Do Tax Subsidies for Private Insurance Reduce Medicaid Costs? Evidence from the Market for Long-Term Care Insurance

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Abstract

In spite of the large expected costs of needing long-term care, only 10-12 percent of the elderly population has private insurance coverage. Medicaid, which provides means-tested public assistance and pays for almost half of long-term care costs, spends more than $100 billion annually on long-term care. In this paper, I exploit variation in the adoption and generosity of state tax subsidies for private long-term care insurance to determine whether tax subsidies increase private coverage and meet policymakers' stated objectives of reducing Medicaid's costs for long-term care. The results indicate that the average tax subsidy raises coverage rates by 2.8 percentage points, or 30 percent. However, the response is concentrated among high income and asset-rich individuals, populations with low probabilities of relying on Medicaid. Simulations suggest each dollar of state tax expenditure produces approximately $0.84 in Medicaid savings, over half of which funnels to the federal government.

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1 Introduction

In 2007, the United States spent $2.2 trillion on health care, equivalent to a 16.2 percent and ever-growing share of GDP. The publicly-financed portion of this spending includes not only amounts spent by Medicare and Medicaid ($431.2 billion and $329.4 billion, respectively) but also the revenue loss that stems from the exclusion of employer-sponsored health insurance from individual income. This loss, currently the single largest tax expenditure, amounted to $145 billion in 2007.[1]

Economists have studied several aspects of the costs and benefits of providing these tax incentives, including their ability to reduce the number of uninsured, the elasticity of firms offering health insurance to their workers, insurance-induced "job lock," and distributional impacts, among others. The results of these studies are important in assessing implications of removing or expanding subsidies for health insurance. Little is known, however, about the ability of tax incentives for private insurance to reduce costs for public means-tested insurance programs. If, for instance, the $145 billion tax expenditure induces private insurance coverage among those otherwise eligible for Medicaid, the net loss in revenue may be less than the amount generally stated.

In this paper, I examine the ability of tax incentives to reduce public expenditures for long-term care, a substantial component of health care expenditures. The cost of long-term care expenditures, providing services to those with mental or physical impairments who cannot perform activities of daily living, amounted to $190 billion (or 8.5 percent of total health care expenditures) for all ages in 2007. This amount is expected to grow substantially due to the aging of the population (CBO, 2004), and represents a large financial risk for the elderly. While the probability of needing assistance is substantial and the costs of long-term care services can be upwards of $60,000 annually, private insurance coverage for long-term care is low: only 10-12 percent of the elderly population currently has private long-term care insurance, and private insurance paid for only 8.1 percent of costs in 2007. Public programs, rather, paid two-thirds of nursing home and home health care costs. Medicaid, the public health insurance program for low-income populations, serves as the primary safety net for catastrophic long-term care expenses once individuals qualify under the strict asset and income limits. Through this channel, Medicaid pays for almost half of long-term

[1] Joint Committee on Taxation, Tax Expenditures for Health Care (JCX-66-08), July 30, 2008, available at http://www.jct.gov. The figure cited does not include payroll tax revenue losses from the exclusion of employer-sponsored health insurance.

care; long-term care expenditures in turn account for over 30 percent of the total amount spent by Medicaid.[2]

The aging of the population has caused policymakers to examine ways to reduce Medicaid's exposure to this large and growing liability. From a policy perspective, providing incentives to purchase private insurance appears attractive because they both encourage individuals to take responsibility for their long-term care expenses and have the potential to deflect costs from Medicaid. Discussions surrounding legislative efforts to implement tax subsidies reflect this view:

> *Initially there will be some negative impact in terms of reduced income tax revenues, but this initial impact should be more than offset by reduced Medicaid costs as benefits become payable under qualifying long term care insurance policies.* (Fiscal Implications of Bill S04884, New York, 1999)

> *In short, enactment of this legislation is in the interest of District residents, as it helps facilitate their purchase of long term care insurance policies, and is in the fiscal interest of the District as it will lessen the need for Medicaid coverage for persons needing such coverage.* (Council of the District of Columbia, Committee on Finance and Revenue Report on Bill 15-136, 2004)[3]

Unlike private health insurance which has historically been heavily subsidized by the government through tax subsidies, private long-term care insurance did not enjoy tax preferences prior to the early 1990s. A limited federal subsidy was offered beginning in 1997, and in recent years, several states passed tax subsidy initiatives: while only three states had tax incentives for private long-term care insurance in 1996, by 2008, twenty-four states and the District of Columbia had adopted a tax subsidy for long-term care insurance premiums (see Figure 1). Furthermore, there is continuing interest at both the state and federal level to provide additional tax subsidies for private insurance: several bills have recently been introduced in Congress calling to expand the currently limited federal subsidy for private long-term care insurance.[4] Montana, one of the earliest adopters of a tax deduction, had a hearing on January 26, 2009 regarding H.B. 202 which outlined the provision of a new $150 tax credit.

[2]These and earlier figures refer to the costs of formal paid care provided in nursing homes and by home health care agencies provided in NHA (2009). The cost of providing informal care in terms of the market wage for these services is roughly of the same order of magnitude (Arno et al., 1999).

[3]This report can be found at http://www.dccouncil.washington.dc.us/images/00001/20050126113408.pdf.

[4]For example, H.R. 6237 "Tax Relief for Long-Term Care Act of 2008" provides a credit toward long-term care insurance premiums; H.R. 2582 "Qualified Long-Term Care Fairness Act of 2007" would allow premiums to be deducted from taxpayers' adjusted gross income.

Policymakers are limited in their ability to quantify the impact of these policies on both rates of insurance coverage and Medicaid expenditures. Fiscal estimates contained in legislative documents often assume no behavioral response in developing estimates of lost revenue. Those that do make an attempt to estimate the implications of such policies cite studies which lack empirical evidence (e.g. Wiener et al. (1994), Cohen et al. (1994), Cohen and Weinrobe (2000), Wiener et al. (2000)). These prior studies and more recent empirical work (Courtemanche and He, 2009) ignore and are unable to identify a key factor in determining the impact of higher rates of long-term care insurance on Medicaid expenditures: namely, that the impact on Medicaid depends crucially on the likelihood of those who respond to the tax incentives to otherwise become eligible for long-term care through Medicaid.

Fortunately, the variation in the adoption and generosity of tax subsidy programs across states and over time provides an ideal setting to examine the role of tax incentives in the market for private long-term care insurance and how responsiveness varies across observable characteristics. Figure 2 shows long-term care insurance coverage rates in the nationally-representative Health and Retirement Study (HRS) for individuals in states that never implemented a tax incentive (control states) and in states that implemented a tax subsidy for long-term care insurance between 1998 and 2001 (accounting for the majority of observations in treatment states). The figure shows that while coverage rates in the control and treatment states were similar prior to implementation of the tax subsidies, long-term care insurance coverage increased significantly in treatment states while remaining almost flat in control states. The growth in coverage is highly correlated with the introduction of tax incentive programs.

Controlling for observable differences across states and time, I find that tax incentives are effective in inducing purchase of private long-term care insurance: implementation of the average tax subsidy increases purchase rates by 2.8 percentage points, or approximately 30 percent. Because the majority of the tax subsidy programs are deductions from income, the value of which increases with the taxpayer's marginal tax rate, low-income individuals receive relatively small discounts from these incentive schemes. Thus it is unsurprising to find that the highest response to the tax incentives comes from individuals who are asset rich and have high income, groups who are less likely to rely on Medicaid for their long-term care.

The goal most widely-stated by policymakers is to shift the burden of long-term care costs away from Medicaid. Despite the relatively large response of purchasers to the tax subsidies, simulations that take into account that the subsidy-induced response in insurance coverage varies with wealth suggest that tax incentives are unlikely to substantially reduce government net expenditures. For each dollar of state tax expenditure, Medicaid saves approximately $0.84 in long-term care expenses, more than half of which is funneled to the federal government which jointly funds Medicaid. While the policy is net savings for the middle of the wealth distribution, those savings are overwhelmed by substantial net costs at the high end. The variability in the net cost across the wealth distribution highlights the fact that estimating the response to tax subsidies differentially by factors that determine Medicaid eligibility can lead to conclusions opposite from those drawn using estimates of average responsiveness, a key contribution of this paper.

Another potential consequence of tax incentives is to alter the set of individuals who purchase insurance, potentially reducing adverse selection and decreasing administrative costs to insurers. The results suggest that tax-induced purchasers do not differ in their observable characteristics from those who purchased long-term care insurance prior to the implementation of a tax subsidy. Thus, while healthy individuals are more responsive to tax incentives, they do not appear to differ greatly from those who purchased insurance prior to the inception of the subsidies.

The evidence suggests that information plays a role in the results. The presence of a tax subsidy appears to drive the response more than the subsidy's generosity, and the response is not proportional to the amount of the subsidy. These results suggest that the response to the tax subsidy may be partially attributable to factors such as increased awareness of long-term care risks, government signaling, or increases in marketing by insurance companies. Differential access to information may be one reason groups respond differently to the implementation of a tax incentive, and the role that information plays is important in assessing policy implications as tax subsidies that alter insurance coverage rates for groups with a higher propensity for Medicaid eligibility could potentially succeed in shifting costs away from Medicaid. Eliminating tax subsidies for high wealth groups may represent an alternative means of making the policies cost-effective.

The variation in the after-tax price caused by the implementation of tax subsidies also allows me to estimate the responsiveness of private long-term care insurance purchase to the after-tax price, of which there is little empirical evidence. I employ a simulated instrumental variables

(IV) approach where the instrument for the after-tax price is equal to the average after-tax price for a nationally representative sample of 5,000 individuals in each state and year by educational attainment. This approach isolates variation in the after-tax price arising from the tax subsidy and eliminates bias stemming from potential correlation between one's marginal tax rate and their demand for long-term care insurance. The panel nature of the HRS also allows me to perform estimation using individual fixed effects. My most-preferred estimate of the price elasticity with respect to the after-tax price is -3.6, significantly more elastic than estimates in the literature for health insurance. This estimate is identified solely by the variation in the after-tax price from changes in state tax incentive programs. I also find similar results when I measure the effects of these tax subsidies on long-term care insurance relative to insurance products that insure similar risks such as life insurance and annuities.

The remainder of the paper proceeds as follows. Section 2 provides additional background on the market for long-term care insurance and tax preferences for private insurance. Section 3 describes the data and the estimation strategy, and the results of the empirical analysis are presented in Section 4. Section 5 describes the consequences of tax incentives as they relate to the division of long-term care financing and adverse selection and Section 6 concludes.

2 Background and Previous Literature

2.1 The market for private long-term care insurance

According to a Congressional Budget Office (CBO) report, 19 percent of individuals 65 and older experience some degree of chronic physical impairment; among those 85 or older, the proportion of people who are impaired and require long-term care is approximately 55 percent (CBO 2004). In addition, the costs of long-term care services can be substantial. In 2006, the national average annual cost of nursing home care was $62,532 for a semi-private room. Assisted living facilities, which provide room, meals, housekeeping, and custodial care, cost an average of $32,294 annually and many residents pay extra for additional skilled services. Home health aides charge an average hourly rate of $25; four hours of home health aide services daily would cost approximately $36,500 per year (Genworth, 2007).

Despite the high risks of needing costly care, only 10-12 percent of the elderly population is covered by private insurance. Public programs, including Medicare and Medicaid, were the largest payers, accounting for over 65 percent of long-term care expenditures in 2007. Medicaid, in addition to being the provider of health care for individuals with limited incomes and assets, provides long-term care services to those who meet certain income and asset eligibility criteria.[5] Medicaid alone accounts for almost half of all long-term care costs. Medicare, the federal program which provides health insurance to individuals over age 65, covers only limited stays in skilled nursing facilities following an acute health event, and some home health care for these eligible individuals. The next largest source of long-term care financing after government sources is out-of-pocket payments (22 percent in 2007). Private insurance paid for a relatively small share of nursing home and home health care expenses, accounting for less than 9 percent of expenditures in 2007 (NHA, 2009).

The market for private long-term care insurance is small and incomplete. Norton (2000) describes many of the possible reasons for a thin insurance market. Demand-side reasons include difficulty in understanding long-term catastrophic risks and misconceptions about who pays for long-term care. Eighty-three percent of non-buyers cite cost as an important or very important reason they do not purchase private long-term care insurance (AHIP, 2007). The average annual premium for a 65-year old for a policy with protection against inflation was $2,346 in 2002, and the cost rose to $7,572 if purchased at age 79 (AHIP, 2004).

The interaction of Medicaid and the market for long-term care insurance has been examined in a series of papers by Brown and Finkelstein (2007, 2008) and Brown, Coe and Finkelstein (2007). In Brown and Finkelstein (2008), the authors show that private insurance pays for benefits that would have otherwise been provided by Medicaid and, by protecting assets, reduces the chances of qualifying for Medicaid. Therefore, while Medicaid's stringent income and asset tests require individuals to spend down their wealth and leave many exposed to considerable out-of-pocket expenditure risk, Medicaid could explain the crowd out of private insurance purchase for at least two-thirds of the wealth distribution.

Policy discussions in the 1980s recognized the fact that private insurance policies may appear unattractive to consumers who were likely to receive benefits from Medicaid. These discussions

[5]The eligibility criteria for Medicaid long-term care services differ from state to state but the criteria are within federally set guidelines.

resulted in the development of a new insurance model called the "Partnership for Long-Term Care." Beginning in 1992, residents of four states (California, Indiana, Connecticut and New York) were able to purchase private policies that relaxed the asset test for Medicaid eligibility once private insurance benefits were exhausted. This model increased asset protection under Medicaid by an amount that depended on the policy purchased and the state rules. The motivation behind these programs, similar to the aim of tax subsidies, was to increase private insurance coverage by those whose long-term care was likely to be financed by Medicaid. The evaluation of these programs was mixed; while some were optimistic that Medicaid expenditures will be reduced (Meiners, 2001), others noted that those who hold partnership policies are perhaps those who would have purchased private policies in the absence of the partnership programs (Stone-Axelrad, 2005).[6] In the empirical analysis that follows, differing levels of demand for private insurance among partnership states can be controlled for by using state fixed effects because the programs were implemented prior to the study period analyzed here.

Supply-side reasons for the lack of private long-term care insurance coverage include high administrative costs. The majority of long-term care insurance policies are sold through the individual market.[7] In addition, insurers demand relatively high risk premiums because the risk that nursing home expenses increase significantly or that a larger share of the population needs long-term care cannot be adequately diversified across cohorts by insurers. The nature of this risk is thought to be a reason the private long-term care insurance market offers "indemnity benefits" rather than "service benefits," i.e. benefits payable as a specific dollar amount per day rather than reimbursement of the costs incurred (Cutler, 1996).

2.2 Tax preferences for private long-term care insurance

Figure 1 shows the states which offered a tax subsidy for private long-term care insurance during the sample period and their relative generosity as a percentage of annual premium costs.[8] The

[6]Following the Deficit Reduction Act of 2005, additional states applied for waivers to implement partnership programs beginning in 2007.

[7]Group policies are increasingly offered by employers and represent a growing segment of the market. According to the U.S. Bureau of Labor Statistics, 12 percent of workers in private industry had access to long-term care insurance through their employer in 2006.

[8]States that implicitly offer the same subsidy at the state level because the tax base for the state return is the same as the federal return described in the following paragraph are not coded as having a tax subsidy in Figure 1 or subsequent analyses.

subsidies take the form of tax deductions or tax credits as described in more detail in Appendix A, and Appendix B describes the methods used to obtain the value of each subsidy as a percentage of premium. Even among states with similar tax incentive structures, there is considerable variation across states in the subsidy amount. While some of the variation is due to the precise definition of the tax incentive, a significant portion is due to differences in state marginal tax rates which influence the value of a premium deduction.

Federal legislation in the 1996 Health Insurance Portability and Accountability Act (HIPAA) enacted a tax preference for long-term care insurance in the federal tax code that took effect in 1997. HIPAA designated that premiums for long-term care insurance could be counted toward the federal tax deduction for unreimbursed medical expenses. Unreimbursed medical expenses, however, must be over 7.5 percent of adjusted gross income (AGI) to be granted a tax deduction, and this deduction is only available to households who itemize deductions on their federal tax return. These restrictions imply that a relatively small set of individuals are eligible for this tax subsidy. In addition, the amount of premium that can be deducted is limited to an amount that varies by age.[9]

Concurrent work by Courtemanche and He (2009) studies this change in the federal tax treatment of long-term care insurance premiums and finds that the federal tax incentives for long-term care insurance increased purchase rates by approximately 25 percent for those likely to itemize their medical expenses (based on previous itemizing status and medical expenses). While the results for the average response are quantitatively similar as those found in this study, the authors' identification strategy prevents them from examining how responsiveness varies across factors that determine Medicaid eligibility, a key driver of the impact on Medicaid costs, due to lack of variation among the treatment group. The numerous and varied state tax initiatives provide a rich setting to not only see how the response varies for different subpopulations, but also to examine the degree to which the size of the subsidy influences the response. Assessing the role of information in increasing take-up of private long-term care insurance has important implications for the design of future tax initiatives and public policy regarding private long-term care insurance.

[9]In 2008, the limits are $310 for age 40 or less, $580 for age 40-50, $1,150 for age 50-60, $3,080 for age 60-70, and $3,850 for age 70+. There is some question as to whether HIPAA only clarified the inclusion of long-term care insurance premiums in medical expenses; some believe that the deduction was used before 1996.

3 Data and Estimation Strategy

3.1 Data source and sample

The data used in this paper comes from the Health and Retirement Study (HRS), sponsored by the National Institute on Aging. The HRS began as a biannual panel study on respondents age 51-61 in 1992 (born in 1931-1941) and their spouses. A separate sample, denoted as Asset and Health Dynamics among the Oldest Old (AHEAD) and consisting of cohorts born before 1923, was surveyed in alternate years until these samples were merged in 1998. At this time, two more samples were added: the War Baby (WB) sample, made up of those born from 1942 through 1947, and the Children of the Depression Age (CODA) sample, containing cohorts born from 1924 through 1930 (i.e. the missing birth cohorts between the HRS and AHEAD samples). All samples were merged for the purposes of this study. The respondents and their spouses were interviewed every two years, and the latest available survey responses comprising the eighth wave of the survey were taken in 2006. The survey contains a large amount of information regarding demographics, health status, family structure, housing, work history and current employment, disability, retirement plans, net worth, income, and insurance coverage.

Similar to the approaches used in Brown, Coe and Finkelstein (2007) and Courtemanche and He (2009), the analysis is limited to individuals aged 50-69, the prime buying age for long-term care insurance.[10] Only Waves 3-8 of the HRS are used in the analysis due to ambiguous question wording in the first two waves of the survey.[11] Restricted access was obtained to match the HRS with state identifiers that are not part of the publicly available dataset. In addition, this dataset was augmented with data describing characteristics of state tax incentives for long-term care insurance which were collected from historical state tax return forms for all states from 1995 onwards. State level data on nursing facility occupancy rates, nursing home beds per 1,000 people age 65 and over, percent of state population age 65 and over, average nursing home private pay and Medicaid rates, and Medicaid eligibility data were merged from various sources.[12] The final sample includes 52,354

[10] In a survey of buyers described in AHIP (2007), over 75 percent of buyers are in this age group. The average age of buyers of long-term care insurance from this survey is 61.

[11] See appendix in Finkelstein and McGarry (2006) for a complete discussion.

[12] Nursing facility occupancy rates, beds data, and demographic data were obtained from AARP's *Across the States* reports, various years. Nursing home private pay rates were available from 2002-2007 from MetLife Nursing Home Surveys, various years. A missing data binary variable for years prior to 2002 is also included. Medicaid rates for 1996-2004 and Medicaid eligibility data were generously provided by David Grabowski. Further discussion regarding

observations on 15,756 unique individuals. The dependent variable in the regression analyses that follow is a binary variable indicating coverage by private long-term care insurance.

In each wave of the survey, approximately 10 percent of the respondents have private long-term care insurance. Table 1 displays characteristics of the sample by long-term care insurance coverage status. The table highlights the fact that long-term care insurance coverage is associated with more assets, higher income, and higher levels of education. There is no large difference in age or gender by coverage status. Approximately 30 percent of the observations were sampled in a state and year where a tax incentive for long-term care insurance was available, with a higher percentage living in a state with a deduction than a credit.

The level of private long-term care insurance coverage varies significantly across different observable characteristics. Table 2 summarizes coverage rates across subsamples before implementation of any tax incentives, and the average subsidy levels available to these different groups. In general, because the likelihood of coverage is highly correlated with income and the subsidies tend to be more valuable to high-income individuals, the highest subsidies are offered to populations with relatively high pre-subsidy coverage rates.

3.2 Identification strategy

The first approach taken in this paper is to formalize the relationship highlighted in Figure 2 to determine whether the presence of a tax incentive led to a higher probability of private long-term care insurance coverage controlling for observable individual-level and state-level characteristics. Specifically, I estimate the equation:

$$LTCI_{ist} = \gamma SUBSIDY_{st} + \beta X_{ist} + \omega_t + \sigma_s + \mu_i + \varepsilon_{ist} \tag{1}$$

The dependent variable $LTCI_{ist}$ is equal to one if individual i who lives in state s has private long-term care insurance in year t. The variable $SUBSIDY_{st}$ is a binary variable that indicates whether state s has a subsidy at time t. X_{ist} is a vector of individual- and state-level characteristics, including controls for education, gender, marital status, age, race, income, assets, number of children, retirement status and health status, and the state-level characteristics

these data can be found in Grabowski et al. (2004) and Grabowski and Gruber (2007) and summary statistics of these data are available upon request.

mentioned previously. This vector also includes a binary variable that indicates whether the individual is eligible to receive a federal subsidy under HIPAA.[13] All specifications include year fixed effects ω_t to control for general trends in private long-term care insurance coverage. State fixed effects σ_s are used as indicated in the results and control for unobservable time-invariant state characteristics such as state nursing home quality, presence of Partnership insurance policies, and residents' taste for insurance that may vary systematically. The panel nature of the dataset also allows estimation using individual fixed effects to estimate within-person effects of tax subsidies on insurance coverage. Specifications which include individual fixed effects, denoted by μ_i, omit time-invariant individual controls such as race, gender, and education. Standard errors are clustered at the state level to account for potential correlation of the error terms within states.

The estimate of γ in Equation 1 represents the effect the presence of a tax subsidy had on long-term care insurance coverage, controlling for observable characteristics, relative to changes over time in states that did not implement a tax incentive. Estimation in specifications with state fixed effects only utilizes variation within states over time in tax incentive programs. The identifying assumption for this model is therefore the absence of state-specific time trends in coverage rates correlated with $SUBSIDY$ that would have caused trends in private long-term care insurance coverage to differ without implementation of the tax subsidy. With the addition of individual fixed effects, identification comes only from within-person changes in $SUBSIDY$.

The second approach taken is to exploit differences in the value of the tax subsidy in terms of its effect on the after-tax price of private insurance. The variable $TAXPRICE$ denotes the after-tax price of \$1 of private long-term care insurance in terms of foregone consumption.[14] I estimate the equation:

$$LTCI_{ist} = \delta TAXPRICE_{ist} + \beta X_{ist} + \omega_t + \sigma_s + \mu_i + \nu_{ist} \tag{2}$$

This approach differs from the method used in Equation 1 because it treats tax incentives that provide a larger value differently from tax incentives that do not heavily subsidize premiums. The variable $TAXPRICE$ varies by state and year with the implementation of the tax subsidy. It also

[13] This binary variable is equal to 1 for individuals who itemize their medical expenses in years 1997 onward.

[14] Details regarding the calculation of the state marginal tax rate and the after-tax price of private long-term care insurance can be found in Appendix B.

varies at the individual level, in many cases with the individual's marginal tax rate. Running OLS on Equation 2 implies that the estimate of δ is identified off of (1) changes in tax incentives for long-term care insurance, and (2) non-linearities in the state's tax schedule, after controlling for the individual's state of residence, income, and other covariates. The concern in the OLS estimate is that the control variables may not completely account for potential correlation between marginal tax rates and individual demand for insurance. The resulting bias could go in either direction. For instance, there may be a negative correlation between $TAXPRICE$ and unobservable individual components of private long-term care insurance demand if insurance is a normal good and the effect of income is not properly accounted for by X. A positive correlation could arise if individuals who value insurance are also taking other actions to reduce their marginal tax rate.

Therefore, I also instrument for $TAXPRICE$ with a set of simulated instruments where the instrument in each state and year is equal to the average after-tax price for a nationally representative sample of 5,000 individuals, similar to the approach developed in Currie and Gruber (1996). Because the after-tax price is calculated for the same set of individuals, the only variation in the instrument comes from changes in tax subsidies for long-term care insurance. To allow the value of the subsidy to change differentially for individuals in different socioeconomic groups, the instrument is averaged separately for low education (high school or less) and high education (some college or more) groups. The IV estimates of δ are therefore identified by changes in the after-tax price arising from the tax subsidies and not contaminated by potential unobserved factors correlated with the individual's marginal tax rate and insurance purchase decisions. This methodology follows several other studies in the health insurance literature that use an IV strategy to address potential correlation between tax rates and insurance purchase (e.g. Royalty (2000), Finkelstein (2002), Gruber and Lettau (2004)). The average simulated after-tax price is a valid instrument as it is highly correlated with $TAXPRICE$, and has no direct bearing on an individual's long-term care insurance purchase decision.

4 Results and Interpretation

4.1 Main results: The effect of tax incentives on long-term care insurance coverage

Figure 2 provided suggestive evidence that tax incentives had a significant causal effect on the purchase of private long-term care insurance, but did not control for other individual or state characteristics that may have been changing over time. The results of the regression described by Equation 1 are summarized in Table 3 and confirm that the tax incentives had a significant impact on private long-term care insurance coverage rates. Column 1 includes only $SUBSIDY$ and year fixed effects. Column 2 adds in all control variables and Column 3 includes state fixed effects. Column 4 represents the fully-specified model, including all control variables and individual fixed effects. The results in Column 4 indicate that the presence of a tax incentive for long-term care insurance increased the probability that an individual will be covered by 2.8 percentage points. This coefficient is precisely estimated and statistically significant at the 1 percent level. At the pre-subsidy coverage rate of 9.4 percent, the implementation of a tax subsidy is associated with a 30 percent increase in the probability of coverage.

The coefficients on additional covariates, displayed in Appendix C, are of the expected signs. Higher income and assets are associated with higher rates of insurance ownership, and coverage rates are higher among individuals with more education. As the number of children increases, the demand for private long-term care insurance decreases, reflecting the substitutability of informal care for formal care that private insurance reimburses. Poor or fair health status is associated with lower ownership rates, and black, Hispanic or the "other" race category are associated with lower take-up relative to whites. Older respondents and those who are retired are more likely to hold private long-term care insurance. The Medicaid eligibility rules and payment rates are not estimated with precision, likely due to the low amount of variability within states.

Table 4 displays the OLS and IV estimates of δ, the coefficient on the after-tax price of private long-term care insurance in Equation 2. As in Table 3, the first set of results in each row contain only year fixed effects; the second set adds control variables; the third set adds state fixed effects; and the final set includes individual fixed effects. In general, the estimated coefficients of $TAXPRICE$ are significantly different from zero. First-stage regression results confirm the power of the simulated after-tax price in predicting the actual after-tax price an individual faces. The hypothesis that

the instrument should be excluded from the first stage can be strongly rejected with F-statistics in the thousands.[15] The OLS estimates are largely identified off of the non-linearities in the tax schedule which may produce bias if marginal tax rates are correlated with long-term care insurance coverage after controlling for observable factors. The IV estimates are more negative than the OLS estimates, suggesting that there are unobservable factors that are positively correlated with private long-term care insurance coverage that are also positively correlated with the after-tax price after controlling for X, biasing the OLS estimate of δ upward. There are several candidates for these unobservable factors. For example, bequest motives are highly predictive of private long-term care insurance purchase because spending down one's wealth to qualify for Medicaid benefits eliminates the possibility of leaving an estate for one's heirs. A person with a large bequest motive may be taking advantage of tax-deferred or tax-free savings vehicles, and consequently, after controlling for income, would have a lower marginal tax rate and a higher after-tax price. Similarly, an individual who is financially savvy and familiar with the tax code (or who has access to a paid tax preparer) may be more likely to respond to long-term care insurance tax incentives and also more likely to take advantages of other tax incentives that reduce her marginal tax rate.

Because of the potential bias arising from identification off of non-linearities (or changes in non-linearities) in the tax schedule and contamination from measurement error in $TAXPRICE$, the estimate in Column 8 of Table 4 represents my preferred estimate of the response in coverage to changes in the after-tax price from tax incentives for long-term care insurance. An estimated coefficient of -0.340 means that a 10 percent decrease in the after-tax price of long-term care insurance increases the probability of coverage by 3.40 percentage points. The implied price elasticity with respect to the after-tax price is simply -0.340/0.0944 = -3.60.

Few studies have provided estimates of the price elasticity of long-term care insurance. Cramer and Jensen (2006) estimate logit models of demand as a function of price and find elasticities in the -0.23 to -0.87 range. However, their results are driven by the variation in premiums by age rather than a source of exogenous variation. Johnson et al. (2007) estimate hazard models of time to purchase long-term care insurance as a function of the net benefit that individuals expect to derive from the policy and estimate a price elasticity of demand of -0.75. Neither estimate accounts for the potential bias created by unobservable components of individual demand.

[15]The complete first-stage results are not reported but available upon request.

Only the elasticity estimated by Courtemanche and He (2009) of -3.9 is within the range of IV estimates produced here, but the approach taken in this study relies on fewer assumptions relating to the exogeneity of treatment status. The validity of Courtemanche and He (2009)'s approach depends on the persistence of itemizing status and medical expenses and the assumption that the decision to file taxes and itemize medical expenses is exogenous to long-term care insurance purchase. Moreover, many of the state initiatives are more broadly defined, applying to a larger segment of the population than the federal incentive. Courtemanche and He (2009) find that 14 percent of people in their sample itemized medical expenses and are likely to be affected by the federal tax incentive. It is uncertain, therefore, whether their results can be generalized to the elderly population.

The estimated price elasticity is larger in magnitude than those generally found for health insurance. Estimates of price elasticities for health insurance are between 0 and -3, with the bulk between -0.5 and -1.[16] However, each elasticity estimate is valid only for a local range of coverage rates, and the much higher baseline ownership rates for health insurance (65-70 percent) make these values difficult to compare. The high estimated price elasticity for long-term care insurance is consistent with survey responses that indicate cost as a large factor in purchasing private coverage.

4.2 The role of information, effects on the intensive margin, and heterogeneity in responsiveness

4.2.1 The role of information

It is possible that the estimated response of long-term care insurance purchase to state tax subsidies is attributed to changes in the after-tax price of long-term care insurance when the true response was primarily due to informational campaigns or media coverage correlated with implementation of the tax incentives. The role of information is important for several reasons. If tax incentives induced long-term care insurance purchase primarily because the existence of a subsidy increased awareness of long-term care costs and risks, there may be policies that increase private insurance coverage

[16] One strand of literature examines the elasticity of insurance coverage (Gruber and Poterba (1994), Marquis and Long (1995), Chernew, Frick and McLaughlin (1997), Auerbach and Ohri (2006)). Because the primary channel of health insurance coverage is through the employer, several studies also examine the price elasticity of firms offering insurance (Feldman et al. (1997), Marquis and Long (2001), Chernew and Leibowitz (1992), Royalty (2000), Finkelstein (2002), Gruber and Lettau (2004)).

rates that are less expensive than offering tax subsidies. Differential information dissemination may be at least partly attributable for responses that vary across demographic characteristics. How big a factor information is in changing coverage rates in this context also dictates the generalizability of the estimated price elasticity to other price changes.

One strategy to address this issue is to determine whether the primary driver of the response is the presence of the subsidy or the subsidy's generosity. I therefore estimate specifications with both $SUBSIDY$ (which indicates a subsidy's presence) and $TAXPRICE$ (a measure of the subsidy's generosity) on the right hand side. Another strategy is to determine whether the response is proportional to the amount of the subsidy. If, for example, states with large subsidies experience the same response as states with small subsidies, there would be evidence that non-price-related factors are playing a large role.

Table 5 presents the results of these specifications. The first row shows the results of including both $SUBSIDY$ and $TAXPRICE$ on the right hand side. The estimates can be compared to those presented in Tables 3 and 4. As more control variables are included, the variable indicating the presence of the subsidy appears to be playing a larger role than the intensity variable.

The second row shows the response among states that have subsidies in the form of tax credit and states that have tax deductions separately. Tax credits tend to be more generous than tax deductions: the average subsidy level in a credit state is 6.6 percent while deductions offer an average discount of 2.6 percent. However, the lack of a large difference in the response suggests that the response is not proportional to the amount of the subsidy. This hypothesis is supported by the results in the third row, which estimates separate responses for states where the average subsidy is less than five percent and states where the average subsidy is greater than five percent.[17] The average subsidy among individuals in small subsidy states and large subsidy states is 2.1 percent and 6.1 percent, respectively. While the large subsidy states experience a larger increase in coverage, the increase is not as large as the relative size of the subsidies may suggest.

In short, the results suggest that the response to tax subsidies is not proportional to the amount of the subsidy. Changes in the after-tax price may be more salient in nature than price reductions and may be perceived as a signal from the government to purchase long-term care insurance;

[17]Small subsidy states are AL, CO, DC, IA, ID, IN, KS, KY, MD, ME, MO, MT, NE, NM, OH, VA, and WV. Large subsidy states include MN, NC, ND, NY, OR, UT, and WI.

therefore, the price elasticities estimated here may not generalize to other price changes. Media coverage about tax subsidies and the risks of needing long-term care may influence coverage rates and tax subsidies may also give an avenue for insurance companies to increase the marketing of their products.

4.2.2 Effects on the intensive margin

Because tax subsidies reduce the after-tax price of long-term care insurance, it is possible that more generous policies were purchased as a result. To examine the effect on the intensive margin, I estimate analogs of Equation 1 with indicators of two optional policy features on the left-hand side for the whole sample of respondents: whether the policy contains a rider for inflation protection that prevents benefits from eroding over time, and whether the policy covers both nursing home care and home care, providing covered individuals with more flexibility to meet their long-term care needs. The results are summarized in Table 6. The estimates indicate that tax incentives increased the probability that individuals had inflation-protected coverage and coverage of both nursing home and home care by 1.1 and 2.5 percentage points relative to a base of 3.8 and 7.0 percent respectively. Tax incentives therefore appear to have affected long-term care insurance coverage decisions both at the extensive and intensive margin.

The higher rates of coverage by both of these optional benefits represents an increase in the comprehensiveness of coverage provided by private insurance contracts. In particular, the lack of inflation protection provided by basic policies leave many exposed to considerable out-of-pocket risk and at greater risk of relying on Medicaid. The associated increase in inflation-protected policies therefore represents a meaningful increase in the insurance value of private long-term care insurance.

4.2.3 Who responds to tax incentives?

As was shown in Table 2, different subsamples of the population had varying degrees of pre-subsidy coverage of private long-term care insurance, and were also treated with different levels of subsidy because of the way the tax subsides were structured. I estimate fully-interacted versions of Equation 1 to determine whether responsive to the tax incentives varies across observable characteristics such

as income, wealth, education, retirement status, marital status, gender, age, self-reported health status, and limitations in activities of daily living (ADLs).

There is substantial heterogeneity in the estimated effect of tax subsidies on the probability of private long-term care insurance across many of these different observable characteristics, as summarized in Table 7.[18] The most striking fact is that the response to tax incentives is heavily concentrated among individuals with high income and a large amount of assets, not surprising given that the value of the subsidies is often directly related to marginal tax rates. The estimated coefficients change in sign and are not statistically significant for the low income and low asset subsamples. The high income subsample has the largest implied elasticities despite the higher base take-up rates prior to implementation of the tax incentive and the higher value of the subsidies to these individuals. Similar effects are present when the sample is cut by education status though there are small effects of tax incentives on coverage among those with a high school education or less. Because of the strong correlation between income, assets, and education, it is difficult to disentangle the effects of these three characteristics separately. However, the evidence indicates that while state tax incentives do induce coverage of private long-term care insurance, they are most effective among groups with high income, a large amount of assets, and those who are more highly educated.

High income and high wealth individuals may be unlikely candidates for receiving long-term care benefits from Medicaid; therefore, the tax expenditures that arise from these policies may not be as effective in reducing public expenditures for long-term care relative to more targeted policies. This issue is explored further in Section 5.

4.3 Specification checks and falsification exercises

4.3.1 Specification checks

The results shown are robust to a variety of different specifications. The above specifications were also estimated using the non-linear probit model and produce estimates that are extremely similar in magnitude, with marginal effects of $SUBSIDY$ between 1.6 and 2.3 percentage points. Because the purchase of long-term care insurance is often a joint decision, the analysis was also done at

[18] The results shown in Table 7 are from specifications analogous to Columns (3) and (4) in Table 3

the couple level in contrast to the above specifications which treat husbands' and wives' decisions separately. When modeling the coverage decision for couples, the analysis was done using two dependent variables: the first a binary variable that indicated whether at least one member of the couple was covered by private insurance, and the second a binary variable that indicated whether both members of the couple were covered. The pre-subsidy coverage rate for the less restrictive dependent variable was 12.2 percent, while only 3.3 percent of couples reported both having private long-term care insurance. The presence of a tax incentive was estimated to have a 2.3 percentage point increase using the first dependent variable, and a 1.2 percentage point increase using the second, broadly consistent with the reported results. Finally, the specifications were run omitting the South, an area with fewer tax incentives and potentially different regional trends. Under this sample selection, the estimated response of tax incentives was to increase coverage rates by 3.0 percentage points, similar to the estimates shown in Table 3.

4.3.2 Comparison to other insurance purchase

To eliminate the possibility that the response is driven by shocks in insurance demand correlated with the implementation of subsidies for private long-term care insurance, I estimate the above specifications with dependent variables that denote either life insurance coverage or annuity income.[19] Because neither life insurance nor annuity income were tax-preferenced in the same pattern as private long-term care insurance, an estimated effect of $SUBSIDY$ on life insurance or annuity demand would signify either unobservable shocks in demand for insurance that happened in conjunction with tax incentive implementation or non-zero gross cross-price elasticities between private long-term care insurance and these other insurance products. This exercise is in the spirit of Royalty (2000) which uses both state variation in marginal tax rates and comparison to non tax-preferenced fringe benefits as sources of identification of the price elasticity of health insurance.

The estimates of $SUBSIDY$ on the probability of coverage are shown in Table 8. Neither life insurance nor annuity income were affected by the tax incentives for private long-term care insurance purchase. The estimated coefficients are small in magnitude, often flip in sign, and are

[19]The definition of life insurance used is a policy that does not provide a cash value upon surrender of a policy. The HRS does not contain information on whether an individual has purchased an individual annuity, so the measure of annuity income used is whether the respondent is currently receiving income from an annuity.

statistically insignificant.[20] The fact that the tax incentives increased long-term care insurance coverage and had no effect on other insurance purchase supports the claim that unobserved trends in insurance demand common to these different types of insurance are not likely to be biasing the estimates of γ and δ described earlier.

5 Further Consequences of Tax Incentives

The impact of policies to provide tax incentives to purchase private long-term care insurance in this context depends strongly on the characteristics of those who respond to tax incentives. One potential consequence is to thicken the market for long-term care insurance and reduce adverse selection. In addition, a central question for policy-makers is the magnitude of the reduction in Medicaid costs incurred by those induced to purchase private long-term care insurance and its relationship to the accompanying tax expenditures. This section assesses these two objectives.

5.1 Do tax-induced purchasers look different from other purchasers?

By subsidizing purchase of private insurance, tax incentives have the potential to expand the pool of buyers and reduce loading factors from premiums. Despite the fact that Finkelstein and McGarry (2006) do not find evidence of high utilization among purchasers of private insurance, Brown and Finkelstein (2007) provide evidence that premiums are marked up substantially higher than expected benefits. The average load for a 65-year-old purchaser is 0.18, implying that the policy holder will receive on average 82 cents for every dollar paid in premiums, and the load increases to 0.51 if lapsation of policies is accounted for.[21] Tax incentives may also reduce the average expected cost by attracting healthier people into the pool. Because of underwriting requirements, it is unlikely that individuals already in poor health would purchase insurance as a result of a tax incentive, confirmed earlier in Table 7.

To explore this idea further, Table 9 presents selected demographic characteristics of individuals living in subsidy states who purchased long-term care insurance before and after the tax incentive

[20] In results not reported, OLS and IV estimates of the coefficient on $TAXPRICE$ provide very similar results.

[21] These loads are higher than those estimated on life annuities in Mitchell et al. (1999) (15-25 cents per dollar) and health insurance in Newhouse (2004) (6-10 cents for group health insurance and 25-40 cents for individual insurance).

was implemented.[22] Overall, there are not large differences among the people in the two groups. Those who purchased coverage after the subsidy are less likely to be female and more highly educated, but do not differ greatly in the amount of income, assets or health status. Table 9 therefore suggests that while healthy individuals are more responsive to tax incentives, the health status of tax-induced purchasers does not differ greatly from those who purchased insurance prior to the implementation of the subsidy.

5.2 Do tax incentives for private insurance reduce Medicaid costs?

The stated objective in implementing tax incentives at the state level is to reduce Medicaid expenditures for long-term care. In this section, I use the results from this paper along with estimates from the literature to provide an estimate of the fiscal impact of tax subsidies for private insurance.

I simulate the estimated savings to Medicaid from higher insurance coverage and the estimated costs of providing a tax subsidy for a 65-year-old in each wealth decile i and gender g. I define insurance coverage rates before and after the implementation of the subsidy as $P_i(I)$ and $P_i'(I) = P_i(I) + R_i$, respectively, where R_i denotes the response to the tax incentive for wealth decile i. $M_{i,g}(I)$ and $M_{i,g}(N)$ represent the share of the expected present discounted value (EPDV) of long-term care expenditures with and without private insurance for wealth decile i and gender g. The Medicaid share prior to and following the tax subsidy is therefore equal to $M_{i,g}(T)$ and $M_{i,g}'(T)$ respectively as defined below:

$$M_{i,g}(T) = P_i(I) \times M_{i,g}(I) + (1 - P_i(I)) \times M_{i,g}(N) \tag{3}$$

$$M_{i,g}'(T) = P_i'(I) \times M_{i,g}(I) + \left(1 - P_i'(I)\right) \times M_{i,g}(N) \tag{4}$$

The expected Medicaid savings $E_{i,g}(S)$ for wealth decile i and gender g follows:

$$E_{i,g}(S) = \left(M_{i,g}(T) - M_{i,g}'(T)\right) \times E_g(LTC) \tag{5}$$

where $E_g(LTC)$ is the EPDV of long-term care costs for an individual of gender g.

[22] For individuals who were covered by long-term care insurance during their first interview, their characteristics at their first interview are summarized.

The expected cost of the tax expenditure for wealth decile i and gender g associated with the Medicaid savings, $E_{i,g}(C)$, is simply:

$$E_{i,g}(C) = S_i \times P_i'(I) \times \pi \times \sum_{t=0}^{T-65} \frac{p_{g,65+t}}{(1+i)^t} \tag{6}$$

where S_i denotes the percentage subsidy offered to wealth decile i, π denotes the annual premium, and $p_{g,65+t}$ denotes the probability the policyholder is alive and not on claim at age $65+t$.[23] The expression $\sum_{t=0}^{T-65} \frac{p_{g,65+t}}{(1+i)^t}$ denotes the present value of an annual stream of \$1 payments that continue for the premium-paying duration valued with interest rate i.[24]

Equations 5 and 6 together define the expected net government benefit of providing the tax subsidy, $E_{i,g}(NB)$, and the return per dollar of tax expenditure, $E_{i,g}(R)$:

$$E_{i,g}(NB) = E_{i,g}(S) - E_{i,g}(C) \tag{7}$$

$$E_{i,g}(R) = \frac{E_{i,g}(S)}{E_{i,g}(C)} \tag{8}$$

Medicaid is jointly funded by states and the federal government, and the federal share varies by state but is at least 50 percent. This feature of Medicaid creates an externality in either entity's decision to implement a tax incentive. In the case of a state tax subsidy, at least half of the savings are captured by the federal government while only the state bears the cost of the tax expenditure. Assuming Medicaid costs are shared equally between the state and federal government, the total expected net benefit can be broken down into the state's net benefit and the federal government's net benefit as follows:

$$E_{i,g}^{state}(NB) = \frac{1}{2}E_{i,g}(S) - E_{i,g}^{state}(C) \tag{9}$$

$$E_{i,g}^{federal}(NB) = \frac{1}{2}E_{i,g}(S) - E_{i,g}^{federal}(C) \tag{10}$$

where $E_{i,g}(C) = E_{i,g}^{state}(C) + E_{i,g}^{federal}(C)$.[25]

[23] Note Equation 6 assumes that tax subsidies are available to both existing and tax-induced purchasers. However, in three states (MD, OR, and VA), only new policies are eligible for tax credits; therefore, the tax expenditure for these states would be significantly lower.

[24] The probability $p_{g,65+t} = 1 - q_{g,65+t}^d - q_{g,65+t}^c$, where $q_{g,65+t}^d$ is the probability of a policyholder dying at age $65+t$ and $q_{g,65+t}^c$ is the probability a policyholder age $65+t$ goes on claim. T is the maximum age of survival.

[25] The value $E_{i,g}^{federal}(C)$ is negative because the federal government gains revenue from state tax subsidies due to the deductibility of state and local taxes on federal tax returns for those who itemize. See Appendix B for more details.

I use the above method to estimate cost savings for the average long-term care insurance subsidy available and the associated average response. I first determine pre-subsidy insurance coverage rates from the HRS by wealth decile. I assume the responses to the tax subsidy by low, medium, and high wealth given in Table 7 correspond to the 20^{th}, 50^{th}, and 80^{th} wealth percentiles, respectively and linearly interpolate response rates for the remaining wealth percentiles.

Table 10 partially reproduces Table 2 of Brown and Finkelstein (2008) which provides estimates of $M_{i,g}(I)$ and $M_{i,g}(N)$, Medicaid's share of the EPDV of long-term care expenditures by gender and wealth decile for 65-year-old individuals with and without private insurance. The private insurance policy modeled provides a \$100 daily benefit, and the wealth percentiles reflect the distribution at age 65.[26] This table shows that Medicaid shares of long-term care costs are declining in wealth and having private insurance reduces Medicaid expenditures more as wealth declines.

I use an annual premium of $\pi = \$2,000$, in line with premium estimates for a policy as modeled in the simulation results in Brown and Finkelstein (2008). The premium is assumed to be the same for both men and women, as premiums in the private long-term care insurance market are gender-neutral. However, the EPDV of long-term care costs differ substantially by gender: $E_f(LTC) = \$43,750$ for women and $E_m(LTC) = \$17,510$ for men. Annuity values were calculated assuming industry estimates of mortality and claim rates by gender for long-term care insurance policyholders taken from Corliss et al. (2007) and a 3 percent discount rate.

The results from these simulations for each wealth decile are shown in Figure 3. Figure 3(a) depicts the net benefit in dollars per 65-year-old at different points in the wealth distribution. The relationship between dollars saved and wealth is non-monotonic: the net benefit is negative for an individual at the 10^{th} percentile, becomes positive for an individual at the 20^{th}, and increases until the 50^{th} percentile. At the high end of the wealth distribution, the cost of the tax expenditure is greater than the total Medicaid savings and the net benefit is negative. On average, the large losses at the high end of the wealth distribution overwhelm the gains in the middle of the distribution and cost governments \$26 per 65-year-old.

[26]Medicaid eligibility is simulated using a utility-maximization framework and probabilities of long-term care utilization from a transition model widely used in the industry. The model is solved using dynamic programming techniques and a 3 percent discount rate. On average, the model predicts that 55 percent of long-term care expenditures are paid for by Medicaid, broadly consistent with other estimates. The Medicaid income and asset threshold used in the simulation are the modal thresholds, used by 35 states.

The non-monotonic nature arises because of two countervailing forces. At low levels of wealth, the potential Medicaid savings from higher private insurance coverage is large, but the response to the tax subsidy is low. At high levels of wealth, there is a large degree of response to the tax subsidy, but increased private insurance coverage does not substantially change the share of long-term care expenses paid for by Medicaid for these groups. The cost of the tax subsidy, by contrast, is monotonically increasing in wealth due to the higher subsidy rates available to high-wealth individuals and higher rates of insurance coverage among these groups.

Figure 3(b) divides the net benefits between the federal and state government assuming Medicaid expenditures are shared equally. Because the tax expenditure is borne solely by the state, the state loses more in foregone tax revenues than their portion of Medicaid savings across the entire wealth distribution, spending on average $140 per 65-year-old. The federal government saves on average $114 per 65-year-old without any associated outlay.[27]

In total, the savings from Medicaid per $1 of tax expenditure is approximately $0.84. More than half of these savings ($0.50) are conferred to the federal government, while the remainder ($0.34) is kept with the state. The return is greater than $1 for individuals between the 20^{th} and the 60^{th} percentiles of the wealth distribution, and less for individuals with very high or very low amounts of wealth. Because the EPDV of long-term care costs is much greater for women and the cost of subsidizing their premiums is the same as for men, there is more to gain from Medicaid paying a reduced share of long-term care expenses for women. The result is that returns are greater for women than for men: $0.41 for men and $1.26 for women for each $1 of tax expenditure.

Figure 3 highlights the importance of performing simulations using response rates that vary with factors related to Medicaid eligibility relative to developing cost estimates from average response rates. If the coefficients estimated in Table 3 were utilized along with Medicaid shares for individuals with median wealth, the average tax subsidy would appear to save $84 per 65-year-old and return $1.49 in Medicaid savings for each $1 of tax expenditure, in stark contrast with the simulation results that take heterogeneous responses into consideration. The error results from finding the net fiscal benefit at the average rather than the average of each wealth decile's net fiscal benefit.

[27]This savings includes $71 in Medicaid savings and $43 in increased federal tax revenues due to the smaller deduction of state taxes by itemizers. See Appendix B for more details regarding the interaction between state and federal tax revenues.

The simulation results rely on the value of each input and the sensitivity to several factors is summarized below. Reducing the premium to $1,800 (with no corresponding decrease in long-term care costs) decreases the net cost per 65-year-old from $26 to $10 and increases the total Medicaid savings per $1 of tax expenditure from $0.84 to $0.94. Increasing the premium to $2,200 increases the net cost to $43 and decreases the savings to $0.77 per $1 of tax expenditure. Within this wide range of premiums, however, the tax incentives are still expected to cost more than they save. Similar results are obtained by adjusting $E_g(LTC)$, the estimated EPDV of all long-term care costs, by 10 percent in either direction. Changing the discount rate assumption affects the expected cost savings because the Medicaid savings are further in the future relative to the premium subsidy, and the cost-benefit analysis is sensitive to the 3 percent discount rate assumed in the simulations. Adjusting the discount rate to 4.5 percent increases the net cost to $48 and reduces the Medicaid savings to $0.67 per $1 of tax expenditure. Under the assumption that the discount rate is 1.5 percent, the policy becomes cost savings, saving $20 per 65-year-old and returning $1.10 for each $1 spent in tax expenditure.

Sensitivity of Simulation Results to Parameter Estimates

		$E(NB)$	$E(R)$
Base Case Scenario		-$26	$0.84
Premiums	+10%	-$43	$0.77
	-10%	-$10	$0.94
Expected Long-Term Care Costs	+10%	-$12	$0.93
	-10%	-$41	$0.76
Discount Rate	1.5%	+$20	$1.10
	4.5%	-$48	$0.67

By assuming that the EPDV of long-term care expenditures does not change after coverage rates increase, the base simulation results implicitly assume no moral hazard. While Grabowski and Gruber (2007) find no evidence of moral hazard in nursing home utilization, empirical evidence suggests that home health care use is more subject to increased utilization through moral hazard (Weissert et al., 2005). The effect of moral hazard would be to decrease the expected Medicaid savings and therefore reduce the net benefit: smaller Medicaid shares through increased insurance coverage would be offset by higher Medicaid expenditures overall. Assuming that, for example, $E_g(LTC)$ is 5 percent higher for individuals with private insurance relative to those without private insurance increases the net cost per 65-year old to $41 and the Medicaid savings per $1 of tax

expenditure decreases to \$0.75. If $E_g(LTC)$ for the privately insured is 10 percent higher, the net cost increases to \$56 and the savings per \$1 of tax expenditure falls to \$0.66.

There are several additional assumptions behind these estimates. First, individuals who purchased insurance after implementation of the tax subsidy are assumed to have similar Medicaid shares as individuals who purchased insurance prior to the subsidy. This assumption is supported by the fact that these two groups do not differ greatly in their health status, income, and assets, as shown in the previous section. Second, as assumed in Brown and Finkelstein (2008), the EPDV of long-term care expenditures is equal across the wealth distribution. Third, the tax expenditure is assumed to stop only if a policyholder dies or goes on claim and therefore ceases paying premiums. Changes in the subsidy level, perhaps due to changes in filing status or income, are ignored. Fourth, the response among men and women to the tax subsidy was assumed to be the same, as supported by the results in Table 7 which showed no statistical difference in the response by gender. The simulations also assume that individuals do not move away from the state they received the subsidy from and in turn save another state's share of Medicaid expenditures rather than the state that bore the tax expenditure or lapse their policy. If there is a positive probability of either moving states or lapsing one's policy, the estimated net savings would be lower given the timing of the expenditure relative to the costs. Finally, interactions with other programs, such as a potential reduction in Medicare costs from having fewer Medicaid recipients, and other general equilibrium effects are ignored.

6 Conclusion

Long-term care is a significant component of health care costs, costing over \$190 billion annually in the United States in 2007, and is projected to grow substantially larger with the aging of the population. Only about 10 percent of the elderly population has private long-term care insurance that provides coverage for these risks. A significant portion of the population is exposed to a large amount of out-of-pocket risk for nursing home and other long-term care expenditures. Medicaid provides worst-case scenario coverage, but the stringent asset and income requirements essentially mean that the deductible is one's wealth and the copayment is one's income. Through this mechanism, Medicaid pays for approximately half of all long-term care expenses.

With the idea that higher rates of private insurance coverage will decrease the reliance on public funds for future long-term care expenses, several states have passed tax incentives for the purchase of private long-term care insurance. In this study, I find that these initiatives increased private long-term care insurance coverage by 2.8 percentage points, or 30 percent of pre-subsidy coverage rates. The identification of this result comes from changes within states and individuals over time in tax subsidy programs. The evidence also suggests that information played a significant role: the presence of a subsidy drives the result more than its generosity and the level of response is not proportional to the amount of the subsidy.

The natural experiment that results in variation in the after-tax price of private long-term care insurance allows me to calculate a price elasticity of demand. The implied price elasticity is approximately -3.6, indicating that demand response to private long-term care insurance is higher than for health insurance. This study uses IV strategies that exploit the variation in the tax subsidy programs and reduce bias that could result from correlation between unobservable economic and demographic characteristics that increase demand for private long-term care insurance and reduce one's marginal tax rate.

While the tax incentives do seem to have induced insurance coverage, moving to the most generous subsidy (a tax credit worth 20 percent of premiums) would be unlikely to substantially reduce the proportion of the population that does not have adequate private insurance coverage for long-term care. Moreover, the effects are concentrated among high income and wealthier populations, groups for whom the externalities presented by Medicaid are smaller. Because Medicaid often allows individuals to keep only $2,000 in assets, individuals who are asset-rich are less likely to have Medicaid pick up the tab should they need long-term care. As a result, tax incentives are unlikely to substantially reduce net government expenditures for long-term care. Simulations suggest that $1 in state tax expenditure produces $0.84 in Medicaid savings, more than half of which is captured by the federal government. One of the central contributions of the analysis is that it highlights the importance of estimating insurance coverage responses separately by factors that determine Medicaid eligibility, ignored in prior literature.

To have a larger effect on the allocation of long-term care financing, tax incentives would need to increase private insurance coverage for those who are at higher risk of spending down to Medicaid eligibility. There are several reasons why low-wealth subgroups may not respond, each giving rise

to different policy implications: information about tax incentives may not be homogeneous across individuals; the subsidy rates offered may be too small to induce coverage; or the market distortions these groups face may be too large to make it worthwhile to purchase private insurance despite the presence of a tax subsidy. Structuring tax incentives such that they target low-wealth populations and increasing awareness of long-term care risks among these groups may be influential, but it may be that without more comprehensive Medicaid reform that reduces market distortions, these populations are unlikely to respond to tax incentives by taking up private insurance.[28] It is likely that the true reason low wealth and income groups do not respond is some combination of these reasons. An alternate strategy that may reduce net government expenditures for long-term care is to eliminate subsidies for the highest wealth groups.

While the tax subsidies as currently structured appear to be unlikely to reduce Medicaid expenditures, the higher rates of coverage they induce may have other desirable consequences not evaluated here. A thicker market may reduce adverse selection and decrease administrative loads, improving the efficiency of this market and possibly having spillover effects for other potential consumers. Higher levels of private insurance take-up implies a reduction in out-of-pocket expenditure risk and greater access to higher quality care for those who purchase coverage. In addition, higher rates of private insurance coverage may reduce reliance on informal caregiving from spouses and children, possibly increasing labor market attachment among these groups.

From a social planner's perspective, financing long-term care through Medicaid has efficiency considerations. The tax incentives raise net government spending, and thus increase deadweight loss because of the excess cost of raising government revenue through income taxation. The net cost of \$26 per 65-year-old amounts to a deadweight loss of $\lambda \times \$26$ for each elderly individual in a state with a tax subsidy, where λ is the excess cost of taxation. Medicaid's asset and income thresholds may also distort savings and work decisions and the large degree of financing through Medicaid may be a factor in nursing home quality because Medicaid pays below the private pay rate. Potential rationale for the existence of tax subsidies may include myopia in understanding

[28] Brown and Finkelstein (2008) suggest a reform that would address both the means-tested nature of Medicaid and its secondary payer status: the reform would involve giving refundable tax credits equal to the expected present discounted value of the Medicaid benefits that are replaced by the private insurance. However, this policy would be difficult to implement in practice.

the risks and costs associated with long-term care or tastes for redistribution. The topic of optimal tax incentives for private long-term care insurance remains an important area for future research.

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Figure 1: Tax Incentive Generosity Over Time, 1996-2006

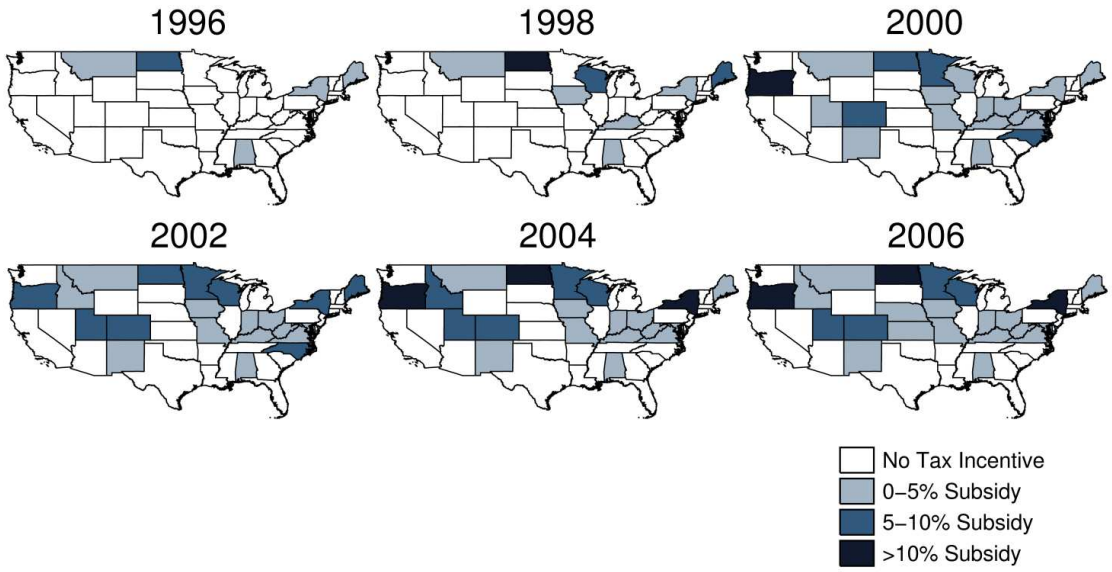
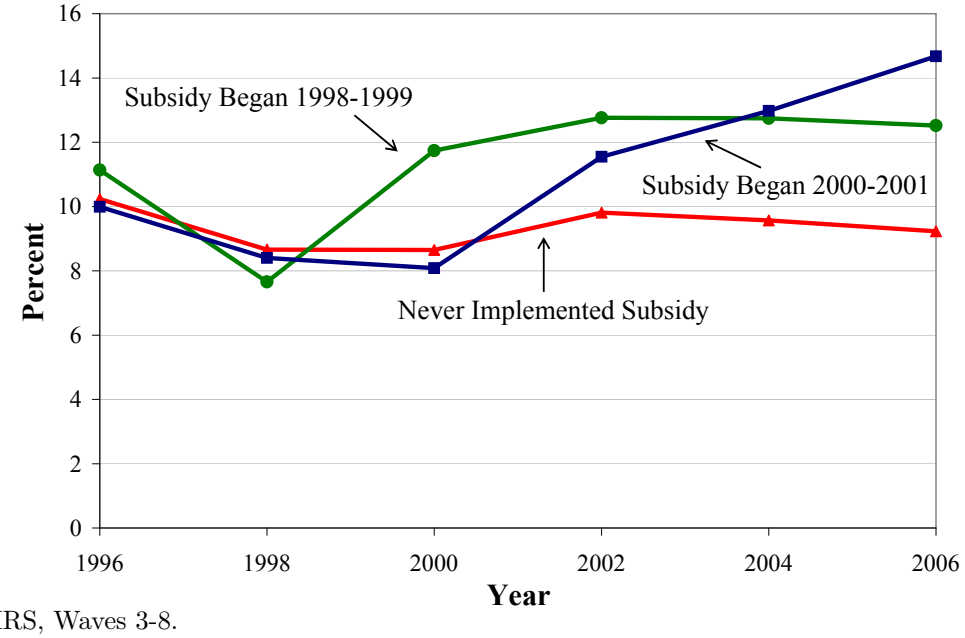
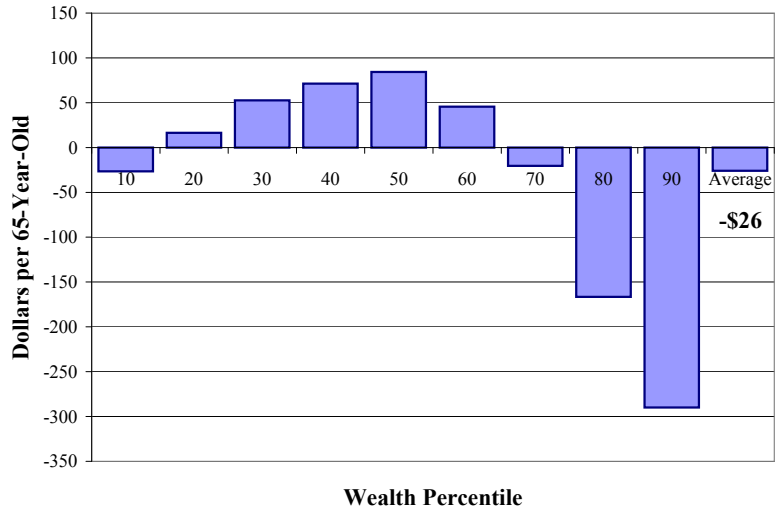


Figure 2: Private Long-Term Care Insurance Coverage, Age 50-69

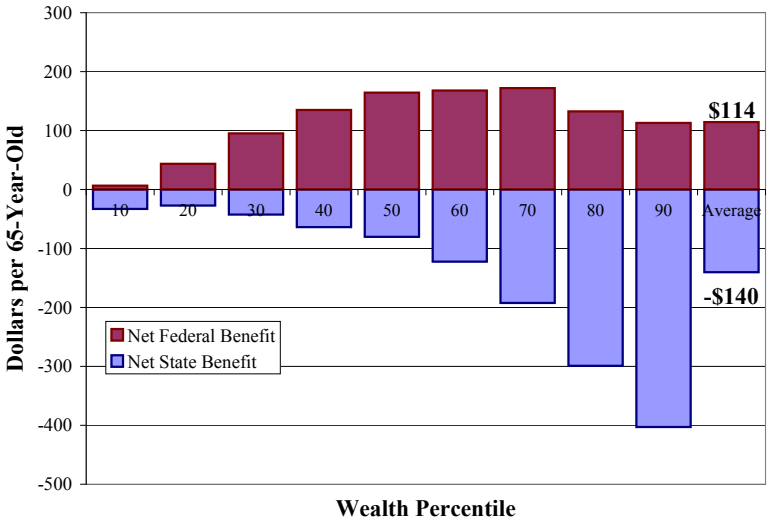


Source: HRS, Waves 3-8.

Figure 3: Estimated Net Benefit from Tax Subsidy for 65-Year-Olds by Wealth Decile



(a) Estimated Total Net Government Benefit



(b) Estimated Federal vs. State Net Government Benefit

Calculations assume $2,000 annual premium, 3 percent annual discount rate, EPDV of long-term care costs = $43,750 for women and $17,510 for men. Net benefits calculated as Medicaid savings less tax expenditure assuming average subsidy levels and response by wealth decile. In (b), federal and state funding for Medicaid is assumed to be shared equally. See text for additional details.

Table 1: Summary Statistics: Individual-Level Control Variables

	Do not have LTCI (N=47,130)		Have LTCI (N=5,224)	
	Mean	Std Dev	Mean	Std Dev
After-Tax Price	0.984	0.040	0.978	0.044
Any Subsidy Available	0.280	0.449	0.334	0.472
Credit Available	0.108	0.311	0.140	0.347
Deduction Available	0.185	0.389	0.217	0.412
HIPAA Subsidy Available	0.117	0.321	0.188	0.391
Income	35,185	98,557	48,438	53,446
Assets	236,800	1,508,370	397,042	861,121
File Tax Return	0.826	0.379	0.916	0.278
Age	59.27	5.18	59.96	5.28
Female	0.556	0.497	0.565	0.496
Married	0.690	0.463	0.763	0.425
Some High School	0.192	0.394	0.081	0.273
High School	0.374	0.484	0.318	0.466
Some College	0.231	0.422	0.244	0.429
College Plus	0.202	0.402	0.358	0.479
Children	3.103	2.023	2.824	1.871
Hispanic	0.084	0.277	0.029	0.169
African-American	0.111	0.314	0.074	0.262
Other Race	0.051	0.220	0.023	0.150
Retired	0.350	0.477	0.406	0.491
Fair/Poor Health Status	0.255	0.436	0.147	0.354

Source: HRS, Waves 3-8. Observations at the person-year level. Income and assets expressed in constant 2006 dollars.

Table 2: Private Long Term Care Insurance Coverage and Average Reduction in After-Tax Price

	Pre-Subsidy LTCI Coverage	Average Subsidy	N
All	9.4%	4.6%	52,354
Gender			
Male	9.4%	4.8%	21,200
Female	9.4%	4.5%	31,154
Age			
50-59	8.7%	5.4%	21,010
60-69	10.3%	3.5%	31,344
Education			
High School or Less	7.0%	4.0%	31,575
Some College or More	12.5%	5.3%	20,779
Income			
Low Income (<$15K)	4.9%	2.7%	16,243
Medium Income ($15K-$40K)	8.7%	4.9%	19,515
High Income (≥$40K)	13.6%	5.7%	16,596
Wealth			
Low Wealth (<$20K)	4.0%	3.4%	16,211
Medium Wealth ($20K-$150K)	8.4%	5.1%	17,503
High Wealth (≥$150K)	14.6%	5.1%	18,640
Retirement Status			
Working	8.6%	5.2%	30,862
Retired	11.0%	3.7%	21,492
Marital Status			
Unmarried	8.1%	3.7%	18,001
Married	10.1%	5.1%	34,353
Self-Reported Health Status			
Fair or Poor	5.4%	3.4%	14,608
Good or Excellent	10.9%	5.0%	37,746
ADL Limitations			
None	9.9%	4.8%	46,539
1+	5.3%	2.7%	5,815

Source: HRS, Waves 3-8. Subsidy level computed as described in appendix. Average subsidy denotes average reduction in after-tax price for individuals in states with tax subsidy. Observations at the person-year level. See text for more details.

Table 3: Linear Estimates of the Effect of Tax Subsidy Programs on Private Long-Term Care Insurance Coverage

	(1)	(2)	(3)	(4)
Subsidy	0.023**	0.019*	0.026**	0.028***
	(0.009)	(0.011)	(0.011)	(0.009)
Control Variables	No	Yes	Yes	Yes
State Fixed Effects	No	No	Yes	Yes
Individual Fixed Effects	No	No	No	Yes

* significant at 10%; ** significant at 5%; *** significant at 1%
Robust standard errors, clustered by states. Person-level weights used. N=52,354

All specifications include year fixed effects. Individual-level controls include education, gender, marital status, age, race, income, assets, number of children, retirement status, health status, and eligibility for federal tax subsidy through HIPAA. State-level controls include nursing facility occupancy rates, nursing home beds per 1,000 pop age 65+, percent of state pop age 65+, average nursing home private pay and Medicaid pay rate, Medicaid income/asset thresholds, spend down indicator.

Table 4: Linear Estimates of the Effect of the After-Tax Price on Private Long-Term Care Insurance Coverage

	Linear Probability Model			
	(1)	(2)	(3)	(4)
After-Tax Price	-0.271***	-0.186**	-0.115*	-0.053
	(0.080)	(0.087)	(0.067)	(0.063)
Implied Elasticity with respect to After-Tax Price	*-2.869*	*-1.969*	*-1.218*	*-0.561*
	(0.847)	*(0.921)*	*(0.709)*	*(0.667)*
	IV: Instrument = Mean Simulated After-Tax Price by Education			
	(5)	(6)	(7)	(8)
After-Tax Price	-0.441***	-0.348***	-0.389***	-0.340**
	(0.101)	(0.112)	(0.141)	(0.156)
Implied Elasticity with respect to After-Tax Price	*-4.669*	*-3.685*	*-4.119*	*-3.600*
	(1.069)	*(1.186)*	*(1.493)*	*(1.652)*
F-Statistic for Test of Excluded Instrument	3,113.55	3,473.05	1,970.69	1,409.40
Control Variables	No	Yes	Yes	Yes
State Fixed Effects	No	No	Yes	Yes
Individual Fixed Effects	No	No	No	Yes

* significant at 10%; ** significant at 5%; *** significant at 1%
Robust standard errors, clustered by individuals. Person-level weights used. N=52,354

All specifications include year fixed effects. Individual-level controls include education, gender, marital status, age, race, income, assets, number of children, retirement status, health status, and eligibility for federal tax subsidy through HIPAA. State-level controls include nursing facility occupancy rates, nursing home beds per 1,000 pop age 65+, percent of state pop age 65+, average nursing home private pay and Medicaid pay rate, Medicaid income/asset thresholds, spend down indicator.

Table 5: The Role of Information in Tax Incentive Response

	(1)	(2)	(3)	(4)
After-Tax Price	-0.136*	-0.067	-0.046	0.077
	(0.080)	(0.073)	(0.078)	(0.075)
Subsidy	0.017	0.016	0.024**	0.031***
	(0.011)	(0.011)	(0.011)	(0.010)
	(5)	(6)	(7)	(8)
Credit State	0.029***	0.027**	0.032**	0.032***
	(0.010)	(0.011)	(0.013)	(0.011)
Deduction State	0.020	0.016	0.028**	0.033***
	(0.012)	(0.013)	(0.014)	(0.012)
	(9)	(10)	(11)	(12)
Small Subsidy State	0.017	0.011	0.020	0.022**
	(0.015)	(0.014)	(0.013)	(0.010)
Large Subsidy State	0.031***	0.035***	0.041***	0.041***
	(0.009)	(0.009)	(0.013)	(0.013)
Control Variables	No	Yes	Yes	Yes
State Fixed Effects	No	No	Yes	Yes
Individual Fixed Effects	No	No	No	Yes

* significant at 10%; ** significant at 5%; *** significant at 1%
Robust standard errors, clustered by individuals. Person-level weights used. N=52,354

All specifications include year fixed effects. Individual-level controls include education, gender, marital status, age, race, income, assets, number of children, retirement status, health status, and eligibility for federal tax subsidy through HIPAA. State-level controls include nursing facility occupancy rates, nursing home beds per 1,000 pop age 65+, percent of state pop age 65+, average nursing home private pay and Medicaid pay rate, Medicaid income/asset thresholds, spend down indicator.

Table 6: Linear Estimates of the Effect of Tax Subsidy Programs on the Intensive Margin

	Inflation Protection			
	(1)	(2)	(3)	(4)
Subsidy	0.011*	0.008	0.014**	0.011**
	(0.006)	(0.006)	(0.007)	(0.006)
	Nursing Home + Home Care			
	(5)	(6)	(7)	(8)
Subsidy	0.022**	0.019**	0.026**	0.025***
	(0.008)	(0.009)	(0.011)	(0.009)
Control Variables	No	Yes	Yes	Yes
State Fixed Effects	No	No	Yes	Yes
Individual Fixed Effects	No	No	No	Yes

* significant at 10%; ** significant at 5%; *** significant at 1%
Robust standard errors, clustered by states. Person-level weights used. N=52,354

All specifications include year fixed effects. Individual-level controls include education, gender, marital status, age, race, income, assets, number of children, retirement status, health status, and eligibility for federal tax subsidy through HIPAA. State-level controls include nursing facility occupancy rates, nursing home beds per 1,000 pop age 65+, percent of state pop age 65+, average nursing home private pay and Medicaid pay rate, Medicaid income/asset thresholds, spend down indicator.

Table 7: Heterogeneity in Effect of Tax Subsidies Across Selected Subsamples

	State FEs		Individual FEs		N
All	0.026**		0.028***		52,354
Gender					
Male	0.034*		0.032**		21,200
Female	0.017**		0.025***		31,154
Age					
50-59	0.026*		0.033**		21,010
60-69	0.038**		0.025*		31,344
Education					
High School or Less	0.007		0.016*		31,575
Some College or More	0.056***	++	0.045***	+	20,779
Income					
Low Income (<$15K)	-0.005		-0.010		16,243
Medium Income ($15K-$40K)	0.014		0.021*		19,515
High Income (≥$40K)	0.047***	+++	0.063***	+++	16,596
Wealth					
Low Wealth (<$20K)	-0.002		0.005		16,211
Medium Wealth ($20K-$150K)	0.029**	++	0.026**		17,503
High Wealth (≥$150K)	0.055**	++	0.043**		18,640
Retirement Status					
Working	0.022		0.030**		30,862
Retired	0.030***		0.007**		21,492
Marital Status					
Unmarried	0.003		0.020*		18,001
Married	0.055***	+	0.030**		34,353
Self-Reported Health Status					
Good or Excellent	0.035**		0.030**		37,746
Fair or Poor	-0.007	++	0.015*		14,608
ADL Limitations					
None	0.028**		0.029***		46,539
1+	0.006		0.013		5,815

* denotes significantly different from zero (* significant at 10%; ** significant at 5%; *** significant at 1%); + denotes significantly different from top category (+ significant at 10%; ++ significant at 5%; +++ significant at 1%)

Coefficients represent effect of subsidy on private long-term care insurance coverage for subpopulation indicated, estimated using all control variables, year fixed effects, and state or individual fixed effects as specified (specifications (3) and (4) in Table 3). Each category represents a separate regression including interactions between subgroup indicators and all other right-hand side variables.

Table 8: Linear Estimates of the Effect of Tax Subsidy Programs on Alternative Insurance Coverage

	Life Insurance			
	(1)	(2)	(3)	(4)
Subsidy	0.023	0.006	0.013	0.018
	(0.031)	(0.016)	(0.014)	(0.011)
	Annuity Income			
	(5)	(6)	(7)	(8)
Subsidy	-0.001	-0.002	-0.005	-0.003
	(0.002)	(0.002)	(0.004)	(0.004)
Control Variables	No	Yes	Yes	Yes
State Fixed Effects	No	No	Yes	Yes
Individual Fixed Effects	No	No	No	Yes

* significant at 10%; ** significant at 5%; *** significant at 1%
Robust standard errors, clustered by states. Person-level weights used. N=52,354

All specifications include year fixed effects. Individual-level controls include education, gender, marital status, age, race, income, assets, number of children, retirement status, health status, and eligibility for federal tax subsidy through HIPAA. State-level controls include nursing facility occupancy rates, nursing home beds per 1,000 pop age 65+, percent of state pop age 65+, average nursing home private pay and Medicaid pay rate, Medicaid income/asset thresholds, spend down indicator.

Table 9: Demographic Characteristics of Pre- and Post-Subsidy Long-Term Care Insurance Purchasers

	Purchased Coverage Prior to Tax Subsidy (N=475)		Purchased Coverage After Tax Subsidy (N=877)		Test for Difference in Means
	Mean	Std Dev	Mean	Std Dev	p-value
Income	55,377	73,019	55,126	56,929	0.948
Assets	392,571	890,878	388,788	727,169	0.937
File Tax Return	0.936	0.246	0.925	0.263	0.464
Age	58.83	5.21	58.62	5.27	0.492
Female	0.614	0.487	0.539	0.499	0.007
Married	0.759	0.428	0.773	0.419	0.574
Some High School	0.106	0.308	0.085	0.280	0.231
High School	0.369	0.483	0.313	0.464	0.037
Some College	0.214	0.411	0.217	0.413	0.891
College Plus	0.311	0.463	0.385	0.487	0.006
Children	3.060	1.867	2.857	2.021	0.064
Hispanic	0.016	0.126	0.020	0.141	0.582
African-American	0.079	0.270	0.090	0.286	0.475
Other Race	0.033	0.178	0.015	0.123	0.059
Retired	0.313	0.464	0.340	0.474	0.320
Fair/Poor Health Status	0.158	0.365	0.150	0.357	0.692

Source: HRS. Observations at the person level. Values taken at time of purchase or earliest observation if purchased before 1996. Income and assets expressed in constant 2006 dollars.

Table 10: Medicaid Share of Expected Present Discounted Value of Total Long-Term Care Expenditures for 65-Year-Old by Gender and Wealth

	Men		Women	
Wealth Percentile i	No Private Insurance $M_{i,m}(N)$	With Private Insurance $M_{i,m}(I)$	No Private Insurance $M_{i,f}(N)$	With Private Insurance $M_{i,f}(I)$
10th	0.98	0.52	0.99	0.55
20th	0.89	0.44	0.93	0.50
30th	0.80	0.41	0.88	0.46
40th	0.71	0.37	0.80	0.43
50th	0.60	0.32	0.72	0.38
60th	0.46	0.26	0.60	0.33
70th	0.32	0.20	0.45	0.24
80th	0.17	0.12	0.24	0.15
90th	0.07	0.05	0.08	0.06

Source: Brown and Finkelstein (2008)

Appendix A: State Tax Subsidies for Private Long-Term Care Insurance

In 2006, fifteen states allowed taxpayers to deduct premiums from their income, six states offered tax credits, and two states offered both. The credits are not refundable, and therefore may only be used to offset existing tax liabilities. Their values are generally capped at a specific dollar amount or proportion of premium, and tend to be more generous than subsidies arising from premium deductions. Tax incentives in the form of deductions are in most cases allowable in addition to the standard deduction, not requiring taxpayers to itemize their deductions.

State	Year Started	Credit	Deduction
Alabama	1995		✓
Colorado	2000	✓	
District of Columbia	2005		✓
Idaho	2001		✓
Indiana	2000		✓
Iowa	1997		✓
Kansas	2005		✓
Kentucky	1998		✓
Maine	1990		✓
Maryland	2000	✓	
Minnesota	1999	✓	
Missouri	2000		✓
Montana	1992		✓
Nebraska	2006		✓
New Mexico	2000		✓
New York[a]	1996	✓	✓
North Carolina[b]	1999	✓	
North Dakota	1994	✓	✓
Ohio	1999		✓
Oregon	2000	✓	
Utah	2000		✓
Virginia	2000	✓	✓
West Virginia	2000		✓
Wisconsin	1998		✓

[a] New York provided a tax deduction of long-term care insurance premiums from 1996 through 2001, and a credit from 2002 onwards.

[b] North Carolina implemented a credit in 1999 available through 2003; a modified version was subsequently reinstated in tax year 2007.

Appendix B: Calculation of After-Tax Price

Calculation of the after-tax price of $1 of long-term care insurance was performed using each state's description of the tax incentive and often required calculation of the individual's marginal tax rate. Marginal tax rate simulations were done using NBER's TAXSIM program (Feenberg and Coutts, 1993).

Simulations of marginal tax rates

The RAND version of the HRS was used, merged with additional variables from the HRS. A mapping of the financial variables in the HRS to TAXSIM input is provided below.

TAXSIM input	Description	HRS Variable(s) used
pwages	Wage income of primary taxpayer	Individual earnings
swages	Wage income of secondary taxpayer	Individual earnings of spouse
dividends	Dividend income	Included in household capital income
otherprop	Interest and other property income	Other household income
pensions	Taxable pension income	Respondent's and spouse's pension income
gssi	Gross social security benefits	Respondent's and spouse's Social Security retirement and disability income
transfers	Non-taxable transfer income	Respondent's and spouse's other government transfers
rentpaid	Rent paid	Rent paid
proptax	Property tax paid	Property tax paid
otheritem	Other itemized deductions	Charitable donations and itemizable medical expenses
childcare	Child care expenses	Imputed as zero
ui	Unemployment compensation benefits	Respondent's and spouse's unemployment + workers compensation benefits
mortgage	Mortgage interest paid	Outstanding mortgage amount * 6 percent
stcg	Short term capital gain/loss	Household capital income
ltcg	Long term capital gain/loss	Imputed as zero

Imputation of after-tax price

The first step in the imputation of an individual's after-tax price was to assign each person a premium amount based on their state, year, and age. The premium amounts came from Table 5-4 in Johnson et al. (2007), which summarizes Weiss Ratings, Inc. premium data from 2002.

Premiums for ages that were not reported were interpolated from the available data and premiums were assumed to grow by 3 percent each year.

Next, a credit value and deduction value was calculated for each person. If a state had a tax credit for long-term care insurance, the credit value was determined by the following formula:

$$C = \max(\min(\min(c_s \times \pi, \bar{c}_s), T_s), 0)$$

where c is the fraction of the premium payable as a credit, π is the premium, and $\bar{c}_s$ is the maximum dollar amount of the credit. The value of the credit is constrained to be between zero and the individual's state tax liability, T_s, because the credits are nonrefundable. Similarly, the value of a deduction in states with a deduction is given by:

$$D = \max(\min(d_s \times \pi, \bar{d}_s) \times \tau_s, 0)$$

where d_s is the fraction of the premium deductible, τ_s is the individual's state marginal tax rate, and $\bar{d}_s$ is the maximum amount deductible. Where the tax incentives differed by age or income, appropriate adjustments were made. For individuals who itemize their expenses, the subsidy value was reduced by their federal marginal tax rate to account for the deductibility of state income taxes. For individuals who did not file a tax return, the after-tax price was set to 1. Therefore, the after-tax price $TAXPRICE$ is given by:

$$TAXPRICE = \begin{cases} 1 & \text{if non-tax filer} \\ \frac{\pi-(C+D)(1-\tau_f)}{\pi} & \text{if itemizer} \\ \frac{\pi-(C+D)}{\pi} & \text{otherwise} \end{cases}$$

Appendix C: Full Estimation Results for Table 3

	(1)	(2)	(3)	(4)
Subsidy	0.023**	0.019*	0.026**	0.028***
	(0.009)	(0.011)	(0.011)	(0.009)
Eligible for HIPAA deduction		0.046***	0.043***	0.020**
		(0.009)	(0.009)	(0.008)
Income ($100,000's)		0.006	0.006	0.005
		(0.005)	(0.005)	(0.004)
Assets ($10,000,000's)		0.007	0.002	0.002
		(0.019)	(0.019)	(0.005)
Female		0.013***	0.0128***	
		(0.005)	(0.005)	
Married		0.015	0.024	-0.011
		(0.014)	(0.016)	(0.026)
Education (Omitted: Some High School)				
High School		0.023***	0.022***	
		(0.005)	(0.006)	
Some College		0.041***	0.039***	
		(0.008)	(0.008)	
College Plus		0.094***	0.090***	
		(0.007)	(0.007)	
Children (Omitted: No Children)				
One Child		-0.013	-0.014	0.042
		(0.011)	(0.011)	(0.036)
Two Children		-0.018*	-0.018*	0.059
		(0.010)	(0.010)	(0.038)
Three Children		-0.035***	-0.036***	0.038
		(0.010)	(0.010)	(0.030)
Four Children		-0.027**	-0.030***	0.043
		(0.011)	(0.011)	(0.030)
Five + Children		-0.028***	-0.031***	0.050
		(0.010)	(0.010)	(0.031)
Hispanic		-0.025***	-0.032***	
		(0.007)	(0.007)	
Race (Omitted: White)				
Black		-0.013**	-0.014**	
		(0.006)	(0.006)	
Other Race		-0.026***	-0.026***	
		(0.008)	(0.008)	
Retired		0.015***	0.015***	0.005
		(0.004)	(0.004)	(0.004)
Fair/Poor Health Status		-0.027***	-0.026***	-0.002
		(0.004)	(0.004)	(0.004)
Constant	0.103***	0.028	0.068	0.240*
	(0.004)	(0.067)	(0.093)	(0.131)
R^2	0.0019	0.0301	0.0359	0.0108
Control Variables	No	Yes	Yes	Yes
State Fixed Effects	No	No	Yes	Yes
Individual Fixed Effects	No	No	No	Yes

* significant at 10%; ** significant at 5%; *** significant at 1%
Robust standard errors, clustered by states. Person-level weights used. N=52,354

Regressions correspond to results in Table 3. Not shown: year fixed effects, age fixed effects, state fixed effects, state-level controls.