What Did Medicare Do (And Was It Worth It)?

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Abstract: We study the impact of the introduction of one of the major pillars of the social insurance system in the United States: the introduction of Medicare in 1965. Our results suggest that, in its first 10 years, the establishment of universal health insurance for the elderly had no discernible impact on their overall mortality. However, we find that the introduction of Medicare was associated with a substantial reduction in the elderly's exposure to out of pocket medical expenditure risk, specifically an over two-fifths decline in out of pocket spending for the top two deciles of the spending distribution. A stylized expected utility framework suggests that the welfare gains from such reductions in risk exposure may be substantial relative to the costs of the Medicare program. These findings underscore the importance of considering the direct insurance benefits from public health insurance programs, in addition to any indirect benefits from an effect on health.

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"No longer will older Americans be denied the healing miracle of modern medicine. No longer will illness crush and destroy the savings that they have so carefully put away over a lifetime"

Lyndon Johnson, July 30 1965, Independence Missouri

A major economic rationale for social insurance is its potential to redress the consequences of market imperfections in private insurance markets. In the presence of market failure in private health insurance markets, public health insurance offers two major potential benefits: direct risk-reduction benefits and indirect health benefits. As the above quotation highlights, both of these potential benefits figured prominently in the motivation for the establishment of the U.S. Medicare program.

A very large empirical literature has investigated the health benefits of health insurance. For the non-infant population, the evidence points strongly to no or only very modest health benefits (see e.g. Levy and Meltzer 2004 for a review of this literature). Although the risk reducing properties of insurance are at the core of any theoretical analysis of the benefits from insurance, to date, they have received comparatively little empirical attention in analyses of the impact of health insurance.

In this paper, we demonstrate empirically that even in the apparent absence of health benefits, public health insurance can have important benefits from its role in reducing risk exposure. These results suggest that the near-exclusive focus on health benefits in empirical analyses of the impact of health insurance can substantially understate the total benefits from health insurance provision.

We study the impact of the introduction of Medicare in 1965, which provides nearly universal public health insurance coverage to the elderly. The introduction of Medicare was, and remains to date, the single largest change in health insurance coverage in U.S. history. Its introduction was followed by a substantial and prolonged decline in elderly mortality (see Figure 1). Nevertheless, using several different empirical strategies, we find no compelling evidence that, in its first 10 years, Medicare reduced overall elderly mortality. Our evidence suggests the explanation for this finding is that, prior to Medicare, elderly individuals with health conditions that hospitals were effective at treating sought care even if they lacked insurance, as long as they had legal access to hospitals.

Although we detect no impact of the introduction of Medicare on overall elderly mortality, we estimate that its introduction was responsible for a striking and substantial decline in the large right-tail of the out of pocket medical expenditure distribution for the elderly. At the top decile of out of pocket spending, we find that Medicare's introduction is associated with an average decline in spending of almost $1,200 per person (in year 2000 dollars), or over two-fifths of the pre-Medicare out of pocket spending level. At the second decile, we estimate an average $300 per person spending decline, again over two-fifths of the pre-Medicare spending level.

Within a simple expected utility framework, we simulate the welfare gains associated with this change in risk bearing and compare it to the costs associated with the Medicare program (both the moral hazard costs and the marginal cost of public funds). The simulation results suggest that the consumption-smoothing benefits of Medicare alone – even without any health benefits – cover between half and three quarters of the cost of the Medicare program. The model is highly stylized and the specific estimates it produces are therefore subject to considerable caveats. Nevertheless, at a broad level, the findings provide a gauge of the order of magnitude of the welfare benefits from Medicare's impact on consumption-smoothing, and underscore the importance of considering such effects in any evaluation of the impact of health insurance.

The rest of the paper proceeds as follows. Section 1 provides some brief background on the Medicare program. Section 2 analyzes the 10-year impact of Medicare on elderly mortality. Section 3 investigates the impact of Medicare on the distribution out of pocket expenditures. Section 4 uses these estimates to perform a cost-benefit analysis. The last section concludes.

Section 1: Background: Medicare, health care utilization and health care spending.

The U.S. Medicare program is one of the largest public health insurance programs in the world. With annual spending of $260 billion per year, it constitutes about 17 percent of all U.S. health expenditures, one-eighth of the federal budget, and 2 percent of GDP (National Center for Health Statistics 2002, Newhouse 2002, US Congress 2000).

Medicare was enacted in July 1965 and implemented essentially nationwide in July 1966. It provided

virtually universal public health insurance to individuals aged 65 and older (coverage for the disabled was added in 1973). Individuals aged 65 and over are automatically enrolled in Medicare Part A, which covers up to 90 days of inpatient hospital expenses after an initial deductible and a 25 percent co-payment for days 61 – 90; it is funded by a payroll tax. The elderly can choose to enroll in Medicare Part B, which covers physician costs after an initial deductible and 20 percent (uncapped) co-pay; it is funded partly by general revenues and partly by individual premiums which were designed to cover 50 percent of the program costs (Somers and Somers, 1967). Medicare's cost-sharing provisions and uncapped potential out of pocket spending make the extent of its consumption smoothing properties a priori uncertain.

Medicare's impact on health insurance coverage for the elderly was enormous, increasing by 75 percentage points the proportion of the elderly with any meaningful health insurance (Finkelstein 2005). The introduction of Medicare was associated with a substantial increase in health care utilization (Dow 2002, Cook et al. 2002, Finkelstein 2005) and spending (Finkelstein 2005). In more recent times, Medicare coverage is also associated with a substantial increase in health care utilization (Lichtenberg 2002, Decker and Rappaport 2002, McWilliams et al., 2003, Card et al., 2004.)

Section 2: Medicare and Mortality

In this section, we examine the impact of the introduction of Medicare on elderly mortality. Mortality is, of course, only one measure of health. Our focus on mortality is motivated both by its importance and by the striking decline in elderly mortality rates that began shortly after the introduction of Medicare (see Figure 1). From a practical standpoint, mortality is also one of the few objective, well-measured health outcomes; as a result, it is the focus of many of the studies examining the impact of health insurance on health (Levy and Meltzer, 2004).

We use annual age- and state-specific mortality data from 1952 – 1975. Data from 1959 to 1975 are from the NCHS Multiple Causes of Death micro-data, which include the universe of death certificates; prior to that, we use aggregate published death statistics (Vital Statistics, various years). Alaska and Hawaii are excluded from the analysis since they do not enter the data until 1959.

Previous work on the impact of Medicare on health outcomes has used the age-variation in Medicare coverage to identify its effect, exploiting the fact that Medicare covers individuals over 65 but not under 65. This work points to, at best, very modest health benefits from Medicare, both at the time of its introduction (Dow 2002, Cook et al., 2002) and in more recent times (Card et al., 2004). Using the same age-based identification strategy, we also find no compelling evidence of an impact of the introduction of Medicare on elderly mortality (section 2.1). We explore two alternative sources of variation to further investigate Medicare's impact. In Section 2.2 we exploit geographic variation in the increase in insurance coverage associated with Medicare's introduction. In Section 2.3, we exploit variation in the timing of Medicare's implementation in certain Southern counties.

These additional empirical strategies serve two purposes. First, they help shed light on why Medicare appears to have had only modest health benefits at best. Second, each of the three approaches has its own strengths and weaknesses, which we discuss below. Similar results from three separate, yet complementary, empirical strategies therefore increase our confidence in the conclusion that Medicare appears to have had no impact on overall elderly mortality in its first 10 years.

2.1 Mortality estimates based on Medicare's coverage by age

Figure 2 shows trends in mortality rate for the "young elderly" (aged 65-74) who become covered by Medicare in 1966 and the "near-elderly" (aged 55-64), who do not. The mortality decline for the young elderly begins several years *before* Medicare's introduction, while that for the near-elderly begins slightly after. Not surprisingly, therefore, formal regression analysis does not indicate any impact of the introduction of Medicare on the mortality rate of the young elderly relative to the near elderly. Specifically, we estimate:

$$\begin{aligned}\ln(\text{deaths})_{ast} &= \beta_1 \ln(\text{pop'n})_{ast} + \beta_2 \text{elderly}_a + \alpha_s * \mathbf{1}(state_s) + \delta_t * \mathbf{1}(Year_t) \\ &\quad + \sum_{t=1952}^{t=1975} \lambda_t (\text{elderly}_a) * \mathbf{1}(Year_t) + X_{st}\beta + \varepsilon_{ast}\end{aligned} \tag{1}$$

Our dependent variable is the log of the number of deaths in state *s* and year *t* in age group *a*. We construct annual, state- and age-group-specific population estimates by fitting separate cubics to the 1950

through 1980 census data for each state-age group cell. Although we include $\ln(\text{pop'n})_{ast}$ due to the potential for measurement error in our imputed population estimates, in practice the results are not sensitive to using the log of the death rate or the death rate as the left hand side variable. We include an indicator variable ($elderly_a$) for whether the deaths are for the young-elderly rather than the near-elderly, and a series of state and year fixed effects ($\mathbf{1}(State_s)$ and $\mathbf{1}(Year_t)$ respectively).

The key variables of interest are the series of year fixed effects interacted with the elderly indicator variable ($(elderly_a) * \mathbf{1}(\text{Year}_t)$). The pattern of coefficients on these variables (the λ_t's) show the flexibly estimated trend in *ln(deaths)* over time for the Medicare-eligible elderly population relative to the non-eligible non-elderly. Under the assumption that changes in the time pattern of mortality for the young elderly relative to the near elderly around 1966 reflect the effect of Medicare, the change in the pattern of λ_t's after the introduction of Medicare should provide an estimate of the effect of Medicare on *ln(deaths)*.

Medicaid, the public health insurance program for the indigent was, like Medicare, also enacted in July of 1965. However, the timing of Medicaid implementation – unlike that of Medicare – was left up to the individual states (see Gruber, forthcoming for details). We control for any impact of Medicaid on health outcomes by including a series of indicator variables (X_{st}) for the number of years since (or before) the implementation of a Medicaid program in state *s*. In practice, the results are not sensitive to these controls, which is not surprising given that the relative impact of Medicaid (compared to Medicare) on the elderly was quite small (National Center for Health Statistics 2002 and Holahan 1975).

We report results from weighted estimation of equation (1) by OLS. The weights are the square root of the population of age group *a* in state *s* and year *t*. Unweighted estimates (not reported) are very similar. We calculate robust standard errors, allowing for an arbitrary variance-covariance matrix within each state. Our empirical framework is quite similar to that of Dow (2002); we differ mainly in our adoption of a substantially more flexible functional form, and our controls for Medicaid implementation.

Figure 3 shows the λ_t's from estimating equation (1). The level of the graph is arbitrary; we set it at 0 in 1966, the omitted year. It indicates that although mortality for the young elderly is declining relative to that of the near-elderly after Medicare, this decline begins in 1962, four years before Medicare is implemented; moreover, this relative mortality decline for the young elderly reverses in the mid 1970s. The visual impression of no compelling evidence of an impact of Medicare on young elderly mortality relative to near elderly is confirmed by statistical tests (not shown). We also found no evidence of an impact of Medicare for sub-populations where we might expect a bigger impact of Medicare on health: non-whites – who are among the most vulnerable in the population – and individuals in urban areas – where availability and access to medical care is much greater than in rural areas (not shown).

2.2 Mortality estimates based on geographic variation in insurance prior to Medicare

The age-based identification strategy is not well-suited to examining the impact of Medicare on mortality for the oldest of the elderly, for whom Medicare might conceivably have a larger mortality impact. In addition, the age-based strategy will be biased against finding an impact of Medicare if the treatment of individuals just under age 65 is affected by the insurance coverage Medicare provides to all individuals over age 65. Physician practice norms, concerns about malpractice liability, or joint costs of the production of health care could all contribute to "health insurance spillovers"; Baker (1997), Hellerstein (1998) and Glied and Zivin (2002) present evidence consistent with such spillovers.

We therefore employ an alternative strategy based on the substantial geographic variation in private health insurance coverage among the elderly prior to the introduction of Medicare. Table 1 shows the variation across sub-regions in the percent of the elderly without any hospital insurance or the percent without Blue Cross hospital insurance. The data are from the 1963 National Health Survey.[1] By either measure, the percent without insurance was lowest in the North East and North Central United States, and highest in the South and West. Using the Blue Cross measure, the increase in insurance coverage for the

[1] For more information on the data, see National Center for Health Statistics, 1964.The survey also contains information on coverage by surgical insurance. Surgical and hospital insurance coverage are highly correlated (correlation = 0.92); for simplicity, we focus on hospital insurance, since hospitals constitute the largest portion of expenditures.

elderly associated with the introduction of Medicare ranged from a high of 88 percentage points in the East South Central United States to a low of 49 percentage points in New England.

Elderly insurance coverage rates are clearly not randomly assigned and are in fact highly correlated with socio-economic status. Our empirical approach is to look for a break in any pre-existing level or trend differences in mortality rates at the time of Medicare's introduction in areas where Medicare had more of an effect on insurance coverage relative to areas where it has less of an effect. Using this same identification strategy, Finkelstein (2005) demonstrates a substantial impact of Medicare on hospital spending and utilization.

The basic estimating equation is:

$$\begin{aligned} \ln(deaths)_{st} &= \beta_1 \ln(\mathrm{pop'n}_{\mathrm{st}}) + \alpha_s * \mathbf{1}(State_s) + \delta_t * \mathbf{1}(Year_t) \\ &+ \sum_{t=1952}^{t=1975} \lambda_t (pctuninsured)_z * \mathbf{1}(Year_t) + X_{st}\beta + \varepsilon_{st} \end{aligned} \quad (2)$$

The variables are defined as in equation (1), except that the key coefficients of interest – the $\lambda_t's$ -- are now the coefficients on the variable $(pctuninsured)_z * \mathbf{1}(Year_t)$, the interaction between year effects and the percentage of the elderly population in sub-region *z* without private health insurance in 1963. We estimate equation (2) by OLS using the square root of the population in state *s* and year *t* for weights. Unweighted estimates (not reported) are very similar. We adjust our standard errors to allow for an arbitrary covariance matrix within each state over time.

We present results using the Blue Cross measure since, unlike most other forms of health insurance for the elderly, Blue Cross insurance actually provided meaningful coverage. In addition, Medicare benefits were explicitly modeled after these plans (Anderson et al. 1963, Ball 1995, Newhouse 2002). In practice the results are not sensitive to the choice of health insurance measure (not shown).[2]

Figure 4 shows the $\lambda_t's$ from estimating equation (2). Panel A shows that, for individuals aged 65 and over, mortality rates were rising in areas with less insurance relative to the areas with more insurance

[2] In principle, the impact of Medicare varies not only according to the percent of the elderly without insurance but also the percent of the elderly in the area. In practice however, there is very little variation even across counties in the percent elderly.

prior to the introduction of Medicare; this is not surprising since areas with less insurance are also poorer. The identifying (or, counterfactual) assumption is that, absent Medicare, the differential trend in mortality improvements would have continued. Any systematic divergence from this differential trend after 1966 would suggest an impact of Medicare. However, there is no indication of any divergence. In results not reported, we implemented statistical tests that confirm this visual impression. We also find no evidence of an impact of Medicare on mortality for two sub-populations where health insurance might have been expected to have more of an impact on health: non-whites or individuals living in urban areas (not shown).

One of the advantages of using the geography-based identification strategy instead of the age-based identification strategy is the ability to look at the effect of Medicare separately for different age groups. Panels B and C of Figure 4 therefore report results separately for, respectively, individuals aged 65-74 and individuals aged 75 and over. For neither age group is there evidence of any differential decline in mortality rates in areas where insurance coverage increased more as a result of Medicare's introduction. Indeed, the results for individuals aged 65-74 suggest that Medicare is associated with an *increase* in mortality rates, while results for individuals aged 75+ indicate no impact of Medicare in either direction. Statistical tests (not reported) confirm this visual impression.

A concern with using geographic variation in private insurance coverage to identify the impact of Medicare is that the mid-1960s through early 1970s were a period of innovation in the treatment of cardiovascular disease, including new information about the risks of smoking and the development of anti-hypertensives (Cutler and Kadiyala 2003). If individuals in richer areas were more likely to adopt these health care innovations, this would bias our estimates of the mortality benefits of Medicare downward, since richer areas also had higher pre-Medicare insurance rates and thus a lower estimated impact of Medicare. This may explain the puzzling result in Figure 4B that Medicare appears to be associated with an increase in mortality among individuals aged 65-74. To address this issue, we performed a triple-difference analysis by combining the age-based variation in the previous subsection

with the geographic identification strategy used in this sub-section. This analysis also yields no statistical or substantive impact of Medicare on mortality (results not shown).[3]

2.3 Mortality estimates based on lags in Medicare certification due to required desegregation

For a hospital to be eligible to receive Medicare funding, it had to be racially desegregated. As a result, the implementation of Medicare increased non-whites' access to hospitals in segregated parts of the South (Smith, 1999; Almond et al., 2003). It also resulted in some staggered timing in the introduction of Medicare in parts of the South that had not desegregated their hospitals by the start of Medicare. Only three-quarters of counties in the entire South – and only one quarter of counties in the Mississippi Delta – had a Medicare certified hospital by the end of 1966.[4]

Using the variation in timing of Medicare implementation in certain southern counties, Almond et al. (2003) show that, in the Mississippi Delta, counties that had a Medicare-certified hospital by February 1969 – and had therefore desegregated by that point – experienced dramatic declines in non-white *post-neonatal* mortality from diarrhea and pneumonia in the late 1960s relative to counties that did not have Medicare-certified hospitals. We follow Almond et al.'s (2003) empirical strategy and estimate the impact of Medicare on *elderly* mortality in the Mississippi Delta:

$$y_{ct} = \alpha_c + \delta_t + \lambda Certified_{ct} + \varepsilon_{ct} \qquad (3)$$

The dependent variable is a measure of deaths in county *c* and year *t.* The regression includes a series of county fixed effects (α_c) and year fixed effects (δ_t). The key coefficient of interest is λ, which represents the change in elderly mortality associated with having at least one Medicare-certified hospital in county *c* at time *t*. We adjust our standard errors to allow for an arbitrary covariance matrix within each county over time.

[3] The results are also robust to a number of other specifications including: a linear rather than log-linear model, estimating the model separately by gender, excluding one subregion at a time, excluding all four Southern sub-regions at once, replacing "percent without BC insurance" with an indicator variable for "more than 75 percent of elderly are without insurance," and excluding the Medicaid control variables (not shown).
[4] Authors' calculations from the American Hospital Association's Annual Survey of Hospitals. We follow Almond et al. (2003) in their definition of the "Mississippi Delta" counties.

We estimate equation (3) separately by race, and within race by disease. As a result of this fine cutting of the data, a reasonably high proportion of counties has no deaths in a given year. We therefore report results in which the death rate (in levels) is the dependent variable as well as results in which *ln*(deaths) is the dependent variable and *ln*(population) is included on the right hand side.

Table 2 reports the results. The first two columns indicate that the introduction of Medicare had no discernible impact on overall elderly mortality in the Mississippi delta, either for non-whites (Panel A) or whites (Panel B). However, the next two columns suggest that the introduction of Medicare is associated with a statistically significant decline in non-white elderly *pneumonia* mortality rates. There is no evidence of comparable effects for whites, or for other diseases. For example, the last two columns indicate no impact of Medicare on a decline in mortality from cardiovascular disease, which accounted for two-thirds of elderly deaths in 1965.

Although statistically significant, the impact of Medicare on non-white elderly pneumonia mortality is substantively small. The point estimates suggest that Medicare is associated with a 35 percent (log-linear specification) or 0.1 percentage point (linear specification) decline in non-white elderly pneumonia deaths. Only 3.3% of elderly deaths in 1965 were from pneumonia; therefore even the larger estimate suggests that Medicare reduced non-white elderly overall mortality in these counties by only 1 percent. By contrast, pneumonia-related deaths were over one-quarter of infant deaths.[5] This explains why Almond et al. (2003) estimate a substantially larger impact of Medicare on non-white post-neonatal mortality than we do for non-white elderly mortality, even though Medicare provided insurance coverage to the non-white elderly in addition to the access to hospitals it provided to non-whites of all ages.

2.4 Why did Medicare have no overall effect on elderly mortality in the first 10 years?

The above evidence suggests that – at least in its first 10 years – Medicare played essentially no role in the dramatic decline in mortality rates for the elderly that began in the late 1960s. Since Medicare was associated with a substantial increase in the elderly's use of hospital care (Dow 2002, Cook et al. 2002, Finkelstein 2005), this implies that the Medicare-induced increase was ineffective, at least for mortality.

[5] Cause-specific death rates based on authors' calculations from the 1965 micro death data.

At the time of Medicare's introduction, elderly mortality was due primarily to chronic conditions, such as cardiovascular disease. Most of the decline in elderly mortality starting in the late 1960s was due to declines in cardio-vascular disease stemming from changes in lifestyle (such as decreased smoking), and to a lesser extent the use of new anti-hypertensive drugs (Goldman and Cook 1984, Cutler and Kadiyala 2003); Medicare reimbursement covered neither of these.

Medicare did reimburse for acute hospital care. Yet, as Somers and Somers (1961) wrote in their contemporary analysis of the health care sector, "In 1960… most [general hospitals] are still primarily concerned with the treatment of short-term acute illness. Preventive medicine, ambulatory care, the problems of the chronically ill… are secondary in the usual list of priorities" (page 64). Our findings suggest that – apart from non-whites who were denied access to hospital care in some places prior to Medicare – individuals with pneumonia and other infectious diseases that hospitals could treat effectively at the time were likely to seek medical care regardless of insurance status. This explains why we find evidence of an impact of Medicare's introduction on the elderly non-white pneumonia mortality rate in the segregated South – where the introduction of Medicare opened up access to hospitals for these individuals – but not for whites in the same areas, since whites already had access to these hospitals. It also explains why we find no discernable impact of Medicare's introduction on the elderly pneumonia mortality rate for either race using either the age-based or geography-based identification strategy (not shown).

If, prior to Medicare, individuals sought hospital care where it was likely to be effective regardless of insurance coverage, they must have paid out of pocket and/or relied on charity care. Consistent with this, the next section documents a large amount of out of pocket medical spending by the elderly prior to Medicare.

Section 3: Medicare and Exposure to Out-Of-Pocket Medicare Expenditure Risk

To examine the impact of Medicare on out of pocket expenditure risk, we use data on health care expenditures from the 1963 and 1970 Surveys of Health Service Utilization and Expenditures. These data contain information on health care expenditures for 7,802 individuals in 1963, and 11,619 in 1970. For

much of the analysis, we limit the sample to the 3,030 individuals aged 55-74 in either year.[6] The data contain detailed information on medical spending both by type of spending (e.g. hospital, physician, drug) and by source of payment (out of pocket, private insurance, public insurance, and total).[7]

Table 3 provides some descriptive statistics on the medical spending by the elderly in 1963, prior to the introduction of Medicare. All dollar estimates in this and subsequent tables are converted to 2000 dollars using the CPI-U. At $844, average annual per capita medical spending by the elderly in 1963 represented over 10 percent of income. Over 90 percent of this spending was paid out of pocket, and 60 percent of these out of pocket expenditures were for medical services that subsequently became covered by Medicare (i.e. doctor and hospital expenditures); the rest were for drugs, primarily prescription drugs.[8] Figure 5 indicates that there was a substantial right tail to the distribution of elderly out of pocket medical expenditures in 1963 that would subsequently be covered by Medicare, a finding that to our knowledge has not been previously demonstrated. This right tail also persists as a percentage of income (not shown).

Our empirical strategy is to compare changes in spending for individuals over age 65 to changes in spending for individuals under age 65 between 1963 and 1970. To increase the plausibility of the identifying assumption that, absent Medicare, changes in spending for individuals above and below age 65 would have been the same, we focus primarily on changes in spending for the young elderly (ages 65 to 74) relative to that for the near elderly (ages 55 to 64). The confounding effect of the introduction of Medicaid likely biases down our estimates of the impact of Medicare on increasing total spending and reducing out of pocket spending. Medicaid was also introduced between 1963 and 1970, and Medicaid spending is higher for the near-elderly (our control group) than the young-elderly (our treatment group); unlike in the mortality analysis, we do not have geographic identifiers and therefore cannot exploit the

[6] The surveys were conducted by the Center for Health Administration Studies and the National Opinion Research Center. Neither includes usable population weights, so all of our estimates are unweighted. The 1970 survey over-sampled the elderly, as well as individuals in rural areas and the urban poor. The institutionalized population is not surveyed in either year.

[7] Out of pocket spending is reported directly only in 1970. We therefore construct out of pocket spending in each year as the difference between total spending and total insurance spending. We compared the reported measure to our constructed measure in 1970 and found them to be the same in 92 percent of cases.

[8] We have not classified home health care as Medicare-eligible because Medicare covered only a very limited amount of home health care at that time (Somers and Somers 1967). In practice, given how small home health care expenditures were, including it in Medicare-covered expenditures has little effect on any of the analysis.

variation across states in the timing of Medicaid introduction; we also cannot use the geographic variation in Medicare's impact on insurance to identify its effects on out of pocket medical expenditure risk.

3.1 Impact of Medicare on mean spending

Although our primary interest is in the impact of Medicare on the distribution of out of pocket spending, we begin with some brief analysis of the impact of Medicare on average spending of different types. Our basic estimating equation is:

$$\text{spend}_{\text{iat}} = \gamma X_{iat} + \beta_1 \text{elderly}_{\text{a}} + \beta_2 \text{year1970}_{\text{t}} + \beta_3 (\text{elderly}_{\text{a}} * \text{year1970}_{\text{t}}) + \varepsilon_{iat} \qquad (4)$$

The dependent variable ($spend_{iat}$) is one of the various spending measures for individual *i* in age group *a* and year *t*. We include a series of covariates (X_{iat}), including age, age squared, and indicator variables for male, married and education group (6 years of school or less, between 6 and 12 years, or 12 or more years of school). $Elderly_a$ is an indicator variable for whether the individual is aged 65 or older. $Year1970_t$ is an indicator variable for whether the data are from the 1970 survey. The coefficient of interest is β_3 ; it indicates the differential change in $spend_{iat}$ between 1963 and 1970 for individuals aged 65 and older, relative to individuals younger than 65. We estimate equation (4) by OLS and calculate Huber-White robust standard errors.[9]

Table 4 reports the results for Medicare-eligible expenditures (physician and hospital). For each of the four spending categories –out-of-pocket spending, private insurance spending, total insurance spending, and total spending –mean spending in 1963 is substantively quite similar and statistically indistinguishable for the two age groups (not shown). The results include controls for the covariates described above but are virtually identical without these controls (not shown).

The first column indicates that the introduction of Medicare is associated with an overall decline in mean out of pocket spending of $117. This represents a one-quarter decline from the out of pocket spending by the young elderly in 1963. Although the overall decline is not statistically significant, the $72 decline in physician (Part B) out of pocket expenditures shown in the third row is; this corresponds to a

[9] In results not reported, we found that the p-values are essentially unaffected if we instead implement the randomized inference approach of Bertrand, Duflo and Mullainathan (2004).

reduction in mean out of pocket spending by the elderly on physicians by about one-third. These estimates are somewhat smaller than estimates of the impact of other social insurance programs on risk reduction. For example, Gruber (1997) estimates that the public unemployment insurance system reduces the fall in consumption associated with an unemployment spell by about two-thirds.

The remaining three columns suggest that Medicare is associated with declines in private insurance spending, and increases in total insurance spending and total spending. Although the increase in total spending is not statistically significant, the point estimate implies that Medicare was associated with a 28 percent increase in total medical spending. Interestingly, the estimates from the RAND health insurance experiment would also predict that the introduction of Medicare would be associated with a 28 percent increase in medical spending.[10]

In results not reported, we found substantial heterogeneity in Medicare's impact by education and by race. For higher socio-economic status individuals, Medicare is associated with substantial declines in out of pocket spending and private insurance spending but little discernible increase in total spending. For lower socio-economic status individuals, however, Medicare is associated with substantial increases in total spending, but little reduction in out of pocket spending or private insurance spending. We also found no evidence of an impact of Medicare on drug spending, which Medicare does not reimburse.

The possibility, discussed above, that the introduction of Medicare may have spillover effects on health spending of the non-elderly could bias downward our estimates of the impact of Medicare on the increase in total health spending, as the control group of near-elderly could also experience some increased spending associated with Medicare. Of course, such spillovers could also bias upward our estimate of the impact of Medicare on reducing out of pocket spending of the elderly if the spillovers induced increased out of pocket spending by the near-elderly. While we cannot rule out this possibility, we note that the time series evidence does not seem to suggest such an effect: there is no statistical or substantive change in mean out of pocket spending for the near elderly. Figure 6 similarly indicates that

[10] See Newhouse (1993) for details on the RAND estimates and Finkelstein (2005) for how to use the Rand estimates to infer the predicted impact of Medicare on spending.

the distribution of out of pocket spending did not change for the near elderly between 1963 and 1970. The difference-in-difference estimates of the impact of Medicare on out of pocket spending by the young elderly are thus virtually identical to the simple time series difference.

Figure 6 also conveys the impact of Medicare on the *distribution* of out of pocket spending. The distribution of out of pocket spending for the near elderly in 1963 and 1970 as well as for the young elderly in 1963 all lie close to each other. By contrast, the distribution of out of pocket spending for the young elderly in 1970 (i.e. after Medicare) lies substantially below the upper three distributions in the top quartile of the distribution.

3.2 Effect of Medicare on the out of pocket spending distribution: centile treatment estimates

To estimate the impact of Medicare on the distribution of out of pocket spending more formally, we estimate quantile treatment effects for each centile of the spending distribution, following the approach outlined in Bitler at al. (2003). The quantile treatment effect for quantile q is estimated as follows:

$$\begin{aligned}\Delta_q &= \{\text{spend}_\text{q}(1970, \text{elderly} = 1) - \text{spend}_\text{q}(1963, \text{elderly} = 1)\} \\ &\quad - \{\text{spend}_\text{q}(1970, \text{elderly} = 0) - \text{spend}_\text{q}(1963, \text{elderly} = 0)\}\end{aligned} \qquad (5)$$

To adjust for covariates, we replace the centile from the spending distribution with the centile from the distribution of spending residuals from a linear regression of spending on the covariates described above. We calculate confidence intervals for our estimates using the empirical standard deviation of 200 bootstrap replications of the quantile treatment estimates.

The results are shown without covariate adjustment (Figure 7a) and with covariate adjustment (Figure 7b). The results are striking. There is no evidence of an impact of Medicare on out of pocket spending until the top quartile of the out of pocket spending distribution. For this top quartile, the declines are dramatic, and increase monotonically throughout the quartile. Table 5 reports the point estimates – and statistical significance – of the 75th through 99th centiles in columns 3 and 4. We estimate that for the top decile, Medicare is associated with an average decline in out of pocket spending of about $1,200 per person, or over two-fifths of the pre-Medicare spending level. For the second highest decile, Medicare is associated with an average decline in out of pocket spending of about $300 per person, again over two-

fifths of the pre-Medicare spending level.[11] Figures 8c and 8d show that the quantile treatment estimates look similar if we expand the elderly sample to include all those aged 65 – 90. Because we will use these estimates from the larger sample for the welfare analysis below, these point estimates are also reported in columns 5 and 6 of Table 5.

The quantile treatment estimator in equation (5) uses as a proxy for the change in spending that would have occurred for spending *quantile* q in the treatment group absent the introduction of Medicare, the change in spending that did occur for the same quantile q in the control group. An alternative estimator suggested by Athey and Imbens (2003) uses as a proxy for the change in spending that would have occurred for spending *level* y in the treatment group absent the introduction of Medicare, the change in spending that did occur in the control group at the quantile in the control group that corresponds to that same level y. Given the similarity of the treatment and control distributions in the pre-period (see Figure 6), we find, not surprisingly, that the two approaches yield very similar results (not shown).

The identifying assumption behind the foregoing analysis is that, absent the introduction of Medicare, spending changes for the young-elderly would have been similar to those experienced by the near-elderly. We provide some indirect support for this identifying assumption by examining how spending changed between 1963 and 1970 for adjacent age groups who both experienced the same change in public health insurance coverage over this period. Figure 8a shows that out of pocket spending in the top decile of the distribution actually *increased* for individuals aged 60-64 relative to individuals aged 55-59, although the increase is not statistically significant. Figure 8b indicates a decrease in out of pocket spending for individuals aged 70-74 relative to individuals aged 65-69 at most of the top end of the distribution. Unlike our main results, however, the point estimates suggest an increase for the very top two percentiles. Moreover, the decreases are statistically insignificant and are about half the magnitude of the estimated decreases for individuals aged 65-74 relative to individuals aged 55-64. These findings suggest that our

[11] These estimates are based on the covariate-adjusted specification. The estimates without covariates suggest virtually identical declines for the top decile and slightly higher declines for the second decile.

main analysis comparing 65-74 year olds to 55-64 year olds is not merely picking up an underlying change in the spending distribution that differs systematically by age.

Section 4: Cost benefit analysis

We use a stylized expected utility framework to simulate the insurance value of the estimated reduction in risk exposure associated with Medicare and compare this to the estimated costs of Medicare, which consist of the moral hazard costs of any induced health care consumption as well as the marginal cost of public funds for Medicare expenditures.[12] Estimation of the insurance value of Medicare requires that we make a number of modeling assumptions. While we therefore consider our findings here more speculative than the results in the previous section, we believe they provide a useful way to gauge the likely magnitude of the welfare benefits associated with Medicare's reduction in risk exposure.

4.1 The insurance value of Medicare

Our analysis of the insurance value of Medicare is similar in spirit to Skinner and McClellan (1997), who analyze the relative insurance value of Medicare for individuals at different parts of the income distribution. However, while Skinner and McClellan (1997) use the expected utility model and parametric assumptions about the price and income elasticity of demand for medical care to solve for the optimal consumption of medical care in the presence and absence of Medicare, we instead use our empirical estimates of the distribution of medical expenditures before and after Medicare as inputs into the expected utility framework.

We assume the individual's utility $u(c)$ is a function of his non-health consumption (c). We assume the individual must satisfy a period-by-period budget constraint:

$$c = y - m$$

[12] Our analysis assumes that the elderly were underinsured prior to Medicare and therefore that reductions in risk exposure are welfare improving. This was the premise behind the Medicare legislation (Ball 1995). The considerable empirical evidence of adverse selection in private health insurance markets also supports our assumption of under-insurance (Cutler and Zeckhauser 2000). We do not consider the distributional impact of Medicare, which is analyzed by McClellan and Skinner (1997) and Bhattacharya and Lakdawalla (2002).

where y is his per-period income (such as from Social Security) and m is his out of pocket medical expenditures. m is a random variable with probability density function $f(m)$ and support $[0, \overline{m}]$. $f(m)$ depends both on the distribution of random health shocks, and on the nature of any health insurance held. The individual's expected utility is given by:

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

To calculate the welfare gain associated with increased health insurance coverage, we follow the general approach used in the existing literature that calculates the welfare gains associated with other insurance products (e.g. Mitchell et al. 1999, Brown and Finkelstein, 2004 and Feldstein and Gruber, 1995). Specifically, we compute the individual's risk premium under both the pre- and post-Medicare spending distributions. 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. The risk premium π is therefore defined implicitly by:

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

A decrease in risk exposure in the post-Medicare world relative to the pre-Medicare world will appear as a decline in the risk premium; this decline provides a measure of the insurance value (and hence welfare gain) of the Medicare coverage.

We assume a constant relative risk aversion utility function. For our central estimate, we follow a long line of simulation literature of the value of social insurance for the elderly and assume a coefficient of relative risk aversion of 3 (see e.g. Hubbard, Skinner and Zeldes 1995, Skinner and McClellan 1997, Mitchell et al. 1999). However, in recognition of the range of plausible parameters, we also report results for coefficients of risk aversion of 1 and of 5.

Our analysis is based on the sample of 658 individuals aged 65 and over in 1963. We construct individual income by dividing the household income reported in the data by the number of individuals in

the household. For each individual, we make 50 random draws without replacement from his potential out of pocket spending distribution. Since pre-Medicare out of pocket medical expenditures are strongly positively correlated with household income, we divide our individuals into income terciles and make the 50 draws for a given individual from the out of pocket expenditure distribution of his income tercile.[13]

The first column of Table 6 shows the average risk premium when each individual faces the original out of pocket expenditure distribution that existed prior to Medicare. For a coefficient of relative risk aversion of 3, the risk premium is $953, indicating that this individual would be willing to pay up to $953 to avoid any future out of pocket medical expenditure risk. This willingness to pay is more than double the reduction in average out of pocket spending ($412).[14]

The second column shows the decrease in risk premium associated with moving from the original, pre-Medicare distribution to the out of pocket spending distribution the individual faces once the quantile treatment estimates of Medicare's impact are applied. We make this adjustment based on our quantile treatment estimates of the reduction in out of pocket medical spending associated with Medicare for individuals aged 65 and over (see Figure 8c). For a coefficient of relative risk aversion of 3, the results indicate a welfare gain of $411 from facing the post-Medicare spending distribution instead of the pre-Medicare spending distribution.

Of course, Medicare coverage reduces not only the variance but also the mean of the out of pocket spending distribution. For the first generation of Medicare recipients, the decline in mean out of pocket spending was an almost complete windfall gain, since Medicare hospital expenditures are funded out of payroll taxes paid by working individuals, and Medicare Part B premiums were subsidized 50 percent. To separate out the insurance value from the windfall intergenerational transfer, we recalculate the post-

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[13] Even with tercile-specific draws, it is still possible to get a draw that is very high relative to (or higher than) income, which is unrealistic relative to actual spending patterns. Empirically, the 95th percentile of the distribution of out of pocket spending as a share of income for individuals in the bottom tercile of the income distribution is 80%, so we cap out of pocket spending as a fraction of income for each draw at 80%. Using this approach, roughly one-third of individuals have at least one draw capped. As a result, the mean out of pocket Medicare-eligible expenditures as a percent of income in our simulation is somewhat lower than in the actual distribution (0.06 compared to 0.08), which suggests that we may underestimate the risk reduction associated with Medicare.

[14] The $412 reduction in out of pocket spending is slightly less than the $448 in Medicare-eligible out of pocket spending in Table 3 because of the capping procedure described above.

Medicare risk premium under the assumption that individuals must "pay for" the actuarial expected value of Medicare. Specifically, we subtract from the individual's income the average difference in out of pocket expenditures between his 50 draws for the original pre-Medicare distribution and his 50 draws from the post-Medicare distribution. Column 3 shows the change in risk premium associated with moving from the pre-Medicare distribution to the post-Medicare distribution when this insurance is "actuarially fair"; for a coefficient of relative risk aversion of 3, the results in column 3 indicate a welfare gain of $236 per person, or just over half the welfare gain without accounting for the windfall (column 2).

These results understate the decline in risk exposure associated with Medicare coverage because they incorporate the behavioral response to Medicare. Both the income and substitution effect from Medicare lead to increased consumption of health care and hence out of pocket spending. This increased out of pocket risk reflects individual optimization decisions, and therefore should not be counted against the welfare gain. (Of course, the behavioral response does contribute to the costs of the program, and we therefore account for these moral hazard costs in the cost-benefit analysis below.)

To abstract from the behavioral response to Medicare in calculating the insurance value, we estimate the post-Medicare out of pocket spending distribution by mechanically adjusting the pre-Medicare 1963 distribution to account for what Medicare would have covered had Medicare existed in 1963. [15] Figure 9 shows this mechanically adjusted distribution; for comparison, it also shows the pre-Medicare distribution and the pre-Medicare distribution adjusted using the quantile treatment estimates. As expected, the mechanical adjustment produces a distribution that lies below that from the quantile treatment adjustment.

Columns 4 and 5 of Table 6 report the welfare benefits using the mechanical adjustment to estimate the post-Medicare out of pocket spending distribution. Column 4 shows the change in risk premium when individuals are given Medicare "for free" while column 5 reports the results under the assumption that individuals must "pay for" the actuarial expected cost of Medicare. In both cases, the decline in risk premium associated with Medicare is larger than that estimated using the quantile treatment adjustment.

[15] The details of the Medicare benefits at the time of its introduction are taken from Somers and Somers (1967). Since the part A co-payment depends on the length of the hospital stay, we draw on the data on the individual's length of hospital stay in calculating the part A cost sharing requirements for the individual.

For a coefficient of relative risk aversion of 3, the results in column 5 indicate that the mechanical introduction of Medicare (at actuarially fair rates) is associated with a welfare gain of $519 per person. There were about 19 million people aged 65 and over in 1965. This implies that Medicare's reduction in risk exposure was associated with $9.9 billion per year in welfare gains.

For several reasons, the estimates in Table 6 may be underestimates of the consumption smoothing benefits associated with Medicare. The stylized model treats medical expenditures as affecting the budget constraint only and does not allow for any utility from increased medical expenditures. While some of the increased spending associated with Medicare may have been socially inefficient, the cost-sharing provisions ensure that its social marginal benefit was not zero. In addition, to the extent that some of the elderly's medical expenditures were paid for by their adult children in the pre-Medicare era, Medicare may have had additional consumption smoothing benefits for this other group of individuals.

In one respect, however, the estimates in Table 6 may overestimate the value of Medicare. Our analysis assumes that the individual cannot borrow or save across periods but must consume each period their net-of-medical expenditures income. This may be a reasonable assumption for many elderly households, since many enter retirement with relatively little financial assets. Indeed, our calculations from the 1962 Survey of Consumer Finances (SCF) suggest that almost one-third of elderly households had no liquid assets whatsoever, and many of those who do have liquid assets have relatively small amounts. However, at the high end of the wealth distribution, savings might be an important form of consumption smoothing and failure to account for them will result in an overstatement of the insurance value of Medicare for these individuals. Nonetheless, we believe that our per-person welfare estimate is likely to be a reasonable approximation for much of the wealth distribution.[16]

4.2 Comparison to estimated costs

[16]We re-calculated welfare gains separately for each income tercile to confirm that our estimate of the average per-person welfare gain is not driven by disproportionate gains at the top of the distribution where we are likely to be over-estimating the gain. Indeed, per-person welfare gains were slightly higher for individuals in the lower portions of the distribution; for example, we estimated a welfare gain of $482 for the top income tercile for "actuarially fair" Medicare with risk aversion of 3, compared to a welfare gain of $523 for the bottom tercile.

Medicare imposes two types of costs. First, there is the cost of raising the revenue to pay for the public program. In 1970, Medicare spending was (in 2000 dollars) $34 billion. The consensus estimate of 0.3 for the marginal cost of public funds in the US (Poterba, 1996) implies that the annual revenue raising costs associated with Medicare were $10.2 billion. Second, there are the efficiency costs from the increased health spending due to the moral hazard associated with health insurance. By treating all of the increase as a cost, we provide an upper bound on the efficiency costs of Medicare, since part of the moral hazard effect comes from the income effect of health insurance, which does not have efficiency costs. The moral hazard estimates in section 3.1 – which suggest that Medicare is associated with a 28 percent increase in the elderly's health spending –imply that Medicare is associated with a moral hazard cost of $2.8 billion.[17] The four-fold larger moral hazard estimates in Finkelstein (2005) imply that Medicare is associated with a moral hazard cost of $11.2 billion.[18]

Combining the moral hazard and public funds costs suggests that the annual cost of Medicare was $13 to $21.4 billion. Using a risk aversion coefficient of 3, we estimated above that the consumption smoothing benefits from Medicare were worth roughly $9.9 billion annually. Thus, the direct insurance benefits cover between forty-five and seventy-five percent of the costs of the program. [19]

Section 5: Conclusion

This paper has examined the impact of the introduction of Medicare, the single largest change in health insurance coverage in U.S. history. Using several different empirical approaches, we find no evidence that the introduction of nearly universal health insurance for the elderly had an impact on overall elderly mortality in its first 10 years. These results are particularly surprising in light of the fact that the introduction of Medicare was followed by a period of prolonged and substantial declines in elderly mortality. Our analysis suggests that insurance coverage provided by Medicare did not contribute to this

[17] There were about 19 million people aged 65 and over in 1965 and their average per capita Medicare-eligible health spending in 1963 was $518 (see Table 3).

[18] One reason for the larger estimates is that estimates – such as those in this paper – based on the age variation in Medicare coverage will be biased downward if Medicare affects health spending among the "control group" of individuals aged 55 to 64. See Finkelstein (2005) for a more detailed discussion of this issue.

[19] Using data from the Health and Retirement Survey in the 1990s, Khwaja (2005) also estimates substantial risk-reducing benefits from Medicare relative to the costs of the program.

mortality decline because *legal access* to hospitals, rather than insurance coverage per se, was the main barrier to receiving hospital care at the time of Medicare's introduction.

We also find that, although Medicare did not produce measurable mortality benefits, it did provide considerable risk reduction benefits. We estimate that the introduction of Medicare was responsible for a striking and substantial decline in the right-tail of the out of pocket medical expenditure distribution for the elderly. At the top two deciles of out of pocket spending, we estimate that the introduction of Medicare is associated with over a two-fifths decline in out of pocket spending relative to pre-Medicare levels. A stylized expected utility framework suggests that the welfare gains associated with this reduction in risk bearing are substantial, and may be sufficient to cover between half and three quarters of the costs associated with the Medicare program, even in the absence of any health benefits. These findings suggest that – in answer to the question posed by the title of the paper – the benefits from the introduction of Medicare are likely to have been worth their costs.

Our empirical findings underscore the importance of considering the direct consumption smoothing benefits of health insurance, in addition to any indirect benefits from the effect of insurance on health. Relatedly, they suggest that the extensive empirical literature devoted to estimating the health benefits of health insurance – which has tended to find no or only modest benefits for adults – may be substantially underestimating the total benefits from health insurance.

The analysis of this paper is done in a static environment in which medical technology is taken as given. However, Finkelstein (2005) presents evidence that Medicare may have played an important role in the adoption of new medical technologies. The increase in life expectancy from these new technologies is extremely large (Cutler, 2003). This raises the interesting and important possibility that, although we found no compelling evidence of an impact of Medicare on mortality in its first 10-year, the longer-run impact of Medicare on mortality via induced technological change may be substantially larger. A critical issue, however, is how the marginal benefits of any new technology use induced by Medicare compare to the average benefits discussed by Cutler (2003). We consider this an important area for further research.

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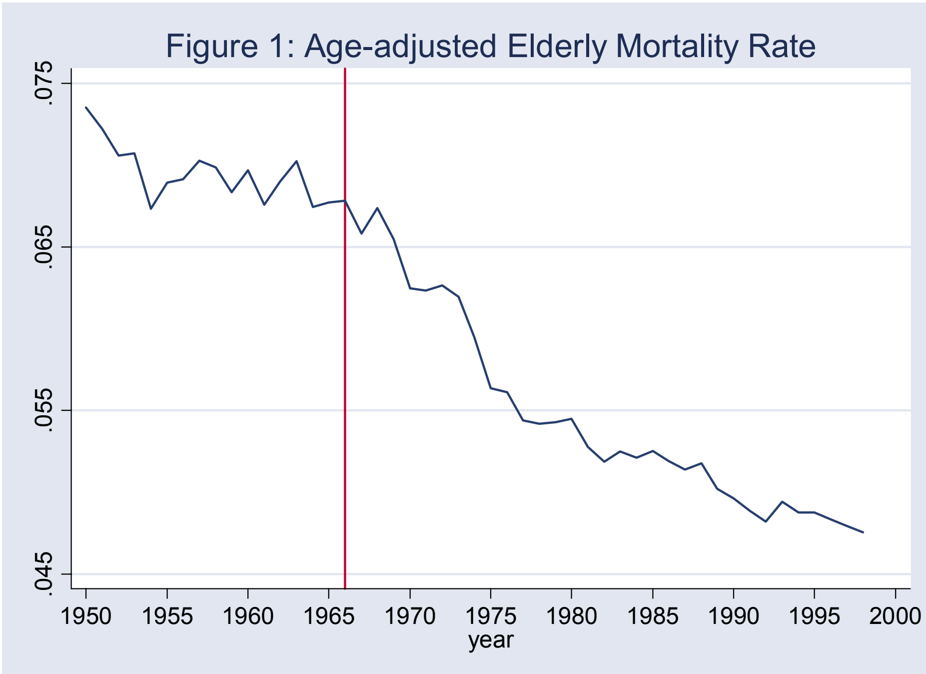
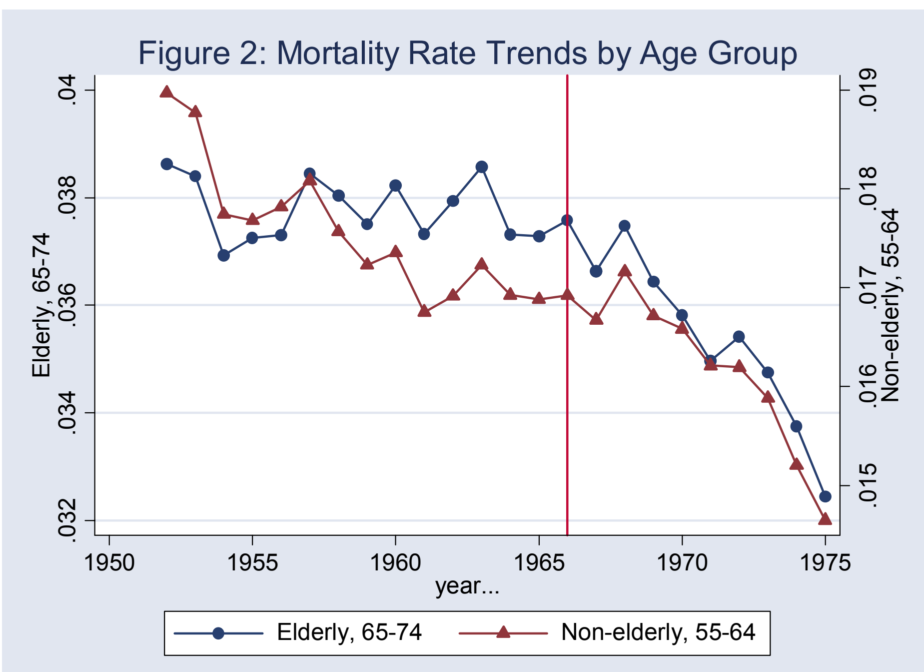
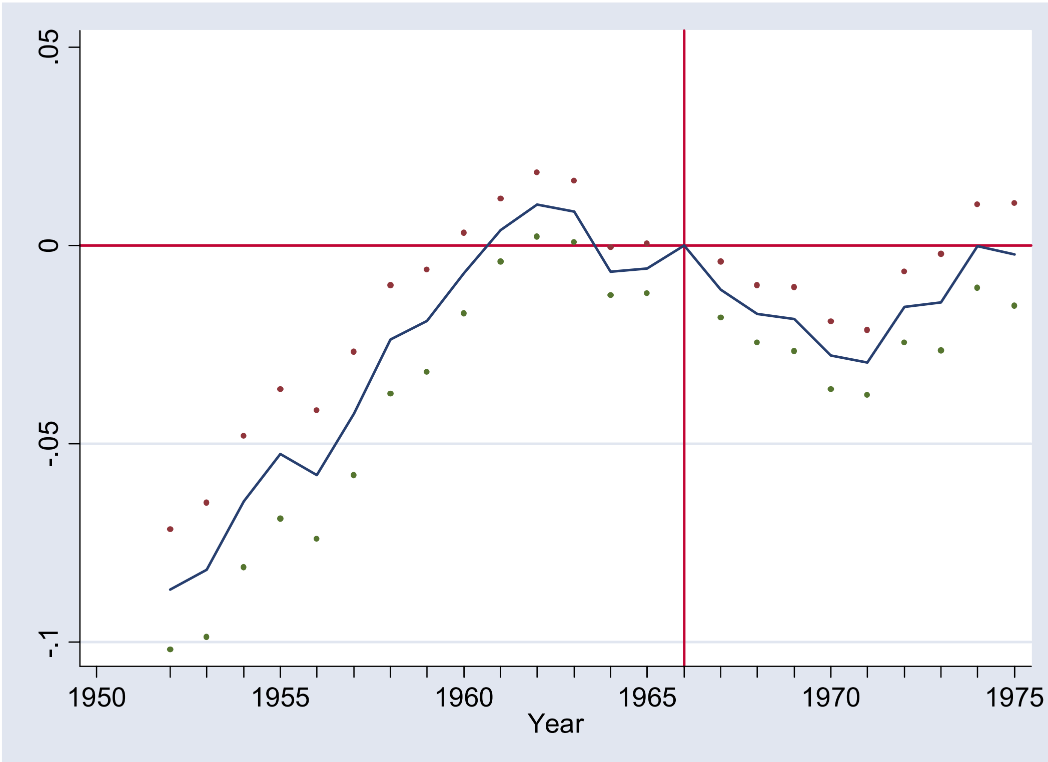


Note: Graph shows the all-cause mortality rate for individuals aged 65+. Figure is reproduced from Cutler and Meara, 2003, Figure 9.4. The mortality rate in each year is the weighted sum of mortality rates for 65-74, 74-85, and 85+ age groups in that year, with weights reflecting the age distribution of the 65+ population in 1990. We are grateful to Ellen Meara for providing us with the data underlying their figure. Vertical line indicates 1966, the year Medicare is first in effect.



Source: Authors' calculation based on mortality data from the NCHS Multiple Causes of Death micro-data (1959-1975) and Vital Statistics (various years) for 1952-1958. Population estimates are constructed based on census data as described in text. Vertical line indicates 1966, the year Medicare is first in effect.

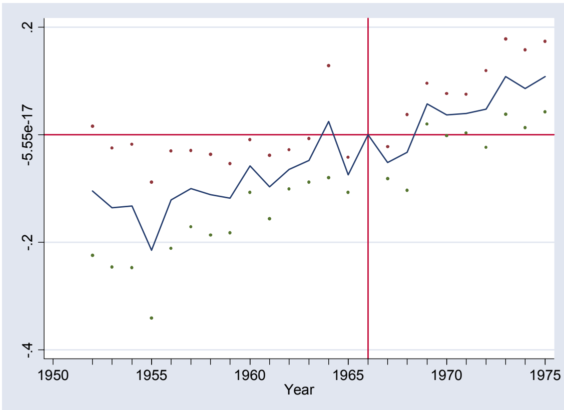
Figure 3. Estimates of equation (1), the age identification strategy, for ages 55-74.



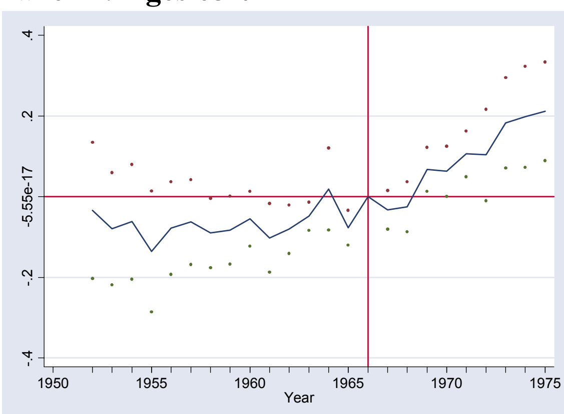
Note: Graphs show the coefficients on the interaction of "young elderly" with the year fixed effects (i.e. the λ_t's) from estimating equation ( ). Dependent variable is log deaths for age group *a* in state *s* and year *t*. Other covariates are log population, indicator variable for young-elderly age group (vs. near-elderly), state fixed effects, year fixed effects, and indicator variables for year since Medicaid implementation in the state. Standard errors are adjusted for an arbitrary variance-covariance matrix within each state. Vertical line indicates 1966, the year Medicare is first in effect.

Figure 4: Estimates of equation (4), the geographic variation strategy

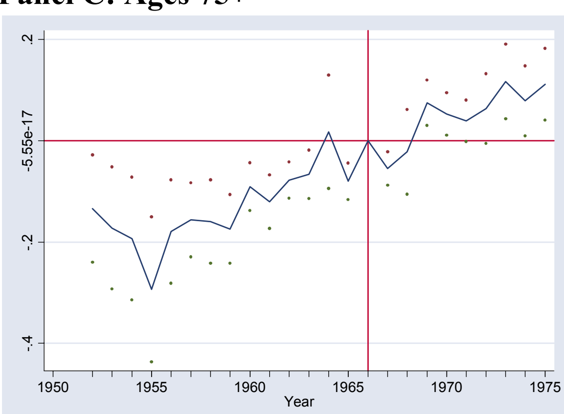
Panel A: Ages 65+



Panel B: Ages 65-74



Panel C: Ages 75+



Note: Graphs show the coefficients on the interaction of "percent without insurance" with the year fixed effects (i.e. the λ_t's) from estimating equation (4). Dependent variable is log deaths in state *s* and year *t*. Other covariates are log population, state fixed effects, year fixed effects, and indicator variables for year since Medicaid implementation in the state. Standard errors are adjusted for an arbitrary variance-covariance matrix within each state. Vertical line indicates 1966, the year Medicare is first in effect.

Figure 5: Centiles of out of pocket spending for individuals aged 65+ in 1963

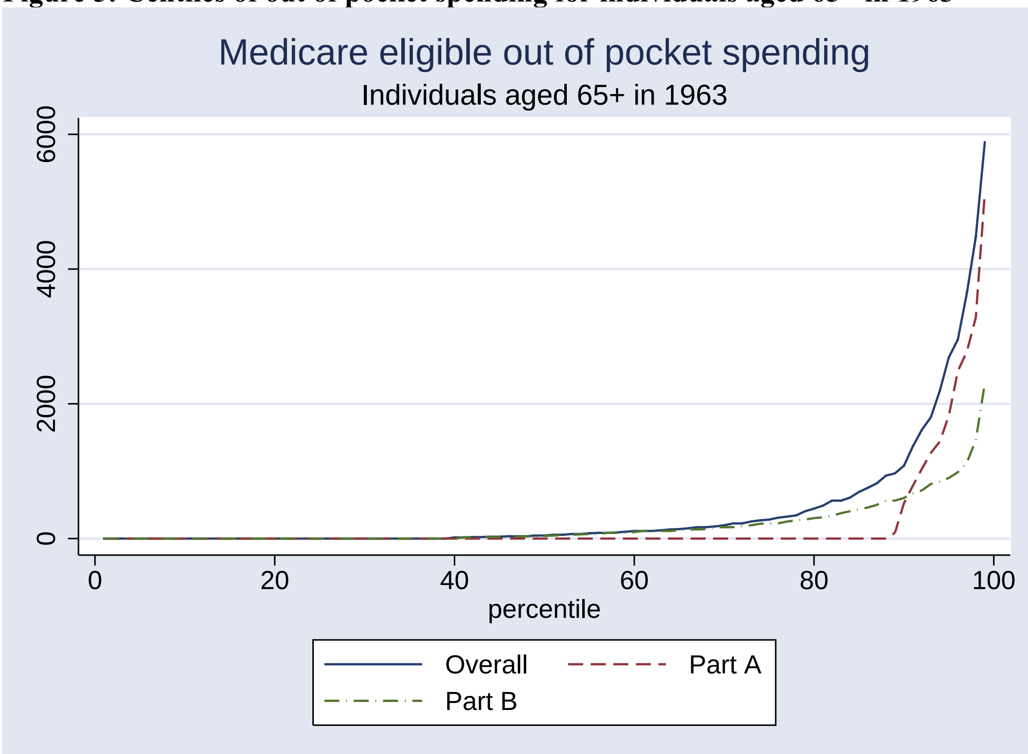


Figure 6: Centiles of Medicare-eligible out of pocket spending by age group and year

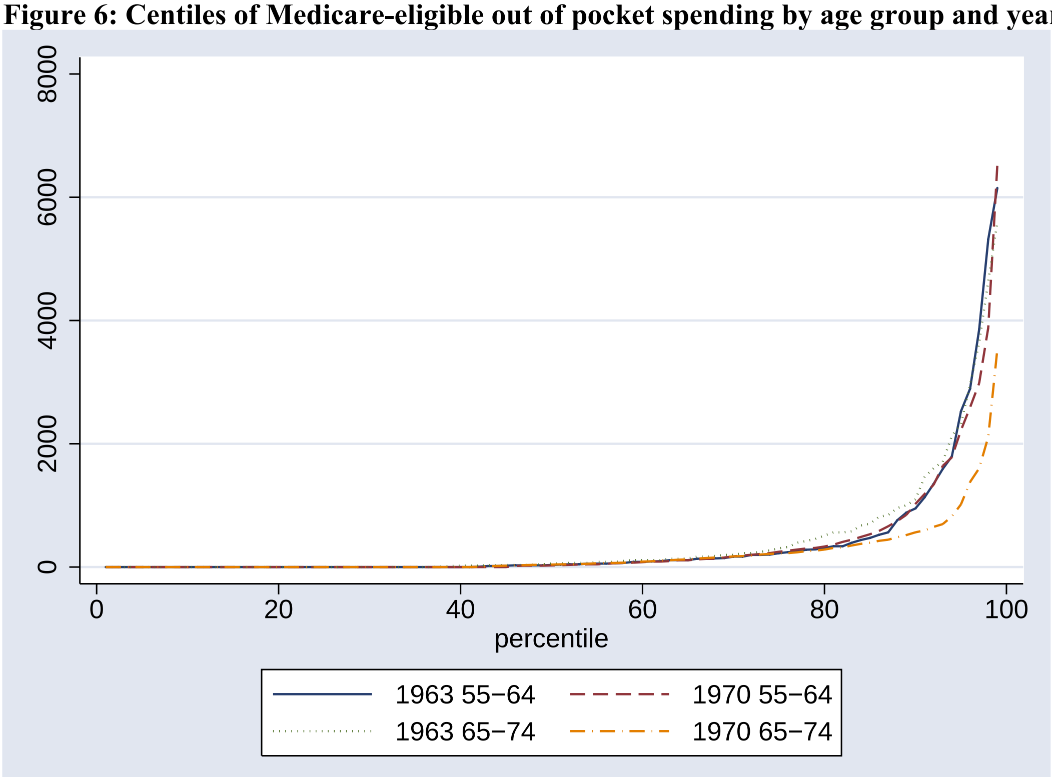
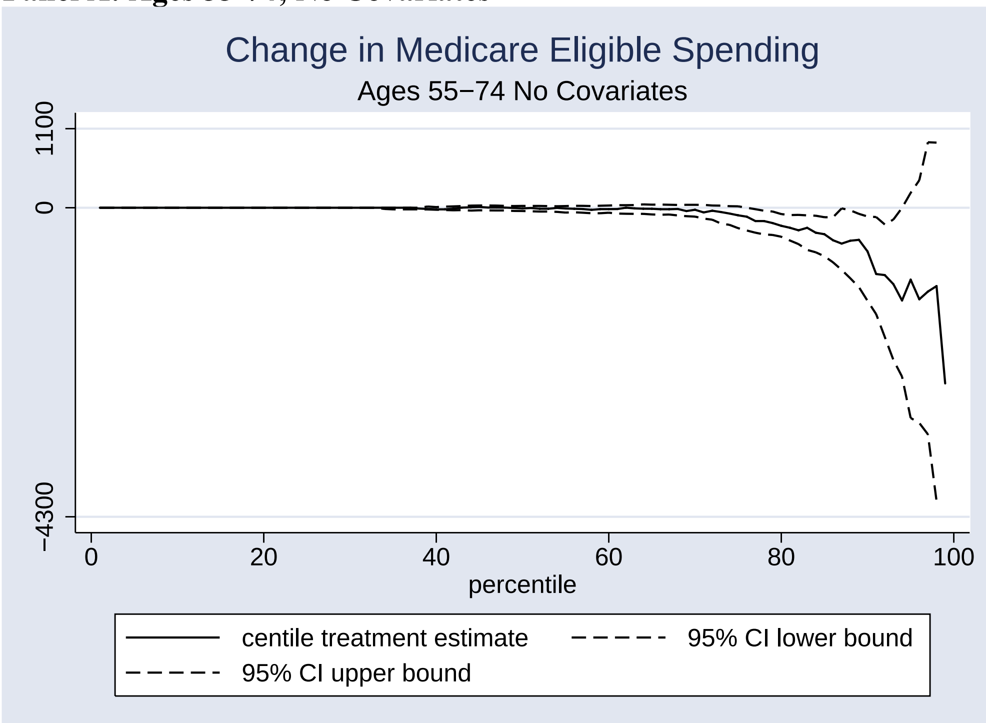


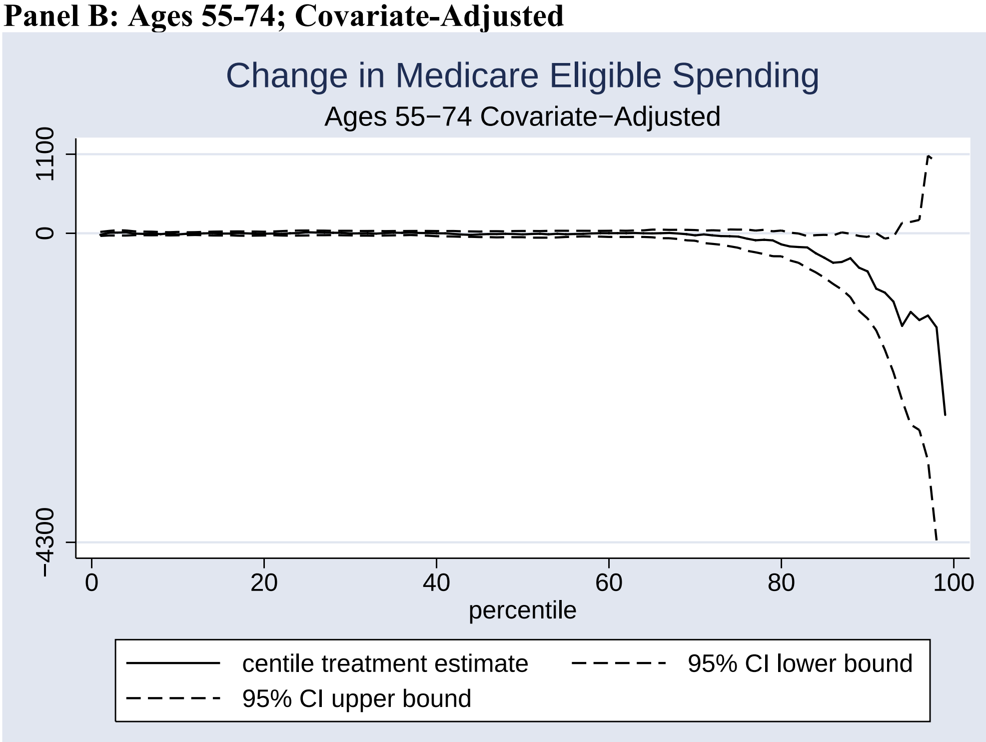
Figure 7: Quantile treatment estimates for out of pocket spending

Panel A: Ages 55-74; No Covariates



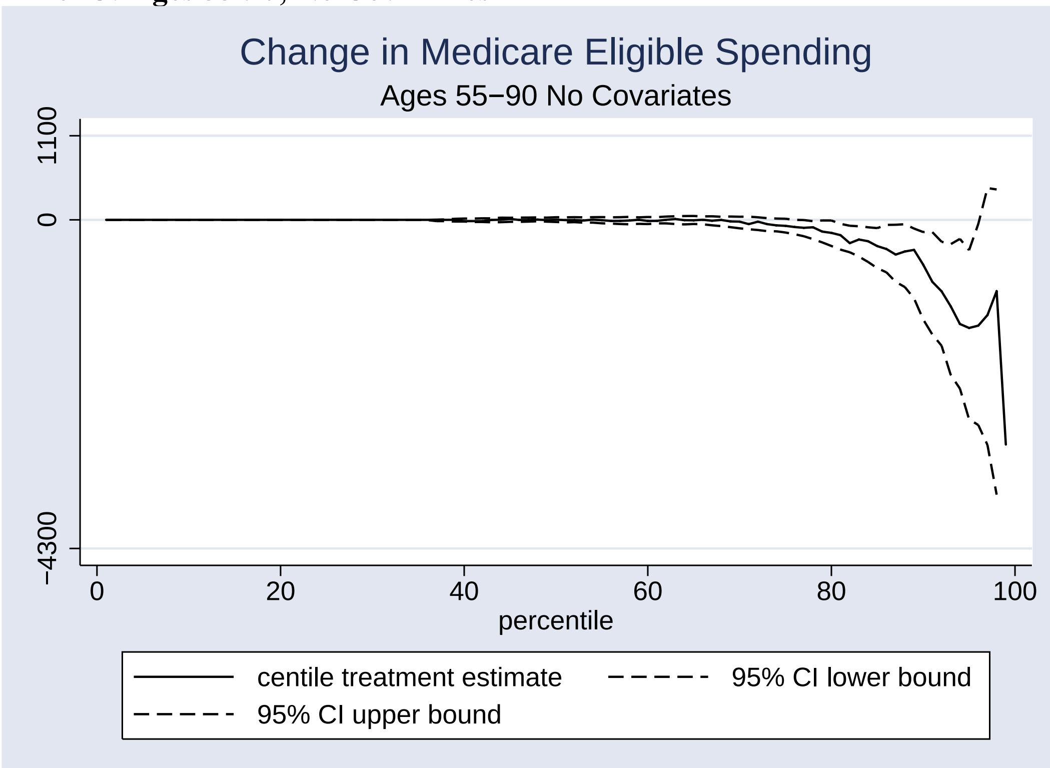
Note: Dashed lines indicate 95% confidence intervals. The 95% confidence interval for the 99th percentile (-7036, 1737) is not shown on the graph.

Panel B: Ages 55-74; Covariate-Adjusted



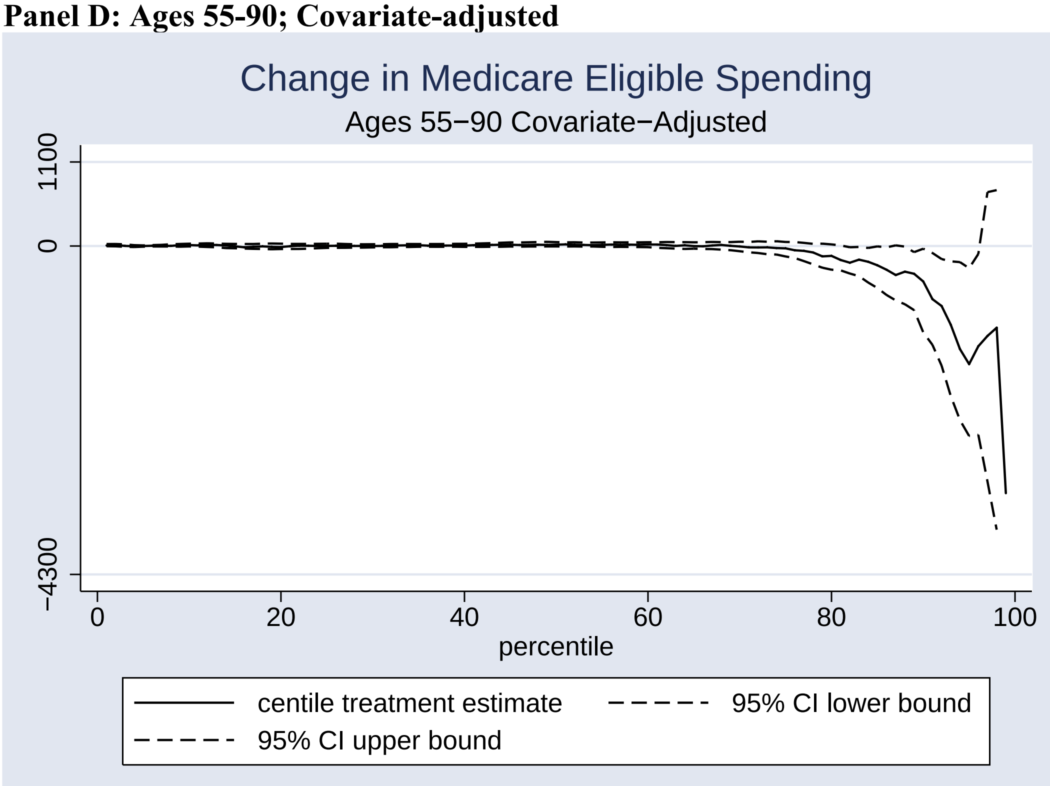
Note: The 95% confidence interval for the 99th percentile (-7036, 1737) is not shown on the graph

Panel C: Ages 55-90; No Covariates



Note: The 95% confidence interval for the 99th percentile (-9814, 1392) is not shown on the graph

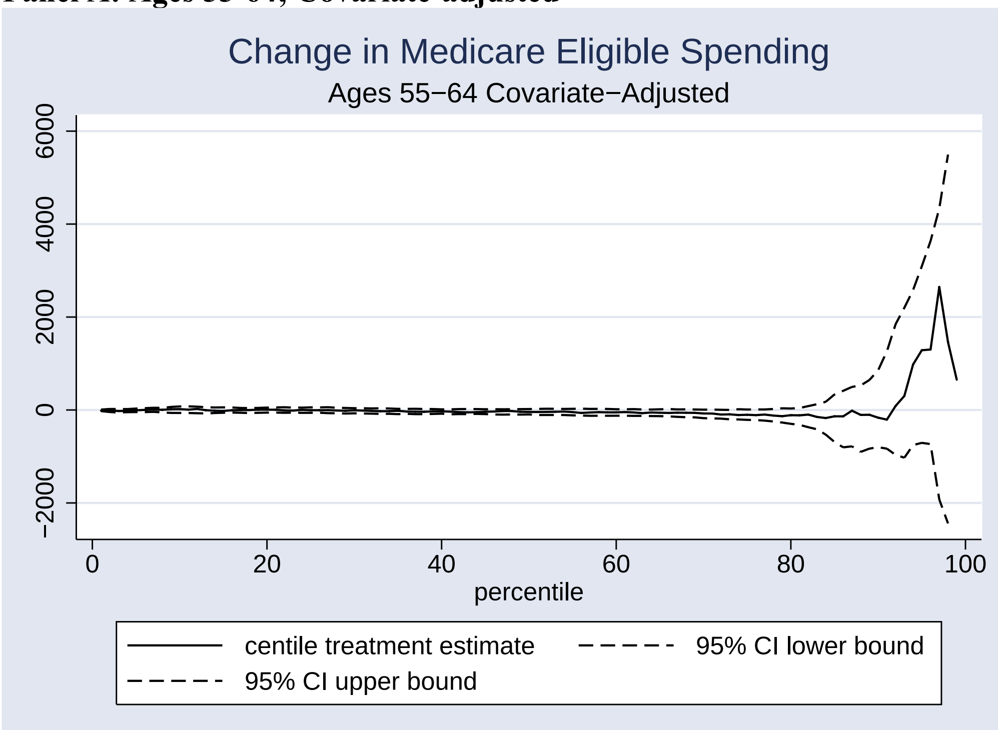
Panel D: Ages 55-90; Covariate-adjusted



Note: The 95% confidence interval for the 99th percentile (-7866, 1206) is not shown on the graph

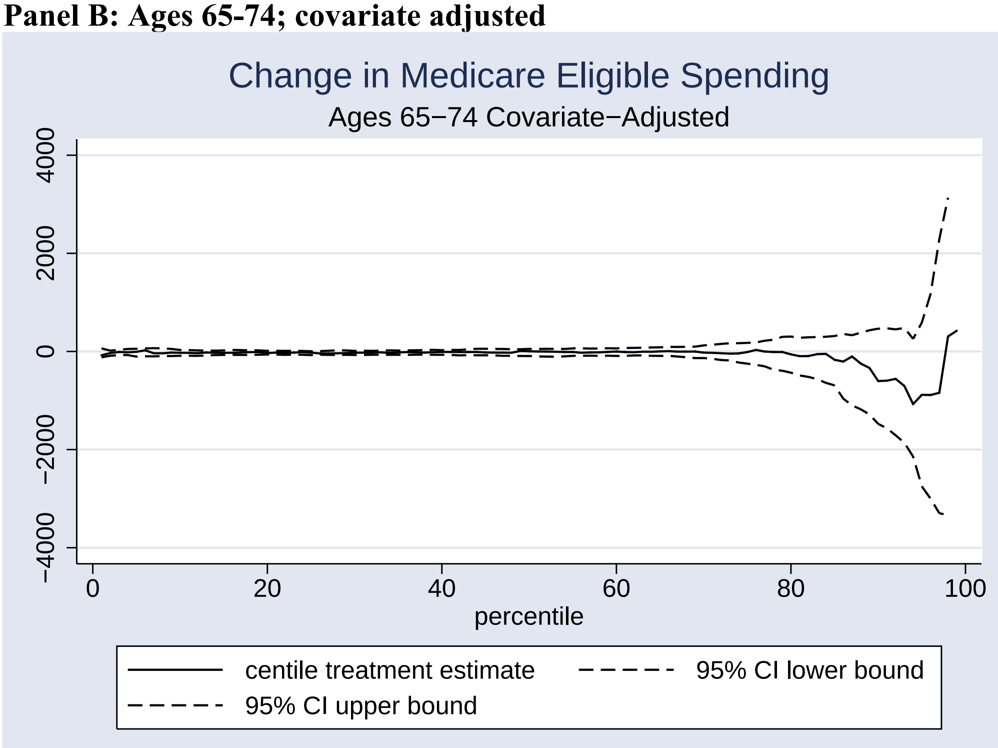
Figure 8: Quantile treatment estimates for oop spending: testing the identifying assumption

Panel A: Ages 55-64; Covariate-adjusted



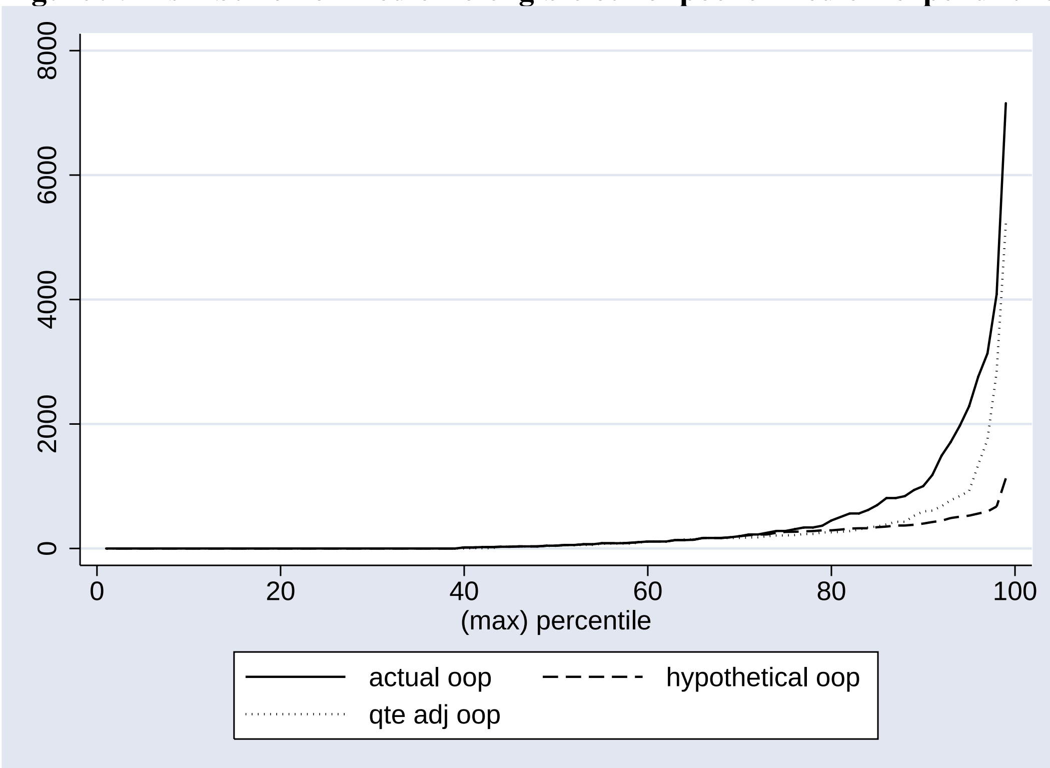
Note: Dashed lines indicate 95% confidence intervals. The 95% confidence interval for the 99th percentile (-7091, 5003) is not shown on the graph.

Panel B: Ages 65-74; covariate adjusted



Note: The 95% confidence interval for the 99th percentile (-14088, 26512) is not shown on the graph.

Figure 9: Distribution of Medicare-eligible out of pocket medical expenditures



Note: Actual is for ages 65+ in 1963; quantile adjustment uses individuals age 55-64 as control.

Table 1: Percent of Elderly Without Hospital Insurance, 1963 National Health Survey

Sub-Region	Any Insurance	Blue Cross
New England (CT, ME, MA, NH, RI, VT)	0.37	0.49
Middle Atlantic (NJ, NY, PA)	0.41	0.60
East North Central, Eastern Part (MI, OH)	0.32	0.55
East North Central, Western Part (IL, IN, WI)	0.42	0.75
West North Central (IA, KS, MN, MO, NE, ND, SD)	0.47	0.81
South Atlantic, Upper Part (DE, DC, MD, VA, WV)	0.45	0.75
South Atlantic, Lower Part (FL, GA, NC, SC)	0.50	0.81
East South Central (AL, KY, MS, TN)	0.57	0.88
West South Central (AR, LA, OK, TX)	0.55	0.85
Mountain (AZ, CO, ID, MT, NV, NM, UT, WY)	0.50	0.78
Pacific (OR, WA, CA, AK, HI)	0.52	0.87
U.S. National	0.46	0.73

Note: Data on individual's health insurance are from the 1963 National Health Survey, and national, random sample of households conducted from July 1962 through June 1963. Through a special request to the government, we obtained a version of the survey that identifies which of 11 sub-regions the individual is in. We limited the sample to the 12,757 individuals aged 65 and over. Minimum sample size for a sub-region is 377.

Table 2: Estimated Effect of Having at Least 1 Medicare-Certified Hospital in the County

	All Causes		Pneumonia		Cardiovascular disease	
	Log-Linear	Linear	Log-Linear	Linear	Log-Linear	Linear
Panel A: Non-White						
Certified	0.00024	-0.001	-0.345***	-0.001**	0.060	0.001
	(0.027)	(0.002)	(0.145)	(0.000)	(0.044)	(0.002)
ln(pop'n)	0.446**		0.341		.190	
	(0.218)		(1.236)		(0.340)	
Mean of dependent variable	4.58	0.066	0.937	0.002	4.046	0.039
N	425	425	304	425	425	425
Panel B: White						
Certified	-0.009	0.0002	0.025	-0.00013	0.026	0.001
	(0.034)	(0.002)	(0.123)	(0.00027)	(0.042)	(0.001)
ln(pop'n)	0.747***		1.464***		0.642***	
	(0.198)		(0.543)		(0.191)	
Mean of dependent variable	4.16	0.061	0.734	0.002	3.709	0.039
N	425	425	311	425	425	425

Note: Results are from estimating equation (3) on the 25 counties in the Mississippi Delta for non-white and white elderly. Standard errors in parentheses.. Data are from 1959 – 1975 only, since data before 1959 are not available at the county level by race. *, **, *** denotes significance at, respectively, the 10 percent, 5 percent, and 1 percent level.

Table 3: Summary statistics: 1963 Spending, Ages 65+

	Total Spending	Total (Public + Private) Insurance Spending	Private Insurance Spending	Out-of-pocket Spending	Total Spending as % of Income	Out-of-pocket Spending as % of Income
Total	844	75	75	770	10.4%	10.1%
Medicare eligible (Parts A + B)	518	71	71	448	5.2	4.9
Hospital (Part A)	263	16	16	247	2.1	2.2
Physician (Part B)	255	55	55	201	3.1	2.7
Home visits	31	1	1	31	0.6	0.6
Drugs	294	3	3	291	4.6	4.6

Table reports mean spending in year 2000 dollars for individuals aged 65 and over in 1963. N=658. Individual income is calculated as household income divided by number of individuals in the household. We measures total insurance spending as private insurance spending in 1963, and as private insurance spending plus Medicare and Medicaid spending in 1970. The 1963 survey does not collect information on public insurance spending; however, we know that public assistance for medical spending prior to 1965 was virtually non-existent (Stevens and Stevens, 1974, United States Senate 1963).

Table 4: Changes in average Medicare-eligible expenditures

	Out-of-pocket Spending	Private Insurance Spending	Total (public + private) Insurance Spending	Total Spending
All Spending	-117.3	-507.1***	259.0*	142.3
	(106.5)	(97.0)	(150.2)	(204.7)
Part A	-44.7	-465.9***	127.5	85.3
	(89.8)	(87.6)	(133.84)	(171.1)
Part B	-72.58**	-41.2*	131.5***	57.0
	(34.1)	(23.3)	(32.3)	(53.9)

Note: Table reports the coefficient on elderly*year1970 from estimating equation (4) by OLS on a sample of 55 to 74 year olds. Robust standard errors in parentheses. ***, **, * denote significance at the 1 percent, 5 percent and 10 percent levels respectively. All estimates are in year 2000 dollars. N = 2,834

Table 5: Effect of Medicare on Distribution of Out of Pocket Spending

Centile	Out of pocket spending (Ages 65-74 in 1963)	Centile Treatment Estimates			
		Individuals 55-74		Individuals 55-90	
		Overall (no covariates)	Overall (covariate adjusted)	Overall (no covariates)	Overall (covariate adjusted)
(1)	(2)	(3)	(4)	(5)	(6)
75	304	-105	-46	-78*	-31
76	326	-124*	-74	-94*	-56
77	395	-185**	-97	-104*	-64
78	422	-185**	-91	-97*	-84
79	456	-213**	-99	-154**	-136
80	512	-251**	-155	-171**	-129*
81	563	-278**	-183*	-201**	-183*
82	563	-314**	-191**	-305**	-218**
83	580	-279**	-197**	-258**	-178**
84	675	-347**	-278**	-280**	-206**
85	703	-368**	-341**	-344**	-252**
86	816	-452**	-410**	-382**	-310**
87	844	-499**	-400*	-454**	-380*
88	957	-459**	-347**	-414**	-336**
89	1002	-447**	-478**	-393**	-363**
90	1097	-608**	-531**	-587**	-464**
91	1463	-922**	-771*	-812**	-695**
92	1304	-937**	-825**	-935**	-785**
93	1711	-1064**	-951**	-1131**	-1031**
94	2127	-1291**	-1289*	-1363**	-1349**
95	2324	-1000*	-1094	-1415**	-1546**
96	2954	-1274*	-1208	-1384**	-1312**
97	3641	-1166	-1144	-1246	-1177
98	4637	-1090	-1309	-932	-1069
99	5599	-2444	-2527	-2940	-3236

Note: Centile treatment estimates are from equation (5). ** denotes significance at the 5 percent level; * denotes significance at the 10 percent level. Results below the top quartile tend to be 0 or very close to 0 and statistically insignificant.

Table 6: Per-person Welfare Effect of Medicare's Change in Medicare-Eligible Out of Pocket Medical Expenditure Risk

		Decrease in Risk Premium Associated with Changing from Original Pre-Medicare Distribution to			
		Distribution adjusted using quantile treatment estimates		Distribution adjusted "mechanically"	
Risk Aversion	Risk Premium, Original Pre-Medicare Spending (1)	Medicare (no charge) (2)	Medicare (actuarially fair) (3)	Medicare (no charge) (4)	Medicare (actuarially fair) (5)
1	503	192	44	350	86
3	953	411	236	785	519
5	1714	751	558	1524	1256

Note: All estimates are in year 2000 dollars. See text for further details.