# Consequences of Government Provision and Regulation of Health Insurance

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# Abstract

The first two chapters of this dissertation concern the effect of public catastrophic insurance programs. In the first chapter, I show how these programs, which only protect against large health shocks, induce advantageous selection in private insurance. I use data on older Americans with Medicare insurance from the Health and Retirement Study to test if individuals with supplemental private health insurance are systematically lower-risk in states with public catastrophic insurance programs. I find that these programs decrease the average health risk for the privately insured by $700 and that a one standard deviation increase in an individual's health risk decreases her probability of having private insurance by 4 percentage points.

In the second chapter, I show that these programs reduce the incentive to invest in risk-reducing activities. I find large decreases in self-protection after a program is introduced and that individuals for whom the program is less generous are more likely to engage in self-protection. These effects are stronger for women than for men and apply to a variety of investments in health, including decisions about smoking, obesity, and cancer screening.

The third chapter considers a different form of government intervention in insurance markets. In this chapter, I study laws mandating that employer-sponsored health insurance provide coverage for mental illness. I show that industries for which mental health coverage became more generous had larger increases in the average mental distress of their insured workforce. Part of the increase in generosity was due to regulations mandating coverage of mental health benefits. I then show that these regulations affected the behavior of individuals in the labor market—individuals who value more generous mental health benefits and switch jobs work longer hours after these regulations take effect, but individuals who do not value mental health benefits decrease their labor supply. These results are consistent with firms cutting back on their demand for labor due to the cost of the mandate, which leads to lower wages and a decrease in labor supply by individuals who do not value mental health benefits, but an increase in labor supply by individuals who do value mental health benefits highly.

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# Chapter 1

# Selection and Public Insurance: Evidence from Medicare and the Medicaid Medically Needy Program

## 1.1 Introduction

An essential prediction of many models of insurance is that higher risk individuals purchase more generous insurance than do lower risk individuals, i.e. the market for insurance should be adversely selected (Rothschild and Stiglitz, 1976; Wilson, 1977). However, a growing body of research finds evidence for the opposite relationship—higher risk individuals tend to have less generous insurance than lower risk individuals.[1] In some cases, this negative correlation arises because more risk averse individuals are lower risk, but those individuals also have a preference

[1] Cawley and Philipson (1999) study the market for life insurance and reject the hypothesis that higher risk (higher mortality) individuals purchase more insurance than do lower risk individuals. Finkelstein and Poterba (2004), studying the market for annuities, find no evidence that higher risk (lower morality) individuals purchase annuities with higher annual payments, but do find evidence of adverse selection on other dimensions of the annuity contract. Cardon and Hendel (2001) find no relationship between risk and generosity of health insurance coverage among individuals with employer-provided health insurance. Fang et al. (2008) conclude that lower risk (healthier) individuals are more likely to purchase Medicare Supplementary insurance. Cohen and Siegelman (2010) provide a thorough review of the literature on adverse selection.

for more insurance (Cutler et al., 2008).[2] But in some markets, for example the health insurance market that I study, safety net coverage that provides more protection for large risks than for smaller risks may cause advantageous selection in the demand for private insurance.

Specifically, I demonstrate that public insurance causes advantageous selection in the markets for Medigap and Medicare Advantage health insurance plans, private plans which complement or substitute for health insurance provided by the U.S. Medicare program. In this case public insurance provides catastrophic, or high-deductible, coverage that reduces out-of-pocket spending for high-risk individuals compared to their out-of-pocket spending with either type of private insurance. But, this program has minimal effects on out-of-pocket spending for lower risk individuals. As a result, lower risk individuals are more likely to purchase private insurance than are higher risk individuals. In addition to selection effects from the presence of public catastrophic insurance (PCI), more generous programs—those with lower deductibles—should have a larger effect on selection since smaller health shocks admit an individual into the program. Finally, the catastrophic insurance programs I study use an individual's holdings of certain types of assets to determine the deductible, so individuals should have lower holdings of assets that are included in the deductible calculation.

I test for selection from PCI in the U.S. Medicare program, which provides health insurance to almost all Americans over the age of 65 and has several unique features that make suitable for testing if PCI can induce advantageous selection. First, Medicare uses high cost-sharing requirements to deter excess utilization, leading to the creation of two regulated forms of supplemental private insurance, Medigap, which pays the cost-sharing requirements in Medicare, and Medicare Advantage, which is a private alternative to the traditional Medicare program that substitutes supply-side techniques to control costs for the cost-sharing approach used in traditional Medicare. Enrollment in either of these forms of supplemental insurance is voluntary. Second, some states provide PCI through state Medicaid Medically Needy programs, while other states provide no catastrophic risk protection, which enables me to test for selection from this program. Third, the introduction of prescription drug coverage in 2006 (the Medicare Part D program) makes PCI more expensive to the individual, in the sense that an individual has less medical spending—because of prescription

[2]Finkelstein and Poterba (2006) develop a more general test for adverse or advantageous selection based on the idea that some characteristics are correlated with insurance coverage and risk, but are not observed by insurers (or used in either pricing policies or accepting applicants).

drug coverage—to use to hit the deductible, hence there should be less selection from PCI after prescription drug coverage takes effect.[3]

I use data from the Health and Retirement Study, an ongoing survey of older Americans, which provides detailed information on insurance coverage, health status, assets, and income. In order to maximize statistical power, I restrict my sample to higher risk individuals who are more likely to be affected by the incentives provided by the Medically Needy program. Overall, I replicate a previous finding (Fang et al., 2008) that the privately insured are lower risk than those without private insurance—in a regression of health risk on an indicator for private insurance, I find that individuals with private insurance are on average .06 standard deviations[4] healthier than those without private insurance. I explain the reason for this: privately insured individuals are lower risk in states with Medically Needy programs, by 0.10 standard deviations, compared to the privately insured in states without such programs. When I look at Medigap and Medicare Advantage separately, I find that average risk is higher in Medigap plans when PCI becomes less generous (i.e. when the deductible is higher). The introduction of Medicare Part D, which resulted in larger health shocks being necessary for individuals to be eligible for Medically Needy coverage, increased the average risk among the privately insured in states with Medically Needy programs. Lastly, I find that individuals living in states with Medically Needy programs are 2.6 percentage points (30%) more likely to use Medicaid, which houses the Medically Needy program, for at least one month over the subsequent two years and these users have higher current risk scores, by 0.3 standard deviations, in states with Medically Needy programs, relative to users in states without such programs. These results imply that the marginal users due to state Medically Needy programs are considerably sicker than the average individual.

I also find that individuals are shifting the composition of their assets, but not reducing their asset holdings, in response to Medically Needy programs: the Medically Needy program reduces the share of total wealth results held in assets that are used in computing the deductible by 19 percentage points and increases home equity by 17.6 percentage points. However, in states with less generous programs, individuals shift fewer assets into home equity, most likely because they

[3]The Medicare Part D program also includes substantial subsidies making Part D optimal for more than 80% of seniors in the first year and more than %97 percent of seniors because of late-enrollment penalties (Heiss et al., 2010).

[4]Each standard deviation corresponds to approximately $7,000 in total expected health care spending.

do not expect to use the Medically Needy program. But the net effect is small, for the average state Medically Needy program, this shift in the composition of assets reduces the deductible by $5,000 and increases home equity by almost $7,500.

The selection results are strongest for individuals with higher cognitive ability. In particular, I find that health risk among the insured is lower for high ability individuals in states with Medically Needy programs, but cognitive ability has no effect in states without these programs. Given the complex incentives created by the Medically Needy program, these findings lend credence to my interpretations. Furthermore, these results provide an explanation for how cognitive ability, which has been shown to be an important source of advantageous selection (Fang et al., 2008), affects selection into insurance.

## 1.2 Related Literature

The empirical literature on selection is substantial, covering a variety of markets and employing various methods. One basic approach tests for a correlation between risk and insurance coverage, which indicates the presence of an information asymmetry. The sign of the correlation enables researchers to distinguish between different types of information asymmetries—a positive correlation indicates the presence of either moral hazard or adverse selection, while a negative correlation indicates advantageous selection.[5]

Researchers have applied this positive correlation test to a variety of markets with varied implications for the direction of selection. Cawley and Philipson (1999) study the market for term life insurance and find, positive selection, that higher risk (higher mortality) individuals were less likely to purchase insurance and purchased policies with smaller face amounts. In the market for voluntary annuities in the United Kingdom, Finkelstein and Poterba (2004) conclude that annuities are advantageously selected on payment levels—individuals who purchase more generous annuities are also more likely to die—but indexed annuities or escalating annuities were more likely to be purchased by longer-lived individuals, indicating adverse selection.

[5]Moral hazard, like adverse selection, would make the relationship between risk and insurance more positive, hence the only way to get a negative correlation is if advantageous selection outweighs moral hazard.

A number of papers, relevant to this work, have studied selection in health insurance markets.[6] Cutler and Reber (1998) use a change in how Harvard University contributed to its employees' health insurance plans to document the existence of adverse selection and the exit from the market of the most generous plan. However, Cardon and Hendel (2001) estimated a structural model of insurance choice jointly with health care consumption using data from the 1987 National Medicare Care Expenditure Survey find no evidence of asymmetric information among individuals with employer-provided insurance coverage. Finkelstein and McGarry's (2006) study of long-term care insurance presents a more nuanced picture of selection with some individuals purchasing insurance because they are high risk, indicating adverse selection, while others purchase insurance out of caution.

The closest paper to the current one is by Fang et al. (2008), who demonstrate that there is advantageous selection in the market for Medigap insurance. Using data from the Medicare Current Beneficiary Survey (MCBS) and the Health and Retirement Study (HRS), they document lower spending for individuals with Medigap coverage when they only control for the variables insurers use when pricing policies.[7] They are able to reject one common source for advantageous selection, heterogeneity in risk aversion (de Meza and Webb, 2001), and conclude that advantageous selection is due to cognitive ability. They come to this conclusion by noting that conditional on cognitive ability there is a statistically significant and positive correlation between coverage and risk, however, they are unable to identify the mechanism by which cognitive ability induces advantageous selection.

There have been a number of other studies of Medigap which have found evidence of adverse selection. For example, Wolfe and Goddeeris (1991) using the 1970s Retirement History Study document a positive correlation between lagged spending residuals and Medigap purchase among Medicare beneficiaries, which they interpret as indicating that the Medigap market is adversely selected.[8] Ettner (1997) approaches the question of selection into Medigap coverage by using

[6] See Cutler and Zeckhauser (2000) for a more through review of the literature on selection in health insurance.

[7] The negative coefficient demonstrates advantageous selection since there are two potential information asymmetries—moral hazard and selection. Moral hazard would tend to increase spending (Manning et al., 1987), as would adverse selection, hence the negative coefficient demonstrates advantageous selection.

[8] Finkelstein (2004) draws similar conclusions for the same time period based on the behavior of consumers and insurers in response to minimum benefit standards that were introduced in the late 1970s.

individuals with employer-sponsored supplemental insurance, which she assumes is exogenous, to identify moral hazard; the remaining difference in utilization between those with and without Medigap coverage is the defined to be the selection effect. Based on data from the 1991 MCBS, she finds evidence that Medigap plans are adversely selected and that Medigap coverage leads to moral hazard. These earlier findings are not inconsistent with Fang, et al. because a substantial reform of the Medigap market in 1992 may have affected the direction of selection.[9]

## 1.3 Institutional Background

Medicare is the principal source of insurance for individuals over the age of 65 in the United States, but it only covers certain goods and services. The program is divided into four parts: Part A provides insurance for hospital expenses and home health; Part B pays for physician and outpatient expenses; Part C, also known as Medicare Advantage, provides a private alternative to Parts A and B using managed care as a substitute for cost-sharing to constrain utilization; and Part D provides prescription drug coverage through subsidized private plans. Most individuals receive Part A coverage by virtue of having paid into the system while working and purchase Part B coverage (>95% of Medicare Part A enrollees also have Part B coverage); Parts C and D charge premiums based on a formula that depends on the cost of insuring the average individual, relative to a benchmark.[10] In addition to premiums, payroll taxes, and general revenue funds, Medicare Parts A and B use cost-sharing[11] both to lower costs and limit utilization.

In light of Medicare's substantial cost-sharing requirements, most Medicare beneficiaries have some form of supplemental insurance that pays some, or all, of the cost-sharing and may cover additional services. In about 30 percent of cases, supplemental coverage is provided by previous employers. However, for individuals who do not have coverage from a previous employer, Medicare Advantage provides comparable coverage to traditional Medicare with lower cost-sharing

[9]The reform limited Medigap insurers to offer a fixed set of plan designs, limited medical loss ratios, and prescribed when insurers could reject applicants on the basis of health.

[10]Parts C and D use different methods to construct benchmarks. The Part C benchmark is essentially set by Congress (McGuire et al., 2011), while the Part D benchmark is based on costs of an insurer's competitors, providing a form of yardstick competition (Shleifer, 1985).

[11]In 2005, consumers paid $912 per discharge for hospital care (with additional payments for stays longer than 60 days), a $110 annual Part B deductible, and 20% coinsurance for Part B services, in nominal terms.

requirements, while Medigap plans pays the cost-sharing requirements of traditional Medicare. These plans, however, still provide only a limited reduction in risk, for example, Medigap plans will pay Medicare coinsurance, but they do not provide meaningful prescription drug coverage.

State Medicaid programs provide the final source of coverage with all states providing supplemental coverage, similar to Medigap, to individuals who have income less than 100% of the poverty line and more comprehensive coverage for individuals who are eligible for Supplemental Security Income.[12] But, individuals who have Social Security income in excess of the income limits for Medicaid eligibility[13] are only eligible for Medicaid coverage in states that have "Medically Needy" programs. These programs base eligibility on a combination of having limited countable assets[14] and income net of medical expenses below a specific limit. These limits define a person-specific "deductible," based on the greater of an individual's assets in excess of the asset limit or her income in excess of the income limit. Unlike the deductible in traditional insurance plans, the Medically Needy deductible is essentially a life time deductible because the deductible is almost always determined by an individual's countable assets. After the individual has medical expenses exceeding her deductible she is eligible for Medicare coverage through the Medically Needy program. Figure 1.1 presents the Medically Needy asset limits for 2002 and 2008, which demonstrates that there has been little variation over time in these limits, with the exception of New York which more than tripled the asset limit in 2008. However, a number of states made other notable changes—Oklahoma and Oregon terminated their programs in 2002, and Tennessee froze enrollment in 2005 but reopened the program in 2008.

[12]Some states do not provide coverage for all individuals with SSI coverage because of more stringent Medicaid eligibility standard, but these states must permit individuals with SSI to become eligible for Medicaid by paying a person-specific deductible that is similar to the Medically Needy program described below.

[13]Social Security income is not unique in this regard, but rather because Social Security provides a fixed payment, adjusted for inflation, an individual can not reduce her Social Security income in order to become eligible for Medicaid.

[14]Countable assets excludes the primary home, usually one car, and household goods.

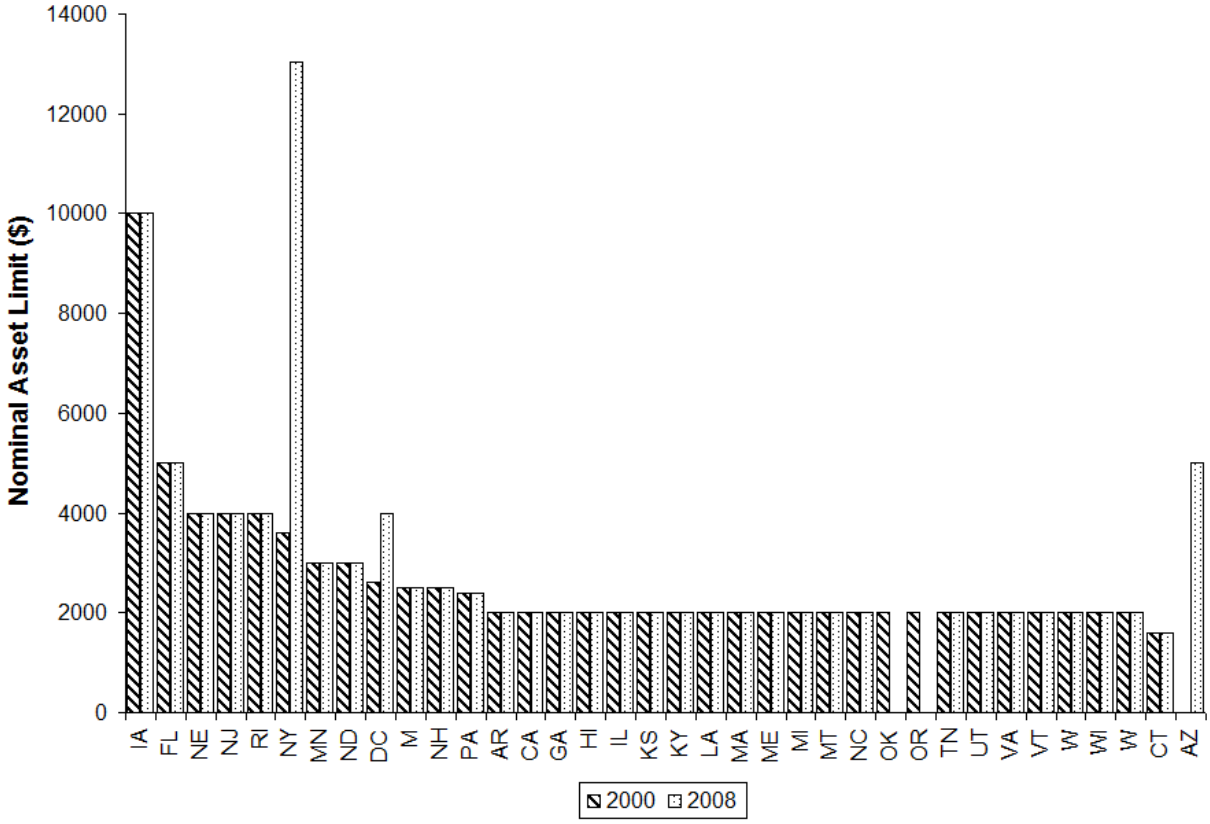


Figure 1.1: State Medically Needy Asset Limits, Single Individuals

Note: Tennessee had suspended enrollment in its Medically Needy program from 2005 through 2007.

## 1.4 Public Catastrophic Insurance and Selection

Public catastrophic insurance can cause advantageous selection by being more attractive to high risk than to low risk individuals. In my setting the government offers public catastrophic insurance that provides full insurance after out-of-pocket spending exceeds a certain level, while private insurers only offer partial insurance. So the protection provided by PCI is analogous to a high deductible insurance plan. I assume that an individual knows her health risk, which is related to her spending in the event of a loss, risk varies in the population, and insurers do not use risk to set premiums.[15] Private insurance can reduce an individual's out-of-pocket spending, but not

[15]In my setting this is because of government regulations, but insurers would also be unable to price on risk if risk were not observable to the insurer.

eliminate it, and out-of-pocket spending will be higher for higher risk individuals. As a result higher risk individuals will be more likely to purchase insurance, while lower risk individuals will not. Therefore, individuals purchasing private insurance will be systematically higher risk than those who do not purchase private insurance, in the absence of PCI, which is the standard adverse selection result from Akerlof (1970).

Introducing a PCI program limits an individual's out-of-pocket spending to her deductible. As a result, if the deductible is sufficiently low (less than the insurance premium and her expected out-of-pocket spending with insurance is sufficient), then she is better off not purchasing private insurance because she will expect to spend more with private insurance than without it. Because out-of-pocket spending is a function of risk, higher risk individuals will be more likely to exceed the deductible and, therefore, should be less likely to purchase private insurance than lower risk individuals. Therefore the privately insured are lower risk when there is a PCI program to siphon off high-risk individuals, than when there is no such program, leading to advantageous selection because of the PCI program. In addition, when the deductible is higher—the program becomes less generous—some higher risk individuals who were on the margin of purchasing private insurance will now find that private insurance offers a better deal than the public program, which increases the average risk among the privately insured.

The introduction of Medicare Part D affected the decision to purchase private insurance in states with Medically Needy programs. Prior to the widespread availability of public prescription drug coverage, beginning in 2006, individuals with high prescription drug spending would have little incentive to purchase private insurance since they could exceed the PCI deductible on prescription drug spending alone. After Part D took effect, these individuals were better off purchasing prescription drug insurance that lowered their total prescription drug spending.[16] As a result, they are less likely to exceed the deductible and more likely to purchase private insurance. The individuals who are induced to take up private insurance coverage because of prescription drug coverage will be higher risk individuals, so Medicare Part D increases average risk among the privately insured in states with a Medically Needy program.

These predictions can be summarized as:

1. Introducing PCI lowers the average risk of individuals who purchase private insurance;

[16]The Federal government pays, on average, 74.%5 of costs.

2. When PCI programs become more generous—i.e. the deductible is lower—the average risk of the privately insured will be lower;

3. The probability that an individual has private insurance coverage is lower for higher risk individuals when there is a PCI program;

4. The probability that an individual has private insurance coverage is higher for individuals with higher deductibles; and

5. When a larger health shock is required to exceed the deductible then the average risk in the private insurance pool will be higher.

The design of the Medicaid Medically Needy program implies a sixth prediction because the deductible in Medically Needy programs is a function of an individual's holdings of certain classes of assets and her income. Thus, there is an incentive to shift one's wealth into asset classes that are not included in the deductible calculation (Hubbard et al., 1995; Kotlikoff, 1986; Levin, 1995).[17] As a result, the share of wealth held in asset classes that are exempt from the deductible calculation should be higher in states with Medically Needy programs.

Sources of supplemental coverage interact with the Medicare program in various ways. In order to shed light on these interactions, Figure 1.2 presents the relationship between out-of-pocket spending risk, health risk and the value of private Medigap insurance coverage (the construction of these graphs is described in appendix 1.A). The top graph presents the certainty equivalent, a measure of out-of-pocket spending risk,[18] for individuals with Medigap, or no insurance in one of three conditions—no Medically Needy program, a Medically Needy program with high asset limits (so a lower deductible, $20,000), and a less generous Medically Needy program ($40,000 deductible)—as a function of health risk. These certainty equivalents are highly correlated and follow the expected pattern of rising with health risk. The lower graph presents the willingness to pay for Medigap compared to each of the three no insurance situations, where willingness to pay is defined as the certainty equivalent for the alternative less the certainty equivalent for Medigap.

[17] Kotlikoff (1986) and Hubbard et al. (1995) demonstrate that means-tested social and health insurance programs reduce savings, although neither paper studies how these programs affect the composition of wealth. Levin (1995) demonstrates that individuals with larger holdings of assets that are excluded from a means-test are more likely to rely on means-tested insurance, although he assumes that assets are exogenously determined.

[18] The measure is how much an individual would pay to avoid all of her out-of-pocket spending risk.

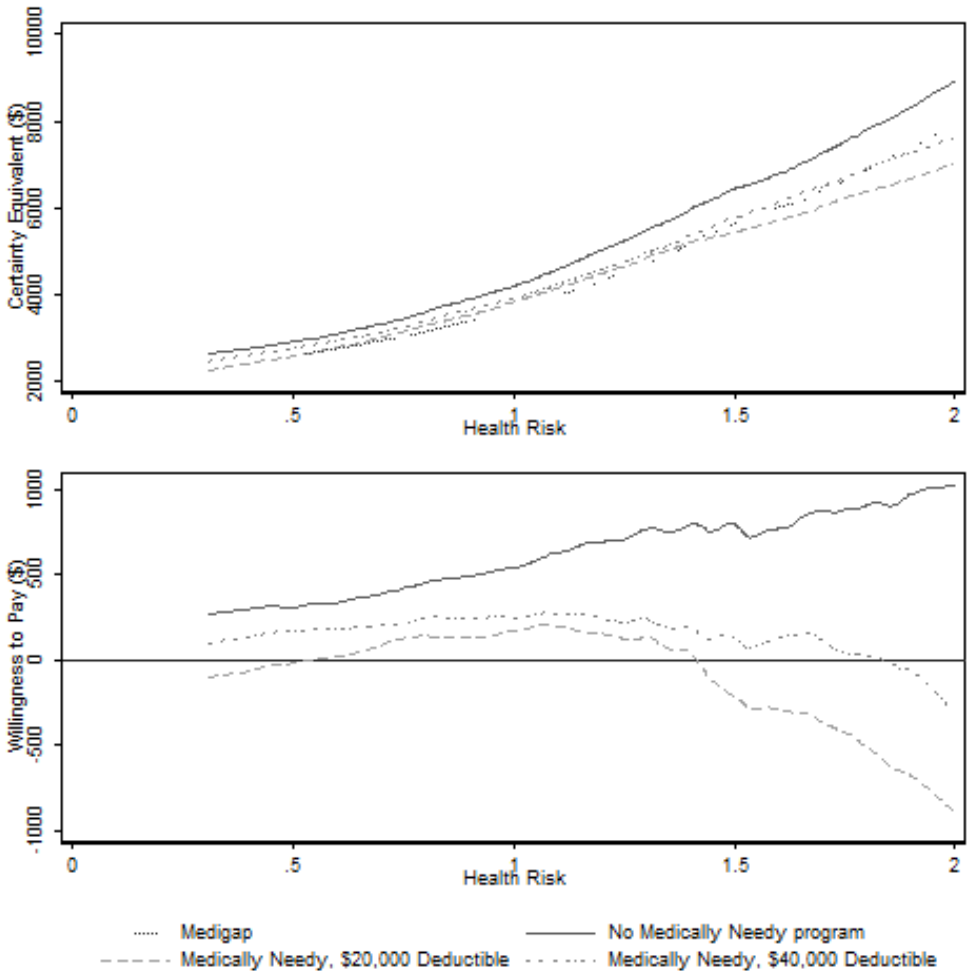


Figure 1.2: Health Risk, Certainty Equivalent and Willingness to Pay for Insurance

Notes: Health risk (capped at 2) on the x-axis. Certainty equivalent and willingness to pay for Medigap coverage, calculated as described in the Appendix using a CARA utility function with coefficient of absolute risk aversion of 0.00001, which corresponds to a coefficient of relative risk aversion of 1 at median total wealth. The top graph presents the certainty equivalent for four conditions—with private supplemental insurance ("Medigap"), without any supplemental insurance, and two Medically Needy programs that differ in the deductible. The bottom graph plots the willingness to pay for Medigap coverage, compared to the remaining three conditions. Data come from the Medical Expenditure Panel Survey from 2000-2008 and excludes Medicare beneficiaries with Medicaid or any employer provided insurance. See Appendix 1.A for additional details.

In the absence of a Medically Needy program, willingness to pay for Medigap is increasing with health risk, which would lead to adverse selection in the Medigap market or the failure of markets to form (Akerlof, 1970). However, the introduction of either type of Medically Needy program reduces the willingness to pay for Medigap for the highest-risk individuals because, conditional

on needing care, this population is more likely to exceed their deductible simply with spending on goods and services that are not covered by Medigap insurance, so Medigap provides no additional risk protection.

## 1.5 Data and Methods

### 1.5.1 Data

Data for this study come from the core and exit surveys of the Health and Retirement Study (HRS), which is a longitudinal survey of more than 30,000 individuals near or in retirement. The initial sample was recruited in 1992 and additional cohorts were recruited in 1998 and 2004 so that the sample is representative of the U.S. population over the age of 50. The survey instrument was redesigned in 2002 in ways that made it easier to identify different types of supplemental insurance, hence I only use data from the 2002 through 2008 cores waves of the survey and the 2004 through 2008 exit surveys in order to ascertain insurance coverage prior to death. I restrict the sample to individuals 65 and older with Medicare Parts A and B (or Medicare Part C) coverage, who do not have supplemental insurance from a former employer or the military and who are not currently enrolled in Medicaid. I define employer-sponsored insurance as any non-drug insurance plan that is purchased from or provided by an individual's former employer, a spouse's current or former employer, or the employer or union of a previous spouse. All other private insurance plans are assumed to be individually purchased; in some analyses I distinguish between Medigap and Medicare Advantage plans and I assign individuals who report both types of coverage to Medicare Advantage (270 observations report both Medigap and Medicare Advantage coverage). An individual is a future Medicaid user if in her next interview (two years later) or in an exit interview her proxy reports that she ever used Medicaid for a non-nursing home purpose since her last interview. With the exception of the Exit interview, I exclude all observations with a proxy respondent or who failed to provide a complete interview (1,388 observations).

I measure risk using an individual's self-report of ever having been diagnosed with one of a specified list of conditions. I convert these diagnoses into an index of risk using the CMS Medicare Advantage risk adjustment weights for 2004 (CMS, 2003). These weights are calibrated to approximate an individual's spending in the subsequent year, based on physician diagnoses as

reported on Parts A and B claims. The self-reported diagnoses that I use introduce a potential sources of bias because I could be capturing diagnoses from many years in the past and individuals may incorrectly report that they do, or do not, have a given condition. For purposes of predicting spending, this type of bias would be problematic, but an individual's recalled diagnoses are more likely to reflect the information she uses when assessing her own health and choosing to purchase insurance. I convert the risk score into a mean 0, standard deviation 1 variable with one standard deviation corresponding to $\sim$\$7,000 in total spending. The diagnoses that I include in the score and the associated weights are in Appendix Table 1.A.

I use asset and income imputations for the HRS developed by RAND to measure total wealth, countable assets, exempt assets, and earned and unearned income. I define exempt assets as equity in the primary residence, vehicles,[19] and other assets (primarily household goods). Countable assets are all other assets, net of debt. All dollar figures are converted to real 2010 dollars using the CPI-U.

I restrict my sample to individuals whose Social Security income exceeds the SSI threshold (making them ineligible for most non-Medically Needy Medicaid programs), have countable assets that are less than \$200,000 (making it at least plausible that they will exceed their deductible in their lifetime), and have health risk scores that are no more than one-half of a standard deviation below the mean health risk (eliminating individuals who would not be likely to purchase private insurance because they are too healthy).

I measure cognitive ability using the first principal component from a factor analysis of an individual's ability to recall a list of ten words immediately and after a five minute delay, the number of times she correctly subtracts seven from 100, the number of correct answers given to three mathematical word problems (numeracy), and an adapted version of the Telephone Interview for Cognitive Status (Ofstedal et al., 2005). Because individuals only report on numeracy in 2002 and 2006, I fill in numeracy in 2004 and 2008 based on the previous wave.

Data on state Medically Needy programs come from surveys by the Kaiser Family Foundation (Kaiser Family Foundation, 2003, 2009), state regulatory codes, and discussions with officials from state Medicaid agencies to clarify any disagreements. I further restrict the sample to unmarried

[19]Most Medically Needy programs only permit individuals to exempt one vehicle, but the HRS asks about all vehicles combined.

individuals living alone and married individuals living in two-person households[20] in order to match the state rules. I use these rules to construct the deductible based on the income disregards that are used to determine eligibility for Supplemental Security Income.[21]

Table 1.1 compares individuals living in states with and without Medically Needy programs. On most dimensions the two groups are similar, but private supplemental insurance is more common, rather than less common, in states with a Medically Needy program. Other demographic differences—in particular age and gender—provide some explanation for the difference in insurance coverage. Differences in health status and wealth, which could be troublesome, are small and do not rise to statistical significance.

### 1.5.2 Empirical methods and identification

I test for risk selection based on correlations between coverage and risk and allow selection to differ in states with and without Medically Needy programs. The introduction of Medicare Part D complicates the analysis since it may affect risk selection, so I include interactions with an indicator for Medicare Part D. The resulting model can be written as:

$$\begin{aligned} H_{ist} =& \beta_1 MN_{st} + \beta_2 Insured_{ist} + \beta_3 Insured_{ist} \times PartD_t + \beta_4 MN_{st} \times PartD_t \\ &+ \beta_5 MN_{st} \times Insured_{ist} + \beta_6 MN_{st} \times PartD_t \times Insured_{ist} \\ &+ \beta_7 Deduct_{ist} + \beta_8 Deduct_{ist} \times PartD_t + \beta_9 Deduct_{ist} \times Insured_{ist} \\ &+ \beta_{10} Deduct_{ist} \times PartD_t \times Insured_{ist} + X_{it}\Gamma + \sigma_s + \tau_t + \varepsilon_{ist} \end{aligned} \tag{1.1}$$

Where $H_{ist}$ is health status for person $i$ in state $s$ for year $t$, $MN_{st}$ is a dummy for living in a state with a Medically Needy program, $Insured_{ist}$ is a dummy for private insurance, $PartD_t$ is an indicator for the period after Medicare Part D took effect (2006 and later), $Deduct_{ist}$ is the "deductible" an individual must spend in order to be eligible for public insurance coverage and is 0 in states without a Medically Needy program, $X_{it}$ is a vector of other individual characteristics,

[20]The HRS does not assign assets to individuals, but rather to households, and state Medicaid rules differ considerably for individuals with a spouse in a nursing home.

[21]The disregards are $20 per month of unearned income and $65 per month plus one half of all earned income. Almost all states use these disregards in every year.

Table 1.1: Summary Statistics

| | Medically Needy (N=5570) | | Not Medically Needy (N=1705) | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| Any private insurance | 0.68 | (0.47) | 0.63 | (0.48) |
| Medicare Advantage | 0.36 | (0.48) | 0.35 | (0.48) |
| Medicare and Medigap | 0.32 | (0.47) | 0.27 | (0.45) |
| Medicaid ever next wave | 0.06 | (0.24) | 0.07 | (0.25) |
| Health risk score | 0.54 | (0.92) | 0.53 | (0.94) |
| Smoker | 0.09 | (0.29) | 0.11 | (0.31) |
| Deductible | 42646 | (51665) | 0 | NA |
| Simulated Deductible | 44422 | (17767) | 0 | NA |
| Financial wealth | 44086 | (53070) | 43375 | (52199) |
| Age | 78.0 | (7.6) | 77.0 | (7.4) |
| Female | 0.54 | (0.50) | 0.49 | (0.50) |
| Race | | | | |
| White | 0.83 | (0.38) | 0.81 | (0.39) |
| Black | 0.11 | (0.32) | 0.10 | (0.30) |
| Hispanic | 0.05 | (0.22) | 0.08 | (0.27) |
| Other | 0.01 | (0.09) | 0.01 | (0.09) |
| Marital status | | | | |
| Married | 0.44 | (0.50) | 0.49 | (0.50) |
| Separated / Divorced | 0.08 | (0.27) | 0.08 | (0.28) |
| Widowed | 0.46 | (0.50) | 0.42 | (0.49) |
| Never married | 0.02 | (0.12) | 0.01 | (0.11) |
| Education | | | | |
| Less than high school | 0.31 | (0.46) | 0.30 | (0.46) |
| High school | 0.55 | (0.50) | 0.56 | (0.50) |
| Any college | | | | |
| Advanced degree | 0.03 | (0.18) | 0.04 | (0.20) |
| 2006 and later | 0.53 | (0.50) | 0.58 | (0.49) |
| Cognitive Ability | 0.01 | (0.98) | -0.03 | (0.99) |

$\sigma_s$ and $\tau_t$ are state and year fixed effects, and $\varepsilon_{ist}$ is the error term. Three of my predictions map directly onto coefficients in this regression. First, the Medically Needy program lowers risk in the private insurance pool if $\beta_5 < 0$. Second, the private insurance pool is higher risk in states with less generous Medically Needy programs, which implies higher deductibles, if $\beta_9 > 0$. Third Medicare Part D reduces advantageous selection from the Medically Needy program if $\beta_6 > 0$.

The model in (1.1) is suited for addressing the predictions about the average risk among the

insured, but can not address the predictions about how financial and health risk affect the demand for insurance. To test those predictions, I estimate the model:

$$\begin{aligned} Insured_{ist} =& \delta_1 MN_{st} + \delta_2 MN_{st} \times PartD_t + \delta_3 Deduct_{ist} \\ &+ \delta_4 Deduct_{ist} \times PartD_t + \delta_5 MN_{st} \times H_{ist} \\ &+ \delta_6 MN_{st} \times H_{ist} \times PartD_t + \theta_1 H_{ist} \times PartD_t \\ &+ f(H_{ist}) + X_{it}\Gamma + \sigma_s + \tau_t + \varepsilon_{ist} \end{aligned} \tag{1.2}$$

Where $f(H_{ist})$ is a cubic polynomial in health status. High risk individuals are less likely to have private insurance coverage if $\delta_5 < 0$, while individuals with higher deductibles are more likely to have private insurance coverage if $\delta_3 > 0$. $\delta_1$ provides a measure of crowd-out from the Medically Needy program.[22]

To test if countable assets are lower in states with Medically Needy programs I run the regression:

$$\begin{aligned} A_{ist} =& \gamma_1 MN_{st} + \gamma_2 MN_{st} \times PartD_t + \gamma_3 SimDeduct_{st} \\ &+ \gamma_4 SimDeduct_{st} \times PartD_t + X_{it}\Gamma + \rho_i + \tau_t + \varepsilon_{ist} \end{aligned} \tag{1.3}$$

Where $A_{ist}$ is a measure of asset holdings (either the level of holdings of a particular type of asset, or the share of total wealth held in a given asset class) and $\rho_i$ is an individual fixed effect. The individual fixed effect accounts for the fact that I can not accurately measure permanent income, hence I can not construct asset-to-permanent income ratios. The Medically Needy program reduces countable asset holdings if $\gamma_1 < 0$. Interpreting the coefficients on the simulated deductible is more difficult because there are two behavioral responses at work reflecting the financial cost of using the Medically Needy program and the probability that an individual will use the program. Holding the probability of use constant, one would expect individuals to reduce their countable asset holdings in order to lower the financial cost. However, the individual can manipulate the probability of use by increasing her holdings of countable assets. Hence, the signs of $\gamma_3$ and $\gamma_4$ are ambiguous

[22]Neither of the regressions in (1.1) and (1.2) are written as difference-in-differences models. However, in fact they are difference-in-differences models, but can not be written as such because the deductible in states without a Medically Needy program is infinite. In Appendix 1.B I elaborate on this point and demonstrate both the formal equivalence between the specifications in (1.1) and (1.2) and the standard difference-in-differences model and that my preferred specification both solves a co-linearity problem and provides readily interpretable results.

If individuals do alter their savings decisions in response to the Medically Needy program then the deductible will be endogenous. Therefore, I instrument for the Medically Needy deductible using a "simulated deductible" (Currie and Gruber, 1996; Mahoney, 2012). I construct the simulated deductible for $K$ groups defined by exogenous demographic characteristics: age group (65-69,70-74,75-79,80 and up), gender, education, and race/ethnicity. Denoting the individual's vector of assets and income by $A_i$, the rules in effect in state $s$ and year $t$ by $R_{st}$, her demographic group by $k$, and $D(\cdot,\cdot)$ as the function converting assets and rules into a deductible, the simulated deductible, $SimDeduct_{stk}$ is:

$$SimDeduct_{stk} = \frac{1}{\#I_k} \sum_{i \in I_k} D(A_i, R_{st})$$

Where $I_k$ is the set of observations in demographic group $k$ and $\#I_k$ is the size of $I_k$. The simulated deductible provides an exogenous parameterization of the generosity of a state's Medically Needy program, with higher values corresponding to less generous programs. Including demographic groups accounts for the fact that Medically Needy program is less generous to individuals who belong to wealthier demographic groups.

## 1.6 Results

### 1.6.1 Selection from the Medically Needy Program

I begin with qualitative evidence on risk selection in insurance coverage and future Medicaid utilization. Figure 1.3 presents private insurance coverage (top) and future Medicaid utilization (bottom) rates, adjusted for year and age, as a function of health risk for individuals in my sample prior to 2006 and living in states with no policy changes in 2002 or 2004. The left axis is the share of the population with either insurance coverage or who use Medicaid in the future, while the right axis is the rate in states with Medically Needy programs minus the rate in states without such programs. The top graph demonstrates that private insurance coverage is less common for individuals at higher risk in states with Medically Needy programs, with coverage decreasing from 75% to 65% at the highest level of risk. The relationship between private insurance and risk for individuals living in states without a Medically Needy program is noisy, with the decrease in coverage in the middle of the risk distribution reflecting a ten percentage point decrease in Medigap

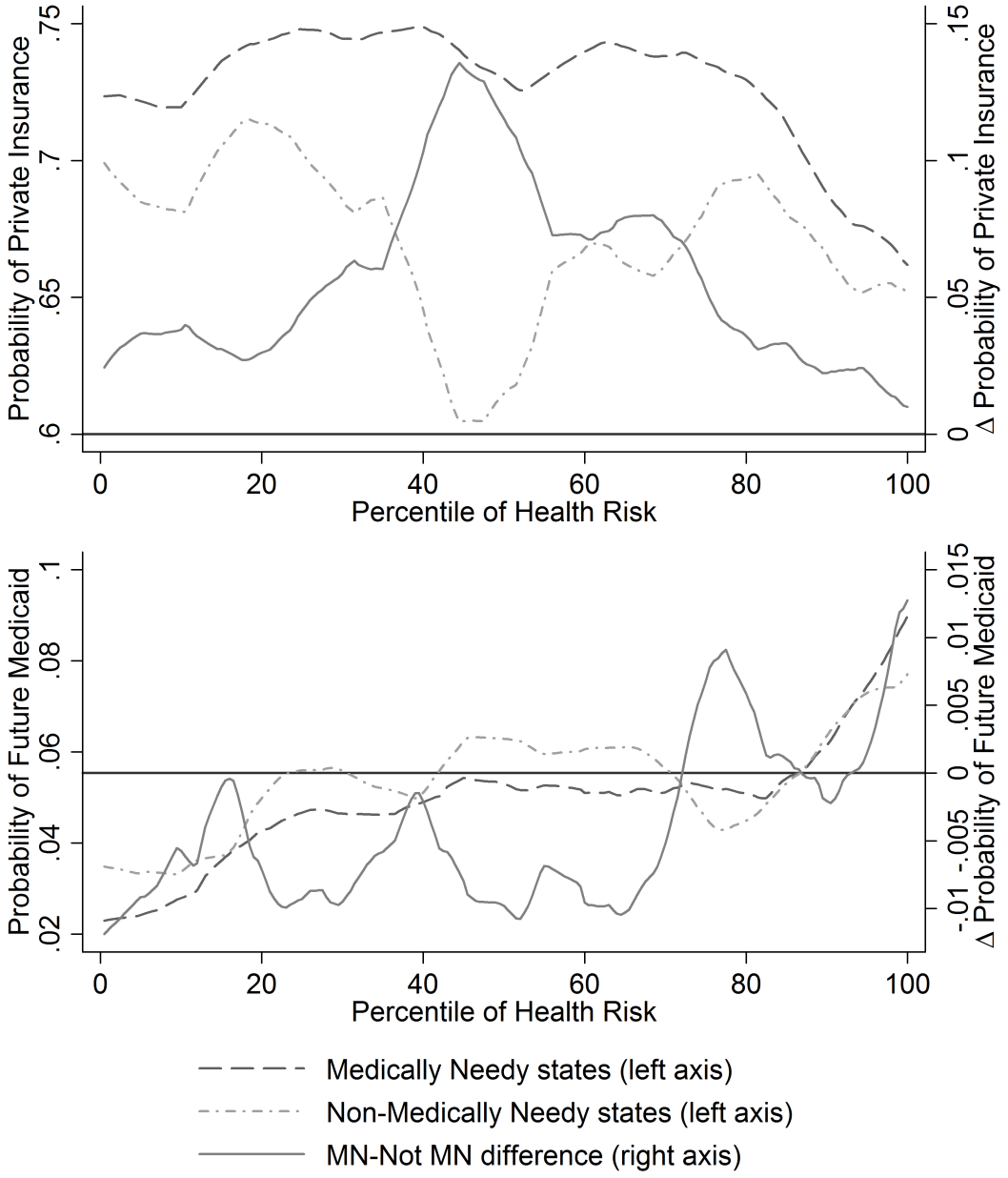


Figure 1.3: Insurance coverage and health

Notes: Graphs are locally weighted average residuals from regression of private insurance coverage (top) or future Medicaid (bottom) on year and age dummies. Horizontal axis is percentile in the health risk distribution. Line labeled difference is the Medically Needy minus not Medically Needy locally weighted average residual.

coverage, while Medicare Advantage coverage rates are steady across the risk distribution (not shown). The bottom graph demonstrates that there is little difference in future Medicaid utilization at low levels of health risk. But in the upper half of the risk distribution, future Medicaid utilization is increasing more rapidly for individuals living in states with Medically Needy programs.

Figure 1.4 illustrates trends over time in private insurance coverage and future Medicaid uti-

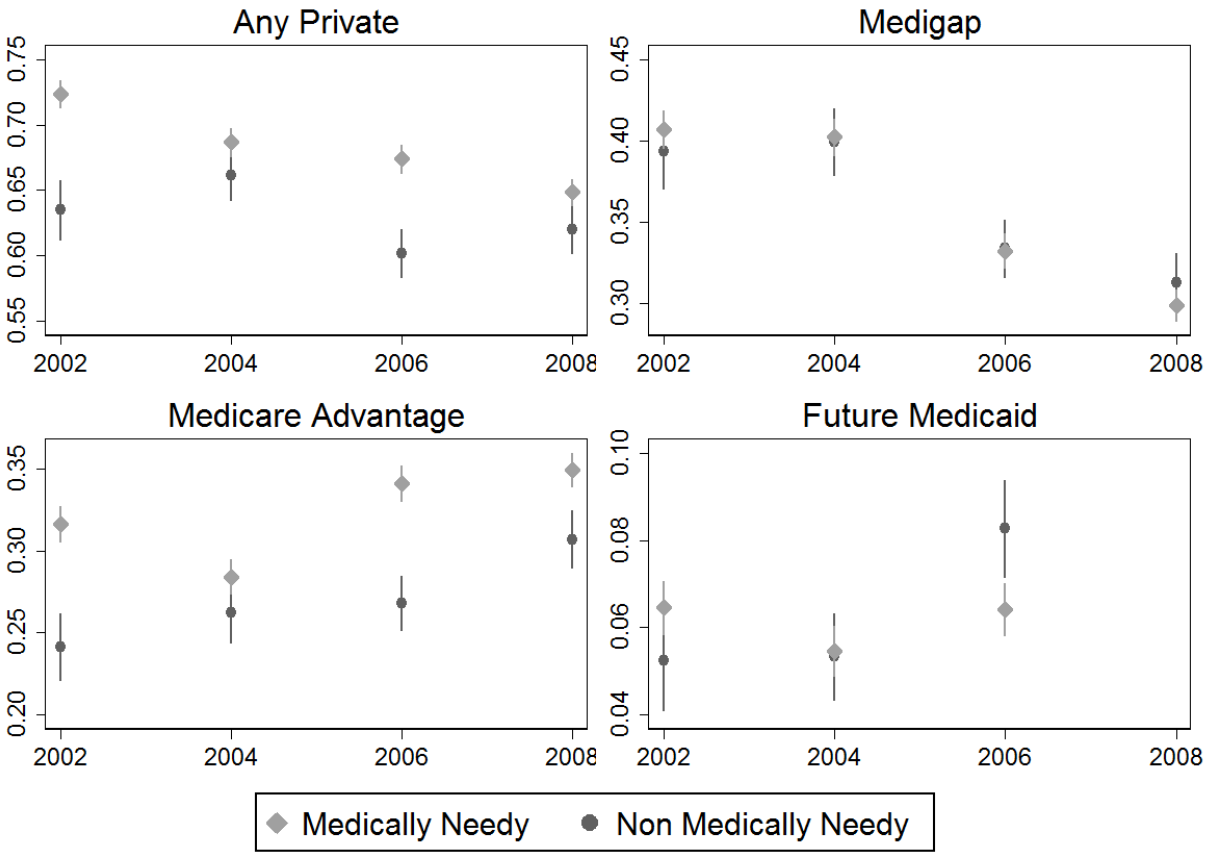


Figure 1.4: Time Trends in Private Insurance Coverage and Medicaid Utilization

Note: Point estimates based on full sample, vertical lines are 95% confidence intervals.

lization for individuals living in states with and without Medically Needy programs. Prior to the introduction of Medicare Part D in 2006, the trends in private insurance coverage are different for individuals in each set of states. However, this is due solely to differences in Medicare Advantage enrollment—enrollment in Medigap is virtually identical in states with and without Medically Needy programs in all years. Tends in future Medicaid utilization are similar prior to 2006.

Figure 1.3 provides qualitative evidence in favor of selection induced by Medically Needy programs. I begin my quantitative tests by estimating the regression equation in (1.1); the results are presented in table 1.2. In the odd-numbered columns, I include controls for how supplemental private insurance plans are priced—gender, smoking status, age, and state[23]—which permits me to interpret the coefficients on insurance status as a positive correlation test for asymmetric information (Chiappori et al., 2006; Chiappori and Salani, 2000). In the even-numbered columns, I include fixed effects for each demographic group used in constructing the simulated instrument and marital status, in addition to the covariates in the first set of regressions. The first two columns show that private insurance is advantageously selected, consistent with previous work. But, the next two columns demonstrate that private insurance is advantageously selected only in states with Medically Needy programs. The introduction of Medicare Part D, which lowered out-of-pocket spending per unit of health risk, lead to an increase in risk among the privately insured in states with Medically Needy programs, although this was primarily due to a reduction in risk in states without Medically Needy programs. These results are consistent with the Medically Needy program inducing advantageous selection in the private insurance market.

The next four columns test if the deductible affects risk selection. I instrument for the deductible using the simulated deductible (see Appendix Table 1.B for the first stage regressions associated with estimating (1.2) in table 1.3).[24] Overall the coefficients on the deductible and its interaction with insurance coverage do not provide evidence that the financial cost of using the Medically Needy program is an important contributor to selection. The negative coefficient on the deductible in column (5) provides an indication that individuals who are wealthier, since wealth is an important determinant of the deductible, are also healthier, but this effect does not persist after I include a more exhaustive set of controls for demographic characteristics.

[23]Medigap plans are priced at the zip code level, but Maestas et al. (2009) find very little within-state variation in premiums, so state fixed effects should be sufficient to control for the prices of contracts that insurers offer to individuals (Fang et al., 2008).

[24]The two-stage least squares coefficient estimates on the deductible differ in specifications that do not include demographic fixed effects from specifications that do include demographic fixed effects because of a mechanical correlation between those fixed effects and the simulated deductible. In the absence of demographic fixed effects, the local average treatment effect (Angrist et al., 1996) reflects two sources of variation—state changes in eligibility rules and differences between demographic groups—but including demographic fixed effects ensures that the treatment effect is only due to state changes in eligibility rules. That does not mean that the difference in these two treatment effects is unimportant, rather these differences demonstrate that individuals who belong to demographic groups that have systematically higher deductibles, due to larger wealth holdings, are also in better health.

Table 1.2: Risk Selection from State Medically Needy Programs

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Insured | -0.063+ | -0.065* | 0.037 | 0.018 | 0.034 | 0.014 | 0.034 | 0.014 |
| | (0.034) | (0.032) | (0.051) | (0.049) | (0.050) | (0.050) | (0.050) | (0.050) |
| Part D × Insured | -0.005 | -0.004 | -0.151+ | -0.141 | -0.150+ | -0.140 | -0.150+ | -0.138 |
| | (0.048) | (0.047) | (0.082) | (0.088) | (0.080) | (0.086) | (0.080) | (0.086) |
| Medically Needy × Insured | | | -0.129* | -0.108+ | -0.096 | -0.101+ | 0.019 | -0.014 |
| | | | (0.061) | (0.058) | (0.061) | (0.060) | (0.111) | (0.117) |
| MN × Part D × Insured | | | 0.193* | 0.180+ | 0.198* | 0.189+ | 0.187 | 0.148 |
| | | | (0.095) | (0.102) | (0.096) | (0.104) | (0.127) | (0.138) |
| Deductible | | | | | -0.023** | -0.005 | -0.004 | 0.009 |
| | | | | | (0.008) | (0.011) | (0.016) | (0.017) |
| Deductible × Part D | | | | | -0.004 | -0.006 | -0.007 | -0.013 |
| | | | | | (0.010) | (0.011) | (0.015) | (0.017) |
| Deductible × Insured | | | | | | | -0.029 | -0.022 |
| | | | | | | | (0.025) | (0.027) |
| Deductible × Part D × Insured | | | | | | | 0.001 | 0.009 |
| | | | | | | | (0.021) | (0.025) |
| R-squared | 0.04 | 0.09 | 0.04 | 0.09 | 0.03 | 0.01 | 0.03 | 0.01 |
| N | 7239 | 7239 | 7239 | 7239 | 7238 | 7238 | 7238 | 7238 |
| F on excluded instruments | | | | | 143.3 | 163.1 | 37.4 | 59.0 |

+ $p<0.1$, * $p<0.05$, ** $p<0.01$

Notes: Dependent variable is the standardized risk score, Any Private is an indicator for having some form of supplementary insurance in addition to Medicare, Part D is an indicator for 2006 and 2008. Pricing controls are a cubic polynomial in age, gender, and smoking status. Demographic fixed effects are indictors for each unique combination of gender, race, ethnicity, and education, see text for additional details. All models include state and year fixed effects; models with demographic fixed effects also include marital status. Instruments for the deductible and its interactions are the simulated average deductible and its interactions. Standard errors clustered on state in parentheses.

I next turn to the effect of the Medically Needy program on the decision to purchase private coverage. Table 1.3 presents results based on the regression in (1.2). The first column demonstrates that the Medically Needy program does not reduce private insurance coverage. Without a change in private insurance coverage, either higher or lower, the only way to reduce average risk among the privately insured is if high risk individuals are less likely to purchase insurance, while low risk individuals are more likely to purchase insurance in states with Medically Needy programs. Column 2 shows that this is the case—the probability of purchasing private insurance is 4.2 percentage points lower for a one unit increase in risk. Assuming that the demand for insurance for low risk individuals is decreasing in price, the implication is that the Medically Needy program reduces premiums .[25]

The remaining four columns incorporate the Medically Needy deductible, allowing the effect of the Medically Needy to vary among individuals for whom the program is more or less generous. The OLS results (columns 3 and 5) indicate that individuals with higher deductibles are more likely to have private insurance, although once I instrument for the deductible, using the simulated deductible, the effect of the deductible is no longer statistically significant. The deductible becomes less relevant after the introduction of Medicare Part D because, by lowering the price of risk, Medicare Part D makes it more difficult to enter the Medically Needy program. The result is that lower deductible individuals should be more likely, at the margin, to purchase private insurance after Medicare Part D.

The previous discussion pools results for two distinct types of supplemental insurance. In table 1.4 I present results from estimating (1.1) and (1.2) separately for Medigap and Medicare Advantage coverage. Panel A, which presents results for risk selection from (1.1), suggests that both types of insurance are advantageously selected in states with Medically Needy programs, but it is only Medigap plans for which risk is higher in states with higher deductibles. Rather, individuals with higher deductibles and Medicare Advantage coverage are healthier than individuals with lower deductibles. Panel B, corresponding to enrollment based on (1.2), indicates that the Medically Needy program has offsetting effects on enrollment into Medigap and Medicare Advantage, although neither are statistically significant, and that the bulk of the response to the incentives of

[25]If the premium were unaffected by the Medically Needy program there would be no effect on enrollment by low-risk individuals and the coefficient on Medically Needy in column (1) would be negative.

Table 1.3: Effect of the Medically Needy Program on Demand for Private Insurance

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Medically Needy | 0.004 | 0.024 | -0.023 | -0.034 | -0.003 | -0.014 |
| | (0.027) | (0.031) | (0.031) | (0.048) | (0.034) | (0.052) |
| MN × Part D | -0.016 | -0.044 | -0.017 | 0.045 | -0.046+ | 0.019 |
| | (0.025) | (0.028) | (0.025) | (0.037) | (0.028) | (0.039) |
| MN × Risk | | -0.046** | | | -0.043** | -0.042* |
| | | (0.017) | | | (0.017) | (0.017) |
| MN × Part D × Risk | | 0.057** | | | 0.056* | 0.050* |
| | | (0.022) | | | (0.022) | (0.021) |
| Deductible | | | 0.006** | 0.008 | 0.006** | 0.007 |
| | | | (0.002) | (0.008) | (0.002) | (0.008) |
| Deductible × Part D | | | 0.001 | -0.014* | 0.001 | -0.014* |
| | | | (0.002) | (0.006) | (0.002) | (0.006) |
| R-squared | 0.13 | 0.13 | 0.13 | 0.01 | 0.14 | 0.01 |
| N | 7239 | 7239 | 7239 | 7238 | 7239 | 7238 |
| F on excluded instruments | | | | 152.9 | | 141.3 |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variable is dummy for having some form of supplementary insurance in addition to Medicare, Part D is an indicator for 2006 and 2008, Risk is the standardized health risk score, Deductible is the amount the individual must spend to be eligible for coverage under the Medically Needy program. All models include year, state, and demographic group fixed effects, marital status, a cubic polynomial in age, and an indicator for smoking. Instruments for the deductible and the deductible interacted with Part D are the simulated average deductible and the simulated average deductible interacted with Part D. Standard errors clustered on state in parentheses.

Table 1.4: Effect of Medically Needy Programs on Medigap and Medicare Advantage

| | Medigap | | Medicare Advantage | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A: Risk | | | | |
| Medically Needy × Insured | -0.035 | -0.160 | -0.076 | 0.096 |
| | (0.088) | (0.111) | (0.088) | (0.127) |
| MN × Part D × Insured | 0.059 | 0.168 | 0.131 | 0.001 |
| | (0.076) | (0.156) | (0.136) | (0.192) |
| Deductible × Insured | | 0.027+ | | -0.039+ |
| | | (0.014) | | (0.021) |
| Deductible × Part D × Insured | | -0.021 | | 0.028 |
| | | (0.030) | | (0.031) |
| R-squared | 0.09 | 0.01 | 0.09 | 0.01 |
| F on excluded instruments | | 67.9 | | 75.2 |
| Panel B: Enrollment | | | | |
| Medically Needy | 0.026 | -0.019 | -0.022 | 0.005 |
| | (0.032) | (0.062) | (0.019) | (0.050) |
| MN × Part D | -0.026 | -0.018 | 0.011 | 0.036 |
| | (0.024) | (0.032) | (0.025) | (0.033) |
| Medically Needy × Risk | | -0.015 | | -0.028+ |
| | | (0.023) | | (0.016) |
| Medically Needy × Part D × Risk | | 0.027 | | 0.023 |
| | | (0.020) | | (0.023) |
| Deductible | | 0.010 | | -0.003 |
| | | (0.008) | | (0.007) |
| Deductible × Part D | | -0.004 | | -0.010+ |
| | | (0.006) | | (0.006) |
| R-squared | 0.17 | 0.02 | 0.23 | 0.01 |
| F on excluded instruments | | 141.3 | | 141.3 |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variable in Panel A is the standardized risk score, and in Panel B is an indicator for having the specific form of insurance. Insured is an indicator for having the specified form of supplementary insurance in addition to Medicare, Part D is an indicator for 2006 and 2008. All models include state, year, and demographic fixed effects, smoking status, marital status, and a cubic polynomial in age. Instruments for the deductible and its interactions are the simulated average deductible and its interactions. Standard errors clustered on state in parentheses.

the Medically Needy program comes from individuals deciding if they will enroll in a Medicare Advantage plan, or not.

If individuals are responding to the incentives provided by the Medically Needy program, one would expect that individuals in states with a Medically Needy program are more likely to use Medicaid in the future and that future Medicaid users are in worse health now since eligibility through the Medically Needy program is (partially) dependent on health. Table 1.5 estimates equations (1.1) and (1.2) for future Medicaid utilization. The first three columns demonstrate that individuals who use Medicaid in the future are systematically less healthy in Medically Needy states than similar individuals in states without a Medically Needy program—although this trend reverses with the implementation of Medicare Part D, because future Medicaid users in states without Medically Needy programs become considerably less healthy after Part D.

Individuals in states with Medically Needy programs are also more likely to use Medicaid in the future, relative to individuals living in states without such programs. The 2.6 percentage point increase in utilization, relative to a mean of 6.2%, is large, but it is not implausible given that more than 30% of the sample does not have any supplemental insurance and an individual is considered to have used Medicaid if she has used Medicaid for even one month over the previous two years.[26] Assuming that the additional users of Medicaid in the future gain Medicaid coverage through the Medically Needy program, the increase in utilization, combined with the increase in average risk, indicates that users of the Medically Needy program are in substantially worse health now than individuals who do not go on to use the Medically Needy program. The increase in average risk and the increase in demand given an increase in risk imply that either enrollment is growing and the growth in enrollment is among individuals who are sicker than the inframarginal enrollee, or enrollment is falling and the decline is due to individuals who are healthier than the inframarginal enrollee deciding not to use Medicaid; the increase in future Medicaid utilization indicates that the marginal users are sicker than the inframarginal enrollees. Lastly, when I control for the Medically Needy deductible, the effect of risk on insurance coverage is sharply attenuated, reflecting a negative correlation between the deductible and health risk. Given that the deductible is a function of assets, the implication is that individuals in states with Medically Needy programs are not engaging in precautionary savings.

I test the final implication from Table 1.5—that means-tested public insurance programs distort

[26]These effects can be scaled to the monthly hazard rate that an individual uses Medicaid, which is 0.27% at the mean, and a 2.6 percentage point increase in future Medicaid utilization increases the hazard rate to 0.38%.

Table 1.5: Future Medicaid Coverage and the Medically Needy Program

| | Health Risk | | | Medicaid Utilization | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Medically Needy | -0.071 | -0.081 | -0.022 | 0.026* | 0.023 | 0.035 |
| | (0.081) | (0.083) | (0.120) | (0.013) | (0.017) | (0.027) |
| MN × Part D | 0.011 | 0.054 | 0.044 | -0.009 | 0.017 | 0.042 |
| | (0.057) | (0.063) | (0.078) | (0.015) | (0.012) | (0.027) |
| MN × Future Medicaid | | 0.283* | 0.249+ | | | |
| | | (0.138) | (0.143) | | | |
| MN × Part D × Future Medicaid | | -0.688** | -0.688** | | | |
| | | (0.216) | (0.212) | | | |
| Deductible | | | -0.013 | | | -0.002 |
| | | | (0.014) | | | (0.004) |
| Deductible × Part D | | | 0.001 | | | -0.006 |
| | | | (0.013) | | | (0.005) |
| MN × Risk | | | | | 0.023* | 0.022* |
| | | | | | (0.011) | (0.011) |
| MN × Part D × Risk | | | | | -0.054* | -0.057** |
| | | | | | (0.022) | (0.021) |
| R-squared | 0.11 | 0.11 | 0.02 | 0.11 | 0.12 | 0.02 |
| N | 4388 | 4388 | 4386 | 4388 | 4388 | 4386 |
| F on excluded instruments | | | 86.4 | | | 84.3 |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variable in columns 1-3 is the standardized risk score, columns 4-6 is an indicator for using Medicaid anytime in the next two years. Future Medicaid is an indicator for using Medicaid anytime in the next two years, Part D is an indicator for 2006 (2008 is excluded to construct Future Medicaid), MN is short-hand for Medically Needy. All models include year, state, and demographic group fixed effects, marital status, a cubic polynomial in age, an indicator for smoking, and main effects for all interactions. Instruments for the deductible and its interactions are the simulated average deductible and its interactions. Standard errors clustered on state in parentheses.

savings behavior (Hubbard et al., 1995; Kotlikoff, 1986; Levin, 1995)—using (1.3) and present the estimates in levels for total wealth, countable and exempt assets, and equity in the primary residence, and countable assets and equity in the primary residence as a share of total wealth in Table 1.6. The results demonstrate that the Medically Needy program reduces countable assets and induces a shift in assets towards those that are exempt from the deductible calculation. The shift towards home equity is not complete, i.e. the growth in exempt assets is not only due to an increase in home equity. This reflects the fact that one can only reduce mortgage debt, which is the easiest way to increase home equity, up to the outstanding balance of the mortgage. Finally, the effect of an increase in the simulated deductible indicates that asset shifting is most common for individuals in demographic groups that should have low deductibles—i.e. those who are most likely to be able to use the Medically Needy program.

### 1.6.2 Cognitive Ability and Medically Needy Coverage

Previous research has demonstrated that advantageous selection into Medigap is due to cognitive ability (Fang et al., 2008), however, Fang, Keane, and Silverman do not identify the mechanism by which cognitive ability leads to advantageous selection. I test if the Medically Needy program, which uses a complex set of procedures to determine eligibility, provides a mechanism by which cognitive ability leads to advantageous selection. To do so, I interact an index of cognitive ability with indicators for the Medically Needy program, risk, the Medically Needy deductible, and Medicare Part D and re-estimate equations (1.1) and (1.2) incorporating these interactions with ability. The results of this analysis are presented in table 1.7 for both risk selection and demand for private insurance coverage in states with Medically Needy programs. The results in table 1.7 demonstrate that cognitive ability induces advantageous selection. Cognitive ability is associated with being lower risk and being more likely to purchase private insurance in states with Medically Needy programs, but not in other states. This relationship indicates that as long as cognitive ability is unobserved by the insurer[27] then cognitive ability is a source of advantageous selection

[27] In principle insurers could, in fact, screen on cognitive ability by designing complicated application forms or using other devices that make the application process or using benefits more complex, however, in the Medigap market this type of screening by contract is prohibited since all new Medigap contracts must conform to a fixed set of standard contracts. In the Medicare Advantage market this is a concern and it is known that the greater the number of choices the lower the probability that an individual will choose to enroll in a Medicare Advantage plan (McWilliams et al.,

Table 1.6: Medically Needy Programs and Asset Holdings

| | Levels ($0,000s) | | | | Shares | |
|---|---|---|---|---|---|---|
| | (1) Total Wealth | (2) Countable Assets | (3) Exempt Assets | (4) Home Equity | (5) Countable Assets | (6) Home Equity |
| Medically Needy | -1.41 | -3.64** | 2.23 | 0.86 | -0.19* | 0.18* |
| | (2.39) | (1.04) | (2.00) | (1.63) | (0.07) | (0.08) |
| MN × Part D | 1.20 | 1.02 | 0.17 | 0.35 | 0.06 | -0.08+ |
| | (1.85) | (0.81) | (1.55) | (1.50) | (0.05) | (0.05) |
| Sim. Deductible | 0.36 | 0.73** | -0.38 | -0.17 | 0.03** | -0.03* |
| | (0.39) | (0.18) | (0.32) | (0.29) | (0.01) | (0.01) |
| × Part D | -0.29 | -0.12 | -0.17 | -0.09 | -0.01 | 0.01 |
| | (0.42) | (0.14) | (0.34) | (0.33) | (0.01) | (0.01) |
| R-squared | 0.84 | 0.84 | 0.81 | 0.83 | 0.70 | 0.69 |
| N | 7239 | 7239 | 7239 | 7239 | 7017 | 7017 |
| Mean | 13.30 | 4.39 | 8.91 | 7.91 | 0.38 | 0.50 |

+ $p<0.1$, * $p<0.05$, ** $p<0.01$

Notes: Dependent variables for levels regressions are indicated by the column heading, countable assets measures assets used for calculating the Medically Needy deductible (total wealth less the primary residence, vehicles, and household goods, which are all exempt assets), shares are calculated as that asset type as a percentage of total wealth (net of any debts), excludes individuals with non-positive wealth. Part D is an Part D is an indicator for 2006 and 2008, the Simulated Deductible is the average deductible in a state for a fixed national sample, see text for more details. All models include year and person fixed effects, marital status, and a cubic polynomial in age. Standard errors clustered on state in parentheses.

Table 1.7: Cognitive Ability, Risk Selection, and Demand for Private Insurance

| | Risk | | Insurance Coverage | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Medically Needy × Insured | -0.074 | -0.055 | | | |
| | (0.060) | (0.059) | | | |
| MN × Part D × Insured | 0.035 | 0.028 | | | |
| | (0.102) | (0.103) | | | |
| MN × Ability | | -0.063+ | 0.041** | 0.023 | 0.031 |
| | | (0.033) | (0.015) | (0.032) | (0.034) |
| MN × Part D × Ability | | 0.061 | 0.008 | 0.013 | -0.007 |
| | | (0.037) | (0.018) | (0.033) | (0.034) |
| MN × Risk × Ability | | | | | -0.016 |
| | | | | | (0.019) |
| MN × Part D × Risk × Ability | | | | | 0.039* |
| | | | | | (0.019) |
| Deductible × Ability | | | | 0.002 | 0.002 |
| | | | | (0.007) | (0.007) |
| Deductible × Part D × Ability | | | | 0.003 | 0.003 |
| | | | | (0.008) | (0.008) |
| R-squared | 0.10 | 0.11 | 0.12 | 0.02 | 0.02 |
| F on excluded instruments | | | | 37.4 | 39.5 |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variable in columns 1 and 2 is the standardized risk score, columns 3-5 is an indicator for having any private supplemental insurance. Any Private is an indicator for having some form of supplementary insurance in addition to Medicare, Part D is an indicator for 2006 (2008 is excluded to construct Future Medicaid), MN is short-hand for Medically Needy. Ability is the first principal component from a factor analysis of immediate and delayed word recall, numeracy, and TICS, see text for details. I carry forward the previous waves numeracy scores, in order to enlarge the sample. All models include year, state, and demographic group fixed effects, marital status, a cubic polynomial in age, an indicator for smoking, and main effects for all interactions. Instruments for the deductible and its interactions are the simulated average deductible and its interactions. Standard errors clustered on state in parentheses.

(Finkelstein and Poterba, 2006).

2011).

### 1.6.3 Specification Checks and Sensitivities

The top panel of table 1.8 presents sensitivity results for the risk selection regression (1.1), while the bottom panel presents a comparable array of sensitivities for (1.2). These specifications include restricting the sample to individuals living in states that did not have major changes to their Medically Needy regulations from 2002 to 2008, including only individuals living in states with Medically Needy programs, and using state-by-year fixed effects and person fixed effects. Results using only those states that did not change policies yield results that are entirely consistent with my main specification, while results that restrict to individuals living in states with Medically Needy programs yield identical coefficient estimates, once one accounts for the main effect of being insured on risk.

Using person-specific fixed effects provides additional evidence of adverse selection in the private supplemental insurance market in states without Medically Needy programs and for (some) advantageous selection in states with such programs. The coefficients on insurance type are identified from within person changes in insurance, hence the positive coefficient on any private insurance in column (8) of the top panel indicates that an individual who has private insurance coverage is choosing to enroll when she is sicker than her average health status, while the negative coefficient on the Medically Needy interaction with private insurance coverage demonstrates that she is healthier than her norm when she enrolls in private insurance coverage in states with a Medically Needy program. However, these selection effects are larger in magnitude than for my base specification, which indicates that the person-specific fixed effects are negatively correlated with average health status, indicating long-run advantageous selection and short-term adverse selection.[28][29]

[28]The coefficients on health risk in models with person fixed effects are identified from individuals who report an additional condition, age into a new category in the Medicare Advantage risk adjustment regime, or forget to report a condition in a subsequent survey wave.

[29]Bolhaar et al. (2012) report adverse selection from short-term health shocks in the Irish health insurance market, but do not find evidence of advantageous selection from long-term health shocks.

Table 1.8: Sensitivity of Risk Selection and Enrollment

| | Constant Policy | | Medically Needy | | State-by-Year | | Person FE | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Panel A: Risk Selection | | | | | | | | |
| Insured | -0.062+ | 0.011 | -0.095** | -0.091** | -0.073* | 0.021 | -0.014 | 0.080* |
| | (0.037) | (0.050) | (0.033) | (0.030) | (0.033) | (0.050) | (0.033) | (0.038) |
| Part D × Insured | -0.007 | -0.112 | 0.041 | 0.061 | 0.006 | -0.137 | 0.057 | -0.047 |
| | (0.049) | (0.089) | (0.050) | (0.055) | (0.050) | (0.085) | (0.037) | (0.053) |
| Medically Needy × Insured | | -0.089 | | | | -0.118+ | | -0.109+ |
| | | (0.062) | | | | (0.061) | | (0.056) |
| MN × Part D × Insured | | 0.150 | | | | 0.196+ | | 0.120 |
| | | (0.105) | | | | (0.106) | | (0.075) |
| R-squared | 0.09 | 0.01 | 0.10 | 0.01 | 0.10 | 0.01 | 0.14 | 0.13 |
| F on excluded instruments | | 135.3 | | 62.4 | | 162.3 | | 54.0 |

+ p<0.1, * p<0.05, ** p<0.01

(continued on next page)

Table 1.8 (continued): Sensitivity of Risk Selection and Enrollment

| | Constant Policy | | Medically Needy | | State-by-Year | | Person FE | |
|---|---|---|---|---|---|---|---|---|
| | (1) Private | (2) Medicaid | (3) Private | (4) Medicaid | (5) Private | (6) Medicaid | (7) Private | (8) Medicaid |
| Panel B: Enrollment | | | | | | | | |
| Medically Needy × Risk | -0.042* | 0.017 | -0.012 | -0.010 | -0.043** | 0.023* | -0.040* | -0.007 |
| | (0.018) | (0.012) | (0.022) | (0.012) | (0.017) | (0.011) | (0.018) | (0.025) |
| MN × Part D × Risk | 0.051* | -0.052+ | 0.011 | -0.010 | 0.047* | -0.060** | 0.023 | -0.019 |
| | (0.024) | (0.030) | (0.010) | (0.011) | (0.021) | (0.021) | (0.026) | (0.029) |
| Deductible | 0.002 | -0.005 | 0.010 | -0.004 | 0.009 | -0.003 | 0.015 | 0.003 |
| | (0.008) | (0.004) | (0.010) | (0.006) | (0.008) | (0.004) | (0.009) | (0.006) |
| Deductible × Part D | -0.008 | -0.008 | -0.016* | -0.006 | -0.017* | -0.005 | -0.012+ | -0.006 |
| | (0.006) | (0.006) | (0.007) | (0.006) | (0.007) | (0.005) | (0.006) | (0.008) |
| R-squared | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 |
| F on excluded instruments | 109.2 | 75.9 | 60.2 | 34.2 | 140.2 | 86.2 | 55.7 | 41.9 |

+ $p<0.1$, * $p<0.05$, ** $p<0.01$

Notes: Dependent variable is the standardized risk score in Panel A and a dummy for having any private insurance (odd) or using Medicaid over the next two years (even) in Panel B, Any Private is an indicator for having some form of supplementary insurance in addition to Medicare, Part D is an indicator for 2006 and 2008. All models include demographic fixed effects, smoking status, marital status, and a cubic polynomial in age; columns 1-4 also include state and year fixed effects, columns 5 and 6 include state-by-year fixed effects, columns 7 and 8 include person and year fixed effects. Even numbered columns in Panel A also include the deductible and the deductible interacted with Part D. Instruments for the deductible and its interactions are the simulated average deductible and its interactions. Constant policy sample consists of individuals living in states that did not have material changes in their Medically Needy policies from 2000 through 2008. Medically Needy sample consists of individuals living in states with Medically Needed programs. Standard errors clustered on state in parentheses.

## 1.7 Conclusions

In this paper, I show that individuals with private insurance have lower risk scores than do those without private insurance in states that have a Medically Needy program, but in other states privately insured individuals are higher risk than those without private insurance. These results demonstrate that the Medically Needy program is inducing high-risk individuals to select out of the private market. I also demonstrate that individuals who use Medicaid over the next two years are less healthy in states with Medically Needy programs than in other states. The increased utilization of the Medicaid program is also reflected in a shift in asset holdings towards home equity, which are typically ignored when determining eligibility for Medicaid.

These results show that advantageous selection not only results from variations in beliefs and preferences, but also reflects the availability of public insurance. In the case that I study, advantageous selection occurs from a rational response to the incentives provided by the Medically Needy program. The consequences of these institutions for social welfare is an important topic for future research and in the design of optimal policies. Particular weight should be given to determining if having a Medically Needy program is, on net, welfare improving, and identifying the optimal "deductible," or other risk-sharing mechanism.

# 1.A Estimating Certainty Equivalent and Willingness to Pay for Insurance

I use data on individuals who were 65 and older with Medicare coverage, but without Medicaid or employer sponsored insurance, from the Medical Expenditure Panel Survey for the period 2000-2008 to estimate the certainty equivalent of various insurance alternatives and the willingness to pay for Medigap coverage. Using self-reported diagnoses I constructed a health risk index that is similar to the index in my main analysis (see Appendix Table 1.A for diagnoses and weights). Because of some extreme outliers in the risk distribution, I capped the distribution at twice the mean.[30] I use total spending by service (hospital inpatient, home health, and outpatient) and corresponding cost-sharing rules ($1,030 deductible for inpatient spending, no cost-sharing for home health, and 20% coinsurance for outpatient spending) to calculate service-specific cost sharing and then I sum these estimates to arrive at the total amount of spending individuals can avert with Medigap coverage (I assumed no insurance coverage for other spending types).

I calculated certainty equivalents assuming a CARA utility function, so that I could ignore consumption, with a coefficient of absolute risk aversion of 0.00001[31]. For each individual, the contribution to utility from spending $m_i$ is $-\exp(\alpha m_i)$, where $\alpha$ is the coefficient of absolute risk aversion and an individual's distribution of spending is defined by actual spending by other individuals in a neighborhood of an individual's health risk. The certainty equivalent solves $-\exp(-\alpha(K-CE)) = -\sum_i \exp(-\alpha(K-m_i))$ and willingness to pay is $CE_{Alternative} - CE_{Medigap}$. The figure is insensitive to using coefficients of absolute risk aversion corresponding to coefficients of relative risk aversion in the range of 0.5 to 3.

# 1.B Alternative Deductible Coding

The empirical work in the body of the paper makes two simplifications which, at first glance, are not obviously correct. First, I code the deductible for individuals living in states without a

[30] Omitting the cap did not change the results below a risk score of ∼2.3, but there was an increase in the willingness to pay at higher risk scores (∼ people out of 16,000).

[31] At the median total wealth, this corresponds to a coefficient of relative risk aversion of 1.

Medically Needy program as 0, although in reality their deductible is $\infty$. Second, my empirical specifications in (1.1) and (1.2) are interpreted as difference-in-differences estimates, although they are not written as such. The essential difficulty in writing the specification as a standard difference-in-differences estimator is that the deductible and the Medically Needy dummy are co-linear when I also include their interaction. To see this, it is useful to first recode the deductible so that it is always finite. I define an alternate deductible as $AltDeduct_{ist} = (1 - \exp(-Deduct_{ist}))$, which is 1 in states without a Medically Needy program and is 0 for individuals who have no need to spend down to enter the Medically Needy program in their state. Now consider the difference-in-differences model:

$$y_{ist} = \beta_0 + \beta_1 MN_{st} + \beta_2 AltDeduct_{ist} + \beta_3 MN_{st} \times AltDeduct_{ist} \tag{1.4}$$

Where $y_{ist}$ is an arbitrary outcome and $MN_{st}$ is a dummy for living in a state with a Medically Needy program. I claim that (1.4) is not identified because:

$$MN_{st} = 1 - (AltDeduct_{ist} - MN_{st} \times AltDeduct_{ist}) \tag{1.5}$$

The first term in parentheses in (1.5) is one in states without Medically Needy programs, while the second term is zero; the second term equals the first term in states with Medically Needy programs, so that the right hand side of the expression is always one in states with a Medically Needy program and zero otherwise.

In appendix table 1.C I estimate versions of (1.1) and (1.2) using the alternative deductible coding (i.e. based on the specification in (1.4)) excluding the Medically Needy dummy and its interaction with the introduction of Medicare Part D (odd columns) and excluding the main effect of the alternative deductible and its interaction with the introduction of Medicare Part D (even columns). None of the qualitative conclusions are affected by this coding, although it is more difficulty to interpret the coefficients on the alternative deductible.[32] In addition, the coefficients on insurance coverage in the health risk regressions (columns 1 and 2) match each other and are almost identical to the corresponding coefficients in column (6) of table 1.2; likewise the coeffi-

[32] One can differentiate (1.4) with respect to the deductible to get $\frac{\partial y_{ist}}{\partial Deduct_{ist}} = (\beta_2 + \beta_3 \times MN_{st}) \times \exp(-Deduct_{ist})$, which does not have a natural economic interpretation.

cients on risk in the private insurance (columns 3 and 4) and future Medicaid (5 and 6) match the corresponding coefficients on risk in column (6) of table 1.3 and column (6) of table 1.5.

# Chapter 2

# Ex Ante Moral Hazard from the Medicaid Medically Needy Program

## 2.1 Introduction

It is well known that insurance distorts behavior both before (ex-ante moral hazard) and after a loss (ex-post moral hazard) (Ehrlich and Becker, 1972; Pauly, 1968; Spence and Zeckhauser, 1971; Zweifel and Manning, 2000). Ex-ante moral hazard manifests as a reduction in self-protection, compared to an individual's behavior without insurance, while ex-post moral hazard, in the health insurance setting, increases the consumption of medical care (Manning et al., 1987). In both cases, insurance distorts a consumer's choices by putting a wedge between the private and social marginal costs and benefits of her choices, which reduces the welfare gains from insurance.

However, the welfare consequences of ex-ante moral hazard can be ameliorated. If insurers can adjust premiums according to self-protective investments, then consumers will internalize the benefits of risk reduction (Ehrlich and Becker, 1972). But, if insurers can not use self-protection when setting premiums, Ellis and Manning (2007) and Goldman and Philipson (2007) show that insuring self-protection is optimal[1] since consumers will respond to the lower price for self-protection by

[1]This is not explicit in Goldman and Philipson (2007), which is primarily concerned with insurance coverage of substitute goods and services, but one can conceive of self-protection as a substitute for treatment, in which case self-protection should be insured.

increasing self-protection.[2] In the extreme case, insurers may want to pay policy-holders to engage in self-protection,[3] which yields an approximation to Ehrlich and Becker's (1972) outcome[4] since consumers will, in effect, be paying different premiums depending upon contemporaneous investments in self-protection.

Despite the clear theoretical importance of ex-ante moral hazard, empirical evidence of ex-ante moral hazard has been limited, mostly because identification is difficult as individuals self select into different insurance arrangements.[5]

A number of papers exploit the discontinuous increase in Medicare coverage in the United States when an individual turns 65 using outcomes that are insensitive to cost-sharing—principally weight, smoking rates, alcohol consumption, and exercise—since Medicare also affects the out-of-pocket cost of preventive care. Card et al. (2004) uses an explicit regression discontinuity to identify ex-ante moral hazard[6] finding weak evidence of ex-ante moral hazard with an increase in the probability of being overweight or obese for specific subgroups of the population (low-education minorities, non-Hispanic Blacks, and men (obese only)). However, the small magnitude of these results is not surprising since smoking is addictive and weight reflects an accumulated energy imbalance, which can not easily be changed in the short-run. Dave and Kaestner (2009) distinguish between direct and indirect effects of insurance on self-protection, where the latter is affected by interactions with the health care system. Using data from the Health and Retirement

[2]I.e. ex-post moral hazard can be used to reduce the ex-ante moral hazard problem.

[3]There are practical problems with this approach since, by assumption, self-protection is not contractible, so a "truth-telling" constraint may prevent insurers from making payments to policy-holders (Ma and McGuire, 1997).

[4]This is only an approximation since there may be excess self-protection, hence the resulting outcome is only second-best efficient.

[5]The analogy to identifying ex-post moral hazard is obvious, but the identification strategies differ since one identifies how demand for health care responds to the price change brought about by insurance to estimate ex-post moral hazard, but one is concerned with changes in self-protection due to risk protection for ex-ante moral hazard.

[6]The basic idea is that individuals who are just under age 65 do not (in general) have access to Medicare insurance, but individuals who have just turned 65 do have access to insurance coverage from Medicare, but these two populations are, for all intents and purposes, identical. However, making inferences from aging into Medicare assumes that the change in the treatment, in this case insurance coverage, is monotonic, which is manifestly true for individuals who were uninsured prior to turning 65, but may be false for individuals who are switching from private insurance to Medicare since they are getting less insurance from Medicare than from private insurance (Kaiser Family Foundation, 2008). As a result the change in an outcome at the discontinuity reflects moral hazard from individuals getting insurance, but is offset by individuals receiving less generous insurance coverage, so the treatment effects are biased towards zero.

Survey, they find no evidence that individuals who gained insurance coverage as a result of aging into Medicare reduced their self-protective investments (exercise, smoking, and alcohol consumption), particularly when compared to behavior immediately prior to entering Medicare.

de Preux (2011) further extends the basic Ehrlich and Becker (1972) model by considering how individuals alter self-protective investments in light of anticipated changes in insurance coverage.[7] In the Health and Retirement Survey, de Preux finds that there is a break in the trend in physical activity when individuals turn 65, which he interprets as evidence of ex-ante moral hazard, but if one ignores a sharp dip in physical activity for individuals who are 63 or 64, there is no change in the trend in physical activity at 65.

Stanciole (2008) instruments for private health insurance coverage, rather than using individuals aging in to Medicare coverage to identify ex-ante moral hazard in the Panel Study on Income Dynamics. Estimates from a multinomial probit regression indicates that insurance coverage increases the probability of smoking, being sedentary, and being obese, all of which are consistent with ex-ante moral hazard. But it is unclear how to interpret these results since the instrument is an index of arthritis, emotional problems, and decline in mental ability, which have direct effects on physical activity and, therefore, obesity, and individuals may smoke in order to alleviate mental distress.

In this paper, I use variation in risk protection among individuals with Medicare coverage from Medicaid Medically Needy programs, which provide public catastrophic insurance coverage, but provide no protection against small risks. The structure of the program, which provides a person-specific deductible, allows me to instrument for the amount of risk protection provided by the program using a simulated instrument (Currie and Gruber, 1996). Ex-ante moral hazard implies that individuals with higher deductibles should make greater investments in self-protection, all else equal. I find that individuals at greater financial risk are more likely to be normal weight (body mass index $< 25$) and to quit smoking, with stronger effects for women than for men. In addition, introducing a public catastrophic insurance program reduces the likelihood an individual quits smoking and makes women less likely to screen for cervical or breast cancer. However,

[7] "Anticipatory" ex ante moral hazard reduces the effect of aging into Medicare and would be indicated by differences in the trends of unhealthy behaviors prior to aging into Medicare, compared to after an individual has aged into Medicare, for individuals without insurance prior to entering Medicare compared to those with insurance prior to entering Medicare.

men become more likely to screen for prostate cancer, but only if they have supplemental private insurance.

## 2.2 Theory

The theory underlying ex-ante moral hazard is well-established with numerous presentations of the basic results; the presentation below follows Ehrlich and Becker (1972) with some modifications from Dave and Kaestner (2009).

Assuming that consumers maximize expected utility, that income is given by $I_s$, where $s$ indexes loss (0 for no loss, 1 for loss) with $I_1 < I_0$, preventive effort is denoted by $r$, and prevention affects the probability of loss given by $p(r)$, with $p'(r) < 0$ and $p''(r) > 2\frac{p'(r)^2}{p(r)}$,[8] then expected utility is:

$$p(r)\,u(I_1 - r) + (1 - p(r))\,u(I_0 - r) \tag{2.1}$$

In this framework, the optimal choice of prevention satisfies:

$$p'(r)\,(u(I_1 - r) - u(I_0 - r)) = (1 - p(r))\,u'(I_0 - r) + p(r)\,u'(I_1 - r) \tag{2.2}$$

As has been noted elsewhere (Dave and Kaestner, 2009; Ehrlich and Becker, 1972), the left-hand side of the first order condition is the return to prevention—the reduction in the probability of falling ill multiplied by the utility gain of not falling ill—while the right-hand side corresponds to the forgone utility to invest in prevention.

I extend this basic model, and follow Dave and Kaestner (2009), by introducing a public insurance scheme that provides a payment, $q$, in the event of illness, yielding expected utility and the first-order condition:

$$p(r)\,u(I_1 + q - r) + (1 - p(r))\,u(I_0 - r) \tag{2.1'}$$

$$p'(r)\,(u(I_1 + q - r) - u(I_0 - r)) = (1 - p(r))\,u'(I_0 - r) + p(r)\,u'(I_1 + q - r) \tag{2.2'}$$

[8] This condition is sufficient, but not necessary, to ensure that the second order condition is satisfied.

Ex-ante moral hazard corresponds to the change in preventive effort due to insurance, $\frac{dr}{dq}$, which can be derived from (2.2') as:

$$\frac{dr}{dq} = \frac{p'(r)\,u'(I_1+q-r) - p(r)\,u''(I_1+q-r)}{\Delta} \tag{2.3}$$

Where $\Delta < 0$ is the second derivative of the utility function. Solving (2.2') for $p'(r)$ (assuming that $q < I_0 - I_1$) and substituting into (2.3) yields the expression:

$$\frac{dr}{dq} = \frac{-(1-p(r))\,u'(1)\,\frac{u'(1)-u'(0)}{u(1)-u(0)} - p(r)\,u''(1)}{\Delta}$$

Where $u(0)$ is shorthand for $u(I_0-r)$ and $u(1)$ is shorthand for $u(I_1+q-r)$. Substituting in the first order Taylor series approximations $u'(1)-u'(0) \approx -u''(1)(I_0-I_1-q)$ and $u(1)-u(0) \approx -u'(1)(I_0-I_1-q)$ yields the condition $\frac{dr}{dq} = -\frac{u''(1)}{\Delta}$. Therefore, for risk averse individuals, for whom $u''(c) < 0$, an increase in public insurance coverage decreases self-protection and the introduction of a new public insurance program should, likewise, decrease self-protection.

## 2.3 Institutional Background

Medicare is the principal source of insurance for individuals over the age of 65 in the United States, but it only covers certain goods and services. The program is divided into four parts: Part A provides insurance for hospital expenses and home health; Part B pays for physician and outpatient expenses; Part C, also known as Medicare Advantage, provides a private alternative to Parts A and B using managed care as a substitute for cost-sharing to constrain utilization; and Part D provides prescription drug coverage through subsidized private plans. Most individuals receive Part A coverage by virtue of having paid into the system while working and purchase Part B coverage (>95% of Medicare Part A enrollees also have Part B coverage); Parts C and D charge premiums based on a formula that depends on the cost of insuring the average individual, relative to a benchmark.[9] In addition to premiums, payroll taxes, and general revenue funds, Medicare

[9]Parts C and D use different methods to construct benchmarks. The Part C benchmark is essentially set by Congress (McGuire et al., 2011), while the Part D benchmark is based on costs of an insurer's competitors, providing a form of

Parts A and B use cost-sharing[10] both to lower costs and limit utilization.

Complementing Medicare are a variety of private and public insurance programs. Many Medicare beneficiaries purchase either supplemental insurance that pays some, or all, of the cost-sharing and may cover additional services or enroll in Medicare Part C plans. In about 30% of cases, previous employers provide supplemental coverage. But many individuals may choose to rely solely on public insurance plans, or may rely on a combination of public and private coverage in the event of severe health shocks.

Public insurance, which is primarily provided by state Medicaid programs, provides coverage that is comparable to the private insurance plans (i.e. the Medicaid program makes cost-sharing payments on the individual's behalf), but is subject to stringent eligibility requirements, including low income and asset thresholds. But, some states also include "Medically Needy" programs, which provide public insurance coverage to individuals who have spent most of their assets[11] and whose income, net of medical expenses, is below a specific threshold. These features implicitly define a "deductible," which I use as a measure of the financial risk protection provided by the state Medically Needy program. Unlike a traditional deductible, this deductible is a life time deductible because the deductible is almost always determined by an individual's assets. After the individual has medical expenses exceeding her deductible she is eligible for Medicare coverage through the Medically Needy program.[12] Figure 2.1 presents the Medically Needy asset limits for 2000 and 2008, which demonstrates that there has been little variation over time in these limits, with the exception of New York which more than tripled the asset limit in 2008. However, a number of states made other notable changes—Arizona introduced a program in 2001,[13] Oklahoma and Oregon terminated their programs in 2002, and Tennessee froze enrollment in 2005 but reopened

yardstick competition (Shleifer, 1985).

[10]In 2005, consumers paid $912 per discharge for hospital care (with additional payments for stays longer than 60 days), a $110 annual Part B deductible, and 20% coinsurance for Part B services.

[11]Most Medically Needy programs consider all assets except the primary home, usually one car, and household goods.

[12]Medicare Part D, which took effect on January 1, 2006, interacts with the Medically Needy program by reducing an individual's prescription drug spending, which makes it less likely that an individual will enter the Medically Needy program.

[13]Technically this program is not a Medically Needy program, but it is sufficiently similar that I classify it as a Medically Needy program.

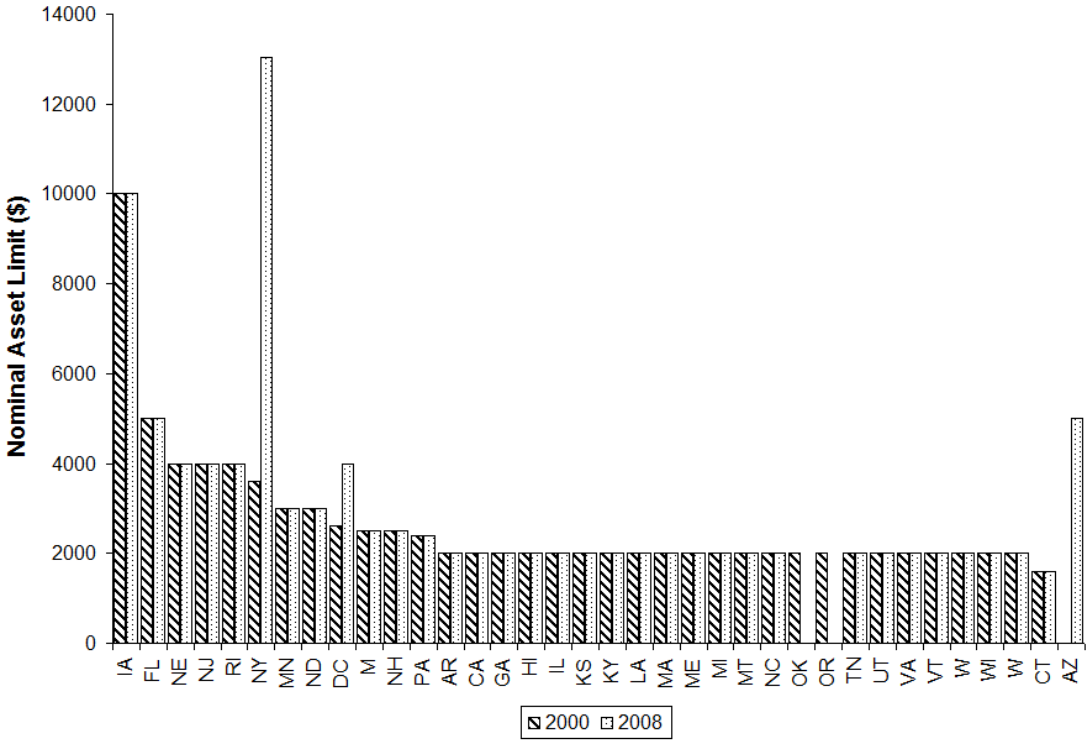


Figure 2.1: Medically Needy Asset Limits for Single Individuals

Notes: Based on state regulatory codes and Kaiser Family Foundation (2003, 2009).

the program in 2008.

## 2.4 Data

Data for this study come from the core surveys of the Health and Retirement Study (HRS), which is a longitudinal survey of more than 30,000 individuals near or in retirement. The initial sample was recruited in 1992 and intended to be representative of the population over 50. Over time, the initial cohort has aged, so additional cohorts were recruited in 1998 and 2004 keeping the sample representative of the U.S. population over the age of 50. I use data from the 2000 through 2008 cores waves of the survey. I restrict the sample to individuals 65 and older with Medicare Parts A and B (or Medicare Part C) coverage, who do not have supplemental insurance from a former employer or the military and who are not currently enrolled in Medicaid. I define employer-sponsored insurance as any non-drug insurance plan that is purchased from or provided by an individual's former employer, a spouse's current or former employer, or the employer or union of a previous spouse. I exclude anyone with a proxy respondent or who failed to provide a complete interview.

I use imputed asset and income data from RAND to measure total wealth, countable assets, exempt assets, and earned and unearned income. I define exempt assets as equity in the primary residence, vehicles,[14] and other assets (primarily household goods). Countable assets are all other assets, net of debt. All dollar figures are converted to real 2010 dollars using the CPI-U.

I restrict my sample to individuals whose Social Security income exceeds the SSI threshold (making them ineligible for most non-Medically Needy Medicaid programs) and have countable assets that are less than $200,000 (making it at least plausible that they will exceed their deductible in their lifetime).

Data on state Medically Needy programs come from a variety of sources including surveys by the Kaiser Family Foundation (2003, 2009) and by reviewing state regulatory codes; officials from state Medicaid agencies clarified any disagreements between sources. In order to map state rules onto asset data, I restrict the sample to unmarried individuals living alone and married individuals living in two-person households. I exclude individuals living in Hawaii because I was unable to get sufficient historical information on their Medically Needy program.

I use several measures of self-protection and for the regressions I code each measure so that

[14]Most Medically Needy programs only permit individuals to exempt one vehicle, but the HRS asks about all vehicles combined.

higher values are more protective. The measures I look at are being obese (defined as a body mass index $\geq 30$), being overweight (BMI$\geq 25$), having a drinking problem,[15] smoking, getting a cholesterol test, getting a flu shot, and three gender specific tests for cancer—prostate exams, mammograms, and Pap smears—in the previous two years. Finally, I construct an index of preventive behaviors as the average of the indicators for being overweight, having an alcohol problem, smoking, getting a cholesterol test, and flu vaccination, which I then normalize to a mean 0, variance 1 variable.

## 2.5 Empirical Methods and Identification

The theoretical background predicts that for risk averse individuals self-protection is decreasing as insurance coverage increases. I use the Medically Needy program to provide exogenous variation in insurance coverage—in this case, the amount of spending needed to enter the program, which corresponds to $I_0 - I_1 - q$.[16] This value is essentially a deductible and I will refer to the amount of spending needed to enter the program as such in the remainder of the paper.

My empirical approach consists of regressing self-protective investments on the deductible in the Medically Needy program, along with a dummy for the state having a Medically Needy program, which also captures the fact that the deductible is infinite in states without a Medically Needy program.[17] For a given investment by individual $i$ in state $s$ and year $t$, $I_{ist}$, the regression is:

$$\begin{aligned} I_{ist} = {} & \beta_1 Deduct_{ist} + \beta_2 Deduct_{ist} \times PartD_t + \beta_3 MN_{st} + \beta_4 MN_{st} \times PartD_t \\ & + X_{ist}\Gamma + \sigma_s + \tau_t + \varepsilon_{ist} \end{aligned} \tag{2.4}$$

In the preceding expression, $Deduct_{ist}$ is the "deductible", $PartD_t$ is a dummy for 2006 and later, $MN_{st}$ is an indicator for living in a state with a Medically Needy program, $X_{ist}$ is a vector of

[15] Defined as consuming more than four drinks in a day for men, three drinks in a day for women, or fourteen drinks in a week for men and women (NIAAA, 2012) .

[16] The loss that an individual can suffer is given by $I_0 - I_1$, so the individual only pays that amount of the loss less the payment provided by the public insurance program, or $I_0 - I_1 - q$.

[17] I code the deductible in these states as 0. See Appendix 2.A for an alternative coding scheme and demonstrates the formal equivalence between the specification in (2.4) and the standard difference-in-differences model.

individual characteristics and I include state ($\sigma_s$) and year ($\tau_t$) fixed effects. The "deductible" is a measure of insurance generosity providing variation in the intensive margin of insurance, while living in a state with a Medically Needy program proxies for the extensive margin. Given the theoretical prediction that greater public insurance reduces self-protection, one can sign the coefficients in the regression to indicate ex-ante moral hazard. One would expect $\beta_1 > 0$ and $\beta_3 < 0$ since higher deductibles increase risk, while Medically Needy programs reduce risk; the introduction of Medicare Part D should, broadly speaking, make it harder to enter the Medically Needy program since individuals have strong incentives to enroll in prescription drug coverage,[18] which effectively makes the Medically Needy program less generous, hence I expect $\beta_2 < 0$ and $\beta_4 > 0$. The coefficients can also indicate the presence of ex-post moral hazard as individuals increase consumption in order to reduce their deductible in the future (Aron-Dine et al., 2012), in which case $\beta_1 < 0$, $\beta_2 > 0$, and $\beta_3 > 0$; the sign of $\beta_4$ is ambiguous since individuals who expect to use the Medically Needy program may increase usage when it becomes harder to enter the program, but individuals may also respond to the increased difficulty of entering the program by reducing ex-post moral hazard.

There are a variety of reasons why the "deductible" is likely to be endogenous in the proposed regression. Individuals may respond to the incentives provided by the Medically Needy program and either increase the rate at which they are dissaving or alter the composition of their assets into assets that are not included in the deductible calculation. Second, asset holdings are likely to be mismeasured, which will bias estimates towards the null. Third, individuals who invest in self-protection may also invest in other forms of human capital, which will affect both earnings and savings. In light of these reasons for worrying about the endogeneity of the deductible, I will, following Currie and Gruber (1996) and Mahoney (2012), instrument for the deductible (and its interaction with Medicare Part D) using a simulated deductible. I construct the instrument by dividing the population into $K$ demographic groups based on exogenous characteristics (I use age group—65 to 69, 70 to 74, 75 to 79, and 80 or older—, gender, race, and education). For each state

[18]The Federal government pays 74.5% of the costs of the program, on average, and Medicare Part D imposes penalties for individuals who do not enroll at their first opportunity

$s$, year $t$, and demographic group $k$, the instrument is:

$$SimDeduct_{stk} = \frac{1}{\#I_k} \sum_{i \in I_k} D(A_i, R_{st})$$

Where $I_k$ is the set of observations in demographic group $k$, $\#I_k$ is the size of $I_k$, and $D(\cdot,\cdot)$ is a function that maps an individual's income and asset holdings, $A_i$, to a deductible by applying the state- and year-specific rules, $R_{st}$. This measure parameterizes the generosity of a state's Medically Needy program in a consistent manner. Further, by including fixed effects for each demographic group and state, I identify the effect of differences in financial risk from within-state differences in behavior.

## 2.6 Results

Table 2.1 provides summary statistics on my sample. On average, individuals have to spend almost $45,000 in order to be eligible for Medicaid coverage through the Medically Needy program, although the average is considerably higher than the median deductible of $20,300. Both the average and median deductibles are considerably larger than the average deductible in an employer-sponsored high-deductible insurance plan.[19] But most of the deductible for the Medically Needy program can be satisfied by increasing one's consumption since the deductible is based on an individual's assets and income. In addition, individuals can (and do) shift assets to types that are exempt from the deductible calculation (see Chapter 1).

The measures of health care utilization—any doctor visit, any hospitalization, and any prescription drug use—are fairly high, which is what one would expect given that senior citizens are sicker than the general population. The self-protective measures do not vary substantially between states with and without Medically Needy programs. On the remaining demographic characteristics there are few differences between individuals living in states with and without Medically Needy programs, although individuals in states with Medically Needy programs are almost a full year older than individuals living in non-Medically Needy states and are more likely to consume alcohol.

[19] In 2011 the average deductible in an employer-sponsored high-deductible insurance plan was $1,908 (Kaiser Family Foundation, 2011).

Table 2.1: Summary Statistics

| | Medically Needy states | | Non Medically Needy states | |
|---|---|---|---|---|
| | Mean | Stan. Dev. | Mean | Stan. Dev. |
| Deductible | 44971 | 52485 | 0 | . |
| Simulated deductible | 45341 | 18324 | 0 | . |
| Any doctor visit | 0.95 | 0.21 | 0.94 | 0.23 |
| Any hospital stay | 0.32 | 0.47 | 0.32 | 0.47 |
| Any prescription | 0.88 | 0.33 | 0.88 | 0.33 |
| BMI | 27.1 | 5.2 | 27.0 | 5.1 |
| Obese | 0.25 | 0.43 | 0.23 | 0.42 |
| Overweight or Obese | 0.64 | 0.48 | 0.63 | 0.48 |
| Smoke | 0.17 | 0.37 | 0.18 | 0.38 |
| Drink | 0.43 | 0.50 | 0.36 | 0.48 |
| Drinking problem | 0.10 | 0.30 | 0.09 | 0.28 |
| Exercise | 0.18 | 0.39 | 0.17 | 0.38 |
| Flu shot | 0.74 | 0.44 | 0.74 | 0.44 |
| Cholesterol test | 0.85 | 0.35 | 0.82 | 0.39 |
| Prostate exam | 0.76 | 0.42 | 0.77 | 0.42 |
| Mammogram | 0.68 | 0.47 | 0.66 | 0.48 |
| Pap smear | 0.44 | 0.50 | 0.42 | 0.49 |
| Preventive index | 0.00 | 0.99 | 0.00 | 1.02 |
| Age | 75.5 | 7.5 | 74.7 | 7.2 |
| Marital status | | | | |
| Married | 0.50 | 0.50 | 0.55 | 0.50 |
| Separated/Divorced | 0.09 | 0.29 | 0.09 | 0.29 |
| Widowed | 0.39 | 0.49 | 0.35 | 0.48 |
| Never married | 0.02 | 0.14 | 0.01 | 0.12 |
| Education | | | | |
| Less than high school | 0.28 | 0.45 | 0.27 | 0.44 |
| High school | 0.55 | 0.50 | 0.56 | 0.50 |
| Any college | 0.11 | 0.32 | 0.11 | 0.31 |
| More than college | 0.05 | 0.22 | 0.06 | 0.24 |
| Race/Ethnicity | | | | |
| White | 0.80 | 0.40 | 0.80 | 0.40 |
| Black | 0.13 | 0.33 | 0.11 | 0.31 |
| Hispanic | 0.06 | 0.24 | 0.08 | 0.27 |
| Other race | 0.01 | 0.11 | 0.01 | 0.08 |
| Female | 0.52 | 0.50 | 0.50 | 0.50 |
| Private insurance | 0.46 | 0.50 | 0.43 | 0.50 |
| Cognitive ability | 0.00 | 1.01 | -0.01 | 0.98 |

### 2.6.1 Utilization

I begin my analysis by considering the effect of the Medically Needy program on the likelihood that an individual uses Medicaid over the next two years and has seen a physician, went to the hospital, or used prescription drugs over the previous two years. These results are presented in table 2.2. The first column demonstrates that individuals living in states with Medically Needy programs

Table 2.2: Utilization Effects of the Medically Needy Program

| | (1) Use Medicaid | (2) Any doctor visit | (3) Any hospital stay | (4) Any prescription |
|---|---|---|---|---|
| Medically Needy | 0.024 | 0.032* | 0.048 | -0.063** |
| | (0.015) | (0.015) | (0.063) | (0.024) |
| MN × Part D | 0.009 | -0.014 | -0.059+ | 0.056** |
| | (0.026) | (0.015) | (0.031) | (0.019) |
| Deductible | -0.003 | -0.002 | -0.006 | 0.008+ |
| | (0.003) | (0.003) | (0.006) | (0.005) |
| Deductible × Part D | -0.005 | -0.001 | 0.009 | -0.007* |
| | (0.004) | (0.003) | (0.006) | (0.003) |
| N | 8614 | 13005 | 12976 | 13005 |
| F on excluded instruments | 541.1 | 774.2 | 766.5 | 774.2 |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variable indicated by column heading. Medically Needy is an indicator for living in a state with a Medically Needy program; MN is short-hand for Medically Needy. Deductible is the amount the individual must spend to be eligible for Medically Needy coverage. Part D is an indicator for 2006 or after. Results from 2SLS regressions, instrumenting for the Deductible and Deductible × Part D using the simulated deductible and the simulated deductible × Part D. All models include state, year, and demographic group fixed effects, a cubic polynomial in age, and marital status. Standard errors clustered on state in parentheses.

are no more likely to use Medicaid in the future.[20] The next three columns present results for utilization, which are a priori ambiguous, because the Medically Needy program reduces private insurance coverage (chapter 1), which would be expected to reduce the likelihood of receiving medical care (Manning et al., 1987). But, as long as individuals are not completely myopic, the ability to lower the deductible in the future provides an incentive to increase utilization (Aron-Dine et al., 2012; Keeler et al., 1977).

[20]In chapter 1, I show that the Medically Needy program does increase future utilization of Medicaid, but that once I account for the deductible the main effect of the Medically Needy program is no longer statistically significant

The effects of the Medically Needy program on doctor and hospital care are consistent with ex-post moral hazard, although in neither case are all of the results correctly signed. However, the main effects indicate that introducing a Medically Needy program increases the likelihood of a doctor's visit. Second, when Medically Needy programs become less attractive, because the introduction of Medicare Part D reduces the likelihood of using the Medically Needy program, hospital utilization falls.

Prescription drug utilization, however, exhibits a pattern of results that are consistent with ex-ante, rather than ex-post, moral hazard. Individuals are less likely to use prescription drugs when a Medically Needy program is introduced, but become more likely with the introduction of Medicare Part D, and individuals who face larger financial costs to use the Medically Needy program are initially more likely to use prescription drugs, but are no more likely to use prescription drugs after Medicare Part D takes effect. To the extent that prescription drugs are costly and only reduce the probability of illness, but not the magnitude of any loss, then prescription drugs act like self protection and should be reduced by the Medically Needy program.

### 2.6.2 Ex-Ante Moral Hazard

I now turn to the existence of ex-ante moral hazard. In the remaining tables, the dependent variables are coded so that higher values correspond to more protection. Table 2.3 presents the result of estimating my main specification for indicators of self-protective behaviors—being obese, being overweight or obese, having a drinking problem, smoking, cholesterol testing, receiving a flu shot, and an index of these behaviors—for both men and women combined. In the interests of space, I only report results in which I instrument for the deductible with the simulated deductible. All regressions include controls for demographic groups, age, marital status, and state and year. Standard errors are clustered on the state.

The results provide clear evidence of ex-ante moral hazard, with the index of preventive behaviors indicating a sharp decrease in self-protection after Medically Needy coverage is made available. The positive coefficient on the deductible implies that there is less moral hazard for individuals at greater financial risk, or for whom the program is less generous. The preventive index summarizes the results in the first six columns, all but two of which have coefficients that are consistent with ex ante moral hazard. The results for cholesterol testing reflect changes in Medi-

Table 2.3: Prevention and the Medically Needy Program (Men and Women)

| | (1) Not Obese | (2) Not Overweight | (3) No Drinking problem | (4) Quit smoking | (5) Cholesterol test | (6) Flu shot | (7) Preventive index |
|---|---|---|---|---|---|---|---|
| Medically Needy | -0.047 | -0.040 | 0.021 | -0.083* | 0.050 | -0.050 | -0.102* |
| | (0.038) | (0.036) | (0.018) | (0.034) | (0.033) | (0.053) | (0.052) |
| MN × Part D | -0.026 | 0.019 | 0.010 | 0.018 | -0.001 | 0.047 | 0.112+ |
| | (0.026) | (0.027) | (0.019) | (0.029) | (0.031) | (0.035) | (0.060) |
| Deductible | 0.003 | 0.009* | -0.003 | 0.015** | -0.003 | 0.005 | 0.026* |
| | (0.005) | (0.004) | (0.003) | (0.005) | (0.004) | (0.006) | (0.011) |
| Deductible × Part D | 0.001 | -0.006 | -0.002 | -0.004 | 0.001 | -0.009 | -0.028** |
| | (0.005) | (0.006) | (0.004) | (0.005) | (0.006) | (0.007) | (0.011) |
| N | 12890 | 12890 | 13005 | 7766 | 7668 | 7772 | 13005 |
| F on instruments | 807.1 | 807.1 | 774.2 | 499.3 | 430.8 | 426.8 | 774.2 |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variable indicated by column heading. Medically Needy is an indicator for living in a state with a Medically Needy program; MN is short-hand for Medically Needy. Deductible is the amount the individual must spend to be eligible for Medically Needy coverage. Part D is an indicator for 2006 or after. Results from 2SLS regressions, instrumenting for the Deductible and Deductible × Part D using the simulated deductible and the simulated deductible × Part D. All models include state, year, and demographic group fixed effects, a cubic polynomial in age, and marital status. Standard errors clustered on state in parentheses.

care coverage that took effect in 2005.[21] Among the individual measures, smoking provides clear evidence of ex ante moral hazard, while there is a decrease in the probability of being overweight for individuals with higher deductibles.

Table 2.4 present comparable results for men (Panel A) and women (Panel B). The results for men indicate that men who are overweight increase their weight after a Medically Needy program takes effect, which is indicative of ex-ante moral hazard, but with the exception of smoking, the remaining results are inconsistent with ex-ante moral hazard.

Women present a more nuanced story, particularly with regard to weight. After 2006, when Medicare Part D took effect, women appear to be splitting into two groups in states with Medically Needy programs—some women become obese in response to the incentives provided by the program, while other women lose weight. The remaining results indicate that prior to 2006, low deductible women did not decrease their self-protective investments and higher deductible women undertook more self-protective investments. But after 2006, women with low deductibles increased their self protection, while women with higher deductibles cut back on self-protection. These results are, for the most part, consistent with ex-ante moral hazard.

When I stratify the sample on insurance coverage (table 2.5) I find consistent evidence of ex ante moral hazard for individuals both with (Panel A) and without supplemental insurance coverage (Panel B). Although, individuals with supplemental insurance were more likely to get a cholesterol test and more likely to be overweight or obese, while individuals without any other insurance exhibit ex ante moral hazard for cholesterol testing, in addition to smoking, and other preventive behaviors.

Given that the Medically Needy program principally provides protection against very large health shocks, one would expect to see effects on cancer screening rates since cancer is extremely costly and many individuals will exceed the Medically Needy deductible if they are diagnosed with cancer.[22] In table 2.6 I show that women are less likely to screen for cervical or breast cancer

[21] Prior to 2005, individuals had to make cost-sharing payments for cholesterol testing, so getting a cholesterol test serves to reduce one's future deductible. Beginning in 2005 Medicare stopped requiring these payments provided that the cholesterol tests were done for screening purposes and no more than once every five years. Hence, one should see ex-post moral hazard prior to 2005 and ex-ante moral hazard after 2005.

[22] The total costs, not only out-of-pocket costs, for an individual newly diagnosed with cancer ranges from $20,000 to $45,000 in the first year (Mariotto et al., 2011), depending on the type of cancer, and a cancer diagnoses increases lifetime out-of-pocket spending by 10-20% (Webb and Zhivan, 2010)

Table 2.4: Prevention and the Medically Needy Program, by Gender

| | (1) Not Obese | (2) Not Overweight | (3) No Drinking problem | (4) Quit smoking | (5) Cholesterol test | (6) Flu shot | (7) Preventive index |
|---|---|---|---|---|---|---|---|
| Panel A: Men | | | | | | | |
| Medically Needy | -0.094* | -0.055 | 0.067* | -0.086+ | 0.100** | -0.017 | -0.128 |
| | (0.046) | (0.058) | (0.028) | (0.046) | (0.037) | (0.039) | (0.108) |
| MN × Part D | 0.073* | -0.042 | 0.010 | -0.037 | -0.029 | -0.016 | -0.091 |
| | (0.037) | (0.031) | (0.027) | (0.038) | (0.043) | (0.044) | (0.100) |
| Deductible | 0.008 | 0.003 | -0.009+ | 0.008 | 0.001 | 0.006 | 0.020 |
| | (0.007) | (0.007) | (0.005) | (0.007) | (0.005) | (0.005) | (0.017) |
| Deductible × Part D | -0.014+ | -0.000 | 0.000 | 0.006 | 0.007 | -0.001 | 0.006 |
| | (0.007) | (0.006) | (0.006) | (0.006) | (0.008) | (0.009) | (0.016) |
| N | 6116 | 6116 | 6130 | 4528 | 3655 | 3697 | 6130 |
| F on instruments | 550.7 | 550.7 | 534.3 | 218.1 | 337.8 | 344.5 | 534.3 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Panel B: Women | | | | | | | |
| Medically Needy | -0.004 | -0.038 | -0.012 | -0.016 | 0.018 | -0.060 | -0.068 |
| | (0.051) | (0.039) | (0.025) | (0.054) | (0.051) | (0.083) | (0.076) |
| MN × Part D | -0.102** | 0.077* | 0.012 | 0.072 | -0.007 | 0.075+ | 0.213** |
| | (0.034) | (0.039) | (0.018) | (0.044) | (0.042) | (0.042) | (0.073) |
| Deductible | -0.000 | 0.016* | 0.004 | 0.018+ | -0.013+ | -0.000 | 0.032* |
| | (0.006) | (0.008) | (0.004) | (0.010) | (0.008) | (0.012) | (0.016) |
| Deductible × Part D | 0.011+ | -0.013 | -0.005 | -0.019* | 0.001 | -0.010 | -0.048** |
| | (0.007) | (0.009) | (0.004) | (0.010) | (0.008) | (0.009) | (0.015) |
| N | 6773 | 6773 | 6874 | 3237 | 4012 | 4074 | 6874 |
| F on instruments | 201.9 | 201.9 | 202.1 | 141.7 | 123.6 | 125.9 | 202.1 |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variable indicated by column heading. Medically Needy is an indicator for living in a state with a Medically Needy program; MN is short-hand for Medically Needy. Deductible is the amount the individual must spend to be eligible for Medically Needy coverage. Part D is an indicator for 2006 or after. Results from 2SLS regressions, instrumenting for the Deductible and Deductible × Part D using the simulated deductible and the simulated deductible × Part D. All models include state, year, and demographic group fixed effects, a cubic polynomial in age, and marital status. Standard errors clustered on state in parentheses.

Table 2.5: Insurance Status

| | (1) Not Obese | (2) Not Overweight | (3) No Drinking problem | (4) Quit smoking | (5) Cholesterol test | (6) Flu shot | (7) Preventive index |
|---|---|---|---|---|---|---|---|
| Panel A: Insured | | | | | | | |
| Medically Needy | -0.038 | -0.089* | 0.022 | -0.076 | 0.144** | 0.002 | -0.037 |
| | (0.048) | (0.043) | (0.026) | (0.046) | (0.035) | (0.080) | (0.060) |
| Medically Needy × Part D | -0.000 | 0.043 | 0.015 | -0.023 | -0.030 | -0.033 | 0.039 |
| | (0.038) | (0.047) | (0.027) | (0.046) | (0.033) | (0.044) | (0.079) |
| Deductible | 0.003 | 0.016** | -0.002 | 0.012 | -0.013* | -0.006 | 0.019+ |
| | (0.006) | (0.005) | (0.004) | (0.008) | (0.005) | (0.008) | (0.011) |
| Deductible × Part D | -0.005 | -0.007 | -0.005 | 0.003 | 0.004 | 0.003 | -0.013 |
| | (0.006) | (0.010) | (0.006) | (0.008) | (0.006) | (0.008) | (0.015) |
| N | 8842 | 8842 | 8909 | 5369 | 5296 | 5361 | 8909 |
| F on excluded instruments | 219.2 | 219.2 | 214.7 | 163.7 | 188.9 | 189.9 | 214.7 |
| Panel B: Not Insured | | | | | | | |
| Medically Needy | -0.040 | 0.035 | 0.016 | -0.090 | -0.271+ | -0.042 | -0.162 |
| | (0.044) | (0.036) | (0.044) | (0.064) | (0.141) | (0.147) | (0.113) |
| Medically Needy × Part D | -0.073 | -0.038 | 0.016 | 0.074 | 0.024 | 0.114* | 0.144 |
| | (0.047) | (0.036) | (0.027) | (0.049) | (0.051) | (0.047) | (0.102) |
| Deductible | -0.002 | -0.005 | -0.003 | 0.014+ | 0.010 | 0.029* | 0.033+ |
| | (0.007) | (0.006) | (0.006) | (0.008) | (0.011) | (0.014) | (0.019) |
| Deductible × Part D | 0.011 | -0.003 | 0.000 | -0.014+ | -0.004 | -0.023* | -0.043* |
| | (0.011) | (0.007) | (0.006) | (0.008) | (0.011) | (0.011) | (0.017) |
| N | 4048 | 4048 | 4096 | 2396 | 2370 | 2409 | 4096 |
| F on excluded instruments | 107.3 | 107.3 | 105.9 | 82.8 | 97.6 | 97.9 | 105.9 |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variable indicated by column heading. Medically Needy is an indicator for living in a state with a Medically Needy program; MN is short-hand for Medically Needy. Deductible is the amount the individual must spend to be eligible for Medically Needy coverage. Part D is an indicator for 2006 or after. Results from 2SLS regressions, instrumenting for the Deductible and Deductible × Part D using the simulated deductible and the simulated deductible × Part D. All models include state, year, and demographic group fixed effects, a cubic polynomial in age, and marital status. Standard errors clustered on state in parentheses.

when a Medically Needy program is introduced and these results are essentially unchanged when I look at women with supplemental insurance and those without supplemental insurance separately. However, men are more likely, rather than less likely, to screen for prostate cancer.

Table 2.6: Cancer Screening and the Medically Needy Program

| | All | Insured | Uninsured |
|---|---|---|---|
| Panel A: Pap Smears | | | |
| Medically Needy | -0.250** | -0.223** | -0.392** |
| | (0.049) | (0.083) | (0.078) |
| MN × Part D | 0.082 | 0.057 | 0.085 |
| | (0.053) | (0.075) | (0.078) |
| Deductible | 0.008 | 0.009 | 0.020 |
| | (0.011) | (0.017) | (0.020) |
| Deductible × Part D | -0.017+ | -0.014 | -0.016 |
| | (0.010) | (0.014) | (0.017) |
| Panel B: Mammograms | | | |
| Medically Needy | -0.110* | -0.120 | -0.102 |
| | (0.055) | (0.089) | (0.204) |
| MN × Part D | 0.015 | 0.067 | -0.082 |
| | (0.039) | (0.058) | (0.058) |
| Deductible | -0.001 | 0.002 | 0.014 |
| | (0.011) | (0.015) | (0.019) |
| Deductible × Part D | -0.007 | -0.006 | -0.015 |
| | (0.008) | (0.012) | (0.018) |
| Panel C: Prostate Exams | | | |
| Medically Needy | 0.069 | 0.168** | -0.088 |
| | (0.057) | (0.060) | (0.179) |
| MN × Part D | -0.084* | -0.159** | -0.009 |
| | (0.042) | (0.056) | (0.059) |
| Deductible | 0.001 | -0.011 | 0.019 |
| | (0.005) | (0.008) | (0.015) |
| Deductible × Part D | 0.014* | 0.021* | 0.007 |
| | (0.006) | (0.009) | (0.012) |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variable indicated by column heading. Medically Needy is an indicator for living in a state with a Medically Needy program; MN is short-hand for Medically Needy. Deductible is the amount the individual must spend to be eligible for Medically Needy coverage. Part D is an indicator for 2006 or after. Results from 2SLS regressions, instrumenting for the Deductible and Deductible × Part D using the simulated deductible and the simulated deductible × Part D. All models include state, year, and demographic group fixed effects, a cubic polynomial in age, and marital status. Standard errors clustered on state in parentheses.

## 2.7 Conclusions

Theory predicts that insurance, by providing risk-protection, reduces an individual's investment in risk-reducing activities because the return to risk reduction is shared between the individual and the insurer (ex-ante moral hazard). This effect can manifest in a variety of ways; in the health insurance context one would expect an increase in smoking and drinking for individuals with greater risk protection, and a decrease in testing for disease and vaccination rates. Previous efforts to test for ex-ante moral hazard have relied on exogenous changes in insurance coverage, which affects both the price of medical care and risk protection. In this paper, I have used variation in risk protection provided by public catastrophic insurance programs. These programs only affect risk protection, leaving the marginal out-of-pocket cost of medical care unaffected. Using a simulated deductible to instrument for the actual deductible, I demonstrate that financial risk increases self-protective investments. Individuals with greater risk exposure are more likely to have a body mass index $< 25$ and to quit smoking. In addition, introducing a public catastrophic insurance program reduces the likelihood an individual quits smoking and makes women less likely to screen for cervical or breast cancer, while men become more likely to screen for prostate cancer, but only if they have supplemental private insurance.

These results also highlight two conflicting policy goals in the United States—increasing insurance coverage, while simultaneously improving the health of the nation, particularly with regards to smoking and obesity. For example, the Affordable Care Act eliminates cost-sharing for a number of preventive health measures, which will have the effect, even if it was not the intent, to minimize the decrease in self-protection associated with increased risk protection. The ACA also explicitly allows employers to adjust premiums on the basis of self-protection and it will be interesting to see how that provision is employed and what effect it has on self-protective investments.

# 2.A Alternative Deductible Coding

The empirical work in the body of the paper makes two simplifications which, at first glance, are not obviously correct. First, I code the deductible for individuals living in states without a Medically Needy program as 0, although in reality their deductible is infinite. Second, my empirical specification in (2.4) is interpreted as a difference-in-differences estimator, although it is not written as such. The essential difficulty in writing the specification as a standard difference-in-differences estimator is that the deductible and the Medically Needy dummy are co-linear when I also include their interaction. To see this, it is useful to first recode the deductible so that it is always finite. I define an alternate deductible as $AltDeduct_{ist} = (1 - \exp(-Deduct_{ist}))$, which is 1 in states without a Medically Needy program and is 0 for individuals who have no need to spend down to enter the Medically Needy program in their state. Now consider the difference-in-differences model:

$$y_{ist} = \beta_0 + \beta_1 MN_{st} + \beta_2 AltDeduct_{ist} + \beta_3 MN_{st} \times AltDeduct_{ist} \tag{2.5}$$

Where $y_{ist}$ is an arbitrary outcome. I claim that (2.5) is not identified because:

$$MN_{st} = 1 - (AltDeduct_{ist} - MN_{st} \times AltDeduct_{ist}) \tag{2.6}$$

The first term in parentheses in (2.6) is one in states without Medically Needy programs, while the second term is zero; the second term equals the first term in states with Medically Needy programs, so that the right hand side of the expression is always one in states with a Medically Needy program and zero otherwise.

In appendix table 2.A I estimate versions of (2.4) using the alternative deductible coding (i.e. based on the specification in (2.5)) excluding the Medically Needy dummy and its interaction with the introduction of Medicare Part D (odd columns) and excluding the main effect of the alternative deductible and its interaction with the introduction of Medicare Part D (even columns). None of the qualitative conclusions are affected by this coding, although it is more difficulty to interpret the coefficients on the alternative deductible.[23]

[23] One can differentiate (2.5) with respect to the deductible to get $\frac{\partial y_{ist}}{\partial Deduct_{ist}} = (\beta_2 + \beta_3 \times MN_{st}) \times \exp(-Deduct_{ist})$, which does not have a natural economic interpretation.

# Chapter 3

# Mental Health Benefits and Labor Supply

## 3.1 Introduction

In the United States, health insurance is a common component of an employee's compensation. Most Americans with private health insurance have their coverage from either their own or a family member's employer. However, employer-sponsored insurance plans vary widely in terms of the services covered and the generosity with which those services are covered. Because lower wages offset the cost of employer-sponsored health insurance (Kolstad and Kowalski, 2012; Summers, 1989), individuals pay for their employer-sponsored policy when they choose to work at firms that offer health insurance (Rosen, 1986). Therefore, there should be a positive correlation between an individual's valuation of health insurance and the generosity of her coverage,[1] which is due to either employers setting benefits in response to desired employee preferences or employees considering health insurance coverage when choosing a job.

In this paper, I test if employees consider the fringe benefits offered by an employer when accepting a job. To do so, I use the enactment of laws mandating that employer-sponsored health insurance plans must include mental health coverage. These laws should uniformly reduce labor demand among firms that offer health insurance by raising the cost of providing health insurance.[2] However, the effect on labor supply depends on the mechanism that yields the positive correlation

[1] This correlation is unlikely to equal one since individuals are not perfectly mobile.

[2] Firms can avoid these laws by self-insuring their health insurance plans, but become subject to non-discrimination laws as a result, that also raise the cost of providing health insurance (Carrington et al., 2002).

between employee preferences and fringe benefits offered by employers. If the correlation is a result of an employer responding to the preferences of its employees, then there should be no effect on labor supply since the benefit is either not valued by the employee or the employee has already internalized the wage offset, in which case individuals who value the benefit will experience a relative wage increase. On the other hand, if an employer offers a benefits package and employees choose to accept the job then a benefit mandate should increase the labor supply of an individual who values the mandate since the benefit substitutes for cash wages, which shifts her labor supply curve out.

Using data on the design of insurance plans from the Medical Expenditure Panel Survey and the Employee Benefits Survey, I first show that industries in which mental health coverage became more likely or more generous between 1996 and 2008 saw an increase in the average mental distress of employees with employer-sponsored insurance. I measure mental distress using a validated, self-reported scale that is predictive of mental illness (Kessler et al., 2003).[3] I also demonstrate that industries with a larger increase in the fraction of insured employees in states that enact these regulations have larger increases in the average mental distress of new employees and also have larger increases in the likelihood and generosity of coverage for mental illness, indicating that the regulations affected at least some employers. These results provide some evidence that sorting occurs and suggest that employees were choosing employers on the basis of mental health benefits.

Using data from the National Health Interview Survey from 1997 to 2001 on individual labor supply, mental distress, and insurance coverage I directly test for sorting using the benefit mandate. For less educated individuals, for whom the trade-off between insurance coverage and cash wages is more stark, I document an increase in hours worked in response to these mental health benefit mandates for individuals who changed jobs in the prior year and have health insurance from their employer who value the benefits more highly. But individuals who do not switch jobs or are more educated do not increase labor supply in response to these mandates. These results are consistent with employees responding to employer offers of fringe benefits.

[3]The Kessler scale is not sensitive to coding intensity, but is responsive to treatment, so one would expect lower distress scores among individuals who receive mental health treatment.

## 3.2 Mandating Mental Health Benefits and Heterogeneous Valuations

### 3.2.1 Regulation of Mental Health Benefits

Historically, employers have provided less generous insurance coverage for mental health needs than for physical health needs. This disparity was motivated by evidence that demand for mental health care is more price elastic than the demand for physical health care (Newhouse, 1993),[4] and because employers feared attracting less healthy employees if they offered generous mental health benefits (McGuire and Montgomery, 1982).[5]

Many states responded to the disparity in coverage for mental and physical health care by regulating the mental health benefits included in employer-sponsored and individually purchased insurance plans. These regulations vary in the margin that they affect, with some regulations requiring that firms offer a minimum level of mental health coverage, while other regulations affect the generosity of coverage, and some regulations do both. Regulations affecting the generosity of mental health coverage typically affect the out-of-pocket costs to the consumer and in many cases only apply to firms that choose to offer mental health coverage. In addition to state regulations, there is also a Federal mental health benefit mandate that requires firms offering mental health coverage to have equal maximum benefit limits and out-of-pocket cost-sharing, which took effect in 1998. This Federal mandate interacts with state level mandates that require employers to include mental health coverage so that those states effectively both require mental health coverage and regulate the generosity of that coverage.

Despite the rapid expansion of mental health benefit regulations in the 1990s, which in principle affected nearly half the population, exemptions built into the benefit regulations, typically based on firm size or cost growth (Gitterman et al., 2001), and a Federal law exempted many insurance plans

[4]Recent observational research finds a much smaller price elasticity for mental health care (Barry et al., 2006; Meyerhoefer and Zuvekas, 2010), which may be due to an increase in insurers providing incentives for physicians to provide less care, rather than relying on the consumer's out-of-pocket price to limit utilization.

[5]If the cost of the mental health benefit is correlated with a worker's valuation of the benefit and if workers choose employers on the basis of benefits, then firms offering a mental health benefit will spend more for insuring its employees than for insuring a random sample of potential employees (the firm will be adversely selected).

from these regulations.[6] As a consequence, less than 20% of the population was actually affected by the benefit mandates (Buchmueller et al., 2007). However, even if a firm is exempt from benefit regulations, in equilibrium the firm may need to adjust wages or mental health benefits in order to remain competitive, thus the regulations are likely to affect firms that are not subject to the regulations.[7]

### 3.2.2 Effects of Mental Health and Other Benefit Mandates

Most empirical research on mental health benefit regulations have focused on the effects of mental health parity mandates, which should have the largest effects by mandating coverage of mental health care and lowering the out-of-pocket cost of mental health care.

The largest study of the effect of mandating mental health parity on utilization of mental health services comes from an experiment in the Federal Employees Health Benefit Program, in which plans were required to implement mental health parity. Despite the decrease in out-of-pocket costs associated with the mandate, the change in spending on mental health and substance abuse treatment was similar for the Federal plans and a matched set of private comparison plans after the mandate took effect (Goldman et al., 2006). But a number of plans in the FEHBP began to incentivize providers to limit mental health utilization after the mandate took effect, which tends to slow the growth in mental health spending (Zuvekas et al., 2002), while the private comparison plans had already taken these steps to slow the growth in mental health spending. The result is that the experiment provides a lower bound for the effect of parity on mental health spending.

Other analyses of mental health parity mandates have likewise found no or small effects on utilization. Early studies using cross-sectional data from the Healthcare for Communities survey found that parity legislation reduced mental health care utilization, although states that went on to pass mental health parity mandates had lower mental health utilization prior to passing parity mandates than states that did not pass such laws (Pacula and Sturm, 2000; Sturm and Pacula,

[6]ERISA allows firms to self-insure a health insurance plan and exempts self-insured plans from state regulation (in a self-insured plan, the insurer writes checks on the employer's account, rather than it's own account). Because the exemption is applied at the plan level, firms must self-insure all of their health insurance offerings in order to be fully exempt from state regulations.

[7]The regulations effectively increase the reservation utility of some employees or makes the labor supply curve to the firm more elastic. In either case, the implication is that even if the firm is not directly subject to the mandate, the firm must still respond to benefit mandates by either increasing wages or offering similar benefits.

1999). Using longitudinal data from the same survey, Bao and Sturm (2004) conclude that "strong" parity legislation—laws requiring equality in all cost-sharing dimensions and without exemptions by employer size—increases mental health care utilization for individuals with probable mental disorders, based on a triple difference approach comparing individuals with greater mental health need to those with less need for mental health treatment, before and after these regulations took effect.

Two more recent studies conclude that parity regulations increase the use of mental health services and reduce out-of-pocket spending for individuals in need of mental health care. Busch and Barry (2008) use data from the National Survey of America's Families to estimate the effect of parity regulations on mental health service utilization. Unlike previous studies, Busch and Barry distinguish individuals by the size of their employer in order to remove individuals who worked at employers that were exempt from parity mandates. They find an increase in the likelihood of using any mental health care among individuals working at firms with 50 to 100 employees. These effects were larger for lower income individuals and individuals in worse mental health. In a second study using privately insured children from the Children with Special Health Care Needs survey, Barry and Busch (2007) demonstrate that parity laws also reduce the financial burden of mental illness on families.

Cseh (2008) is the only recent paper to consider the effect of mental health benefit regulations on labor market outcomes. Using data from the March CPS supplement for individuals working at firms with fewer than 100 employees he estimates the effects of parity mandates on the probability of having employer provided health insurance, contributions towards insurance, hours worked, fulltime work, and earnings. In no case is there a statistically significant effect of mental health parity mandates on these outcomes.

Studies of other mandated benefits have shown effects on labor market outcomes. Gruber (1994a) studied the introduction of maternity coverage mandates, which married women of childbearing age will, on average, value more highly than would unmarried men. Using the introduction of state mandates in a triple difference model he finds that mandating maternity coverage reduced wages for married women of childbearing age, relative to unmarried men, and a subsequent Federal law had similar effects, but did not study the effect on hours worked. Lahey (2012) uses a similar empirical approach to show that mandating coverage of infertility treatment reduces the labor supply of older, married, college education women—a group that is statistically more likely

to use infertility treatment, indicating that infertility mandates are not valued at cost (Summers, 1989).

However, two other studies of mandated benefits found no effect on employer-sponsored insurance or labor market outcomes. Gruber (1994b) studies five "high-cost" mandates[8] that were enacted in the late 1970 and 1980s. While the point estimates indicate that the mandates reduces private insurance coverage among employed individuals, none were statistically significant. Using data on existing insurance plans, Gruber concludes that the mandates were not binding since many firms, both large and small, were already providing the benefits. Kaestner and Simon (2002), using a similar approach, finds little evidence that benefit mandates and other insurance market regulations affect the labor market, with a modest effect on hours worked at firms with 25 to 99 employees, and minor effects on hourly wages.

The literature on utilization effects of mental health parity laws provide weak evidence that the parity mandates were binding on at least some firms. The lack of any labor supply effects is consistent with studies of other mandates (although those papers also study mental health mandates). But the two cases in which mandated benefits did have labor supply effects both feature identifiable groups that are statistically more likely to benefit from the mandate.

### 3.2.3 Benefit Mandates when Valuations Vary

The effect of benefit mandates on the supply and demand for labor is well understood (Gruber, 1992, 1994a; Gruber and Krueger, 1991; Summers, 1989). Summers (1989) provided one early exposition of the implications of a benefit mandate and distinguished the effects of a benefit mandate from a tax-financed benefit program. Both interventions decrease labor demand, by raising the cost of hiring an individual, but the benefit mandate also affects labor supply. In particular, if individuals value the mandate at the cost to the employer of providing the mandate then the increase in labor supply will restore the original level of employment. Gruber (1992, 1994a) extended the theory to the case in which individuals differ in their valuation of a mandated benefit. In this model, the wage offered to high valuation individuals falls by the full cost of the mandate if high valuation individuals value the mandate at cost, or if high and low valuation individuals are perfect substi-

[8]Minimum benefits for alcoholism treatment, drug abuse treatment, and mental illness, mandated coverage of chiropractors, and mandated continuation of benefits coverage for terminated employees and their dependents.

tutes. The first condition reflects the fact that when employees value the benefit at cost, providing the benefit and reducing wages by the cost of the benefit leaves the supply curve unchanged and does not affect demand for low valuation workers. The second condition arises because the firm can shift the labor demand curves for high and low valuation workers independently.

These shifts in labor demand and supply can be used to identify sorting and distinguish between alternative mechanisms for generating sorting. Consider first the case when firms respond to preferences of their employees (Bundorf, 2002; Goldstein and Pauly, 1976; Scott et al., 1989), in which case firms will already be providing the lowest cost compensation package to their employees, subject to a utility constraint (Scott et al., 1989). In this setting the benefit mandate will have no effect on labor supply, unless the cost of providing the benefit is lower when it is mandated than when it is offered on a voluntary basis.[9] Alternatively, employees may choose employers (partially) on the basis of the fringe benefits that employer offers. In this setting, a benefit mandate that is not valued only increases the cost to the employer of hiring an individual, which shifts labor demand in. But, for individuals who value the benefit the mandate substitutes for compensation at firms that did not previously offer the benefit, resulting in an outward shift in their labor supply curve.

## 3.3 Empirical Methods

My empirical approach is to estimate a difference-in-difference-in-difference model[10] of the effect of mandating that mental health benefits be included in health insurance plans. I allow the estimated effect to vary with mental distress[11], which I use as a proxy for an individual's valuation of mental health coverage. The resulting model for individual $i$ in MSA $c$, month $m$, and year $t$ is:

[9]For example, the mental health benefits that I study have historically not been provided because employers feared attracting more expensive individuals, which would raise the cost of providing mental health benefits. The benefit mandate provides a way to circumvent the adverse selection problem and should increase wages for individuals who were receiving the benefit on a voluntary basis prior the mandate.

[10]Comparing before versus after the mandate takes effect, low versus high education, and individuals who stay at versus switch jobs.

[11] The mental distress score is the six-item Kessler scale (Kessler et al., 2003), which is based on an individual's self-reported response to six statements, is designed for use in large population based studies, and is predictive of mental illness.

$$\begin{aligned} O_{icmt} =& \beta_1 Benefits_{ct} + \beta_2 Distress_i + \beta_3 NewJob_i + \beta_4 HighEd_i + \beta_5 \mathbf{1}_{1997} \\ &+ f(Distress_i) + X_i\Gamma + \chi_c + \mu_m + \tau_t + \varepsilon_{icmt} \end{aligned} \tag{3.1}$$

Where $O_{icmt}$ is an outcome, $Benefits_{ct}$ is an indicator that equals one when employers who offer health insurance are required to cover mental illness in MSA $c$ in year $t$, $Distress_i$ is a standardized (to variance 1) Kessler score.[12] $NewJob_i$ is an indicator that equals one if the individual has been at her current job for one year or less. $HighEd_i$ is an indicator for having any college education, and the last term, $\mathbf{1}_{1997}$, is a dummy for the year prior to the implementation of the Federal mental health benefits mandate. I also include all two-, three-, four-, and five-way interactions of these variables. Including the interactions with $\mathbf{1}_{1997}$ ensures that the remaining coefficients reflect the effect of the mental health mandates after the Federal law took effect. $X_i$ is a vector of additional demographic covariates that include gender, age, education, marital status, and race/ethnicity, and I include MSA, year, and month fixed effects ($\chi_c$, $\mu_m$ and $\tau_t$). In the results below, I report the coefficient on $Benefits_{ct}$ and its interactions with $Distress_i$, $NewJob_i$ and $HighEd_i$. In models in which the dependent variable is either being employed or having switched jobs I omit $NewJob_i$.

In order to facilitate interpretation, I also compute the average effect of implementing the benefit mandate for individuals defined by $NewJob_i$, $HighEd_i$, and the presence (or absence) of any distress.[13]

## 3.4 Results

### 3.4.1 Correlations Between Mental Distress, Benefits, and Regulations

If individuals are sorting into different industries on the basis of mental health benefits, then industries that, on average, have a greater increase in the generosity of mental health benefits

[12] The mean standardized Kessler score is 0.78, corresponding to a raw score of 2.2.

[13] In total there are eight groups. When I compute the average effect for distressed individuals, I do so at the average level of distress for individuals with any distress (1.39 standard deviations or a raw score of 3.9).

should also have a larger change in mental distress among their new employees. Figure 3.1 uses

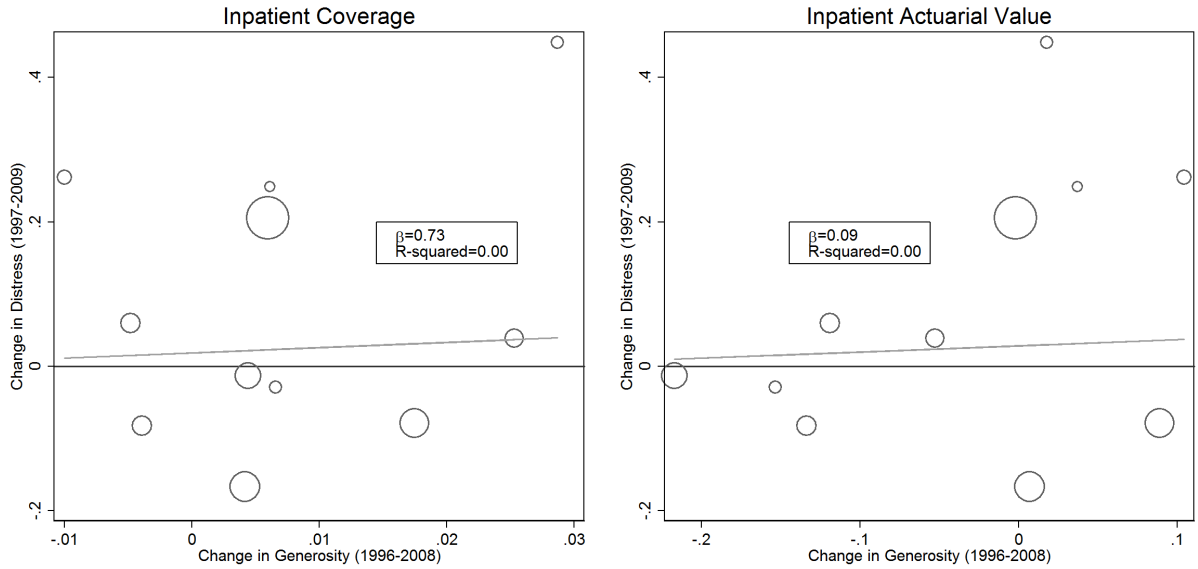


Figure 3.1: Sorting Into Industry.

Note: Each circle corresponds to the change in average mental distress of new employees and change in the probability of inpatient mental coverage (left) or actuarial value of the mental health benefit (right) for a given industry. Change in the actuarial value is the change in the average actuarial value based on data on insurance plans from the 1996 Medical Expenditure Panel Survey and the availability of certain types of mental health benefits from the 2008 Employee Benefits Survey, weighted by the average actuarial values from the 1996 data (see Data Appendix for details). Change in inpatient coverage is the change in the fraction of firms with health insurance in a given industry offering inpatient mental health coverage. Change in distress is the change in average mental distress among newly employed individuals with insurance from their employer in a given industry. Circles are proportional to weighted number of new hires with insurance in that industry in 2009. Fitted line from OLS regression weighted by the inverse of the sum of the variance in mental distress for 1997 and 2009 (this is the variance of the change, assuming that mental distress is uncorrelated over time).

data on insurance benefits from the 1996 Medical Expenditure Panel Survey Health Insurance Plan Abstract file, which combines data on individuals with descriptions of their health insurance plans, and the 2008 Employee Benefits Survey[14] and mental distress from the 1997 and 2009 National Health Interview Surveys to document sorting by new employees into more generous industries (these data are described in detail in the Data Appendix; the industries are listed in

[14]This is the first year after 1996 for which data on mental health benefits are available that provides a breakdown by industry. Previous years of both the Employer Benefits Survey and the National Compensation Survey provide data on mental health benefits by type of plan, but those data are insufficient to test for sorting.

appendix table 3.A along with the average Kessler score, coverage of inpatient and outpatient mental health care, and actuarial value for 1996 and 2008; I exclude Utilities and Other Services from the analysis). Each panel plots the change in generosity against the change in distress, with the circles corresponding to the number of insured new employees in each industry group in 2009. The left panel plots changes in the extensive margin of inpatient mental health coverage against the change in average mental distress. Industries that increased coverage of mental health also had an increase in mental distress among new employees. The fitted regression line, which is weighted by the inverse of the variance of the change in mental distress,[15] indicates that a one percent increase in the probability of offering mental health coverage increased average mental distress by .007 standard deviations. The right panel plots the intensive margin of inpatient mental health coverage and demonstrates that mental distress is lower in industries that reduced the share of inpatient mental health spending covered by insurance, with a one percentage point increase in the generosity of mental health coverage increasing mental distress by 0.001 standard deviations.

These results provide some indication that individuals are sorting on the basis of benefits, but must be interpreted with caution. First, the NHIS only provides insurance information for one adult in the household, but individuals may be seeking family coverage due to another family member's mental distress, rather than their own. Second, I am observing a measure of current mental distress, rather than distress at the time the individual chose her employer. Third, I do not observe the benefits at the individual's own employer, but rather I observe the average for the industry of her employer. However, table 3.1 shows that the positive correlation between benefits and mental distress (top panel) is due to new employees and that there is generally only a weak relationship between the generosity of mental health coverage and mental distress for existing employees. But this is not surprising—if mental health care reduces an individual's mental distress, then the relationship between the generosity of mental health benefits and mental distress is ambiguous because more individuals will be treated when benefits are more generous leading to lower mental distress scores and attenuating the relationship between the generosity of mental health coverage and mental distress for existing employees.

These results, however, only provide evidence on sorting into industries. Figure 3.2 shows

[15] Denoting the standard error of the mean before the policy by $SE_0$ and after by $SE_1$ the variance of the difference is assumed to be $SE_0^2 + SE_1^2$ (so I am assuming that mental distress in an industry is not autocorrelated).

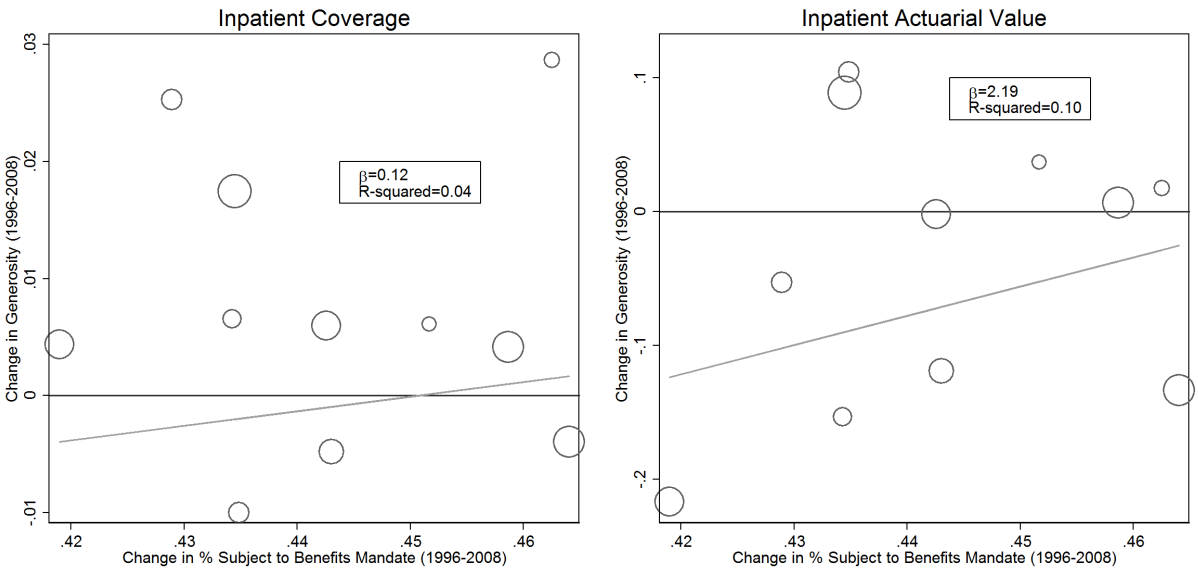


Figure 3.2: Benefit Regulations and Generosity of Mental Health Coverage.

Note: Each circle corresponds to the change in the probability of inpatient mental coverage (left) or actuarial value of the mental health benefit (right) and the change in the share of insured individuals in a given industry living in a state with a mental health benefits mandate. See Note to Figure 3.1 for description of change in actuarial value. Change in the percent subject to benefit mandates is the change from 1996 to 2008 in the fraction of employed individuals with insurance from their employer in that industry who live in a state with a benefit mandate (using the 1997 and 2009 March CPS supplements). Circles are proportional to weighted number of people in that industry in the 2009 March CPS. Fitted line from OLS regression weighted by the inverse of the sum of the variance of generosity for 1996 and 2008.

that industries with a greater increase in (all) insured employees in states that mandate coverage of mental health benefits are more likely to provide inpatient mental health coverage (left panel) and provide more generous coverage (right), than industries that experienced less growth in those states.[16] The implication is that the benefit mandates were binding on some firms and may be used as a proxy for the generosity of benefits at an individual firm. The bottom panel of table 3.1 indicates that an increase in the share of insured employees exposed to a benefit mandate increases the generosity of inpatient mental health benefits, but reduces outpatient mental health benefits.

[16]Using all, rather than just new, employees with employer-sponsored insurance is the appropriate approach because the benefit mandate applies to all employees, not merely newly hired employees.

Table 3.1: Association Between Mental Distress and Generosity of Mental Health Benefits

| | Total | Inpatient | | Outpatient | | |
|---|---|---|---|---|---|---|
| | (1) Act. Value | (2) Coverage | (3) Act. Value | (4) Coverage | (5) Act. Value | (6) Distress |
| Δ Mental Distress | | | | | | |
| Δ Benefit Generosity | -0.05 | -0.61 | -0.05 | -0.01 | -0.02 | |
| | (0.05) | (0.48) | (0.08) | (0.15) | (0.03) | |
| ×New Employee | 0.82 | 1.34 | 0.13 | -0.98 | 0.34 | |
| | (0.20) | (4.79) | (0.36) | (0.58) | (0.14) | |
| Δ % Mandated Benefits | | | | | | 0.08 |
| | | | | | | (0.86) |
| × New Employees | | | | | | 0.67 |
| | | | | | | (3.18) |
| R-squared | 0.30 | 0.02 | 0.02 | 0.12 | 0.22 | 0.01 |
| N | 22 | 22 | 22 | 22 | 22 | 22 |
| Δ distress | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Δ Benefit Generosity | | | | | | |
| Δ % Mandated Benefits | -4.25 | 0.12 | 2.19 | -1.33 | -6.64 | |
| | (2.94) | (0.25) | (2.66) | (1.15) | (4.37) | |
| R-squared | 0.18 | 0.04 | 0.10 | 0.06 | 0.19 | |
| N | 11 | 11 | 11 | 11 | 11 | |
| Mean change in generosity | -0.00 | -0.00 | -0.07 | -0.13 | -0.07 | |

Note: The dependent variable in top panel is the change in average mental distress of employees with insurance from 1997 to 2009. Δ Benefit Generosity is the change in the indicated measure of mental health coverage from 1996 to 2008. Δ% Mandated Benefits is the change in the percent of employed individuals with insurance from their employer in an industry who live in a state with a benefit mandate using the 1997 and 2009 March CPS supplements. The dependent variable in the bottom panel is Δ Benefit Generosity. All regressions are weighted by the inverse of the variance of the change in the dependent variable. Data on plan benefits from the 1996 MEPS Health Insurance Plan Abstract file and the 2008 Employer Benefits Survey, data on mental distress in the top panel from the 1997 and 2009 NHIS, data on change in the percent subject to mandated benefits from the 1997 and 2009 March CPS supplements; see Data Appendix for details.

### 3.4.2 Effects of Mandated Fringe Benefits on Labor Supply

The previous results provide some evidence of sorting into different industries on the basis of mental health benefits. I now turn to microdata from the NHIS, which are described in more detail in the Data Appendix. The NHIS, while the best survey data generally available for my purpose, has some significant drawbacks. In particular, the survey only collects detailed data on

employment and mental distress on one adult and one child, if any, in each household. I restrict my sample to adults who are living alone in order to eliminate potential sources of bias due to unmeasured spousal mental distress and labor supply and because demand for insurance for one's child may differ from demand for insurance for oneself. A second difficulty arises because the reference period for questions on earned income, months worked, and hours worked differ—the prior calendar year for earned income and months worked, but the previous week or "usually" for hours worked.[17] In order to avoid misattributing any effects of the benefit mandates, I further restrict my sample by excluding 1998, when the Federal mandate took effect, and the first year in which a mandate is in effect in a given state, so that identical regulations are in effect for the reference periods for all three questions—earned income, months worked, and hours worked.

Table 3.2 presents summary statistics from the NHIS sample for individuals in states with and without requirements that health insurance include mental health benefits. In general, individuals in states that require mental health benefits have higher labor market earnings and wages, but there are no differences on most of the other covariates, except that individuals in states with mandated mental health coverage are more likely to have at least some college education.

I begin by documenting the effect of requiring mental health benefits on employment, job switching, part time employment, and insurance coverage (both employer-sponsored and individually purchased). Table 3.3 presents results from estimating the regression in (3.1) for these outcomes. All models include MSA and year fixed effects, control for education, gender, age, race, marital status, and mental distress. Standard errors are clustered on state and all regressions are weighted to be representative of the U.S. urban population. The first four rows provide the parameter estimates for individuals who never went to college, while the remaining four rows of results indicate how individuals with any college experience differ from individuals without any college.[18] Columns (1)-(3) indicate that there is no change in employment in response to a mental

[17]These questions are similar to the questions on earnings, weeks worked, and hours worked in the March CPS supplement.

[18]I include the interaction with any college for two reasons. First, education was the only meaningful difference among the covariates between states with and without a benefit mandate. Second, more highly educated individuals are more likely to have employer-sponsored health insurance, meaning that there is little room for individuals to increase labor supply in order to get health insurance, so the effect of the benefit regulation on the high education group should come from shifts in labor demand, rather than supply (80.2% of individuals with at least some college have employer-sponsored health insurance, while only 65.7% of individuals with a high school degree or less have health insurance coverage).

Table 3.2: Summary Statistics

| | No Mandate | | Mandate | |
|---|---|---|---|---|
| | Mean | S. D. | Mean | S. D. |
| Earnings, last year ($) | 46551 | 26312 | 50813 | 28209 |
| Months worked, last year | 11.4 | 1.8 | 11.4 | 1.9 |
| Hours worked | 43.4 | 11.9 | 42.9 | 12.1 |
| Hourly Wage ($) | 25.30 | 24.69 | 28.05 | 24.06 |
| Employer-Sponsored HI | 0.77 | 0.42 | 0.76 | 0.43 |
| New Job | 0.34 | 0.47 | 0.33 | 0.47 |
| Part Time | 0.07 | 0.26 | 0.08 | 0.27 |
| Employed | 0.86 | 0.35 | 0.85 | 0.35 |
| Female | 0.43 | 0.49 | 0.43 | 0.50 |
| Age | 38.7 | 12.4 | 38.9 | 12.5 |
| Education | | | | |
| No Schooling | 0.00 | 0.02 | 0.00 | 0.04 |
| Elementary School | 0.02 | 0.15 | 0.02 | 0.15 |
| Some High School | 0.05 | 0.21 | 0.04 | 0.19 |
| High School | 0.23 | 0.42 | 0.19 | 0.39 |
| Some College | 0.44 | 0.50 | 0.47 | 0.50 |
| College | 0.26 | 0.44 | 0.28 | 0.45 |
| Race | | | | |
| White | 0.70 | 0.46 | 0.70 | 0.46 |
| Black | 0.19 | 0.39 | 0.14 | 0.34 |
| Hispanic | 0.08 | 0.27 | 0.11 | 0.32 |
| Other | 0.03 | 0.16 | 0.05 | 0.22 |
| Marital status | | | | |
| Married | 0.00 | 0.00 | 0.00 | 0.00 |
| Divorced | 0.27 | 0.44 | 0.26 | 0.44 |
| Widowed | 0.05 | 0.21 | 0.04 | 0.20 |
| Separated | 0.06 | 0.24 | 0.05 | 0.22 |
| Unmarried | 0.63 | 0.48 | 0.64 | 0.48 |
| Mental Distress | 0.77 | 1.03 | 0.80 | 1.04 |
| Mental Distress, raw | 2.16 | 2.89 | 2.24 | 2.92 |
| N | 6415 | | 4401 | |

Note: All figures weighted to be representative of the U.S. urban population. Variables relating to work (earnings through part time) are for the employed population; unemployed individuals are coded as missing.

health mandate and that individuals who would be expected to benefit from the mandate—those at higher distress—are less likely to switch jobs after the mandate takes effect than before. The remaining two columns indicate that there is a significant change in employer-sponsored insurance

Table 3.3: Employment and Insurance Effects of Benefit Mandates

| | Employment | | | Insurance | |
|---|---|---|---|---|---|
| | (1) Employed | (2) New Job | (3) Part time | (4) Employer | (5) Individual |
| Benefit Required | 0.008 | -0.031 | 0.032 | -0.119** | 0.011 |
| | (0.029) | (0.040) | (0.023) | (0.035) | (0.018) |
| × Distress | -0.010 | -0.033+ | -0.024 | 0.080** | 0.002 |
| | (0.015) | (0.019) | (0.017) | (0.025) | (0.008) |
| × New job | | | -0.010 | 0.274** | 0.012 |
| | | | (0.039) | (0.072) | (0.024) |
| × Distress | | | -0.011 | -0.229** | -0.005 |
| | | | (0.031) | (0.053) | (0.012) |
| × Any College | 0.007 | 0.039 | -0.010 | 0.108** | -0.025 |
| | (0.023) | (0.035) | (0.017) | (0.029) | (0.018) |
| × Distress | 0.003 | 0.005 | 0.030 | -0.091* | 0.019 |
| | (0.018) | (0.027) | (0.020) | (0.035) | (0.016) |
| × New job | | | -0.009 | -0.342** | -0.011 |
| | | | (0.043) | (0.073) | (0.032) |
| × Distress | | | 0.019 | 0.287** | -0.002 |
| | | | (0.036) | (0.059) | (0.017) |
| R-squared | 0.13 | 0.16 | 0.10 | 0.12 | 0.03 |
| N | 10812 | 7032 | 7029 | 7032 | 7032 |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variables are indicators for being employed, working in a job for one year or less, working in a part-time job, having health insurance from one's employer, and purchasing health insurance on the individual market, respectively. Benefit Required is an indicator if the state during that year requires firms that offer health insurance to also provide coverage for mental illness. Distress is the Kessler mental distress score, normalized to have a variance of 1. Any College is a dummy for heaving at least some college education. Standard errors clustered on state in parentheses. All models include MSA and year fixed effects, a cubic polynomial in mental distress and a dummy for no distress, education, gender, a quintic polynomial in age, race, and marital status.

coverage, but that there is no effect on individually purchased health insurance. The decrease in switching for more distressed individuals after the mandate takes effect is consistent with sorting on benefits because after the mandate takes effect all firms[19] that provide health insurance must include mental health benefits, so there is less of a need to switch between jobs to find jobs offering mental health coverage. The pattern of results for employer-sponsored health insurance is consis-

[19]Technically, only firms that are explicitly subject to the mandate, but it is likely that competition in the labor market will result in the mandate binding on other firms as well.

tent with this argument since after the mandate takes effect distressed individuals who switch jobs are less likely to take a job offering health insurance than before the mandate.

In general, the mandate appears to increase the cost of insurance for less educated individuals, resulting in less insurance coverage. But (moderately) distressed individuals[20] and individuals who switch jobs are both more likely to have employer-sponsored insurance after the mandate takes effect. These results are consistent with distressed individuals sorting into jobs that provide health insurance after the mandate takes effect. For individuals who have been to college the effect of the mandate is essentially zero, although individuals who switch jobs are more likely to find a job that does not provide health insurance after the mandate.

Table 3.4 presents coefficient estimates from estimating (3.1) for earnings, hours worked, and wages for all employed individuals (columns 1-4) and just for individuals with employer-sponsored health insurance (columns 5-8), while table 3.5 presents the average effect of the benefit mandate for eight types of individuals. The first row presents the main effect of mandating mental health benefits, which indicates that the mandate leads to a substantial decline in income, reflecting a decrease in hours worked each week and a decrease in the wage, but there is no effect on months worked. There is a smaller effect on individuals who have any college education (the difference between no college and any college is not statistically significant, but the total effect for any college is significantly different from zero), primarily because of smaller decreases in hours worked.[21] These effects imply that there is a broad decrease in the demand for labor affecting individuals with and without insurance from their employer.[22] Mental distress reduces the negative impact of the benefit mandate on earnings, primarily by reducing the effect of the mandate on hours worked and wages. This effect may arise from a number of sources. First, if distressed individuals have (partially) sorted into firms that provide mental health benefits prior to the mandate then the effect of the mandate will be smaller for distressed individual because fewer individuals are affected by

[20]The effect of the benefit mandate on distressed switchers is positive as long as their mental distress scores are less than 1.04 standard deviations, which is approximately 40% of individuals who report any distress.

[21]These results differ from the results in Cutler and Madrian (1998), who conclude that rising health insurance costs, which are a fixed cost per employee, increase hours worked. But a benefit mandate affects the benefits individuals purchase, not prices, so their theoretical result that an increase in the price of health insurance should increase hours worked does not apply.

[22]The results indicate a decrease in labor demand because the decrease in both wages and hours worked corresponds to an inward shift along the labor supply curve, which can only come about from a shift in labor demand.

Table 3.4: Labor Supply Effects of Requiring Fringe Benefits

| | All Employed | | | | Employer Insurance | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) Earnings | (2) Weeks | (3) Hours | (4) Wage | (5) Earnings | (6) Weeks | (7) Hours | (8) Wage |
| Benefit Required | -0.185** | -0.000 | -0.071** | -0.114* | -0.163** | -0.015 | -0.059* | -0.090 |
| | (0.064) | (0.022) | (0.023) | (0.054) | (0.058) | (0.022) | (0.023) | (0.056) |
| × Distress | 0.101* | 0.009 | 0.036 | 0.057 | 0.087* | 0.018 | 0.024 | 0.046 |
| | (0.041) | (0.016) | (0.021) | (0.036) | (0.036) | (0.015) | (0.022) | (0.036) |
| × New job | 0.101 | 0.024 | 0.053 | 0.023 | 0.242+ | -0.045 | 0.078+ | 0.209+ |
| | (0.095) | (0.050) | (0.039) | (0.088) | (0.132) | (0.063) | (0.045) | (0.103) |
| × Distress | -0.119 | -0.038 | 0.001 | -0.082 | -0.094 | 0.054 | -0.005 | -0.144+ |
| | (0.078) | (0.051) | (0.038) | (0.051) | (0.103) | (0.074) | (0.036) | (0.080) |
| × Any College | 0.079 | -0.014 | 0.060+ | 0.033 | 0.068 | 0.010 | 0.046 | 0.012 |
| | (0.058) | (0.018) | (0.033) | (0.058) | (0.050) | (0.016) | (0.034) | (0.055) |
| × Distress | -0.099+ | -0.004 | -0.063* | -0.032 | -0.073+ | -0.019 | -0.036 | -0.018 |
| | (0.051) | (0.020) | (0.024) | (0.044) | (0.037) | (0.015) | (0.022) | (0.043) |
| × New job | -0.064 | -0.003 | -0.076 | 0.015 | -0.145 | 0.073 | -0.078 | -0.140 |
| | (0.100) | (0.056) | (0.048) | (0.100) | (0.128) | (0.064) | (0.051) | (0.098) |
| × Distress | 0.124 | 0.052 | 0.009 | 0.063 | 0.015 | -0.041 | -0.000 | 0.057 |
| | (0.073) | (0.051) | (0.041) | (0.059) | (0.104) | (0.081) | (0.037) | (0.082) |
| R-squared | 0.33 | 0.10 | 0.09 | 0.24 | 0.36 | 0.12 | 0.11 | 0.25 |
| N | 7032 | 7032 | 7032 | 7032 | 5287 | 5287 | 5287 | 5287 |

+ $p<0.1$, * $p<0.05$, ** $p<0.01$

Notes: All dependent variables have been log transformed. Benefit Required is an indicator if the state during that year requires firms that offer health insurance to also provide coverage for mental illness. Distress is the Kessler mental distress score, normalized to have a variance of 1. New Job is a dummy for being at one's current employer for one year or less. Any College is a dummy for having at least some college education. Log wage is computed from log earnings, log hours, and months worked over the previous year assuming that individuals work four weeks per month. Standard errors clustered on state in parentheses. All models include MSA and year fixed effects, a cubic polynomial in mental distress and a dummy for no distress, education, gender, a quintic polynomial in age, race, and marital status.

Table 3.5: Average Effects of Mandated Mental Health Coverage on Labor Supply

| | All Employed | | | | Employer Insurance | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) Earnings | (2) Weeks | (3) Hours | (4) Wage | (5) Earnings | (6) Weeks | (7) Hours | (8) Wage |
| Non Distressed, No College, Stayer | -0.185** | -0.000 | -0.071** | -0.114* | -0.163** | -0.015 | -0.059* | -0.090 |
| | (0.064) | (0.022) | (0.023) | (0.054) | (0.058) | (0.022) | (0.023) | (0.056) |
| Distressed, No College, Stayer | -0.044 | 0.012 | -0.021 | -0.035 | -0.042 | 0.010 | -0.025 | -0.026 |
| | (0.067) | (0.023) | (0.033) | (0.049) | (0.064) | (0.020) | (0.033) | (0.064) |
| Non Distressed, No College, Switcher | -0.085 | 0.024 | -0.017 | -0.091 | 0.078 | -0.060 | 0.019 | 0.119 |
| | (0.091) | (0.043) | (0.039) | (0.077) | (0.135) | (0.058) | (0.047) | (0.096) |
| Distressed, No College, Switcher | -0.110 | -0.017 | 0.033 | -0.127* | 0.069 | 0.041 | 0.045 | -0.018 |
| | (0.105) | (0.063) | (0.038) | (0.060) | (0.148) | (0.082) | (0.047) | (0.094) |
| Non Distressed, Any College, Stayer | -0.106** | -0.014 | -0.011 | -0.081* | -0.095* | -0.005 | -0.012 | -0.077+ |
| | (0.035) | (0.012) | (0.023) | (0.037) | (0.040) | (0.011) | (0.026) | (0.041) |
| Distressed, Any College, Stayer | -0.103+ | -0.008 | -0.049+ | -0.046 | -0.075 | -0.007 | -0.030 | -0.038 |
| | (0.054) | (0.019) | (0.027) | (0.035) | (0.051) | (0.011) | (0.031) | (0.041) |
| Non Distressed, Any College, Switcher | -0.070 | 0.007 | -0.033 | -0.043 | 0.002 | 0.023 | -0.012 | -0.009 |
| | (0.088) | (0.031) | (0.033) | (0.073) | (0.085) | (0.032) | (0.025) | (0.080) |
| Distressed, Any College, Switcher | -0.060 | 0.032 | -0.057+ | -0.035 | -0.089 | 0.040 | -0.037 | -0.092 |
| | (0.053) | (0.031) | (0.032) | (0.048) | (0.065) | (0.041) | (0.030) | (0.059) |

+ $p<0.1$, * $p<0.05$, ** $p<0.01$

Notes: Cell values are the average effects of mandating mental health coverage for the indicated group (row) for the indicated outcome (column) based on coefficients in table 3.4. Non Distressed individuals endorse no items in the Kessler scale, while Distressed individuals endorse at least one item and have an average distress of 1.37 standard deviations. Stayer indicates that the individual has worked at her current employer for more than one year, while Switcher indicates that the individual has been at her current employer for one year or less. No college indicates the individual has no college education, while Any College indicates at least some college education. Standard errors clustered on state in parentheses; significance values are relative to the mandate having no effect for that group.

the mandate. A second reason for the smaller effect of mental distress is if the mandate makes distressed individuals more productive, which should affect insured individuals, but not uninsured individuals, and would manifest as larger effects of the mandate for individuals with insurance than for individuals without insurance. Table 3.5 provides little evidence that this is true, at least in logs, with the mandate reducing wages by .035 log points for distressed individuals who stay at their job and by .026 log points for individuals with insurance from their employer.

Lastly,the effect of the mandate should be most pronounced for individuals who switch jobs, rather than individuals who remain in existing jobs, if individuals are sorting on the basis of benefits. There are no statistically significant effects of switching jobs among all individuals, but there are differential effects of the benefit mandate for individuals with employer-sponsored insurance—these individuals earn higher wages and work longer hours than their peers who do not switch jobs, although the wage increase is smaller for distressed individuals. The decrease in wages for distressed individuals may simply reflect a decision to take some of their compensation in the form of more generous insurance coverage, but my data do not permit me to compare the benefits offered to distressed and non-distressed individuals.

These results can, as in the case for individuals who remain at their jobs, be interpreted in terms of changes in labor demand and labor supply. With the exception of less educated, distressed individuals who change jobs after the mandate takes effect, the pattern of changes in hours worked and wages indicate shifts in labor demand. With one exception these changes indicate a decrease in labor demand, which is consistent with a costly mandate, while the exceptional case—non-distressed, insured, less-educated individuals who switch jobs—experiences an increase in labor demand and may indicate that firms are substituting towards less educated employees and away from more highly educated employees. Among less educated, but distressed individuals, there is a marked increase in labor supply, with a large decrease in wages among all employees and a modest decrease once I restrict to individuals who have insurance from their employer.

## 3.5 Conclusions

In this paper I have demonstrated that individuals take the benefits offered by an employer, in this case coverage for mental illness, into account when choosing a new employer. I first demon-

strated that there was a larger increase in the average mental distress of new hires with health insurance for industries in which mental health coverage became more generous between 1996 and 2008. This relationship is consistent with either individuals choosing to work in industries on the basis of fringe benefits, or firms offering fringe benefits on the basis of employee preferences. I also demonstrated that as the share of insured employees living in states that mandate mental health coverage increases the average mental distress of new hires also increases and the same mechanism was also associated with an increase in the generosity of inpatient mental health insurance coverage, suggesting that mental health benefit mandates were binding on some firms.

Next, using data from the National Health Interview Survey, which provides data on mental distress, labor supply, and insurance coverage, I show that mandating mental health benefits reduces the demand for labor for most individuals. However, there is an increase in labor supply for distressed, less-educated individual who choose to switch jobs and an increase in labor demand for non-distressed, but otherwise comparable individuals. The increase in labor supply is consistent with employees choosing firms on the basis of the benefits that are available, but does not rule out the possibility that firms are also responding to employee preferences when setting fringe benefits.

As states consider new health insurance benefit mandates, which is a requirement in the Affordable Care Act,[23] it is important to keep in mind how these mandates will affect the labor market. While mandating mental health coverage increased labor supply for individuals who valued the benefit, there were also adverse consequences on more educated individuals and individuals in better mental health. Hence, mandating benefits that are valued by a large number of people may cause fewer labor market distortions than mandates that affect a smaller number of individuals, particularly if these individuals are particularly costly to insure.

[23]Technically states are defining a minimum benefits package but this semantic distinction has no economic significance.

# 3.A Data Appendix

Data for this paper come from a variety of sources. Employee benefits data come from the 1996 Medical Expenditure Panel Survey Health Insurance Plan Abstract file and the 2008 Employer Benefits Survey from the Bureau of Labor Statistics. The main empirical work uses the NHIS Sample, which is derived from the National Health Interview Survey from 1997 through 2001.

## 3.A.1 Employee Benefits and Mental Health Coverage

Data on mental health coverage in employee benefit plans come from two sources: the 1996 Medical Expenditure Panel Survey Health Insurance Plan Abstract file and the 2008 Employer Benefits Survey from the Bureau of Labor Statistics. The 1996 Plan Abstract file provides detailed data on more than 5,000 plan-policyholder pairs including indicators for coverage of mental health benefits, mental health-specific and overall deductibles, coinsurance and copayment requirements, and benefit limits. I use data from the 1996 MEPS on individual utilization of inpatient and outpatient services for mental health reasons[24] to construct estimates of total spending and plan payments.

I calculate plan spending for inpatient mental health care for each confinement, or hospitalization, based on the per confinement plan payment parameters—deductibles, benefit limits, and coinsurance rates. For each confinement from the MEPS data, I first calculate the deductible amount by applying per confinement, per day, and a number of days deductible, converting the latter into dollars using the average per diem cost from that confinement. I then compute the cost sharing requirement above the deductible, yielding trial out of pocket and plan payments. The final out of pocket payment is the trial plan payment plus the amount by which the trial plan payment exceeds the maximum plan benefit. Outpatient spending is calculated in a similar manner, but rather than specifying payment parameters in terms of confinements, the parameters are defined by annual limits and per visit costs.

In order to compute the actuarial value of a plan, I calculate average inpatient, outpatient, and total spending by the individual, the plan, and combined, for each plan. I define the actuarial

[24] I defined a claim as being for a mental health reason if it was associated with any of the following three digit ICD-9 diagnosis codes: 290, 294-298, 300-302, 306-315, 317, and 319.

value as the share of total inpatient and outpatient spending paid by the insurance plan and define inpatient and outpatient actuarial value in an analogous manner using service specific spending. For each plan I also construct indicators for providing any or limited inpatient or outpatient mental health coverage, where I define limited as more restrictive than other inpatient or outpatient coverage.

To calculate industry specific measures of generosity I assign an industry to each plan based upon the policyholder's report of the industry of the employer providing the plan. The industry specific average value is just the weighted average of the actuarial values.

These data are linked with two different cross-sections. The 1997 NHIS cross-section consists of all individuals between 18 and 64 reporting insurance from an employer. I assign to each individual the characteristics of the average plan in her industry, compute her mental distress, and then compute the industry-specific average distress. The 1997 March CPS cross-section is defined in a comparable manner, but I also assign to each individual the mental health benefit regulations that are in effect in 1996, which permits me to compute the share of insured employees in each industry that are subject to a benefits mandate.

The 2008 Employer Benefits Survey (EBS) provides far less detailed information on plan benefits. These data identify the fraction of employees in each industry with inpatient and outpatient mental health coverage and distinguish between those plans providing full or limited coverage. I use the 1996 plan data to construct average within industry actuarial values for the different levels of coverage and combine the inpatient and outpatient actuarial values based on the average share of spending in each category in 1996. I then link these data with the 2009 NHIS cross-section and the 2009 March CPS cross section, as I did with the 1996 MEPS data.

### 3.A.2 NHIS Sample

I use data from the 1997 through 2001 National Health Interview Surveys, a nationally representative cross-sectional survey of non-institutionalized adults conducted by the Centers for Disease Control. These time restrictions are necessary because the NHIS did not include a measure of mental distress until 1997; beginning in 2002, the NHIS no longer provided geographic identifiers below the census region. Prior to 2002 the NHIS identified the MSA of residents of the largest MSAs in the country which, along with an indicator for the size of the MSA, can be used to assign

almost every individual living in one of the identified MSAs to a state (individuals in the Washington, D.C. and 7 other MSAs could not be uniquely assigned to a state and are dropped from the analysis[25]).

I measure mental distress using the six item scale developed by Kessler et al. (2003) for use in population-based surveys. The scale consists of six sentiments and for each sentiment an individual chooses one of five answers ranging from not endorsing the sentiment at all to fully endorsing a given sentiment. I convert these five levels into scores from zero to four and define the mental distress scale as the sum of the scores. I exclude individuals with a Kessler score greater than 12, because these individuals are likely to have severe mental disorders that may also affect productivity (Kessler et al., 2003). In the empirical work, I use a normalized distress score with variance 1, but I keep the minimum distress score at 0 so that the main effects of the benefit regulation can be interpreted as the effect for non-distressed individuals.

In a tabulation of data from the Medical Expenditure Panel Survey, I find that a one standard deviation increase in mental distress results is correlated with an $860 increase in total spending for individuals with employer sponsored insurance, of which the individual is responsible for $125, so plan premiums should increase by approximately $60 per month per standard deviation of distress when going from no coverage to the average level of mental health benefits. For individuals without employer provided insurance, the comparable spending figure is $410 per standard deviation of mental distress all of which is paid by the individual. These differences in spending are not only due to increased spending on mental health care, but also spending on other medical services that are correlated with mental health care (Ellis and McGuire, 2007). In essence, individuals who have higher mental distress scores may be in worse physical health, in addition to being in greater mental distress.

In addition, the NHIS provides data on insurance coverage, employment, earnings and income, and hours worked. I define individual insurance using descriptions of up to four insurance plans and apply the hierarchy Medicare, Medicaid, other government, employer-sponsored, and self-

[25] The excluded MSAs are parts of the Boston-Worcester-Lawrence CMSA, Charlotte-Gastonia-Rock Hill MSA, parts of the Cincinnati-Hamilton CMSA, Kansas City MSA, Louisville MSA, Philadelphia-Wilmington-Atlantic City CMSA, Portland-Salem CMSA, Providence-Fall River MSA, and St. Louis MSA. The remaining MSAs are in Arizona, California, Colorado, Connecticut, Florida, Georgia, Illinois, Indiana, Louisiana, Massachusetts, Maryland, Michigan, Minnesota, North Carolina, New Jersey, New York, Ohio, Oklahoma, Pennsylvania, Tennessee, Texas, Utah, Virginia, Washington, and Wisconsin.

purchased insurance to assign a single type of insurance to each individual. In order to develop a sample that has the most consistent set of incentives, I drop anyone with Medicare coverage, either due to age or disability, and individuals with other government (non-Medicaid) insurance, typically from the Indian Health Service or the Department of Veteran's Affairs.

Data on employment, labor supply, and earnings are, unfortunately, not coded in a manner that is optimal for economists. In particular, the survey does not ask about weeks worked during the year, nor about wages, and what data are available have different reference periods. Therefore, I construct wages using data on wage earnings from the previous calendar year, the number of months worked in the previous calendar year at *any* job, and hours worked either last week or usually. The resulting wage measure is imperfect due to both timing differences between the components that are used in constructing the wage and the fact that I can not separately identify the wage of an individual's current main job.

Data on state mental health regulations are derived from Lang (2011), but with some differences affecting states with minimum mandated benefit laws. I code a state as mandating a benefit if Lang indicates that the state had a mental health parity mandate, which requires firm to provide mental health benefits if they provide other health insurance, or if Lang indicates that the state has a minimum benefit and the state law requires firms to provide, not just to offer, that minimum benefit.[26]

[26] The states that require mental health benefits (year of implementation in parentheses) are California (1974), Colorado (1992), Connecticut (2000), Illinois (1991), Louisiana (2001), Massachusetts (1996), Maryland (1995), Michigan (2000), Minnesota (1995), North Carolina (2008), New Jersey (2000), Oklahoma (2000), Pennsylvania (1999), Tennessee (1999), Texas (1998), Virginia (2000), Washington (2006), and Wisconsin (1998); states passing other regulations are Arizona (1998), Florida (1992), Georgia (1998), Indiana (2000), New York (1999), Ohio (1985), and Utah (2001). North Carolina and Washington, do not have any regulations governing mental health benefits during the study period.

# Chapter 4

# Supporting Material

Supporting Table 1.A: HCC Conditions and HRS Mappings

| Survey response | HCC | Description | Weight |
|---|---|---|---|
| Diabetes with kidney trouble | 15 | Diabetes with Renal or Peripheral Circulatory Manifestation | 0.764 |
| Diabetes without kidney trouble | 19 | Diabetes without Complication | 0.200 |
| Arthritis or rheumatism | 38 | Rheumatoid Arthritis and Inflammatory Connective Disease Tissue | 0.322 |
| Emotional, nervous, or psychiatric problem | 55 | Major Depressive, Bipolar, and Paranoid Disorders | 0.431 |
| Congestive Heart Failure | 80 | Congestive Heart Failure | 0.417 |
| Heart attack since last interview | 81 | Acute Myocardial Infarction | 0.348 |
| Angina or chest pains | 83 | Angina Pectoris/Old Myocardial Infarction | 0.235 |
| Stroke | 95 | Cerebral Hemorrhage | 0.392 |
| Chronic bronchitis or emphysema | 108 | Chronic Obstructive Pulmonary Disease | 0.376 |
| Fractured hip since last wave | 158 | Hip Fracture/Dislocation | 0.392 |

Supporting Table 1.B: First stage regressions

| | Without Health Risk | | With Health Risk | |
|---|---|---|---|---|
| | (1) Deductible | (2) Deductible × Part D | (3) Deductible | (4) Deductible × Part D |
| Simulated Deductible | 1.001** | -0.016 | 0.990** | -0.014 |
| | (0.066) | (0.020) | (0.067) | (0.020) |
| × Part D | -0.023 | 0.980** | -0.019 | 0.970** |
| | (0.043) | (0.058) | (0.041) | (0.059) |
| MN × Risk | | | -0.439** | -0.009 |
| | | | (0.112) | (0.024) |
| MN × Part D × Risk | | | 0.097 | -0.305* |
| | | | (0.145) | (0.129) |
| R-squared | 0.06 | 0.30 | 0.07 | 0.30 |
| N | 7238 | 7238 | 7238 | 7238 |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variable is indicated in the column header. Part D is an indicator for 2006 and 2008, Risk is the standardized health risk score, Simulated Deductible is the average amount an individual within a demographic group and drawn from a nationwide sample would need to spend to be eligible for coverage under the Medically Needy program. All models include year, state, and demographic group fixed effects, marital status, a cubic polynomial in age, and an indicator for smoking. Standard errors clustered on state in parentheses.

Supporting Table 1.C: Alternative Deductible Coding

| | Health risk | | Any Private | | Future Medicaid | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Medically Needy | | 0.010 | | -0.023 | | 0.039 |
| | | (0.094) | | (0.058) | | (0.030) |
| MN × Part D | | -0.035 | | 0.028 | | 0.044 |
| | | (0.082) | | (0.041) | | (0.029) |
| Alt Deductible | -0.010 | | 0.023 | | -0.039 | |
| | (0.094) | | (0.058) | | (0.030) | |
| Alt Deductible × Part D | 0.035 | | -0.028 | | -0.044 | |
| | (0.082) | | (0.041) | | (0.029) | |
| Alt Deductible × MN | -0.121 | -0.131 | 0.138 | 0.161 | -0.018 | -0.057 |
| | (0.191) | (0.227) | (0.115) | (0.159) | (0.063) | (0.086) |
| Alt Deductible × Part D × MN | -0.124 | -0.088 | -0.236* | -0.264* | -0.055 | -0.099 |
| | (0.195) | (0.196) | (0.096) | (0.123) | (0.072) | (0.097) |
| MN × Risk | | | -0.042* | -0.042* | 0.022* | 0.022* |
| | | | (0.017) | (0.017) | (0.011) | (0.011) |
| MN × Part D × Risk | | | 0.050* | 0.050* | -0.057** | -0.057** |
| | | | (0.021) | (0.021) | (0.021) | (0.021) |
| Insured | 0.013 | 0.013 | | | | |
| | (0.050) | (0.050) | | | | |
| Part D × Insured | -0.139 | -0.139 | | | | |
| | (0.086) | (0.086) | | | | |
| MN × Insured | -0.098 | -0.098 | | | | |
| | (0.061) | (0.061) | | | | |
| MN × Part D × Insured | 0.189+ | 0.189+ | | | | |
| | (0.104) | (0.104) | | | | |

+ p<0.1, * p<0.05, ** p<0.01

Notes: Dependent variable is indicated in the column header. Part D is an indicator for 2006 and 2008, Risk is the standardized health risk score, Alt Deductible is the alternative coding for the deductible described in Appendix 1.B. Insured is an indicator for having any private insurance coverage. All models include year, state, and demographic group fixed effects, marital status, a cubic polynomial in age, and an indicator for smoking. Standard errors clustered on state in parentheses.

Supporting Table 2.A: Alternative Deductible Coding

| | (1) Not Obese | (2) Not Overweight | (3) No Drinking problem | (4) Quit smoking | (5) Cholesterol test | (6) Flu shot | (7) Preventive index |
|---|---|---|---|---|---|---|---|
| Panel A | | | | | | | |
| Alt. Deductible | 0.072 | 0.126** | -0.034 | 0.070+ | -0.115** | 0.010 | 0.069 |
| | (0.047) | (0.047) | (0.025) | (0.040) | (0.035) | (0.066) | (0.075) |
| × Part D | 0.019 | -0.047 | -0.006 | -0.041 | 0.039 | -0.026 | -0.111+ |
| | (0.029) | (0.033) | (0.028) | (0.031) | (0.036) | (0.043) | (0.059) |
| × Medically Needy | 0.016 | 0.146** | -0.034 | 0.195** | -0.076 | -0.016 | 0.365* |
| | (0.083) | (0.056) | (0.053) | (0.073) | (0.062) | (0.112) | (0.172) |
| × Part D | -0.018 | -0.136 | -0.026 | -0.094 | 0.076 | -0.093 | -0.420** |
| | (0.079) | (0.101) | (0.079) | (0.073) | (0.094) | (0.103) | (0.160) |
| Panel B | | | | | | | |
| Medically Needy | -0.072 | -0.126** | 0.034 | -0.070+ | 0.115** | -0.010 | -0.069 |
| | (0.047) | (0.047) | (0.025) | (0.040) | (0.035) | (0.066) | (0.075) |
| × Part D | -0.019 | 0.047 | 0.006 | 0.041 | -0.039 | 0.026 | 0.111+ |
| | (0.029) | (0.033) | (0.028) | (0.031) | (0.036) | (0.043) | (0.059) |
| × Alt. Deductible | 0.087 | 0.272** | -0.068 | 0.265** | -0.191* | -0.006 | 0.434+ |
| | (0.115) | (0.081) | (0.073) | (0.100) | (0.082) | (0.136) | (0.223) |
| × Part D | 0.001 | -0.183 | -0.032 | -0.135 | 0.115 | -0.119 | -0.530** |
| | (0.101) | (0.122) | (0.103) | (0.094) | (0.122) | (0.139) | (0.199) |

+ $p<0.1$, * $p<0.05$, ** $p<0.01$

Notes: Dependent variable indicated by column heading. Medically Needy is an indicator for living in a state with a Medically Needy program; MN is short-hand for Medically Needy. Part D is an indicator for 2006 or after. Alt Deductible is the alternative coding for the deductible described in Appendix 2.A. Results from 2SLS regressions, instrumenting for the Alt. Deductible and Alt. Deductible × Part D using the simulated alternate deductible and the simulated alternate deductible × Part D. All models include state, year, and demographic group fixed effects, a cubic polynomial in age, and marital status. Standard errors clustered on state in parentheses.

Supporting Table 3.A: Distress and Mental Health Coverage by Industry

| | Mental distress | | Actuarial value | | Inpatient coverage | | Outpatient coverage | |
|---|---|---|---|---|---|---|---|---|
| | 1997 | 2009 | 1997 | 2009 | 1997 | 2009 | 1997 | 2009 |
| Construction | 0.56 | 0.56 | 0.54 | 0.73 | 1.00 | 0.99 | 0.99 | 0.93 |
| Educational services | 0.62 | 0.58 | 0.59 | 0.62 | 1.00 | 1.00 | 1.00 | 0.88 |
| Financial activities | 0.59 | 0.67 | 0.59 | 0.75 | 0.99 | 0.99 | 1.00 | 0.76 |
| Health care and social assistance | 0.58 | 0.60 | 0.57 | 0.52 | 0.97 | 0.99 | 0.99 | 0.91 |
| Information | 0.58 | 0.68 | 0.62 | 0.55 | 0.98 | 0.99 | 1.00 | 0.92 |
| Leisure and hospitality | 0.63 | 0.73 | 0.50 | 0.45 | 0.94 | 0.97 | 1.00 | 0.94 |
| Manufacturing | 0.60 | 0.63 | 0.60 | 0.41 | 0.99 | 0.99 | 1.00 | 0.85 |
| Other services | 0.67 | 0.59 | 0.60 | 0.67 | 1.00 | 0.94 | 1.00 | 0.93 |
| Professional and business services | 0.62 | 0.58 | 0.58 | 0.71 | 0.98 | 0.98 | 0.99 | 0.79 |
| Retail trade | 0.64 | 0.71 | 0.55 | 0.77 | 0.97 | 0.98 | 0.98 | 0.77 |
| Transportation and warehousing | 0.50 | 0.60 | 0.56 | 0.46 | 0.99 | 1.00 | 1.00 | 0.86 |
| Utilities | 0.59 | 0.31 | 0.64 | 0.60 | 0.99 | 0.96 | 1.00 | 0.82 |
| Wholesale trade | 0.53 | 0.57 | 0.54 | 0.78 | 0.97 | 1.00 | 0.99 | 0.80 |

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