rho) + \tau T_i + X_i\theta + u_i \quad (3)$$

where $\omega = \alpha + \beta\gamma$; $h(age_i; \rho) = f(\cdot) + \beta g(\cdot)$ and $\tau = \beta\pi$.[11] [12] Assuming the age profiles $f(\cdot)$ and $g(\cdot)$ are both continuous at age 65, any discontinuities in m_i at that age can be attributed to discontinuities in insurance. In other words, if we assume that the age profiles of financial risk are continuous at age 65 in the absence of Medicare's age-based eligibility rule, then, once we empirically control for such profiles, any estimated discontinuity in our risk measures can be attributed to discontinuities in Medicare coverage. The discontinuity in Medicare coverage at age 65 will enable us to estimate the (local average) treatment effect of Medicare on financial risk protection. The magnitude of the treatment effect τ depends on the size of the insurance changes at age 65, π, and the causal effect of insurance on m_i, β.[13]

Equation (3) is our main estimating equation. As discussed above, our estimates of the effect of insurance on financial risk of the elderly relative to near-elderly, τ , capture a weighted average of the change due to the increase in coverage at age 65 and the change due to Medicare (and supplemental insurance) benefits. For analyses of insurance coverage, mean out-of-pocket spending, the share of total spending paid out of pocket, and reports and sources of medical bill problems, we use Ordinary Least Squares (OLS) regressions. To account for potential misspecification of the age-profiles, we adjust our standard errors to allow for an arbitrary correlation at the level of age in quarters in the MEPS or age in years in the HTHS (Lee and Card 2008). Analyses of different points in the distribution of out-of-pocket spending – e.g., spending at the median, 75th and 95th percentile – are estimated using quantile regressions.

[11] The validity of the RD requires smoothness in the covariates. Assuming smoothness holds, an assumption we partially test, individual characteristics, X_i , are not needed but can be included to increase precision.

[12] In all the results presented below the age profile $\mathrm{h(age_i; \rho)}$ is allowed to differ on either side of the age 65 cutoff.

[13] The variable age is measured as a deviation from age 65, therefore τ can be interpreted as the discontinuous change on outcome m_i at age 65.

Standard errors are estimated using an age-based block bootstrap, analogous to age-based clustering, that randomly samples with replacement the data within each age group and estimates the models on these random samples (Efron and Tibshirani 1994). When an age-block (age in quarters in MEPS or in years in HTHS) is randomly selected all respondents of this age are included in the estimation. The standard errors are then calculated simply as the standard deviation of the coefficient estimates from 500 bootstrap samples.

All regressions (OLS and quantile) employ survey weighting. In order to increase precision, we pool together several years of data. Importantly, the MEPS samples in most years are not completely independent because households are drawn from the same sample geographic areas and many people are in the sample for two consecutive years.[14] Despite this lack of independence, it is valid to pool multiple years of MEPS data and keep all observations in the analysis because each year of the MEPS is designed to be nationally representative.[15]

Other Changes at Age 65

A key assumption of the Regression Discontinuity design is that observable and unobservable characteristics that affect outcomes have a smooth age profile at the arbitrary threshold used for identification (age 65 in the case of Medicare). An obvious concern in our context is employment, since 65 is a traditional age of retirement. Card et al. (2008) demonstrates that the estimated jumps in employment-related outcomes at age 65 are small in magnitude and statistically insignificant in both the 1992-2003 NHIS and the 1996-2004 March CPS. In the MEPS, we find similar smoothness in employment and retirement rates[16], educational attainment, and family income of the near and young elderly as well as in other important observed characteristics, such as racial and ethnic background and geographic location of residence.

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[14] See MEPS-HC Methodology Reports for more details at http://www.meps.ahrq.gov.

[15] Bootstrapped standard errors that specify a common variance structure to reflect the complex sample design of the MEPS are generally smaller than those obtained from either clustering by age or the age-block bootstrap. Thus, we opt for a more conservative approach to inference.

[16] The retirement question in the MEPS measures the fraction that reports having ever retired from any job or business. It is asked only from those ages 55 and above. Given it is not conditional on ever working the question yields somewhat low fractions retired, even at older ages.

The smoothness of some key covariates are shown in Figures 1a-1b which illustrate mean rates of employment, retirement, marriage and personal income along with parametric fits for our main analytic samples – the 2007-2010 MEPS and the HTHS. Table 1 provides the regression estimates for the outcomes shown in these figures as well as for the share with a BA or higher, family size and the share of individuals living in the South. Panel A shows the results for the MEPS and panel B for the HTHS.

Across most outcomes, including several such as the share male, the share Hispanic and the share with less than a high school degrees that are shown in Appendix Table 1, we cannot reject zero discontinuity at age 65 in observed characteristics. An important exception in both the 2007-2010 MEPS and the HTHS is the share married. Specifically, we find a 4 to 5 percentage point increase in rates of marriage at age 65. Off a pre-65 base of 67 and 69 percent married in the MEPS and HTHS respectively, this represents a 5-7 percent increase. One potential reason for this discontinuity is that one can qualify for Medicare at age 65 based on a spouse's work history, even if the spouse is not yet old enough to qualify.[17] Consistent with this hypothesis and the fact that men are more likely to have a work history, results by gender reveal that the discontinuity in the share married at age 65 is larger for women than for men. Thus, the discrete change in marriage rates shown here may suggest an alternate mechanism through which the change in Medicare coverage at age 65 operates.

Across all 11 outcomes in the 2007-2010 MEPS, the change in marriage rates is the only outcome that is significantly different from zero. In the HTHS sample, we also estimate a discontinuity in the share married and in Appendix Table 1, the share male and the share with less than a high school degree. However, as reflected by the F-statistic, the fit for this parametric model is quite poor; the coarseness of these data, which are available by age in years instead of quarter, limits our ability to fit suitable parametric models. Moreover, if we use the full 1996-2010 MEPS sample in order to maximize the power to detect such discontinuities, we cannot reject the hypothesis of no discontinuity for any covariate, including the share married (see Appendix Figure 1a

[17] For details, see http://ssa-custhelp.ssa.gov/app/answers/detail/a_id/400/~/how-to-qualify-for-medicare

and Appendix Table 3, panel A). Given the general smoothness in the data, our analysis satisfies the continuity assumption of the RD design. Thus, we will attribute any discrete change in our measures of financial risk at age 65 to the change in Medicare eligibility at this age.

Issues of Deferability

One concern in comparing the distribution of health spending above and below age 65 is that individuals may choose to defer some health spending until they become eligible for Medicare (or alternatively others with very generous insurance may schedule elective procedures prior to their transition to Medicare). Although previous work demonstrates that hospitalizations increase once individuals transition to Medicare (Card et al. 2008), we find little evidence of deferred care in our sample as a whole, as shown in section IV. Moreover, an increase in health care utilization, particularly costly inpatient stays, at age 65 biases us against finding an effect of Medicare on financial risk protection. Nonetheless, in sensitivity checks we estimate the effect of health insurance on financial risk protection for individuals with unanticipated and non-deferrable health events.

To isolate those with non-deferrable medical conditions we use the MEPS Household Component Event Files, which include hospital inpatient stay files, and the Medical Conditions Files, which ask about diagnoses, medical events, and disabilities. While the accepted approach to identifying these cases involves selecting diagnoses where inpatient admissions through the ER are close to 2/7 on the weekend, as in Dobkin (2003), Card et al. (2009), and Doyle et al. (2011), the MEPS collapses ICD-9 codes for medical encounters down to a level (3 as opposed to 5 digits) that makes this exercise difficult. Consequently, we identify individuals who have medical encounters that cannot be postponed as those who suffered at least 1 of 18 acute conditions in the past year that required immediate care, based on the independent opinions of five physicians (see Appendix Table 2).[18] Restricting the sample to respondents with such non-deferrable conditions decreases sample size significantly, therefore we use the full

[18] Four of five physicians work in emergency medicine and the fifth is a general practitioner. To be conservative, we restricted to conditions that all five agreed required immediate attention.

1996-2010 sample for the non-deferrable analysis. By focusing on individuals with non-deferrable conditions, we can isolate the effect of insurance on financial risk protection from any behavioral effect it may have on the timing of (and thus spending on) more elective care. Because we are interested in the risk-protective value of health insurance for the whole population, however, this analysis is meant only as a check.

Appendix Figures 1a and 1b along with Appendix Table 3 show that for the full 1996-2010 MEPS data as well as the sample restricted to those with non-deferrable medical conditions, the RD smoothness condition holds well. The one exception is an implausibly large *decline* in rates of retirement at age 65 for the non-deferrable sub-sample. The F-statistic in Appendix Table 3 and the plot in Figure 1b, however, suggest that the estimated decline in retirement may be an artifact of the parametric fit.

Sensitivity Checks

We test the sensitivity of our main estimates in several ways. First, we experiment with alternate specifications of the control function, i.e. the age-specific polynomials. While our main specification uses a quadratic in age, which seems to mimic the plots of the outcomes of interest reasonably well, specifications that employ linear or cubic age terms (that in all cases are allowed to vary on either side of the age 65 cutoff) yield quite similar results. Second, we show that narrowing the age window to respondents 55 to 75 years old, and thereby limiting the contribution to the estimation of observations far from the age-65 Medicare threshold, generates similar findings. Finally, we perform "donut-RD" estimates that drop observations right around age 65 to limit any effects of potential heaping (Barecca et al. 2011) due, for example, to the misreporting of age. Moreover, the "donut-RD" estimates are an alternative way to handle potential deferral of medical care, since those right around age 65 are the most likely to defer care in anticipation to health insurance coverage. Here again our estimates are quite similar.

IV. Results

Medicare Eligibility and Health Insurance Coverage and Generosity

Figure 2 shows the age profile of health insurance coverage and generosity for the MEPS sample and the HTHS sample. The figures also show smooth functions fitted to the data before and after age 65. As discussed above, Figure 2 demonstrates quite clearly that health insurance coverage rises discontinuously at age 65, from 87% to 99% in the MEPS and from 87 to 98% in the HTHS (see Table 2). Estimates using alternative specifications of the age polynomial, either linear or cubic age terms, yield nearly identical increases in the MEPS but slightly smaller increases (7.5-8 percentage point increases) in the HTHS. Likewise, we find large increases in our measures of generosity at age 65. The estimates of changes in coverage generosity are quite stable across alternative specifications of the age polynomial. In the MEPS sample, the fraction covered by 2 or more plans increases by about 59 percentage points off a base of only 6 percent. In the HTHS, where we have a direct measure of supplemental coverage, the increase is 64 percentage points off a base of just 6.3 percent. If we consider coverage through a Medicare Advantage plan as well as supplemental coverage (not shown), the increase at age 65 is 67 percentage points off a base of 6.6 percent.[19] While still below the 90% supplemental coverage found in the Medicare Current Beneficiary Survey (KFF 2010), these figures suggest that most individuals transition to a generous package of insurance benefits at age 65. As shown in Table 2, all these increases at age 65 are statistically significantly different from zero. We will use this discontinuous change in coverage and generosity at age 65 to identify the effect of Medicare on medical expenditure risk and financial strain.

Total Spending and Utilization

Because of concerns discussed above about deferability of medical care, which would bias us towards finding no risk protective effects of Medicare, we next consider the change in total spending and utilization at age 65. As shown in Figure 3 and Table 3, total medical spending actually declines at age 65 by about $2200 or almost 35%. Estimates using a linear trend in age (see Panels B and C) are a bit smaller but still imply declines of about $1100 or 18% while estimates from a specification with third

[19] Specifically, the HTHS allows us to look at Medicare plus a supplemental public or private plan or Medicare Advantage coverage. Restricting to just supplemental coverage, we still see a 64 percentage point increase in generosity off a base of 6.4% in the HTHS data (not shown).

order age polynomials are slightly larger at about $2600 or 41%. Likewise, estimates using the narrower age band of 55 to 75 or the donut RDs that drop successively 65 year olds, 64.75 to 66.25 year olds and 64.5 to 66.5 year olds, suggest declines of $1900 to $2400 or about 30 to 33% (see Appendix Table 4). The estimate from the non-deferrable sample (in Appendix Table 5) is quite a bit larger in magnitude, albeit not statistically distinguishable from zero and only about 20% in relative terms, even though the full sample results imply a decline of closer to $850 or 14%.

Importantly, the decline in total medical spending at age 65, which itself runs contrary to the idea of deferability assuming constant prices, does not appear to come from a change in utilization. Figure 3 and Table 3 show that the likelihood of a physician visit, an outpatient hospital visit or an inpatient stay is essentially unchanged at age 65. This is true across alternate specifications of the age polynomials (Panels B and C) and in checks that narrow the age window to 55 to 75 or perform donut RD estimates (in Appendix Table 4). Likewise, we find no clear evidence to support a change in utilization at age 65 in the full 1996-2010 MEPS or the non-deferrable sample (in Appendix Table 5). Across all estimation samples and specifications, the results are similar if we analyze the total number of visits or the log (or inverse hyperbolic sine) of visits (not shown for brevity sake). The implication is that 1) deferability is not a big issue in the sample overall and 2) changes in medical spending at age 65 are likely driven by lower prices negotiated by Medicare, an issue that warrants further study. Because some sub-groups may still defer care, we hesitate to rule out deferability completely and instead conclude that to the extent such behavior exists it is likely to be small and, of course, biases us away from finding any risk protective benefit of Medicare. For this reason, we also present results of the effect of Medicare on medical expenditure risk for the non-deferrable conditions sample, for which this worry is lessened.

Medicare Eligibility and Medical Financial Risk Exposure

Next, we analyze changes in the distribution of total and out-of-pocket medical spending at age 65. Figure 4 presents the regression discontinuity graphs for different parts of the distribution of spending and Table 4 the corresponding RD estimates. We find a discontinuous drop of US$ 326 in mean of out-of-pocket spending at age 65, a drop of almost 33% relative to the mean prior to age 65. The sharp drop in out-of-pocket spending at age 65 increases as we move to higher percentiles of the distribution. At the median, the decline is small – roughly $47. At the 75^{th} percentile the decline is about $210 or almost 18% relative to the pre-65 mean while at the 90^{th} and 95^{th} percentiles, the declines are $865 (36%) and $1730 (52%), respectively. When we analyze the share of total expenditures paid out-of-pocket, there is a drop of approximately 2 percentage points or about 6% off the mean share of 33% below age 65, although this estimate is not statistically distinguishable from zero.

Estimates using linear or cubic age trends (Panels B and C) generally straddle those from our preferred specification with quadratic age trends. With linear age trends, the declines in out-of-pocket spending are $255 (25%) at the mean and $843 (35%) and $1391 (37%) at the 90^{th} and 95^{th} percentiles, respectively. The estimated declines at the median, 75^{th} percentile and in the share of spending that is out-of-pocket are all statistically distinguishable from zero. In the case of the share out-of-pocket, the decline is almost 4 percentage points or 33%. Using cubic age trends, the declines in out-of-pocket spending are $349 (35%) at the mean and $1145 (48%) and $2091 (64%) at the 90^{th} and 95^{th} percentiles, respectively. Declines at the median and 75^{th} percentile are also statistically distinguishable from zero and on the order of 30% in relative terms.

Figure 5 presents the quantile RD estimates for the full distribution of out-of-pocket spending, using our preferred quadratic specification. This figure shows that the changes are concentrated at the top quarter of the distribution, suggesting that the risk protection of Medicare is really working through high, catastrophic medical spending.

The estimates in Appendix Table 6 from regressions using the narrower age band (Panel A) or the donut RDs (Panels B-D) are very similar in magnitude to our main estimates. Restricting to respondents age 55 to 75, the estimates are generally even more precise, showing, for example, a statistically significant $110 decline in out-of-pocket spending at the median. In addition, all of the donut RDs show statistically significant and large, 3 to 4.7 percentage point (10-14%), declines in the share of spending that is out-of-pocket at age 65.

Estimates from the full 1996-2010 MEPS (Panel A of Appendix Table 7 and Appendix Figure 4a) are considerably smaller in magnitude than those from the more recent period. Using all 15 years of data, the estimated decline in spending is only about two-thirds of the decline at the mean and 55% of the decline at the 90th percentile based on 2007-2010 data. Restricting to the non-deferrable sample (Panel B and Appendix Figure 4b) yields considerably larger declines, although the estimates are only statistically distinguishable from zero at the mean ($737 or 37% decline) and at the 90th percentile ($2023 or 42% decline). The loss of power is not too surprising, however, given the much smaller sample sizes for the non-deferrable group.

Medicare Eligibility and Financial Strain

While the observed changes in out-of-pocket spending at age 65, particularly those changes at the right tail of the distribution, indicate that Medicare offers important risk-protection to seniors, the precise numbers are difficult to put into context. To provide further meaning to these changes, we use the HTHS to measure changes in self-reported measures of financial strain.

Figure 6 and the corresponding estimates in Table 5 show discontinuous changes at age 65 in reported problems paying medical bills, medical-bill related collections agency contact, borrowing to pay these bills and using savings to pay these bills. Prior to age 65, 17% of respondents report problems paying medical bills. At age 65, the fraction reporting problems declines by 6 percentage points or 35%. Estimates using linear or cubic age terms (in Panels B and C) suggest smaller declines in medical bill problems, although in both cases they still show sizeable 4 percentage point or about a 25% reduction in reporting such difficulties. Estimates using only respondents ages 55 to 75 or from the donut RDs in Appendix Table 8 are roughly the same as the main estimates or ever larger.

Consistent with the decline in perceived problems paying medical bills, the fraction being contacted by collection agencies about these bills declines by 2.8 percentage points or almost 30% off a base of 9.9%. The declines are a bit smaller - 17 to 22% - using alternative polynomials but still meaningful in magnitude, while the narrower age band and donut RDs yield even larger declines (32-36%). The fraction borrowing to pay these bills declines by 2.9 percentage points (or 35% off a mean of 8.2%; significant at the 10% level), although alternative polynomials yield declines that are smaller in magnitude (17-22%) and statistically indistinguishable from zero. The fraction using savings to pay medical bills declines by 4 percentage points (or 38% off a mean of 10.5%; significant at the 1% level). Linear or cubic polynomials yield declines that are smaller but still sizeable in terms of both magnitude (21-36%) and statistical significance. Estimated declines in borrowing or using savings from the more restricted age group or from the donut RDs are quite similar to the main results and in many cases a bit larger. Interpreting declines in the likelihood of borrowing or using savings to handle medical bills is somewhat difficult, however. For example, the implications of borrowing to smooth consumption may be quite different from borrowing that depletes a retirement nest egg. Since we find large declines in the likelihood that individuals delay major purchases as a result of medical bills at age 65 (4 percentage points off a base of just 9% prior to age 65; see col (5), Table 5), these changes in borrowing and savings do not seem to reflect attempts to smooth consumption. However, more detail is needed to fully understand these patterns.[20]

Finally, we analyze changes in the amount owed in medical bills (see Figure 7 and Table 6). Even though medical debt is a stock, the rate at which individuals acquire debt or at which existing debt grows can still change at age 65. We find a change at the mean on the order of \$120 off a base of \$936 owed in medical bills prior to age 65, but the estimate is too noisy to statistically distinguish from zero. At the 90th percentile, the change is more than 2.5 times larger or \$306, although this estimate is also quite imprecise. We also analyze the inverse hyperbolic sine, $IHS(Y) = \ln(Y + (Y^2+1)^{1/2})$, of the amount owed. This transformation is used because it is defined for zero amount owed and like the natural log yields a parameter estimate that can be interpreted as an elasticity (Pence 2006). With this specification, we estimate a 33% percent decline in the amount owed in medical bills at age 65, further evidence that the estimated changes in out-of-pocket spending in the MEPS have meaningful impacts on medical liabilities

[20] We also analyzed medical bill problems by cause. Surprisingly, the fraction of medical bill problems due to accidents does not change at age 65, but these events may be too rare among respondents in our data. In contrast, the fractions reporting medical bill problems due to illness, test of surgical procedures and other causes all drop at age 65. Results available upon request.

faced by seniors. Using a cubic in age yields an almost identical decline (33%) while linear age trends yield a far smaller but still sizeable decline of 23% (Panels B and C). In contrast, estimates using the narrower age band or from the donut RDs (Appendix Table 9) indicate declines in the amount owed of about 40%. The larger estimates from the donut RDs in particular (41-42%) may reflect the fact that deferred medical care should increase the likelihood of medical bill problems and amounts owed in medical bills and failing to account for such deferral will understate Medicare's protection against medical-related financial strain.

V. Welfare Gain from Reductions in Out of Pocket Expenditure Risk

To better interpret the economic significance of the RD estimates on out-of-pocket medical expenditures in this section we use a stylized expected utility framework to simulate the insurance value of the estimated change in medical expenditure risk exposure associated with Medicare. This approach is similar to the one used by Feldstein and Gruber (1995), Finkelstein and McKnight (2008), Engelhardt and Gruber (2011) and Shigeoka (2012). It assumes a utility $u(c)$ where c is non-health consumption and a budget constraint of $c = y - m$, where y is income and m out-of-pocket expenditure. m is a random variable with probability density function $f(m)$ and support $[0, \overline{m}]$. $f(m)$ depends both on random health shocks and the nature of health insurance held (if any). Expected utility is given by

$$\int_0^{\overline{m}} u(y-m)\, f(m) dm \qquad (5)$$

To calculate the welfare change associated with Medicare, we compare an individual's risk premium (or certainty equivalence) under the pre- and post-65 spending distributions $f(m)$. Following the literature, $f(m)$ is based on the empirical distribution of medical spending in the MEPS. The risk premium (π) is the maximum amount that a risk averse individual would be willing to pay to completely insure against the random variable m:

$$u(u - \pi) = \int_0^{\overline{m}} u(y-m)\, f(m) dm \qquad (6)$$

A decrease in risk exposure for the elderly relative to the near elderly due to Medicare would appear as a decline in the risk premium; this decline provides a dollar measure of the insurance value (and hence welfare gain) from Medicare coverage:

$$\Delta\pi = \pi^{post-65} - \pi^{pre-65}. \tag{7}$$

We use quantile estimates of the parameters in (3) to simulate the expenditure distribution faced by individuals just below and above age 65 and to calculate the risk premium for both groups using (6). We focus on the results from the 2007-2010 sample in order to to compare the contemporary costs and benefits of the program.

As shown in Table 4 and Figure 5, Medicare shifts both the variance and mean level of out-of-pocket spending. However, the change in the mean of out-of-pocket spending for those just above relative to just below age 65 represents a transfer from the government to the insured and not a change in risk. Thus, to calculate a mean-preserving change in risk due to Medicare, we subtract out from the distribution of out-of-pocket spending at age 65 the mean reduction in out-of-pocket spending due to Medicare.

In practice, the computation of (7) is done as follows. First, we use the estimates of the parameters in (3), shown in Figure 5, to simulate for each individual i in the sample the conditional (on individual's characteristics X) quantiles (superscript j) of the out-of-pocket spending distribution pre-65 (without Medicare),

$$\widehat{m}_{i0}^{j} = \widehat{w}^{j} + X_i\widehat{\theta}^{j} \tag{8}$$

And post-65 (with Medicare):

$$\widehat{m}_{i1}^{j} = \widehat{m}_{i0}^{j} + \hat{\tau}^{j} \tag{9}$$

for i=1,.., N and j=1,...,99. The coefficients are estimated using 50-80 year-olds, but we focus on 64-66 year-olds for the prediction in order to better estimate the change in risk premium around the age 65 threshold. We set the very bottom of the distribution (j=0) equal to zero so that each person has 100 points of equal probability of occurrence in the out-of-pocket spending distribution. We truncate predicted out-of-pocket spending from below at zero and from above by dropping the top 1% of predictions at each centile.[21]

We calculate the risk premium without Medicare for each person using

$$U(y-\pi_{i0}) = \frac{1}{99}\cdot\sum_{j=1}^{99} U\left(y-\widehat{m}_{i0}^{j}\right) \quad (10)$$

where j indexes the quantile from the distribution. Similarly, the risk premium with Medicare for each person is

$$U(y-\pi_{i1}) = \frac{1}{99}\cdot\sum_{j=1}^{99} U\left(y-\widehat{m}_{i1}^{j}-\mu\right) \quad (11)$$

where μ is the estimate in Table 4 of the change in the mean out-of-pocket expenditures from Medicare ($326) for the 2007-2010 sample. Following the literature, we specify a constant relative risk aversion (CRRA) utility function, i.e. $U(c) = \frac{C^{1-\rho}}{1-\rho}$, where ρ is the Arrow-Pratt relative-risk aversion parameter. Since there is no consensus on what the coefficient of risk aversion is, we present results for coefficients equal to 1, 3 and 5. In general, the literature uses 3 as the benchmark, which McClellan and Skinner (2006) determine to be the value that best replicates observed spending among the low-income pre-Medicare population (55-64) using a CRRA utility framework and the Panel Survey of Income Dynamics.[22] For this reason, we focus on the results for a risk aversion coefficient of 3 in the discussion below.

The first column of Table 7 shows the mean decline in risk premium (or welfare gain) associated with Medicare for different levels of risk aversion. As expected, the higher the coefficient of risk aversion, the higher the welfare gain. For a risk coefficient of 3 the mean welfare gain is $216 per person.

The calculation described above takes as given the change in health insurance coverage and generosity currently observed in the data at age 65 (a 12 percentage point change for coverage and a 59 percentage point change for generosity, see Table 2). Referring back to the discussion of our main estimating equation (3) in section III, the

[21] We choose this truncation since health spending can in principle exceed income – especially if negative health shocks affect labor market participation. We find similar results if we truncate predicted out-of-pocket spending at 80 percent of individual income and if we don't truncate from above at all.

[22] As McClellan and Skinner (2006) point out, the simulation and thus the determination of 3 as the best measure of relative-risk aversion, also relies on parameter choices related to the relative value of medical spending in bad health and the "necessary" medical spending in bad and good health.

magnitude of the treatment effect (τ) depends both on the size of the insurance changes at age 65 (π) and the causal effect of insurance on medical expenditure (β). If, in the absence of Medicare, a higher fraction of 65 or 66 year-olds is uncovered than currently observed among 64 year-olds, then this calculation would underestimate Medicare's risk protection welfare benefits. In order to have a better idea of how important these effects are, we also present results scaled by the effect of turning 65 on health insurance coverage and generosity in columns (2) and (3) of Table 7.[23] For a risk aversion coefficient of 3, the welfare gains are $518 if we scale by generosity and $1,994 if we scale by coverage.

To put these welfare gains from expenditure risk reduction into perspective, we compare them to the social costs of the program. These costs include: (1) the cost of raising revenue for the program and (2) the efficiency costs from the moral hazard effect of health insurance. As shown in section IV, we fail to reject zero change in utilization at age 65 for the 2007-2010 sample (see Table 3). Moreover, the non-deferrable conditions analysis and the "donut-RD" exercises point to limited strategic timing in health care utilization. Together, these suggest a limited role for moral hazard. Thus below we focus on the social costs of raising revenue for the program only.

According to CBO estimates, increasing the Medicare eligibility age (MEA) by 1 year (65 to 66 years) would save $21 billion dollars, a per capita cost saving of $5,882 per Medicare beneficiary. Using the consensus value for the deadweight loss per dollar of revenue raised of 30 cents (Poterba, 1996), these figures imply an annual social program cost of $1,765 per recipient. Therefore, using the $216 average gain from reducing expenditure risk, the risk-protection afforded by Medicare at age 65 accounts for about 12% of the social costs of financing the program. However, if we use the scaled results, the risk protection benefits account for 30% (assuming the main channel is generosity) or even 113% (assuming it is coverage) of the social cost of the program. Since we don't know what fraction of 66 year olds would have any or generous health insurance coverage in case the MEA is increased, or whether it is coverage or generosity that is the main channel for risk reduction, it is impossible to determine which

[23] The scaled results are calculated by dividing the estimate $\hat{\tau}^j$ in the simulation described in equation (9) by the effect of Medicare on, respectively, health insurance coverage (0.124) and generosity (0.586).

of these figures best represent the welfare gain from the risk protection afforded by Medicare. All we can say is that effect is significant and covers at least (and likely more than) 12% of Medicare's social costs.

Finally, it is important to bear in mind that this calculation ignores both the stress-lowering benefits from reduced financial strain at age 65 that we documented in section IV, any impact this stress-reduction has on health and any direct health improvements from Medicare. Dobbie and Song (2013), for example, find that bankruptcy protection decreases five-year mortality by 1.1 percentage points, suggesting that reduced medical financial strain has potentially important effects on health. In addition, Card et al. 2009 document significant Medicare-induced mortality declines among those with emergent, non-deferrable conditions. Using standard value of life estimates, an extension of life by just one extra week would mean that the welfare gains from Medicare at age 65 fully balance the program's social costs.

VI. Conclusion

We use the discontinuity in Medicare coverage at age 65 to estimate the impact of Medicare expenditure risk among those just eligible versus just ineligible for the program based on age. Our analyses suggest that Medicare plays an important role in protecting against medical expenditure risk for those aged 65 and older. Those just eligible for Medicare based on age are 14% more likely to have health insurance and 10 times more likely to be covered by two or more policies than those just ineligible (i.e. slightly younger than 65).

Using the 2007-2010 MEPS data, we find that the distribution of out-of pocket spending shifts significantly to the left at age 65. For example, out-of-pocket expenditures (all in 2010 dollars) drop by 33% ($326) at the mean and by 53% ($1,730) among the top 5% of medical spenders. The declines are smaller, but still significant, if we consider the 1996-2010 period: out-of-pocket spending at age 65 drops by almost 20% at both the mean ($200) and among the top 5% of medical spenders ($722). These results are robust to different strategies that deal with potential deferability in health care utilization and misspecification of functional form. A welfare calculation indicates that these reductions in out-of-pocket expenditure risk translate into a welfare gain of at least 12% of Medicare's social costs, not including any stress reducing benefits from lower financial strain or direct health improvements.

Results for medical-related financial strain corroborate the importance of changes in out-of-pocket spending for the financial well-being of seniors. Specifically, the fraction reporting medical bill problems and collection agency contacts associated with these bills both decline by about a third at age 65. Likewise, the amount owed in medical bills declines by 33% (with a pre-65 mean amount owed of about $900). Importantly, because of potential bias due to the inclusion of respondents who deferred medical care until age 65, these estimated changes in several measures of medical related-financial stress might provide a lower bound to the true effects.

How do our findings of the risk protective benefits of Medicare today compare to the Finkelstein and McKnight (2008) – referred to as FM—estimates of the effect of the introduction of Medicare in 1965 on out-of-pocket spending? Both studies find reductions in out-of-pocket spending attributable to Medicare that are similar as a percentage of baseline spending (on the order of 30-40%). In addition, both find that the effects are concentrated in the top quartile of the income distribution. However, key differences in the studies suggest some important nuances. FM uses a different empirical strategy – a difference in differences (DID) in contrast to the Regression Discontinuity (RD) approach use here. The difference in the empirical strategy used suggests that Medicare provides greater risk protection today than when it was first introduced almost 50 years ago for two reasons. First, the fraction of the population affected (or the "first stage") in the FM exercise is larger than in ours. At its introduction Medicare raised health insurance coverage for the elderly by 75 percentage points (Finkelstein 2007), while the corresponding increase in coverage at the age 65 threshold today is only 12 percentage points. Therefore, the change in out-of-pocket spending we estimate is coming from a much smaller share of the population. Or said differently, one would need to rescale our expenditure results upwards to make them comparable to FM. Second, our estimates provide local average treatment effects for those around the age 65 cutoff only. In contrast, in their DID, FM calculate the average treatment effect of Medicare for individuals ages 65 to 74. Given that medical expenditure (and risk) is increasing in age one would expect the risk protection from Medicare to be greater at later ages. That Medicare's expenditure risk protection has increased since 1965 is consistent with the rapid rise in total medical spending during the past five decades (Gruber and Levy 2009) and the fact that we estimate larger effects for the 2007-2010 than the overall 1996-2010 period.

Our findings have important implications for policy. Specifically, several recent proposals to address rising Medicare spending and long-term federal budget shortfalls have involved increasing the Medicare Eligibility age (MEA) (see, for example, Emanuel 2012, Murray and King, 2012 and Herger 2012). Based on our findings, if this policy is implemented, those 65 and 66 year-olds who are no longer eligible for Medicare could face substantial drops in insurance coverage and large increases in out-of-pocket expenditures and medical-related financial stress. This is especially true for those in the right tail of the expenditure distribution who, according to our estimates, would see an increase of several thousand dollars per year in out-of-pocket medical expenditures and a consequent substantial financial loss. If we take into account the persistence in health status, something we do not do here, those faced with a negative health shock might face large expenditures for multiple years, increasing the policy's financial consequences. While the medical expenditure risk consequences of increasing the MEA might be attenuated if the Affordable Care Act (ACA) is successful in increasing health insurance coverage, some large states such as Texas and Louisiana continue to maintain that they will opt-out of the Medicaid expansion. If those individuals who would have become eligible via Medicaid expansions are unable to afford private options, increasing the MEA would increase their exposure to medical expenditure risk.

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Figure 1a. Smoothness of Covariates: MEPS, 2007-2010

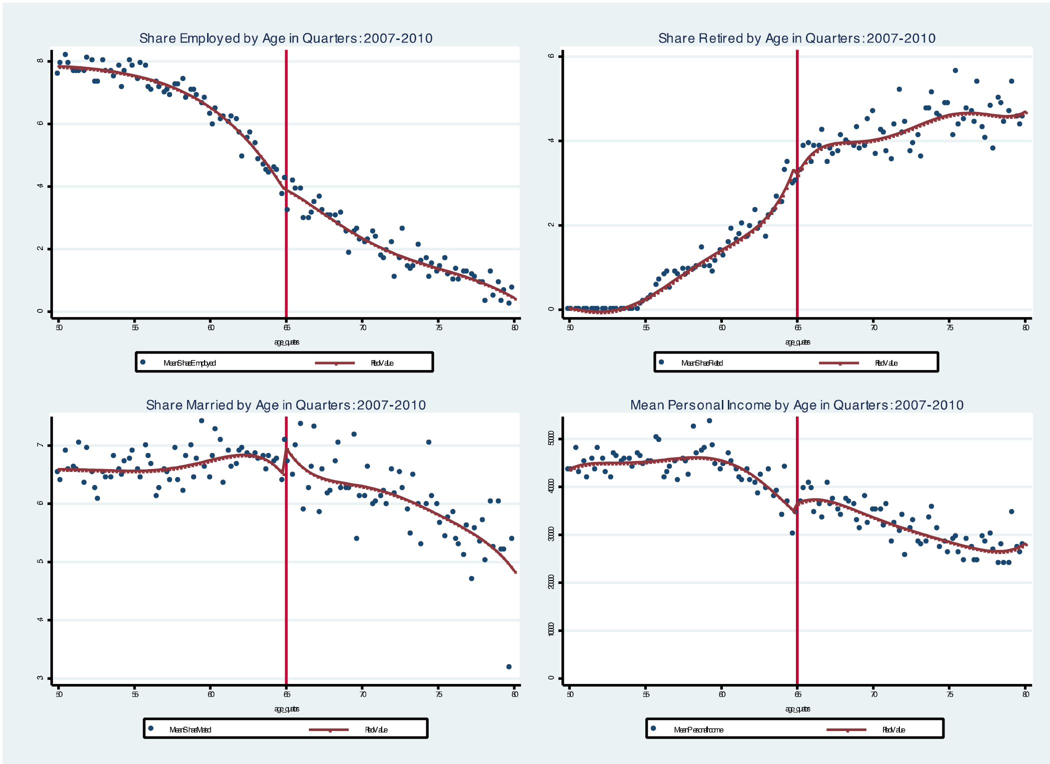


Figure 1b. Smoothness of Covariates: HTHS: 2003, 2007, 2010

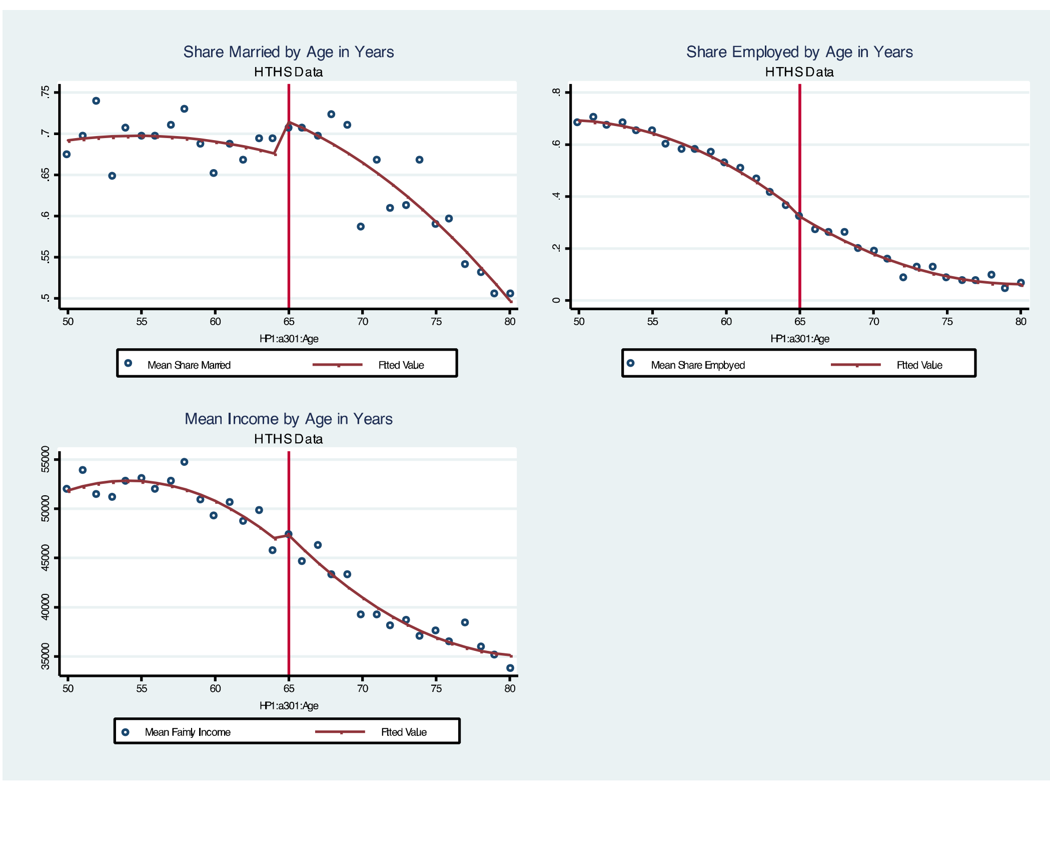


Figure 2a. Change in Health Insurance Coverage at Age 65, MEPS: 2007-2010

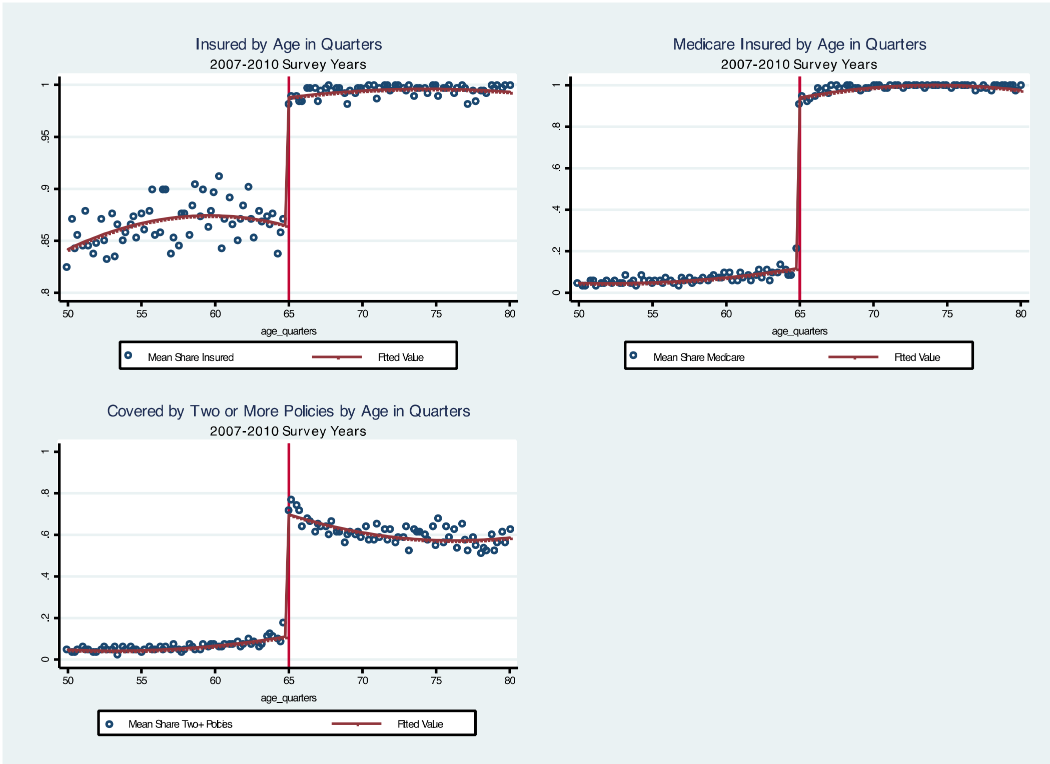


Figure 2b. Change in Health Insurance Coverage at Age 65, HTHS: 2003, 2007, 2010

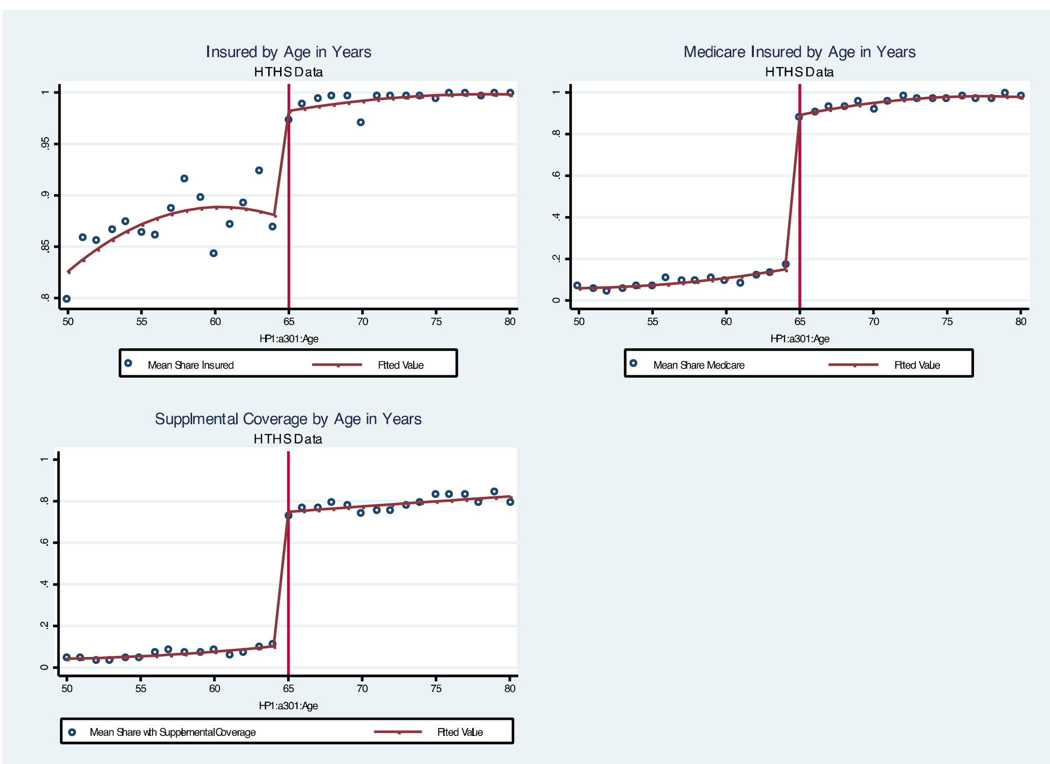


Figure 3. Impact of Medicare on Total Spending and Any Utilization

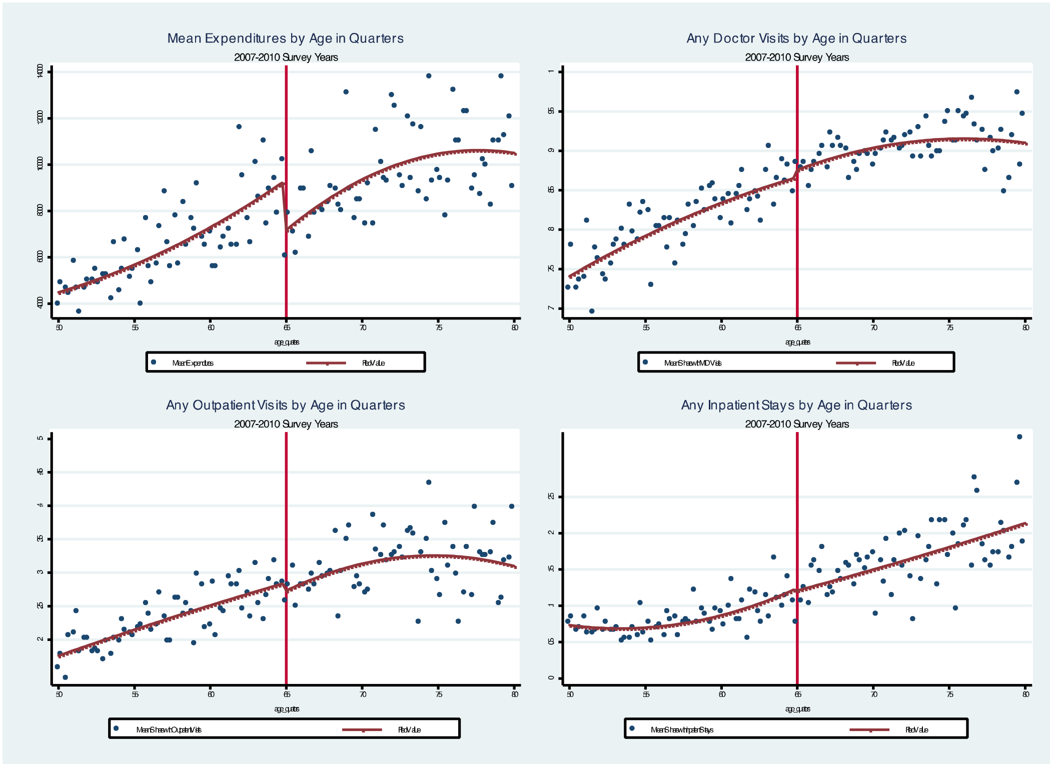


Figure 4. Impact of Medicare on the Distribution of Out-of-Pocket Spending

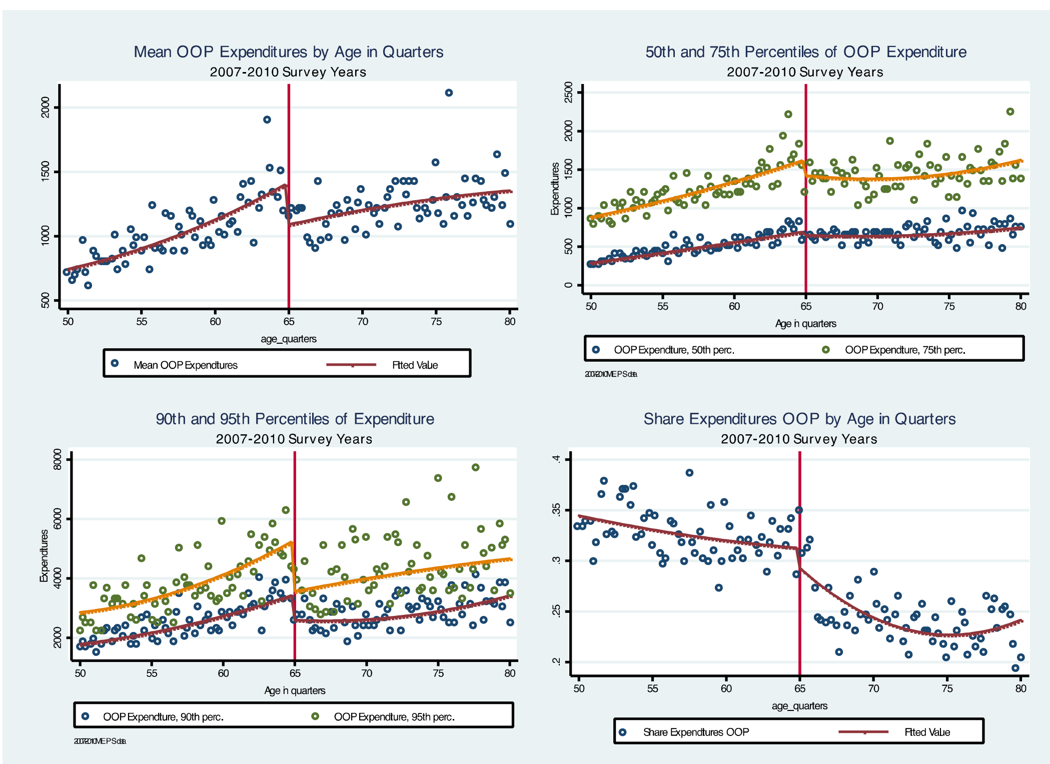


Figure 5. Impact of Medicare on Centiles of Out-of-Pocket Spending, 2007-2010

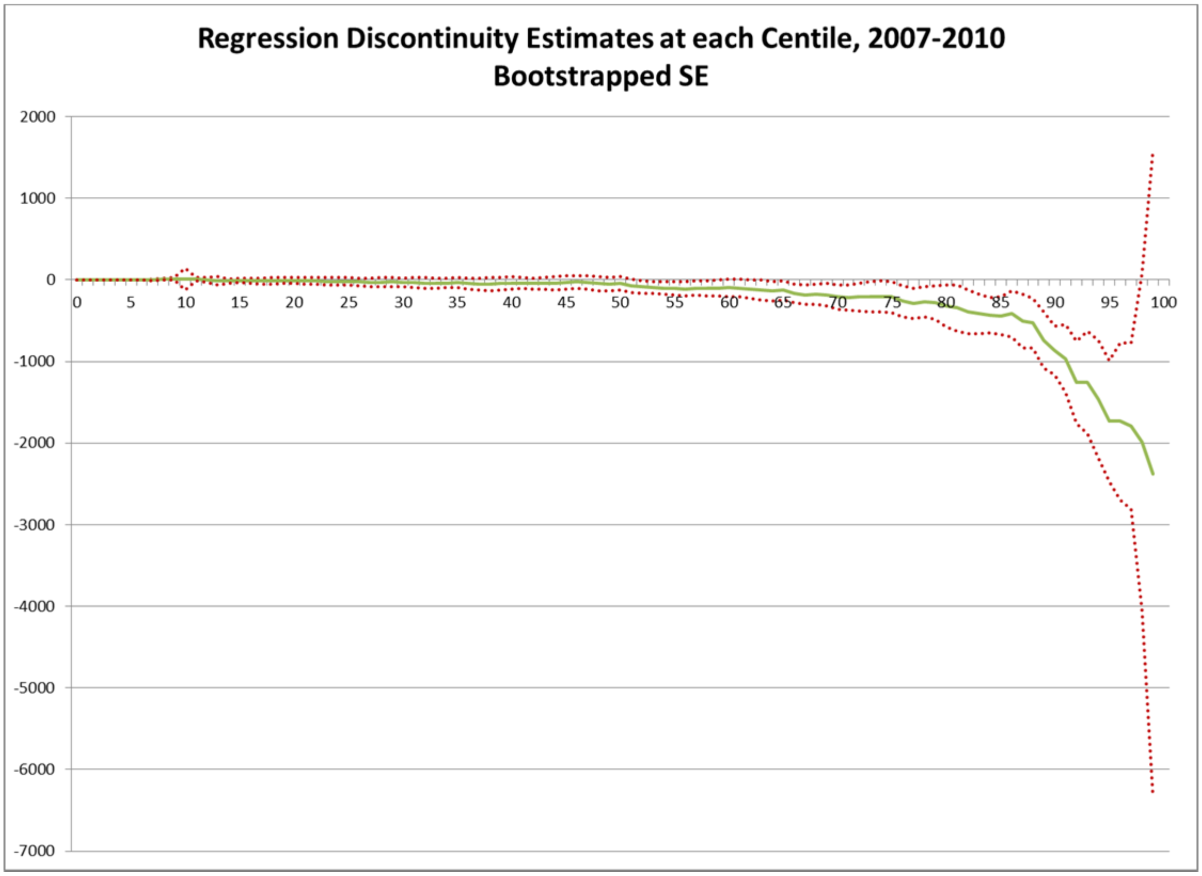


Figure 6. Impact of Medicare on Medical Bill Problems and Collections Activity

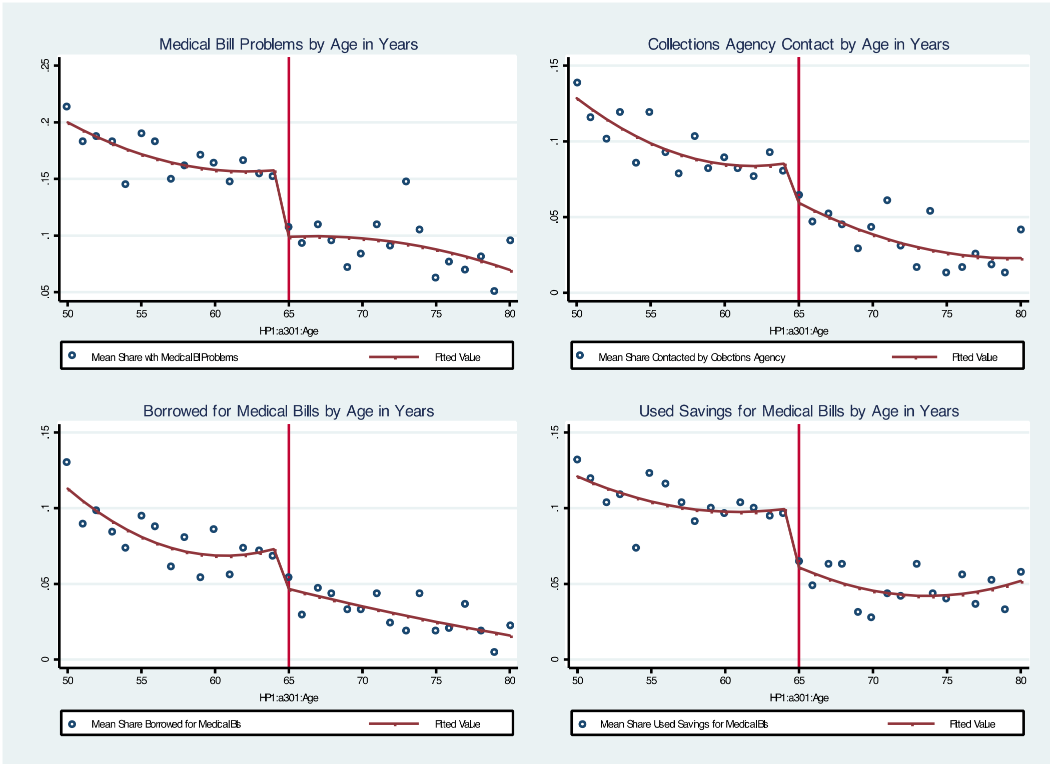


Figure 7. Impact of Medicare on the Amount Owed in Medical Bills

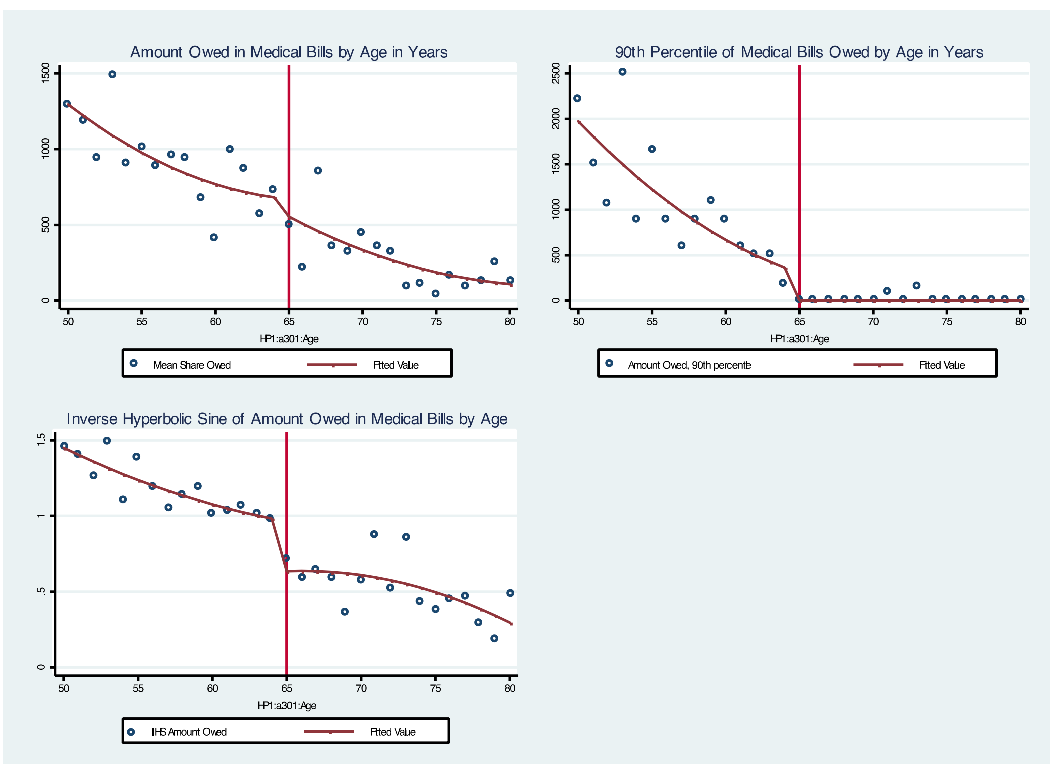


Table 1. Smoothness of Covariates

	Share Employed	Share Retired	Share Married	Income	Share BA or Higher	Family Size	Share living in South
Panel A: MEPS 2007-2010							
Age 65+	0.01	-0.036	0.052**	2,287.05	-0.019	0.023	-0.02
	(0.039)	(0.032)	(0.02)	(4017.75)	(0.023)	(0.057)	(0.021)
Mean pre 65	0.69	0.087	0.665	44154	0.308	2.42	0.359
F-statistic	1.25	1.51	1.45	1.31	1.165	1.53	1.17
Observations	32569	32241	32569	32569	32569	32569	32569
Panel B: HTHS 2003, 2007, 2010							
Age 65+	-0.014		0.043*	1,163	-0.028	0.045+	
	(0.015)		(0.017)	(1381.)	(0.032)	(0.026)	
Mean pre 65	0.588		0.692	51,419	0.308	2.07	
F-statistic	1.48		3.9	1.12	2.74	2.31	
Observations	30172		30172	30172	30172	30172	

Notes: * significant at 5%; ** significant at 1% Data in panel A are from the 2007-2010 Medical Expenditure Panel Surveys. B. Panel B data are from the 2003, 2007 and 2010 HTHS. Both panels include respondents ages 50 to 80 respondents. All regressions include a constant, an indicator for ages 65 and above. Regressions in Panels A include a 5th order polynomial, Panel B uses a fourth order polynomial rather than a fifth order polynomial because of the sparser data, the availability of age in years only and what appeared to be better parametric fits. Standard errors are clustered at the level of age in quarters in the MEPS and by age in years in the HTHS.

Table 2. Impact of Medicare on Health Insurance coverage and generosity

	Insured	Medicare Covered	Covered by 2+ Policies	Insured	Medicare Covered	Covered by 2+ Policies	Insured	Medicare Covered	Covered by 2+ Policies
		Quadratic in Age			Linear in Age			Cubic in Age	
Panel A: MEPS 2007-2010									
Age 65+	0.124**	0.821**	0.586**	0.112**	0.862**	0.576**	0.130**	0.787**	0.599**
	(0.006)	(0.018)	(0.019)	(0.005)	(0.011)	(0.014)	(0.008)	(0.026)	(0.024)
Mean pre 65	0.865	0.064	0.059	0.865	0.064	0.059	0.865	0.064	0.059
Relative Effect (%)	14.34	1282.81	993.22	12.95	1346.88	976.27	15.03	1229.69	1015.25
Observations	32569	32569	32569	32569	32569	32569	32569	32569	32569
Panel B: CTS 2003, 2007, 2010									
Age 65+	0.106**	0.730**	0.639**	0.080**	0.767**	0.650**	0.074*	0.712**	0.642**
	(0.022)	(0.016)	(0.178)	(0.016)	(0.015)	(0.013)	(0.037)	(0.018)	(0.024)
Mean pre 65	0.869	0.089	0.063	0.869	0.089	0.063	0.869	0.089	0.063
Relative Effect (%)	12.20	820.22	1014.29	9.21	861.80	1031.75	8.52	820.22	1019.05
Observations	30172	30172	30172	30172	30172	30172	30172	30172	30172

Notes: + significant at the 10% level; * significant at 5%; ** significant at 1%. Data in panel A are from the 2007-2010 Medical Expenditure Panel Surveys and in Panel B are from the 2003, 2007 and 2010 HTHS. Both panels include respondents ages 50 to 80. All regressions include a constant, an indicator for ages 65 and above and a polynomial in age in quarters in the MEPS and in years in the HTHS that is allowed to vary on either side of age 65.The first three columns show the main specification using a quadratic in age. The next three columns use linear age trends and the last three cubic age terms. Standard errors are clustered by age in quarters for the MEPS samples and age in years in the HTHS..

Table 3. Impact of Medicare on Total Spending and Utilization: MEPS 2007-2010

	Total spending	Any Physician	Any outpatient	Any Inpatient
Panel A: Quadratic in Age				
Age 65+	-2,168.354*	0.009	-0.012	-0.003
	(672.43)	(0.011)	(0.013)	(0.014)
Mean pre 65	6375.7	0.805	0.228	0.081
Relative Effect (%)	-34.01	1.12	-5.26	-3.70
Observations	32569	32569	32569	32569
Panel B: Linear Trend in Age				
Age 65+	-1128.43*	0.011	0.003	0.013
	(498.01)	(0.008)	(0.011)	(0.01)
Mean pre 65	6375.7	0.805	0.228	0.081
Relative Effect (%)	-17.70	1.42	1.47	16.12
Observations	32569	32569	32569	32569
Panel C: 3rd Order Polynomial				
Age 65+	-2,629.336*	0.007	-0.022	-0.009
	(785.37)	(0.013)	(0.017)	(0.017)
Mean pre 65	6375.7	0.805	0.228	0.081
Relative Effect (%)	-41.24	0.87	-9.65	-11.11
Observations	32569	32569	32569	32569

Notes: + significant at the 10% level; * significant at 5%; ** significant at 1%. Data are from the 2007-2010 Medical Expenditure Panel Survey and include respondents ages 50 to 80. All regressions include a constant and an indicator for ages 65 and above and a poynomial in age that is allowed to vary on either side of age 65. Panel A uses a quadratic in age while Panel B a linear trend and Panel C a cubic in age in quarters. Standard errors are clustered by age in quarters.. Standard errors are clustered by age in quarters.

Table 4. Impact of Medicare on Out-of-Pocket Spending in the MEPS: 2007-2010

	Mean	Median	75th Percentile	90th Percentile	95th Percentile	Share out-of-pocket
Panel A: Quadratic in Age						
Age 65+	-326.420*	-46.705	-209.544*	-865.020**	-1,729.822**	-0.02
	(97.48)	(42.27)	(102.34)	(165.6)	(398.33)	(0.015)
Mean pre 65	1002.98	463.68	1188	2402.87	3723.85	0.327
Relative Effect (%)	-32.55	-10.07	-17.64	-36.00	-52.84	-6.12
Observations	32569	32569	32569	32569	32569	29378
Panel B: Linear Trend in Age						
Age 65+	-255.17**	-66.62*	-242.40**	-843.45**	-1390.76**	-0.037**
	(60.77)	(26.75)	(65.24)	(108.05)	(265.89)	(0.011)
Mean pre 65	1002.98	463.68	1188	2402.87	3723.85	0.327
Relative Effect (%)	25.44	-14.37	-20.40	-35.10	-37.35	-11.31
Observations	32569	32569	32569	32569	32569	29378
Panel C: 3rd Order Polynomial						
Age 65+	-348.501*	-141.135*	-352.174**	-1,144.957**	-2,091.466**	-0.019
	(125.25)	(55.78)	(124.67)	(239.86)	(470.24)	(0.02)
Mean pre 65	1002.98	463.68	1188	2402.87	3723.85	0.327
Relative Effect (%)	-34.75	-30.44	-29.64	-47.65	-63.88	-5.81
Observations	32569	32569	32569	32569	32569	29378

Notes: + significant at the 10% level; * significant at 5%; ** significant at 1% Data are from the 2007-2010 Medical Expenditure Panel Survey and include respondents ages 50 to 80. All regressions include a constant, an indicator for ages 65 and above and a polynomial in age in quarters that is allowed to vary on either side of age 65. Panel A uses a quadratic in age while Panel B a linear trend and Panel C a cubic in age in quarters. Standard errors for OLS regressions (mean out-of-pocket spending and share out of pocket) are clustered by age in quarters. Standard errors for quantile regressions are based on a block bootstrap with 500 draws, where the block is age in quarters.

Table 5. Impact of Medicare on Medical Bill Problems in the Past 12 Months: HTHS 2003, 2007, 2010

	Medical Bill Problems	Collections Agency Contact	Borrowed to Pay Medical Bills	Used Savings to Pay Medical Bills	Delayed Major Purchase due to Medical Bills
Panel A: Quadratic in Age					
Age 65+	-0.060**	-0.028**	-0.029**	-0.040**	-0.044**
	(0.012)	(0.009)	(0.01)	(0.009)	(0.011)
Mean pre 65	0.171	0.099	0.082	0.105	0.092
Relative Effect (%)	-35.09	-28.28	-35.37	-38.10	-47.83
Observations	30088	30079	30088	30065	30067
Panel B: Linear Trend in Age					
Age 65+	-0.041**	-0.017*	-0.011	-0.038**	-0.028**
	(0.008)	(0.007)	(0.008)	(0.007)	(0.009)
Mean pre 65	0.171	0.099	0.082	0.105	0.092
Relative Effect (%)	-23.98	-17.17	-13.41	-36.19	-30.43
Observations	30088	30079	30080	30065	30067
Panel C: Cubic in Age					
Age 65+	-0.042**	-0.022+	-0.017	-0.022*	-0.032*
	(0.01)	(0.011)	(0.012)	(0.01)	(0.013)
Mean pre 65	0.171	0.099	0.082	0.105	0.092
Relative Effect (%)	-24.56	-22.22	-20.73	-20.95	-34.78
Observations	30088	30079	30080	30065	30067

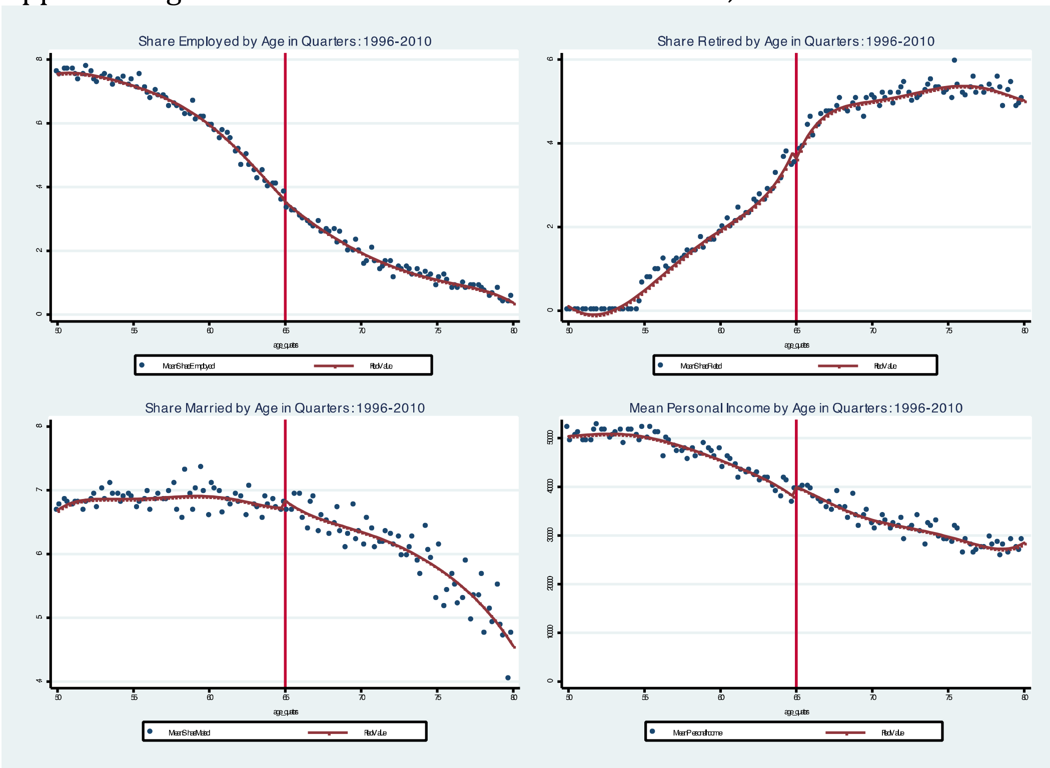
Notes: + significant at 10%; * significant at 5%; ** significant at 1%. Data are from the 2003, 2007 and 2010 waves of the Health Tracking Household Survey and are restricted to respondents ages 50 to 80. All regressions include a constant, an indicator for ages 65 and above and a polynomial in age in quarters that is allowed to vary on either side of age 65. Panel A uses a quadratic in age while Panel B a linear trend and Panel C a cubic in age in quarters. Standard errors are clustered by age in years.

Table 6: Impact of Medicare on Amount Owed in Medical Bills HTHS 2007 and 2010

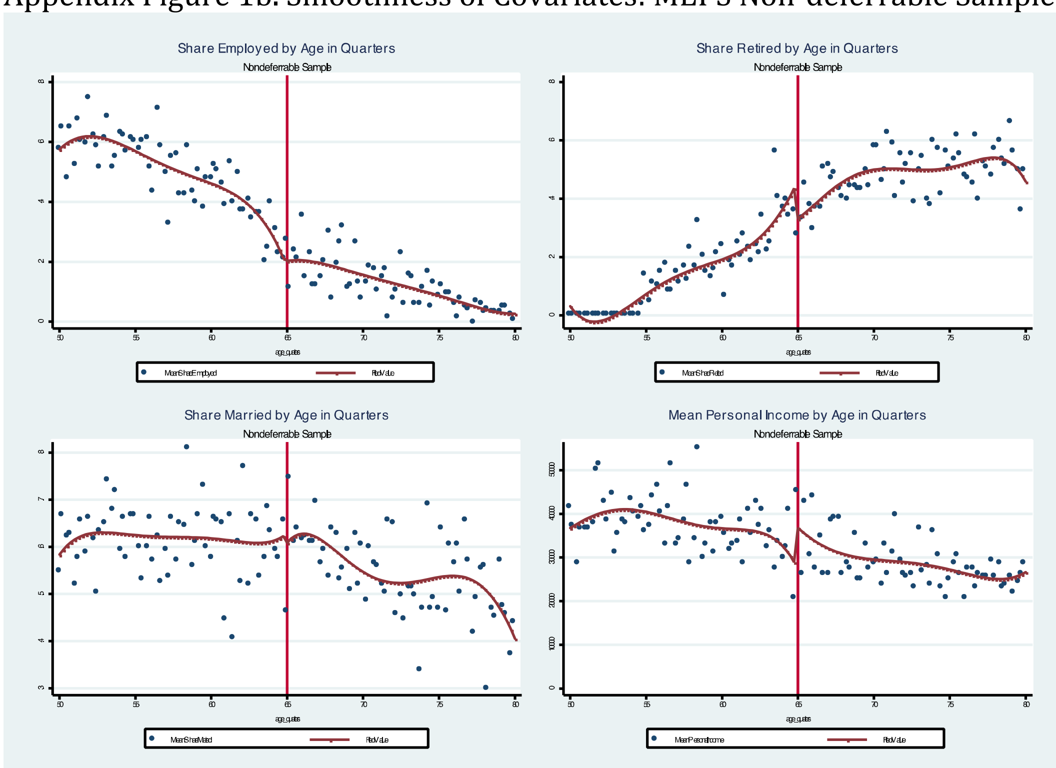
	Amount Owed	90th Percentile of Amount Owed	IHS Amount Owed
Panel A: Quadratic in Age			
Age 65+	-117.96	-305.88	-0.330**
	(197.58)	(355.751)	(0.07)
Mean pre 65	936.05	1000	936.05
Relative Effect (%)	-12.60	-30.59	33
Observations	14072	14072	14072
Panel B: Panel A: Linear Trend in Age			
Age 65+	-51.52	-111.35	-0.230**
	(153.42)	(209.92)	(0.054)
Mean pre 65	936.05	1000	936.05
Relative Effect (%)	-5.50	-11.14	23
Observations	14072	14072	14072
Panel C: Cubic in Age			
Age 65+	-333.6	65.15	-0.334**
	(213.508)	(459.87)	(0.095)
Mean pre 65	936.05	1000	936.05
Relative Effect (%)	-35.64	6.52	33
Observations	14072	14072	14072

Notes: + significant at 10%; * significant at 5%; ** significant at 1%. Data are from the 2007 and 2010 waves of the Health Tracking Household Survey and are restricted to respondents ages 50 to 80. All regressions include a constant, an indicator for ages 65 and above and a polynomial in age in quarters that is allowed to vary on either side of age 65. Panel A uses a quadratic in age while Panel B a linear trend and Panel C a cubic in age in quarters. Standard errors are clustered by age in years except in the case of the (90th) quantile regression, where we use an age blcok bootstrap and 500 draws.

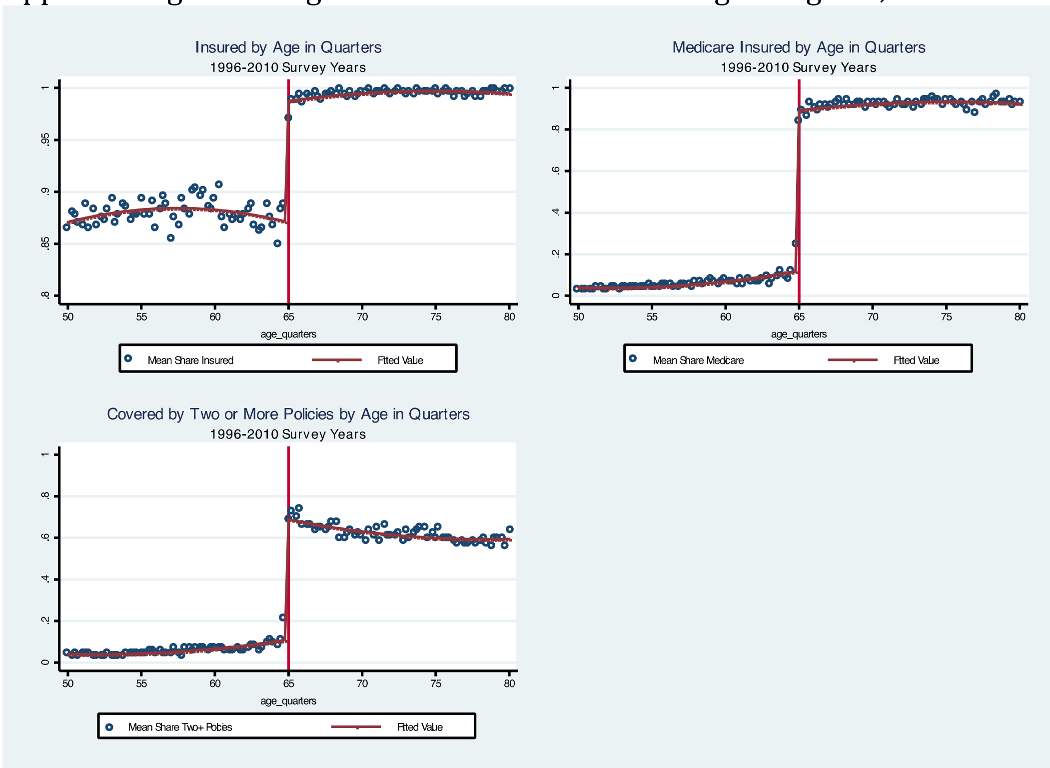
Appendix Figure 1a. Smoothness of Covariates: MEPS, 1996-2010



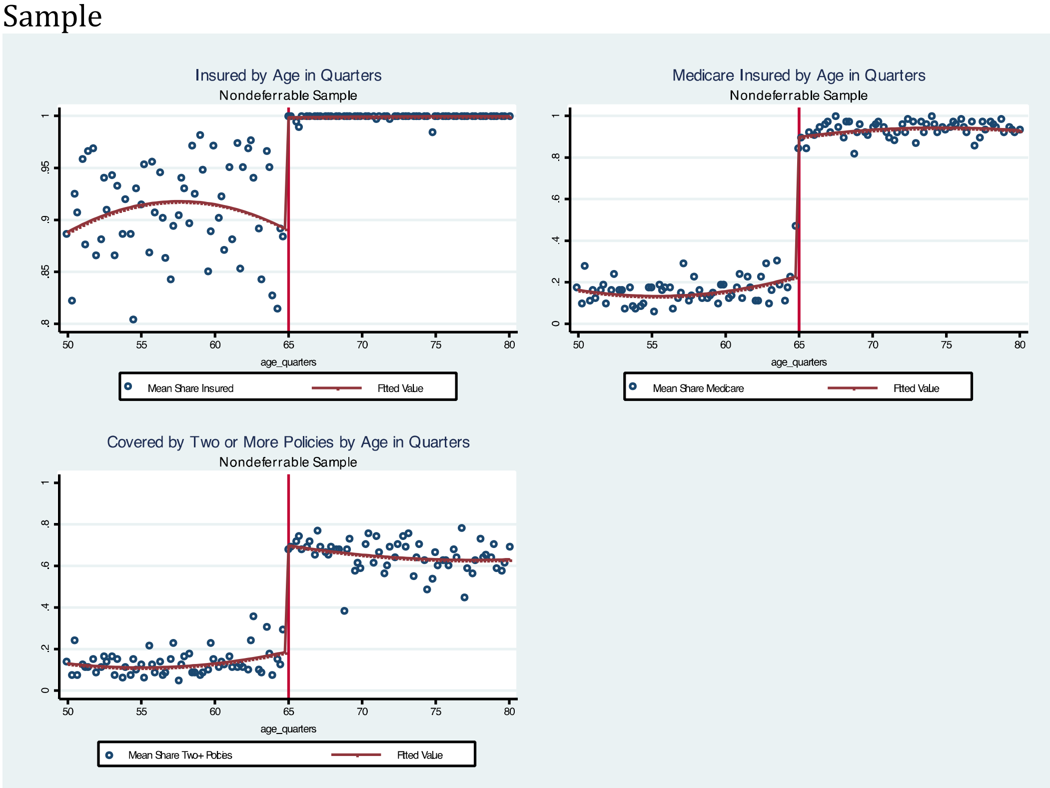
Appendix Figure 1b. Smoothness of Covariates: MEPS Non-deferrable Sample



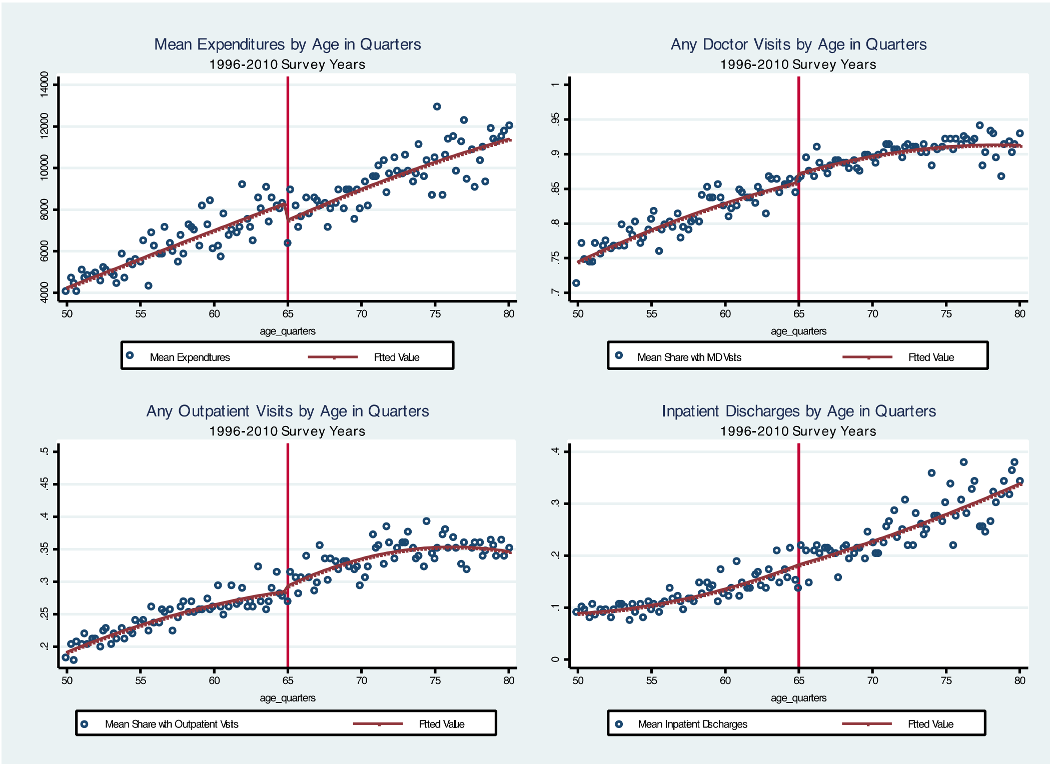
Appendix Fig 2a. Change in Health Insurance Coverage at Age 65, MEPS: 1996-2010



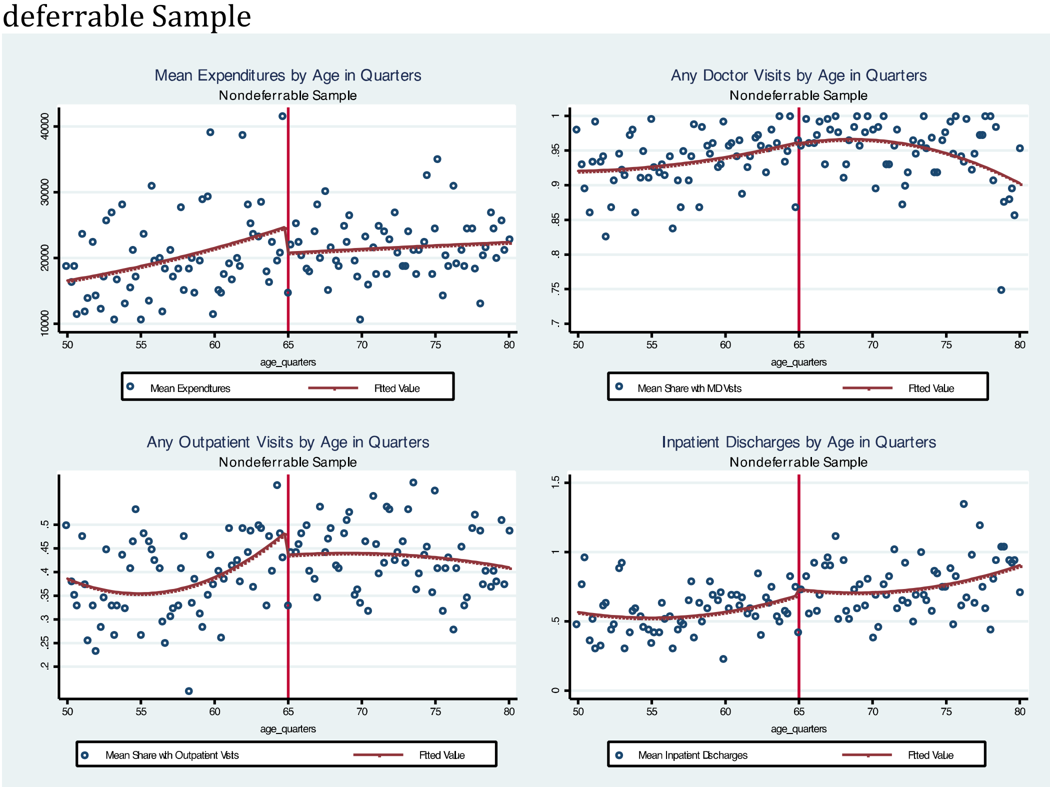
Appendix Fig 2b. Change in Health Insurance Coverage at Age 65 in the Non-deferrable Sample



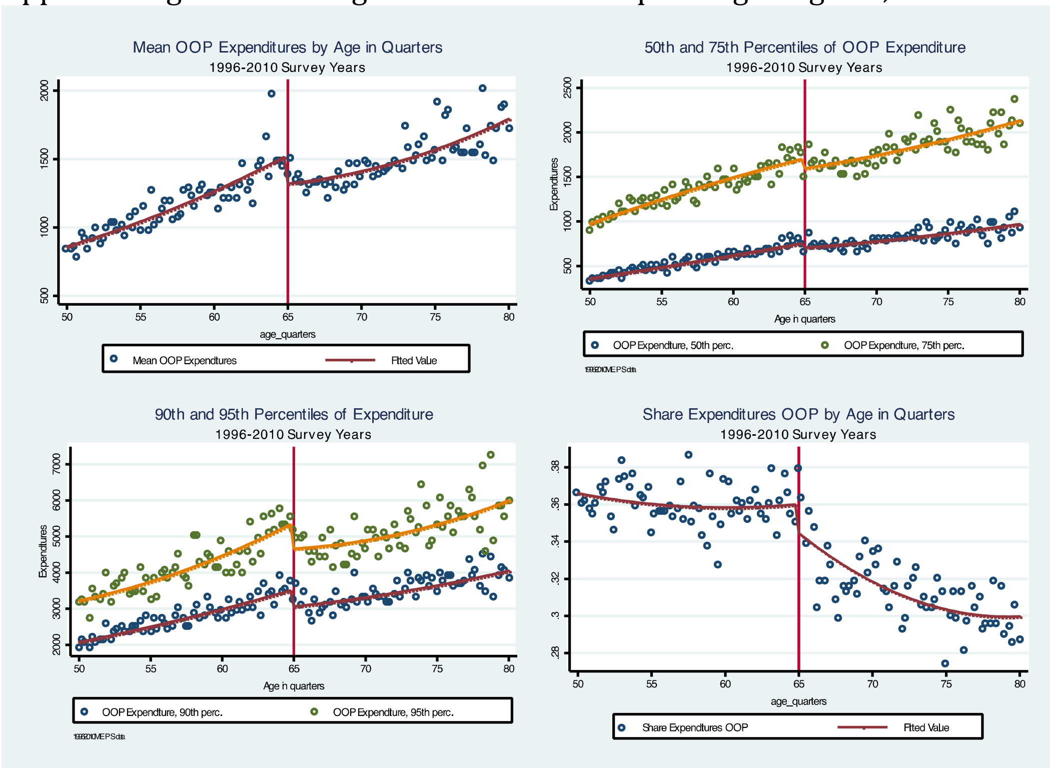
Appendix Figure 3a. Impact of Medicare on Total Spending and Any Utilization, MEPS:1996-2010



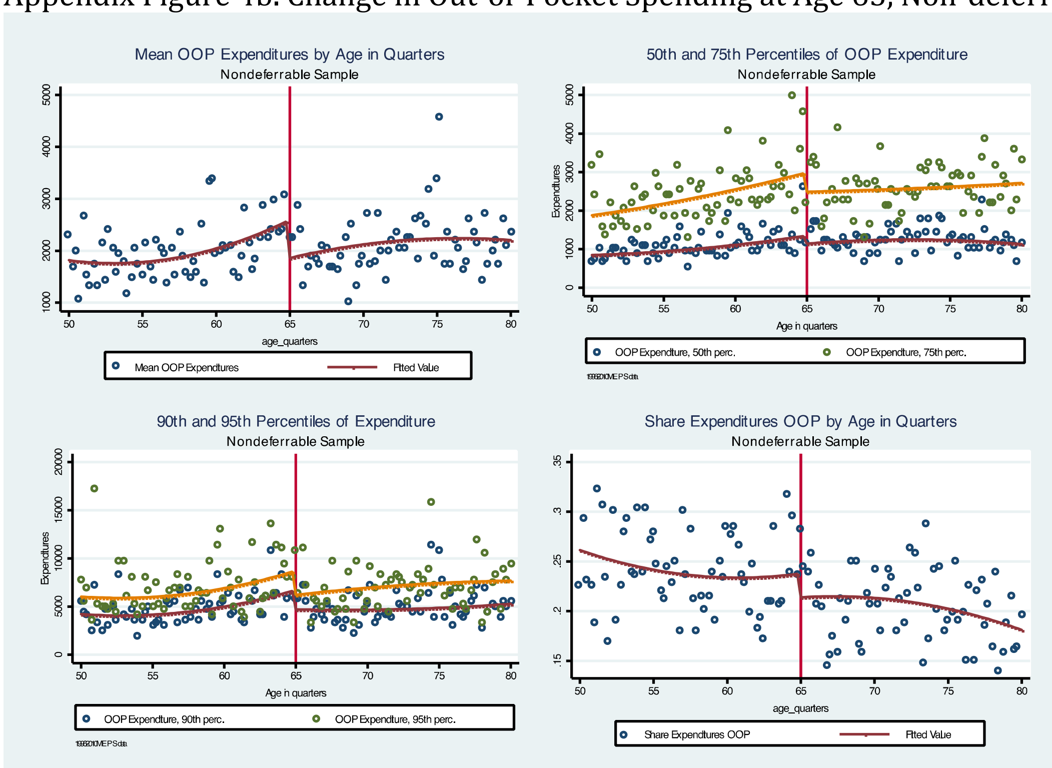
Appendix Figure 3b. Impact of Medicare on Total Spending and Any Utilization, MEPS: Non-deferrable Sample



Appendix Figure 4a. Change in Out-of-Pocket Spending at Age 65, MEPS: 1996-2010



Appendix Figure 4b. Change in Out-of-Pocket Spending at Age 65, Non-deferrable Sample



Appendix Table 1. Additional Covariate Checks

	Share Male	Share with less than HS degree	Share Hispanic	Share living in the West
Panel A: MEPS 2007-2010				
Age 65 and over	0.005	0.001	0.006	-0.001
	(0.036)	(0.023)	(0.011)	(0.019)
Mean pre 65	0.490	0.153	0.092	0.226
F-statistic	1.76	1.10	0.75	1.20
Observations	32569	32569	32569	32569
Panel B: HTHS Sample				
	-0.090**	-0.036**	-0.021	--
Age 65 and over	(0.011)	(0.016)	(0.02)	
Mean Pre-age 65	0.486	0.128	0.087	
F-statistic	1.23	3.46	4.51	
Observation	30172	30172	30172	

Notes: For Panel A, age is measured in quarters while for Panel B it is only available in years. Regressions in panel A B include a fifth order polynomial in age that is allowed to vary on either side of age 65. Regressions in Panel B include a 2nd order polynomial rather than a fifth order polynomial because of the sparser data, the availability of age in years and what appeared to be better parametric fits. Standard errors are clustered at the level of age in quarters in the MEPS and by age in years in the HTHS.

Appendix Table 2. List of Non-deferrable Conditions, MEPS 1996-2010

Clinical Classification Code (CCC)*	Conditions	Cases
2	Septicemia (except in labor)	129
60	Acute Posthemorrhagic Anemia	0
76	Meningitis	31
77	Encephalitis	31
100	Acute myocardial infarction	1319
107	Cardiac arrest and ventricular fibrillation	142
109	Acute cerebrovascular disease	1658
112	Transient cerebral ischemia	232
116	Aortic and peripheral arterial embolism or thrombosis	990
129	Aspiration pneumonitis; food/vomitus	3
131	Respiratory failure; insufficiency; arrest (adult)	38
142	Appendicitis and other appendiceal condition	99
221	Respiratory distress syndrome	0
226	Fracture of neck of femur (hip)	228
227	Spinal cord injury	108
230	Fracture of lower limb	1440
231	Other fractures	952
234	Crushing injury or internal injury	213

Notes: * The Clinical Classification Codes aggregate 5-digit ICD-9-CM condition and V-codes to a smaller number of clinically meaningful categories. Unfortunately the 5-digit codes are not available in the MEPS. Some respondents have more than one condition so the sum of cases does not represent the sum of individuals with non-deferrable conditions

Appendix Table 3. Covariate Checks for 1996-2010 MEPS and Nondeferrable Sample

	Share Employed	Share Retired	Share Married	Income	Share BA or Higher	Family Size	Share living in South	Share Male	Share less than HS degree	Share Hispanic	Share living in the West
Panel A: MEPS 1996 -2010											
	-0.005	-0.035	0.011	2,403.53	-0.015	0.043	0.008	-0.002	0.007	-0.003	-0.006
	(0.021)	(0.024)	(0.011)	(1621.13)	(0.011)	(0.043)	(0.013)	(0.017)	(0.012)	(0.007)	(0.017)
Mean pre 65	0.653	0.112	0.684	47663	0.285	2.42	0.356	0.486	0.179	0.084	0.220
F-statistic	1.11	0.967	1.56	1.04	1.02	1.04	1.42	1.58	1.71	0.92	0.97
Observations	109806	108595	109806	109806	109806	109806	109806	109806	109806	109806	109806
Panel B: Non-deferrable Sample 1996-2010											
Age 65+	0.022	-0.131*	-0.020	9,558	-0.068	-0.006	-0.067	-0.064	-0.031	-0.022	-0.012
	(0.064)	(0.063)	(0.096)	(8793)	(0.064)	(0.091)	(0.052)	(0.059)	(0.048)	(0.025)	(0.04)
Mean pre 65	0.500	0.140	0.619	37,766	0.215	2.24	0.374	0.511	0.231	0.066	0.206
F-statistic	1.40	1.33	1.32	1.38	1.26	1.07	1.20	(0.993)	1.01	(0.726)	1.35
Observatons	6887	6815	6887	6887	6887	6887	6887	6887	6887	6887	6887

Notes: Panel A is based on the full 1996-2010 MEPS and Panel B restricts to the sample of respondents from 1996-2010 with non-deferrable conditions in the past year. See Appendix Table 4 for conditions included in this group. Across both panels, we restrict to respondents ages 50 to 80. Age is measured in quarters. Regressions include a fifth order polynomial in age that is allowed to vary on either side of age 65.

Appendix Table 4. Robustness Checks on Impact of Medicare on Total Spending and Utilization

	Total spending	Any Physician Visits	Any outpatient Hospital Visits	Any Inpatient Visits
Panel A: Ages 55-75 in MEPS 2007-2010				
Age 65+	-2,404.972*	0.008	-0.017	-0.003
	(764.97)	(0.013)	(0.015)	(0.016)
Mean pre 65	7224.21	0.828	0.249	0.088
Relative Effect (%)	-33.29	0.97	-6.83	-3.41
Observations	21398	21398	21398	21398
Panel B: Ages 50-80 but without Age 65 in MEPS 2007-2010				
Age 65+	-1,942.007*	0.008	-0.009	0.005
	(688.013)	(0.012)	(0.014)	(0.014)
Mean pre 65	6375.70	0.805	0.228	0.081
Relative Effect (%)	-30.46	0.99	-3.95	6.17
Observations	32305	32305	32305	32305
Panel C: Ages 50-80 but without Ages 64.75 to 65.25 in MEPS 2007-2010				
Age 65+	-1,880.551**	0.004	-0.009	0.009
	(790.266)	(0.013)	(0.016)	(0.015)
Mean pre 65	6375.7	0.805	0.228	0.081
Relative Effect (%)	-29.50	0.50	-3.95	11.11
Observations	31757	31757	31757	31757
Panel D: Ages 50-80 but without Ages 64.5 to 65.5 in MEPS 2007-2010				
Age 65+	-1,952.899**	0.005	-0.015	0.015
	(888.523)	(0.015)	(0.018)	(0.017)
Mean pre 65	6375.70	0.805	0.228	0.081
Relative Effect (%)	-30.63	0.62	-6.58	18.52
Observations	31267	31267	31267	31267

Notes: * significant at 5%; ** significant at 1% Data in all Panels are from the 2007-2010 Medical Expenditure Panel Survey. All regressions include a constant, an indicator for ages 65 and above and a quadratic in age in quarters that is allowed to vary on either side of age 65. Standard errors are clustered by age in quarters.

Appendix Table 5. Full MEPS and Nondeferrable Sample - spending and utilization

	Total spending	Any Physician Visits	Any outpatient Hospital Visits	Any Inpatient Visits
Panel A: MEPS 1996-2010				
Age 65+	-854.632**	0.012	0.008	-0.007
	(394.6)	(0.007)	(0.01)	(0.008)
Mean pre 65	6091.09	0.802	0.241	0.085
Relative Effect (%)	-14.03	1.50	3.32	-8.24
Observations	109806	109806	109806	109806
Panel B: Nondeferrable Sample				
Age 65+	-4,066.93	-0.002	-0.052	0.024
	(3051.95)	(0.017)	(0.038)	(0.039)
Mean pre 65	20172.5	0.935	0.386	0.359
Relative Effect (%)	-20.16	-0.21	-13.47	6.69
Observations	6887	6887	6887	6887

Notes: Panel A is based on the full 1996-2010 MEPS and Panel B restricts to the sample of respondents from 1996-2010 with non-deferrable conditions in the past year. See Appendix Table 4 for conditions included in this group. Across both panels, we restrict to respondents ages 50 to 80. Regressions include a quadratic in age that is allowed to vary on either side of age 65.

Appendix Table 6. Robustness Checks of Impact of Medicare on Out-of-Pocket Spending

	Mean	Median	75th Percentile	90th Percentile	95th Percentile	Share out-of-pocket
Panel A: Ages 55-75 in MEPS 2007-2010						
Age 65+	-349.302*	-110.38*	-328.70**	-998.3716**	-1790.95**	-0.017
	(117.01)	(53.61)	(126.79)	(218.86)	(431.2)	(0.018)
Mean pre 65	1114.79	540.033	1318.348	2626.778	4084	0.319
Relative Effect (%)	-31.33	-20.44	-24.93	-38.01	-43.85	-5.33
Observations	21398	21398	21398	21398	21398	19568
Panel B: Ages 50-80 but without Age 65 in MEPS 2007-2010						
Age 65+	-340.319*	-41.266	-186.647+	-882.78**	-1,789.61**	-0.031**
	(102.82)	(44.31)	(102.55)	(180.21)	(426.41)	(0.014)
Mean pre 65	1002.98	463.68	1188	2402.87	3723.85	0.327
Relative Effect (%)	-33.93	-8.90	-15.71	-36.74	-48.06	9.48
Observations	32305	32305	32305	32305	32305	29127
Panel C: Ages 50-80 but without Ages 64.75 to 65.25 in MEPS 2007-2010						
Age 65+	-404.832*	-60.765	-215.334+	-909.33**	-2,116.46**	-0.042*
	(110.64)	(47.86)	(113.78)	(206.57)	(452.43)	(0.015)
Mean pre 65	1002.98	463	1182.53	2394.97	3707.83	0.327
Relative Effect (%)	-40.36	-13.12	-18.21	-37.97	-57.08	-12.84
Observations	31757	31757	31757	31757	31757	28622
Panel D: Ages 50-80 but without Ages 64.5 to 65.5 in MEPS 2007-2010						
Age 65+	-419.968*	-43.841	-186.20	-893.776**	-1,899.16**	-0.047*
	(125.92)	(50.87)	(124.67)	(236.47)	(546.28)	(0.015)
Mean pre 65	1002.98	460	1175.77	2382.59	3680.05	0.327
Relative Effect (%)	-41.87	-9.53	-15.84	-37.51	-51.61	14.37
Observations	31267	31267	31267	31267	31267	28173

Notes: * significant at 5%; ** significant at 1%. Data in all Panels are from the 2007-2010 Medical Expenditure Panel Survey. All regressions include a constant, an indicator for ages 65 and above and a quadratic in age in quarters that is allowed to vary on either side of age 65. Standard errors are clustered by age in quarters.

Appendix Table 7. Impact of Medicare on Out-of-Pocket Spending in the 1996-2010 and Nondeferrable Samples

	Mean	Median	75th Percentile	90th Percentile	95th Percentile	Share out-of-pocket
Panel A: MEPS 1996-2010						
Age 65+	-208.584*	-55.781	-114.679+	-473.294**	-722.422**	-0.016+
	(75.61)	(145.51)	(65.78)	(181.84)	(221.15)	(0.009)
Mean pre 65	1127.65	527.86	1318.28	2675.94	4051.9	0.361
Relative Effect (%)	-18.50	-10.57	-8.70	-17.69	-17.83	-4.43
Observations	109806	109806	109806	109806	109806	100044
Panel B: Nondeferrable Sample						
Age 65+	-737.459*	-211.805	-500.502	-2,023.475+	-2,523.20	-0.024
	(231.73)	(203.93)	(734.53)	(1082.23)	(2909.9)	(0.022)
Mean pre 65	1972.89	1041.93	2377.61	4837.64	6681	0.241
Relative Effect (%)	-37.38	-20.33	-21.05	-41.83	-37.77	-9.96
Observations	6887	6887	6887	6887	6887	6818

Notes: Panel A is based on the full 1996-2010 MEPS and Panel B restricts to the sample of respondents from 1996-2010 with non-deferrable conditions in the past year. See Appendix Table 4 for conditions included in this group. Across both panels, we restrict to respondents ages 50 to 80. Regressions include a quadratic in age that is allowed to vary on either side of age 65.

Appendix Table 8. Impact of Medicare on Medical Bill Problems in the Past 12 Months, Ages 55-75 and Donut

	Medical Bill Problems	Collections Agency Contact	Borrowed to Pay Medical Bills	Used Savings to Pay Medical Bills	Delayed Major Purchase due to Medical Bills
Panel A: Ages 55-75 in the HTHS					
Age 65+	-0.060**	-0.033**	-0.031**	-0.041**	-0.049**
	(0.011)	(0.012)	(0.011)	(0.006)	(0.011)
Mean pre 65	0.165	0.09	0.075	0.103	0.088
Relative Effect (%)	-36.36	-36.67	-41.33	-39.81	-55.68
Observations	20367	20361	20361	20348	20352
Panel B: Ages 50-80 but without Age 65 in HTHS					
Age 65+	-0.067**	-0.033**	-0.036**	-0.044**	-0.049**
	(0.015)	(0.01)	(0.011)	(0.011)	(0.012)
Mean pre 65	0.171	0.099	0.082	0.104	0.092
Relative Effect (%)	-39.18	-33.33	-43.90	-42.31	-53.26
Observations	29155	29146	29147	29133	29134
Panel C: Ages 50-80 but without Ages 64-66 in HTHS					
Age 65+	-0.070**	-0.032*	-0.029*	-0.038*	-0.038*
	(0.025)	(0.015)	(0.012)	(0.017)	(0.018)
Mean pre 65	0.172	0.1	0.083	0.105	0.092
Relative Effect (%)	-40.94	-32.00	-34.94	-36.19	-41.30
Observations	27238	27229	27230	27218	27217

Notes: + significant at 10%; * significant at 5%; ** significant at 1%. Data are from the 2003, 2007 and 2010 waves of the Health Tracking Household Survey. Panel A restricts to respondents ages 55 to 75. Panel B and C includes respondents ages 50 to 80 with the exception of those age 65 (Panel B) or those ages 64 to 66 (Panel C). All regressions include a constant, an indicator for ages 65 and above and a quadratic in age in quarters that is allowed to vary on either side of age 65. Standard errors are clustered by age in years.

Appendix Table 9: Impact of Medicare on Amount Owed in Medical Bills, Ages 55-75 and Donut

	Amount Owed	90th Percentile of Amount Owed	IHS Amount Owed
Panel A: Ages 55-75 in the HTHS			
Age 65+	-294.05	-61.704	-0.393**
	(178.921)	(380.03)	(0.086)
Mean pre 65	805.65	700	805.65
Relative Effect (%)	-36.50	-8.81	-39
Observations	9792	14072	9792
Panel B: Ages 50-80 but without Age 65 in HTHS			
Age 65+	-66.8	-305.88	-0.405**
	(303.852)	(317.37)	(0.083)
Mean pre 65	936.05	1000	936.05
Relative Effect (%)	-7.14	-30.59	-41
Observations	13602	14072	13602
Panel C: Ages 50-80 but without Ages 64-66 in HTHS			
Age 65+	387.26	-476.92	-0.424**
	(265.)	(723.48)	(0.148)
Mean pre 65	947.89	1000	947.89
Relative Effect (%)	40.83	-47.69	-42
Observations	12647	14072	12647

Notes: + significant at 10%; * significant at 5%; ** significant at 1%. D Data are from the 2003, 2007 and 2010 waves of the Health Tracking Household Survey. Panel A restricts to respondents ages 55 to 75. Panel B and C includes respondents ages 50 to 80 with the exception of those age 65 (Panel B) or those ages 64 to 66 (Panel C). All regressions include a constant, an indicator for ages 65 and above and a quadratic in age in quarters that is allowed to vary on either side of age 65. Standard errors are clustered by age in years except in the case of the (90th) quantile regression, where we use an age blcok bootstrap and 500 draws.