Do Increased Premium Subsidies Affect How Much Health Insurance Is Purchased? Evidence from the Self-Employed

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Abstract. This paper estimates the effect of recent federal and state level increases in the deductibility of health insurance premiums for self-employed individuals, which reduced the after-tax price of health insurance, on both the take-up of coverage and the amount of insurance purchased. Using a panel of tax returns filed by self-employed taxpayers from 1999 to 2004, we estimate a take-up elasticity of -0.316 overall, with significantly higher elasticities for single taxpayers. On the intensive margin, we find an elasticity of -0.733 overall.

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1. Introduction

Three trends in the US health care market continue to concern policymakers. First, the number of uninsured individuals has grown from 38.8 million in 1999 to 45.7 million in 2007 (though this figure is slightly below the 47 million uninsured in 2006), and the uninsurance rate has grown from 14 percent to 15.3 percent over this period (U.S. Census Bureau, 2008). Second, health care expenditures have been rising faster than inflation, possibly due to the tax exclusion of employer provided health insurance (ESI) giving employees an incentive to over-insure. Third, high premium prices and barriers to coverage in the individual health insurance market may have led individuals who were not eligible for an ESI policy to purchase less coverage than they would have if they were eligible. These trends have prompted much of the current debate over whether and how to reform the health insurance market. As was outlined by CBO (2009), one of the most important features of health insurance reform that Congress is considering involves providing new subsidies in the form of tax credits or direct payment to insurance companies for individuals to purchase health insurance.

The effect of such tax proposals on the number of uninsured and the amount of insurance purchased in the individual market depends critically on the price elasticity of demand for health insurance on both the extensive margin (whether to take-up) and intensive margin (how much to purchase). This paper, then, attempts to answer two questions. First, does a change in the after tax price of health insurance relative to medical expenditures affect the probability of purchasing health insurance? Second, does a change in after tax price of insurance affect the quantity of health insurance purchased?

To answer these questions, this study examines health insurance purchase behavior using a panel of tax returns from almost 18,000 self-employed taxpayers that spans 1999 to 2004. This focus on the self-employed is due to changes in policy that affected the after tax price of health insurance specifically for self-employed taxpayers. The Omnibus Consolidated and Emergency Supplemental Appropriations Act (OCESA) of 1998 increased the deductibility of health insurance premiums for self-employed individuals for federal income tax purposes from 60% in 1999 to 70% in 2002 and to 100% in 2003, and in effect reduced the self-employed price of health care while insured relative to not being insured. In addition, several states increased the deductibility of self-employed health insurance premiums during this period. These exogenous changes in health insurance prices provides a natural experiment to assess the sensitivity of the health insurance take-up and quantity to health insurance prices.

This paper adds to the literature in three ways. First, it is the first to estimate the take-up elasticity using tax data in which one can observe whether the self-employed actually took the health insurance deduction. Second, it is the first to use panel data. Using within variation, we are able to compare the take-up and amount of insurance responses of taxpayers whose price of insurance dropped substantially to the behavior of taxpayers who experienced a much smaller price decrease. This use of policy variation within each taxpayer enables us to avoid the endogeneity problem that is intrinsic when regressing coverage on price, and the use of a panel enables us to avoid the omitted variable that are more critical when using cross sectional data. Third, since self-employed taxpayers who claim the self-employed health insurance deduction report the cost of their premiums on the tax return, we are also able to estimate the effect of a price

change on the total amount of health insurance purchased in the individual market. We are unaware of any other paper that estimates both the take-up elasticity of demand (on the extensive margin) and the elasticity of demand (on the intensive margin) in the individual health insurance market.

Previously published studies that utilized policy induced variation found take-up elasticities of demand for health insurance among the self-employed that ranged from -1.0 to -2.7. Using this new data, we generally find smaller elasticities, with an estimated elasticity from our base specification of -0.316. On the intensive margin, our base results suggest an elasticity of demand of -0.733.

The paper proceeds as follows. Section 2 outlines tax policy toward purchases of health insurance by the self-employed, and in Section 3 the relevant literature is reviewed. In Section 4, the estimation strategy is outlined, and Section 5 describes the panel of tax returns that is used in this study. Section 6 presents the results on the take-up decision, and Section 7 presents the results on the intensive margin. Section 8 concludes.

2. Tax Policy Toward Self-Employed Health Insurance

The federal deduction for self-employed health insurance originated as part of the Tax Reform Act of 1986 (TRA86).[1] Prior to TRA86, the self-employed could deduct health insurance premiums only if they itemized deductions and only to the extent that total health expenditures exceeded 7.5 percent of their AGI. The passage of TRA86 allowed the self-employed to deduct 25 percent of their premiums from income prior to

[1] This discussion of draws from the discussion of policy changes examined in Heim and Lurie (2009).

the calculation of adjusted gross income (AGI) starting in 1987 regardless of whether they itemized deductions. Self-employed taxpayers are eligible to take the deduction if they have a net profit from self-employment[2] and they (and their spouse) are not eligible to participate in an employer-sponsored health insurance (ESI) plan. The self-employed health insurance deduction is limited to net earnings from self-employment less contributions to retirement accounts and half of self-employment taxes, in effect preventing self-employment taxable income from being negative.

Originally, TRA86 made the deduction temporary and was set to expire in 1992. However, the federal tax code was amended several times to extend and increase the deductibility of premiums, with the rate increasing from 25 percent in 1987-1995 to 30 percent in 1996, 40 percent in 1997 and 45 percent in 1998. The Omnibus Consolidated and Emergency Supplemental Appropriations Act of 1998 (OCESA) accelerated the increase in the deductibility of health insurance premiums further and set it at 60 percent from 1999 until 2001, 70 percent in 2002 and 100 percent thereafter.

During the 1999-2004 period, several states also changed the fraction of self-employed health insurance premiums that are deductible for state income tax purposes. In 1999, there were 9 states that did not have an income tax and 3 states that did not allow the self-employed to deduct premiums at all, 4 states had deductions that ranged from 40% to 70%, 26 states that matched the federal deduction, and 9 states that allowed the full premiums to be deducted from income for tax purposes. By 2004, 9 states still had no income tax, 2 states still did not allow the deduction, and 40 states allowed the self-employed to deduct 100% of premiums.

[2] Shareholders of more than 2% in S corp. that receive wages are also eligible for the deduction.

3. Literature Review

Although policies that change the after tax price of health insurance to reduce the number of uninsured have attracted interest recently, the literature on this topic is limited. Estimating the effect of price on insurance demand (both on the extensive and intensive margins) is difficult because health insurance prices are inherently endogenous, resulting in severely biased coefficients if not controlled for.

One approach to overcoming the endogeneity problem is to use a known or computed price scale that is not directly a function of the individual's health status, but correlated with the price that individuals face. Using this approach, several studies found an overall elasticity of demand at the extensive margin (which will henceforth be referred to as the take-up elasticity) that ranges between -0.2 to -0.8 (Marquis and Long 1995; Marquis and Buchanan 1992; Pauly and Herring 2001; Long and Marquis 2002; Marquis et al. 2004; Auerbach and Ohri 2006). It is not clear, however, how successful the price scale approach is in eliminating endogeneity. For example, Marquis and Long (1995) use the price list of a firm standard product to impute prices to individuals by matching each individual to the firm's price by age, gender and three digit zip code. The variation in their price variable, then, comes mostly from regional differences. However, regional price differences may also be correlated with demand differences.

An alternative approach to estimating the take-up elasticity of demand for health insurance is to use variation in prices that is induced by a change in policy. For example, Gruber and Poterba (1994), Selden (2009), and Gumus and Regan (2009) estimate the effect of the increased subsidy to self-employed health insurance purchases on the take-

up of health insurance among the self-employed relative to wage earners. These studies use repeated cross-sectional data to estimate the probability of self-employed taking up coverage.

Using Current Population Survey data from before and after the Tax Reform Act of 1986, in which the federal rate of deductibility for self-employed health insurance premiums increased from 0 percent to 25 percent, Gruber and Poterba estimate the take-up elasticity for the self-employed using the employed as a control group. They also estimate two additional specifications: one comparing the take-up of the high income self-employed to the low income self-employed, and another computing a triple difference comparing the difference between high- and low-income self-employed individuals to the difference between high- and low-income wage earners. When comparing the entire self-employed population to wage earners, Gruber and Poterba find a price derivative of -0.5, which corresponds to an elasticity of almost -1.0. In addition, estimated elasticities for single self-employed individuals were substantially higher, with a triple difference estimator comparing high versus low income self-employed individuals to high versus low income employed individuals yielding a price derivative of -1.27, which corresponds to an estimated elasticity in excess of -3.

Selden (2009) uses data from the Medical Expenditure Panel Survey from 1996 through 2004, a time period in which the federal rate of deductibility for self-employed health insurance premiums increased from 30 percent in 1996 to 100 percent in 2003, and estimates a model of health insurance coverage as a function of the relative price of care while insured compared to being uninsured on a pooled sample of self-employed and employed individuals. Variation in the relative price of care comes from the increasing

deductibility of self-employed health insurance premiums across time, and from variation across states in the tax treatment of self-employed health insurance. In his preferred specification, he finds somewhat higher take-up elasticities that range from -2.0 to -2.7 for self-employed workers or adults in self-employed families. However, since Selden's paper uses repeated cross-sectional data, the identification of the effect of a change in price comes at least in part from differences in prices across individuals, and so omitted variables that are correlated with the choice of purchasing health insurance and prices may bias his results. On the other hand, the use of policy variation in Selden's paper does reduce the endogeneity problem.

Finally, in a recent working paper, Gumus and Regan (2009) use data from the 1996-2006 March Current Population Surveys to estimate models difference-in-differences and price elasticity of demand models that are similar to those in Gruber and Poterba's paper, but using the more recent increase in deductibility that was used in Selden's paper. They find small or insignificant effects of increasing federal deductibility of self-employed health insurance premiums on take-up.

In contrast to those papers, in this paper we use a panel of tax returns from self-employed taxpayers. Since we do not have information on the health insurance status of the employed, we are not able to use employed individuals as a control group like Gruber and Poterba. However, because we have panel data, we can include fixed effects in our estimation specification to control for unobserved characteristics that are correlated with both the price of health insurance and the propensity to purchase health insurance. In addition, we are able to estimate the effect of the price change on taxpayers who were self-employed before and after the price change, and so our estimated effect on health

insurance coverage among the self-employed will not be contaminated if additional taxpayers (with differential take-up patterns) became self-employed because of the policy change. Finally, because we have data from the tax returns filed by the self-employed, we observe whether the self-employed actually claimed the deduction. Presumably, taxpayers responding to a tax policy change by purchasing insurance would claim that purchase on their tax forms. In tax data, it is possible to see whether the self-employed health insurance was claimed on the tax form, whereas other datasets only contain information on whether a policy was purchased. As a result, we can ensure that any estimated response is more likely to be a response to the tax change of purchasing and claiming a health insurance policy.

4. Estimation Strategy

Our estimation of the effect of OCESA and concurrent state tax changes on health insurance coverage and the amount of insurance purchased builds on the estimation strategy introduced by Gruber and Poterba (1994). We start by assuming that the individual's demand for health insurance in time t consists of two decisions. First they choose whether to purchase health insurance or not. Next, if they choose to purchase health insurance they decide how much insurance to buy. Hence, the two choices can be represented by the following demand model:

(1) $D_{it} = P_{it}\alpha_1 + X_{it}\beta_1 + V_i + \varepsilon_{1it,}$

(2) $I_{it} = P_{it}\alpha_2 + X_{it}\beta_2 + V_i + \varepsilon_{2it}$ Conditional on $D_{it}=1$

where D_{it} is one if the self-employed health insurance deduction is claimed on the form (implying they purchased insurance) and zero otherwise, and I_{it} is the total premium. P_{it} is the after-tax price of purchasing health care, X_{it} is a vector of characteristics of the self-employed that vary over time, V_i is a vector of characteristics that do not vary over time, and ε_{it} is the error term.

In the tax return data, both whether the health insurance deduction was taken and the amount of the deduction is observed. Hence, we are able to estimate the demand elasticity on both the extensive margin (Equation (1)), which has been estimated previously, and the intensive margin (Equation (2)), which to our knowledge has not.

To exploit the panel nature of our data, estimation of (1) is performed using a linear probability model, so that all observations contribute to the identification of the coefficients, and not just individuals who change (as is the case in a fixed effects logit).[3] Estimation of (2) is performed using a linear fixed effect model.

The X_{it} vector includes the following information that is gathered on the tax return: age of primary filer, age squared, number of dependent children on the tax return, the filing status (single, married filing jointly, married filing separately, head of household, qualified widower), and a set of indicator variables that denote the filing unit's income relative to the federal poverty line.[4] Also included in X_{it} is a set of year dummies to control for factors that vary over time but do not vary across households.

The main covariate of interest is the after-tax price of health care. In our base specification, we use the relative price concept which was introduced by Gruber and

[3] As a specification check, a fixed effects logit specification was estimated. The results were qualitatively similar to the base specification.

[4] These variables denote whether total income reported on the tax form is between one and two times the federal poverty line (FPL), between two and three times FPL, between three and four times FPL, between four and five times FPL, and above five times FPL. Having income below FPL is the omitted category.

Poterba (1994). The relative price is the after-tax price of purchasing health care through an insurance plan relative to the after-tax price of purchasing health care directly if uninsured, expressed as a ratio. In the case of the self-employed the relative price is:

$$(3)\ RP(\theta_f,\theta_s,\tau_f,\tau_s\ \lambda,\ \delta^{INSU},\delta^{UNIN},\omega,\textit{item}) =$$

$$\frac{(1+\lambda)\omega(1-\theta_f\tau_f-\theta_s\tau_s+(\theta_s\tau_s\tau_f)*\textit{item})+(1-\omega)(1-\delta^{INSU}(\tau_f+\tau_s-(\tau_s\tau_f)))}{1-\delta^{UNIN}(\tau_f+\tau_s-(\tau_s\tau_f))}$$

The numerator reflects the price of purchasing health care while insured. For the share, ω, of health expenditures that is paid as part of a health insurance premium, an administrative load factor, λ, must be paid. However, since health insurance premiums are deductible, the after tax cost of the premium is reduced by $\theta_f\tau_f+\theta_s\tau_s-(\theta_s\tau_s\tau_f)*\textit{item}$,[5], where θ_f and θ_s are the share of self-employed premiums that can be deducted at the federal and state levels, τ_f and τ_s are the marginal tax rates faced by the self-employed taxpayer at the federal and state levels, and *item* is a dummy variable for whether the taxpayer itemizes deductions. For the share, 1-ω, of health expenditures that is paid out of pocket, only a fraction of these, δ^{INSU}, would be deductible given that medical expenses must exceed 7.5% of adjusted gross income to be deductible, and total itemized deductions must exceed the standard deduction in order to make itemization worthwhile. For the share that is deductible, the after tax cost is reduced by $\tau_f+\tau_s-(\tau_s\tau_f)$. The denominator reflects the price of care while uninsured. In this expression, δ^{UNIN} is the share of health care expenditures that could be deducted if not insured, for which the after tax cost is reduced by $\tau_f+\tau_s-(\tau_s\tau_f)$.[6]

[5] If a taxpayer itemized deductions, the reduction in state income taxes by $\theta_s\tau_s$ will increase federal income taxes by this amount multiplied by τ_f.

[6] Note that δ^{INSU} and δ^{UNIN} are positive only if the taxpayer itemizes deductions, and so a reduction in state taxes of τ_s will increase federal taxes by $\tau_s\tau_f$.

As a robustness check, we will also use the "tax price," which is defined as the marginal after-tax cost of additional dollar spent on health insurance premiums and can be represented by $1- \theta_f \tau_f - \theta_s \tau_s + (\theta_s \tau_s \tau_f)*item$. Using the tax price has the advantage that it is measured with less error because no imputations are needed to calculate it. It is, however, a theoretically less desirable measure of the price of health insurance because it does not take into account the cost of paying medical expenses if one does not purchase insurance.

For the take-up specification, we calculate the relative price using the marginal tax rates that apply when the self-employed health insurance deduction is set to zero. We do this to ensure that the tax rates we are using are the rates that would apply to the first dollar of health insurance purchased, which is the relevant price for a taxpayer deciding whether or not to purchase insurance. For the amount specification, we calculate the relative price using the marginal tax rates that apply given the observed amount of health insurance deducted, so that the relative price reflects the marginal price of additional health insurance. However, this price is endogenous to the amount of insurance purchased, since a taxpayer who spends more on a policy will have less taxable income, which in turn will decrease their marginal tax rate and affect their relative price.[7] So, we instrument using the relative price calculated using the first dollar tax rate.

As noted by Gruber and Poterba, one source of variation in the price comes from the changes in deductibility of self-employment premiums (θ_f and θ_s) which provides variation over time. A second source of variation is cross sectional which is due to the differences in the after tax prices of health insurance between households. The main concern with using the cross sectional variation between households to identify the

[7] If the relative price increases as a result, this would tend to bias the coefficient toward zero.

demand elasticity is that differences in household characteristics will be correlated with the demand for health insurance. For example, a taxpayer with bad health is likely to have both lower income (which would correspond to a lower marginal tax rate and a higher relative price) and be less likely to be able to purchase health insurance on the individual market. In addition, self-employed taxpayers who are more risk averse might be more likely to purchase health insurance, and also to be less aggressive in engaging in tax avoidance and evasion, which would tend to decrease their relative price. Hence, omitting any unobserved characteristics can lead to biased estimates of the elasticity of demand. Gruber and Poterba try to alleviate this problem by using a differences-in-difference estimator, where the employed households are used as control group that was not affected by the changes in self-employed ability to deduct health insurance premiums. By looking at relative changes in coverage for self-employed and employed households before and after policy changes, the authors are trying to control for household characteristics that are correlated with the price and demand for health insurance but are similar across the two groups.

The panel structure of our data enables us to diminish this problem. Rather then using the variation between households to identify the changes in demand, the fixed effect model uses variation in the price of health insurance for the same household (within variation). In essence, the fixed effect model differences away unchanging household characteristics that are correlated with the demand and the relative price of insurance. Hence, the fixed effect model enables us to better control for household's characteristics that are correlated with both the price of and demand for health insurance.

Of course, there could still be a concern if changes in the household are correlated with both changes in the price and changes in health insurance status. For example, having an additional child would lower taxable income (which would tend to decrease the marginal tax rate and increase the relative price) and change the likelihood that the taxpayer would purchase health insurance. Similar concerns apply to marital status changes. To eliminate this source of bias, we include fixed effects at the taxpayer-marital status-number of children level. So, if a taxpayer has a change in marital status or number of children, after the change the taxpayer is treated as a different unit of observation. As a result, it is only the variation in price across years in which marital status and childbearing are constant within a taxpaying unit that identifies our coefficients.

Note, however, that we still must assume that within a taxpayer with a particular marital status and number of children, there is no change over the sample period in unobserved characteristics that are correlated with the relative price of insurance and the take-up or purchase amount decisions. Although this assumption is not ideal, it is less strong than the assumptions that would be required for estimates that utilize cross-sectional variation to be unbiased.

5. The 1999 Edited Panel of Tax Returns

The data used in this study come from a six year panel of tax returns known as the 1999 Edited Panel.[8] To create this panel, a stratified random sample was drawn in 1999.[9] In

[8] For more information on the 1999 Edited Panel, see Weber and Bryant (2005).

the five subsequent years, tax returns from any member of this sample, including both primary and secondary filers, were added to the sample. Thus, for any taxpayer in the sample in 1999 who filed a return over each of the next five years, the data contains six observations. Over the six years, the sample consists of 479,171 returns from over 80,000 different taxpayers. Of these taxpayers, over 65,000 are in the sample all six years.[10] Since high income taxpayers were over-sampled in this dataset, to make the estimation sample comparable to the population as a whole, we use sampling weights in most specifications, but also present unweighted estimates.

In the take-up specification, we cut the sample to taxpayer-years in which a positive amount of income was on Schedule SE and no income from wages or salaries on W-2 forms was reported for either the primary or secondary filer.[11] We also cut the sample to include only taxpayers aged 25 to 59 in 1999, to ensure that the primary filer was not covered either by a parent's insurance policy (for those under 25) or by Medicare (for those over 65). Since the self-employed health insurance deduction is not available to taxpayers who are offered employer provided health insurance, these cuts were done to

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[9] The 1999 stratified random sample consisted of two parts. The first subsample, known as the Continuous Work History Subsample (CWHS), consists of all taxpayers for which the primary filer's social security number ended in one of five four-digit combinations. In 1999, this portion of the sample comprised 63,316 returns. The second subsample consists of a sample in which returns were sampled at progressively higher rates at higher income levels. This portion of the sample comprised 20,084 returns in 1999. The entire sample was constructed so that .05% of returns with positive income below $250,000 were sampled, with the sampling rate increasing from .18% for those with income between $250,000 and $500,000 up to 100% for taxpayers reporting income in excess of $20 million. This was done to insure that the sample included a sufficient number of very high income returns, which comprise a large share of both income reported and taxes paid.

[10] It is important to note that this panel suffers from some sample attrition. If a taxpayer in the sample in 1999 does not file in a subsequent year (due, for example, to death of the taxpayer, falling below the filing threshold, or some other reason), they will not be observed in that year. In addition, the sample does not pick up taxpayers who filed tax returns in subsequent years but who did not file a tax return in 1999. Thus, although it is a nationally representative sample in the base year, it is likely to be less so in subsequent years.

[11] For example, if a taxpayer reported only self-employment income in 1999-2003, and reported some wage and salary income in 2004, observations from 1999-2003 would be included in the estimation sample, but the observation from 2004 would not.

ensure that all sample members would have been able to take the deduction. Although it would have been preferable to cut only those wage and salary workers who had actually been offered insurance, information on alternative sources of coverage (either through employer provided insurance or public insurance) is not present in the tax data, unlike in the MEPS and the CPS. So, we perform this rougher cut, and we check the robustness of these results to alternative sample selection criteria.

For the base estimation sample in the amount specification, we include only observations for which the self-employed health insurance deduction was claimed in all years of the panel. The estimates from this specification, then, are representative of self-employed taxpayers who are insured.[12] We also test the robustness of these results to alternative sample selection criteria.

Finally, because we are including fixed effects at the taxpayer-marital status-number of children level, we exclude any observation for whom the taxpayer - marital status - number of children would appear only once in the estimation sample. The resulting sample for the take-up specification consists of 14,354 observations, and the sample for the amount specification consists of 1,692 observations.

Information on whether the taxpayer claimed the self-employed health insurance deduction, and how much a taxpayer claimed, came from the relevant line on the taxpayer's Form 1040.[13]

The strength of using tax data is that we observe the actual deduction taking behavior of the taxpayer, including the amount claimed. However, it is important to note

[12] For an unbiased estimate of the effect of the relative price on amounts claimed among all taxpayers, one would have to estimate a selection corrected regression. The tax data, however, dos not provide any variables that could plausibly satisfy exclusion restrictions, and so any such estimates would be identified strictly from function form assumptions.

[13] Line 28 in 1999-2001, line 30 in 2002, line 29 in 2003, and line 31 in 2004.

some weaknesses in using this tax data.

First, in order for us to observe the purchase of health insurance for the self-employed, the taxpayer must have claimed the deduction. To the extent that the increased deductibility of premiums led self-employed taxpayers to claim purchases they were already making, our results could be biased. However, any such bias would be upward in absolute value, and since this study finds smaller elasticities on the take-up margin than have been found previously, this main result would hold even if any such bias could be eliminated.

Second, we do not observe coverage of other members of the tax filing unit and for those who are not self-employed, and so we cannot use wage and salary workers as "controls" for the self-employed taxpayers in our sample. However, since we have panel data we can include fixed effects, and so self-employed taxpayers in the sample effectively serve as "controls" for themselves in different years.

Third, the amount paid is not only a function of the characteristics of the policy for each person covered by the policy but also of who is covered by the policy. Since we do not have data on the detailed provisions of the insurance policies purchased, we cannot look at the effect of the increased deduction on the type of coverage per se. Thus, increases in coverage in the amount specification may reflect self-employed taxpayers extending coverage to additional family members,[14] or increasing the fraction of the year that family members are covered, and so to some extent confound a type of extensive margin response with any intensive margin response.

Finally, health insurance premiums are also affected by the characteristics of the

[14] Note however, that these family members would have to have been part of the family unit in previous years, since we treat taxpayers whose family unit changes as separate observations before and after the change.

health insurance market. Fortunately, no large changes in state-level regulation of the non-group market occurred during our sample period, suggesting that the results in our amount specification are likely to reflect the effect of the deduction on the comprehensiveness of coverage.

To calculate the relative price of health care described in (3), five items need to be calculated or imputed for each taxpayer in the sample: the share of health expenditures paid out of pocket,[15] the fraction of medical expenses that would be deductible if the self-employed deduction was not claimed, the fraction of out-of-pocket medical expenses that would be deducted if the self-employed deduction was claimed, and state and federal marginal tax rates. Each of these are discussed in the Appendix. Using these variables, and the year-specific percentage of self-employed health insurance premiums that were deductible, the relative price of self-employed health insurance was calculated using Equation 3.

Sample statistics for all variables are presented in Table 1. In the first column, sample statistics for the entire sample are presented. In the second, sample statistics for those who claimed the self-employed health insurance deduction in all six years of the panel are presented. In the entire sample, 38% of the observations claim the self-employed health insurance deduction, with the average deduction amount (including those who do and do not claim the deduction) being $1,611. The average amount claimed among those who claimed the deduction in all six years was $4,432.

The mean relative price in the sample is 1.246, which is comparable to the mean prices of 1.123 to 1.225 found in Selden, whose data covers a similar period. It is

[15] The share of health expenditures paid as part of a health insurance premium is simply one minus this share.

somewhat lower than the mean after-TRA86 average price of 1.334 found in Gruber and Poterba (1994), but this is to be expected given the increase in the portion of premiums that are deductible in the time period under analysis.

Among all self-employed returns, about 57% have taxable income below 200 percent of the federal poverty line (FPL), and over 20% have taxable income above 500% of FPL. Among the sample claiming the deduction in all years, incomes are considerably higher, with only about 16% having taxable income below 200% of FPL and over 57% having taxable income above 500% of FPL. The average age of the sample is 45 years old and the average number of children is less than one. Slightly less than 40% of the sample is single, with married taxpayers filing jointly comprising 41.7% of the sample, and the rest divided between married filing singly (2.2%), head of household (16.2%).

Sample statistics for the key independent and dependent variables are presented, by year, in Table 2. Among the full sample in the top panel, the percentage of taxpayers claiming the self-employed health insurance deduction increased from 36.0% in 1999 to 37.3% in 2000, and increased further in 2001 and 2002 to 37.9% and 38.4%. The proportion claiming the deduction then decreased slightly in 2003 to 37.9% before increasing substantially to 40.6% in 2004. Among those who claimed the self-employed health insurance deduction in all years in the second panel, the mean amount claimed increased steadily over the sample period, from $3,264 in 1999 to $5,707 in 2004.

In the top panel, when the full sample is used, the mean relative price stayed roughly constant between 1999 and 2002, and declined about 2.5% in 2003. The pattern of changes for the tax price resembles that for the relative price (though the decline in the tax price is slightly larger). The tax prices at the end of the period were affected both by

the increases in the deductibility of health insurance premiums for the self-employed (which would tend to decrease the tax price), and by the tax rate cuts passed in the Economic Growth and Tax Relief Reconciliation Act of 2001 (which would tend to increase the tax price).

The time series variation in the relative and tax prices across years in the full sample is attenuated somewhat by the fact that the sample is unbalanced, and affected by panel members entering into and exiting out of self-employment, as well as attrition from the sample. In the bottom panel, when the sample is cut to include only observations that are self-employed and claim the self-employed health insurance deduction all six years of the panel, the variation in the relative and tax prices is more apparent. Among this sample, the mean drop in the relative price between 2002 and 2003 is 5.2%, and the mean drop in the tax price is 6.5%.

We further probe the sources of variation in the relative and tax price variables by state and income level in Figure 1. In this figure, we trace out, for eight different tax units, the relative and tax prices in each year of our sample. For this, we calculated the relative and tax prices for a married couple filing jointly, who report either $30,000 or $60,000 in taxable income, and who live in one of four states (Florida, Indiana, Illinois, or New York). In both panels, the couples earning $30,000 have higher relative prices than those earning $60,000 regardless of the state of residence, and within each group of couples earning the same amount there is considerable variation in relative and tax prices within a year and across time.

Looking at relative prices for couples reporting $30,000 in taxable income in the top panel, the couple living in Florida (which does not have an income tax, and so self-

employed health insurance expenses are not deductible at the state level) faces the highest relative price and the smallest decline in price across years. Looking at the other states, in 1999 the couple in Illinois has a relative price only slightly higher than that of the couple in New York and lower than the couple in Indiana, since the couple in Illinois is able to fully deduct self-employed health insurance expenses at the state level, while the couples in the other two states (whose state marginal tax rates are higher than the rate in Illinois) can only deduct 60%. By 2004, both New York and Indiana increased the fraction deductible to 100%, and so the relative price for the couple in Illinois is higher than the prices for the Indiana and New York couples. The declines in relative prices for these couples between 1999 and 2004 ranges from 5.5 percent for the Florida couple to 7.9 percent for the New York couple.

Similar patterns are found for the couples reporting $60,000 in taxable income in the top panel, and for tax prices in the bottom panel. The couple in Florida faces the highest prices and smallest declines, the couple in New York experiences the largest declines, and the couple in Illinois faces a relatively smaller drop in price than couples in New York and Indiana. The declines in relative prices for couples reporting $60,000 in taxable income range from 8.1 percent to 11.3 percent.

Looking back at Table 2 across individual years, although there does not appear to be an obvious relationship between the aggregate take-up or amount trends and the aggregate relative price, a more nuanced view of the trends suggest that the two may be related, although taxpayers may be slow to adjust. For example, the increase in coverage between 1999 and 2000 followed an increase in the deductibility of self-employed health insurance premiums in from 45% in 1998 to 60% in 1999. Further, although take-up

actually declined slightly in 2003 (when the percent deductible increased from 70% to 100%), it increased by almost 3 percentage points between 2003 and 2004. These results suggest that estimating on levels, and not first differences, is likely to be a better estimation strategy in this context. In addition, since the take-up and amount trends are likely to be driven by non-price factors as well, it will be important to account for those by including year effects. Finally, as noted above, the panel of tax returns suffers somewhat from attrition as the sample moves further away from the base year, and so the aggregate numbers in the top panel are also affected by changes in the composition of self-employed taxpayers in our sample, suggesting that within taxpayer variation may be a more desirable source of identifying variation when examining the take-up margin.

To illustrate the effect of the policy on claiming the deduction and the amount claimed pre- and post-2002[16], in Table 3 we presents simple difference and difference-in-differences estimates comparing the high tax self-employed (where high tax denotes total income less exemptions and the standard deduction falling in the 25% bracket or above) to the low tax self-employed (where low tax denotes total income less exemptions and the standard deduction falling in the 15% bracket or below). Although using the low tax self-employed as a control group for the high-tax self-employed is clearly not the preferred specification for many reasons (including the fact that they both were affected by the policy, and that they have very different rates in claiming the deduction pre-2002), this analysis provides some intuition for the variation that helps to identify our coefficients in our more comprehensive estimation specification.

In the top panel, simple weighted averages show that overall take-up has increased by 2.1 percentage points between the pre- and post-2002 periods, though when include

[16] We exclude 2002, which was a transition year, from this analysis.

controls for demographic characteristics (including total income, age, age squared, the number of children, and filing status), there is no change in take-up. The difference-in-differences estimates (with and without controls) suggest between a 3.0 and 4.3 percentage point increase in take-up for the high tax relative to low income self-employed, which corresponds to an elasticity between -0.65 and -0.93, given the base probability of claiming the deduction among the high tax self-employed of about 70.4% pre-2002, and a change in price of about 6.6%. Similarly, the bottom panel suggests that the higher deductibility of health insurance premiums post-2002 increased the amount of health insurance purchased by the high tax self-employed relative to the low-tax self-employed, though the implied elasticity is implausibly large.

The next two sections will use the more comprehensive method described in Section 3 to estimate the effect of OCESA on take-up of health insurance and amount of health insurance purchased.

6. Take-up Results

The first column of Table 4 presents results from the base take-up estimation of Equation (1) where observations are weighted by the inverse of their sampling probability. The coefficient on the relative price is of the correct sign, significant, and implies a take-up elasticity of -0.316. Thus, compared to Gruber and Poterba (1994) who estimate an elasticity of almost -1, and Selden (2009), whose preferred elasticities range from -2.0 to -2.7, our estimated elasticity is significantly smaller. It is larger, however, than the

results in Gumus and Regan (2009), who find an insignificant effect of increasing federal deductibility of self-employed health insurance premiums on take-up.

To examine whether the weighting the sample biased the results in any way, in the second column the base-specification is rerun, with observations unweighted. In this specification, the implied take-up elasticity is insignificantly larger, at -0.333, and is still significant.

To address whether the way the sample was selected in the base specification drives our results, the third through fifth columns in Table 4 provide estimates of the take-up elasticity using three alternative samples. In Column 3, the sample includes all taxpayers who report any self-employment income, whether or not they received wage and salary income, and in Column 4, the sample includes taxpayers for whom a majority of income came from self-employment, but who could have received wage and salary income. These columns add to the base specification sample some observations who are eligible to claim the deduction because they aren't offered coverage by their employer, and so were erroneously cut in the base specification. However, they are likely to also include taxpayers who are not eligible to claim the deduction because of an offer of insurance from their employer. In addition, the calculation of the relative price variable assumes that no ESI coverage is available for the taxpayer, and so the relative price for these observations is possibly measured with error. However, the estimated coefficients in these two columns are very similar to that in the base specification, suggesting that excluding these observations did not bias our estimated take-up elasticity. Finally, in Column 5, we only include taxpayers who had only self-employment income in all 6 years. The base specification includes taxpayers who may have entered into self-

employment or exited from self-employment at some point in the sample. If these taxpayers that enter tend to be more responsive to taxes, and those that exit tend to be less responsive, our estimated elasticities could be biased upward. However, when we cut taxpayers who entered into or exited from self-employment these estimated elasticity actually increases (though it is not significantly different from the elasticity in the base specification), suggesting that the base specification results were not biased upward by entry or exit. In addition, these results suggest that the consistently self-employed may have been more responsive to the policy changes, perhaps because they are more cognizant of changes in taxes.

Table 5 presents results when the tax price is used in place of the relative price, as well as for specifications that do not include fixed effects. The first column repeats the results from the base specification. To examine whether the panel nature of the dataset and the inclusion of individual fixed effects have a significant impact on the results, in Column 2 the fixed effects were eliminated from the estimation equation. As is apparent from this column, excluding fixed effects results in the estimated take-up elasticity roughly doubling to a highly significant -0.629. One possible explanation for this increase in the estimated take-up elasticity is that unobserved health status is negatively correlated with the relative price (because poor health is likely to imply lower income and a higher net of tax share) and at the same time positively correlated with the ability to purchase insurance on the individual market. Thus, if individual fixed effects are not controlled for, spurious negative cross-sectional correlation between take-up and relative prices can lead to larger take-up elasticity estimates. Furthermore, if the policy induced taxpayers with low relative prices to become self-employed, and those taxpayers also

have strong preferences for purchasing health insurance, then estimating elasticities using cross sectional variation would again bias the elasticity upward.[17] This result, then, points to the importance of using within-taxpayer over time variation when attempting to identify the effects of changes in prices on health insurance take-up.

The results from the previous column, however, raise an additional concern. The relative price used in this study was calculated using imputations for the total cost of health care treatment and out of pocket expenses. To the extent that these imputations are measured with error, the estimated coefficients in both the fixed effects and non-fixed effects specifications could suffer from a downward bias. As Johnston and DiNardo (1997) note, attenuation bias can be particularly severe in fixed effects specifications, since the signal to noise ratio when taking differences can be considerably smaller.

To examine whether attenuation bias is driving these results, we run two additional specifications. In Column 3, we replace the relative price with the tax price. Although this is a theoretically undesirable measure of the price of health insurance, it has the advantage that it is not measured with error. Compared to the base specification, when the tax price is used the estimated take-up elasticity increases somewhat to -0.667, and is still highly significant. However, this implied elasticity is still smaller than those found in Selden (2009) and Gruber and Potorba (1994), suggesting that our main finding of lower elasticities than have been found in those papers is robust to using the tax price in place of the relative price.

[17] See, for example, Heim and Lurie (2009), who find that the decrease in the price of health insurance for the self-employed led to a significant increase in the probability of self-employment, and that the majority of the response consisted of taxpayers becoming self-employed and claiming the self-employed health insurance deduction.

In Column 4, we eliminate the fixed effects from the tax price specification. Again, the estimated elasticity increases substantially, suggesting that measurement error in the relative price alone was not driving the difference between the fixed effect and non-fixed effect relative price specifications.

To examine whether the results differ depending on demographic characteristics of the household, in Table 6 the sample is cut according to marital and childbearing status. The observations are divided into four groups according to whether the taxpayer is married or not and whether the taxpayer claims any dependent children on the tax form. For the two married specifications (married with children and married without children) the estimated elasticties are small and insignificant, with magnitudes of -0.165 and -0.067. However, the elasticities for the two single specifications (single with children and single without children) are -1.364 and -0.591 respectively, and are significant. This pattern is consistent with Gruber and Poterba (1994), who found a significant elasticity for single individuals, but not for married couples. The take-up elasticity estimated here for single taxpayers, however, is substantially smaller than the implied elasticity in excess of -3 found in that paper.

7. Intensive Margin Results

Results from the estimation of the elasticity of demand on the intensive margin are presented in Table 7. Recall that, for these specifications, we include only taxpayers who claim the self-employed health insurance deduction in all years. In these specifications the relative price is calculated using the last dollar marginal tax rate (which takes into

account the amount of the self-employed health insurance deduction that was claimed). Because, as noted above, this price is endogenous to the amount of insurance purchased, we instrument with the relative price calculated using the marginal tax rate that would apply to the first dollar of insurance purchased. Similar to the take-up base specification the observations are weighted by the inverse of their sampling probability.

The first column of Table 7 presents results from the base specification. The coefficient on the relative price in this column is of the correct sign and highly significant, with an implied elasticity of demand of -0.733. It is hard to put this number in context since we are unaware of any other paper estimates the price elasticity in the individual market on this margin. However, Gruber and Washington (2005) find an elasticity of demand of less than -0.1 when examining the ESI choices of federal employees, so this estimate for self-employed taxpayers purchasing in the individual market is quite a bit larger.

It is important to keep in mind that we do not observe any characteristics of the policy purchased, only the amount paid. Controlling for year fixed effects should control for any trends in price that affected all purchasers in the individual market. However, to the extent that prices increased by a greater amount for the self-employed for whom the relative price decreased more (which seems much less likely than an overall change in price), our estimated coefficient may be biased upward. In addition, as noted above, some of the response we are finding could reflect taxpayers adding additional family members to a plan or adding additional months of coverage, confounding a type of extensive margin response with any intensive margin response. Nevertheless, this

estimate suggests that purchases of health insurance are at least somewhat responsive to price.

In the second column, to again examine whether using the weighted sample changes the results in any way, the base specification is rerun without using the weights. When this is done, the estimated implied elasticity increases somewhat to -1.028.

To address whether the way we selected our sample in the base specification drives our results, the third through fifth columns in Table 7 provide estimates of the intensive margin elasticity using alternative samples. In Column 3, the sample includes all taxpayers who were self-employed all years of the sample, and who claimed the self-employed health insurance deduction in at least one of those years. In Column 4, the sample includes taxpayers who were self-employed at least one year of the sample, but claimed the deduction in all years they were self-employed. Finally, in Column 5, all taxpayers who were self-employed at least one year and claimed the deduction in at least one year are included. In all of these columns, observations from these taxpayers are only included in years that they claimed the deduction, to avoid confounding estimates of the intensive margin response with an extensive margin response. In these columns, the estimated elasticity decreases when we use less stringent sample criteria, suggesting that the more consistently self-employed taxpayers tend to also be more responsive to the change in price.

Table 8 presents some additional specification checks of the intensive margin estimation. The first column repeats the results from the base specification. In the second column, to gauge the importance of controlling for fixed effects in the estimation specification, the base specification was rerun omitting fixed effects. When this is done,

the estimated elasticity only increases to -0.854, suggesting that omitted variables bias may not be as big of an issue on the intensive margin as it was on the extensive margin.

To gauge whether attenuation bias due to measurement error in the relative price is driving these results, we reestimate the base specification using the tax price in place of the relative price. When the tax price is used, the estimated implied elasticity is -0.816, and is insignificantly different from the base specification. Finally, using the tax price but excluding fixed effects yields a slightly lower estimate of -0.770.

In Table 9, the sample is cut again according to demographic characteristics of the taxpayer to examine whether the responsiveness of insurance purchase amounts to the price of insuring differs by family type. Here, only for married couples without children is the coefficient on the relative price correctly signed and significant, with an implied elasticity of -.784.

8. Conclusion

The Omnibus Consolidated and Emergency Supplemental Appropriations Act of 1998 (OCESA) and concurrent state tax changes increased the deductibility of health insurance premiums for the self-employed, and provides us with a natural experiment to estimate the sensitivity of the demand for health insurance to price changes. Using a panel of tax returns from 1999 to 2004 we estimated the effect of a change in the after-tax price of health insurance on both the take-up of health insurance coverage and the amount of health insurance purchased.

In our base specification, we find an overall elasticity of demand on the extensive margin (take-up) of about -0.3, which is smaller than earlier findings in the literature that looked at similar policies, though still significant. We also find, similar to Gruber and Poterba, that single taxpayers responded significantly, while we do not find significant results for married couples. On the intensive margin we find a highly significant elasticity of about -0.7 for self-employed taxpayers.

Our results suggest that changing the price of health insurance through a deduction had moderate effects on both the number of self-employed taxpayers purchasing health insurance and the amount of insurance purchased. However, since the natural experiment we study focuses on the self-employed, it is possible that the non-self-employed population, which is arguably less familiar with the tax code, would be less inclined to take-up coverage than the population studied in this paper when faced with a similar policy change.

In addition, there are two major limitations to our study that should be kept in mind when attempting to generalize the effects of OCESA to other proposed subsidies for the purchase of health insurance.

First, although OCESA was one of the largest increases in tax-based subsidies for health insurance since the introduction of the exclusion of employment based health insurance, the change in the after-tax price of health insurance due to OCESA was smaller than some of the major health reform proposals currently being offered. For example, for an individual with a somewhat high marginal income tax rate of 40% (including federal and state taxes), the increase in the deductibility of self-employed health insurance premiums from 60% to 100% lowered the tax price of insurance by

21%[18] and the change in the relative price of health insurance was even smaller. Further, self-employed taxpayers in lower tax brackets experienced an even smaller change in their tax price of insurance (with no change for self-employed taxpayers with no tax liability). Hence, it is not clear that our findings will be valid for proposals that provide subsidies that are substantially larger than those found in OCESA.

Second, a large subsidy through the tax code may alter the market for individual health insurance, since insurers may introduce new products geared at taxpayers who wish to take advantage of the subsidy. In addition, if the tax subsidy is combined with other provisions, it could induce an influx of healthy individuals to enter the market, lowering administrative costs. Thus, a combination of such policies with a substantial subsidy of health insurance through the tax code may induce take-up at higher levels than our estimates predict.

Nonetheless, our results suggest that a subsidy through the tax may increase take-up, but may also increase the amount of insurance purchased by individuals who already have insurance. In structuring a tax subsidy for health insurance, policymakers should be aware that increasing the tax subsidy to both the insured and uninsured may differentially affect behavior on these two margins, and design policies accordingly.

[18] The after tax price in the case of 60% deductibility of self employed health insurance and marginal tax rate of 40% is 0.76 and the tax price in the case of 100% deductibility is 0.60 which implies a percentage change in price of 0.16/0.76.

Appendix

This appendix details the imputations used in the calculation of the relative price in Equation 3 in the text.

Following previous studies, the administrative load factor, λ, is set to .4

To impute (1-ω), the share of health expenditures paid out of pocket, we use data from the 1999-2005 Medical Expenditure Panel Survey (MEPS) to impute out of pocket expenses and total health expenditures, and take the ratio of these imputed amounts.

To impute the total amount of health spending, we cut the MEPS sample to include observations[19] where the primary filer is under 65 and had some private health insurance coverage during the year, and regressed the log of total health expenditures (plus a dollar) against the primary filer's gender, filing status, age, number of exemptions, dummies for itemization and claiming the EITC, year dummies, and dummies for the income bracket into which the taxpayer's earned income fell.[20] We then used the resulting coefficients, along with values of these same variables for observations in the Edited Panel sample, to predict log total health expenses for observations in the Edited Panel. Finally, we retransformed the predicted log amounts of spending to dollars using the expression

$$(4)\ TotalH = \exp\left(\ln \hat{TotalH}\right)\frac{RMSE^2}{2}$$

(see Manning (1998)).

To impute out of pocket expenses, the same MEPS sample was used to run a

[19] The MEPS data was aggregated to form tax filing units using individual's detailed survey answers regarding the tax return they file.
[20] The brackets used were $0-$12500, $12500-$25000, $25000-$50000, $50000-$100000, and $100000 and up.

regression of the log of out of pocket expenses (plus a dollar) against the same set of independent variables as above. The resulting coefficients, along with variables from the Edited Panel, were used to predict log out of pocket expenses while insured for the observations in the Edited Panel, which were converted to dollars using the transformation above.

To impute δ^{INSU}, the fraction of medical expenses that would be deductible if the taxpayer purchased health insurance and the self-employed deduction was claimed, the MEPS data was again cut to include observations where the primary filer was under 65 and had some private health insurance coverage during the year. We then ran a Tobit of out of pocket expenditures against the same set of independent variables as above, and use the resulting coefficients to predict out of pocket expenses if insured for observations in the Edited Panel. Finally, we used the tax calculator described below to calculate, for each observation in the Edited Panel, the proportion of the imputed out of pocket expenses that would be deductible if the taxpayer itemized deductions.

To impute δ^{UNIN}, the fraction of medical expenses that would be deductible if no health insurance was purchased and the self-employed deduction was not claimed, we cut the MEPS sample to include all observations where the primary filer was under 65, regardless of insurance status. We then ran a Tobit of total medical expenditures against the same set of independent variables as above, and use the resulting coefficients to predict total health expenditures for observations in the Edited Panel. Finally, we used the tax calculator described below to calculate, for each observation in the Edited Panel, the proportion of the imputed total health expenses that would be deductible if the taxpayer itemized deductions.

Marginal tax rates were calculated using tax calculators provided by Jon Bakija.[21] Marginal tax rates in this study include federal income tax and state income tax rates. Tax rates were calculated for each observation in the Edited Panel by incrementing adjustments to income by $100 and calculating the marginal decrease in taxes owed.

[21] Documentation for these tax calculators is detailed in Bakija (2008).

References

[1] Auerbach, David and Sabina Ohri. (2006). "Price and the Demand for Nongroup Health Insurance." *Inquiry*. 43:122-134.

[2] Bakija, Jon. (2008). "Documentation for a Comprehensive Historical U.S. Federal and State Income Tax Calculator Program" Working paper, Williams College. http://www.williams.edu/Economics/papers/bakijaDocumentation_IncTaxCalc.pdf

[3] Congressional Budget Office (CBO). (2009) "The Budgetary Treatment of Proposals to Change the Nation's Health Insurance System". Economic and Budget Issue Brief, CBO. Web site: http://www.cbo.gov/ftpdocs/102xx/doc10243/05-27-HealthInsuranceProposals.pdf

[4] Gruber, Jonathan and James Poterba. (1994). "Tax Incentives and the Decision to Purchase Health Insurance: Evidence from the Self-Employed." *The Quarterly Journal of Economics*. 109(3): 701-733.

[5] Gruber, Jonathan and Ebonya Washington. (2005). "Subsidies to Employee Health Insurance Premiums and the Health Insurance Market." *Journal of Health Economics*. 24(2):253-276.

[6] Gumus, Gulcin and Tracy L. Regan. (2009). "Tax Incentives as a Solution to the Uninsured: Evidence from the Self-Employed." Working Paper. Web site: http://moya.bus.miami.edu/~tregan/Insurance.pdf

[7] Heim, Bradley T. and Ithai Z. Lurie. (2009). "The Effect of Health Insurance Premium Subsidies on Entry into and Exit from Self-Employment." Working Paper Web site: http://home.comcast.net/~bradheim/files/HeimLurieSEHIEntExit.pdf

[8] Johnston, Jack and John DiNardo. (1997). *Econometric Methods: Fourth Edition*. New York: The McGraw-Hill Companies.

[9] Long, S. H., and M. S. Marquis. (2002). ''Participation in a Public Insurance Program: Subsidies, Crowd-Out and Adverse Selection.'' *Inquiry* 39 (3): 243–57.

[10] Marquis, M. Susan, Melinda Beeuwkes Buntin, José J. Escarce, Kanika Kapur, and Jill M.Yegian. (2004). "Subsidies and the Demand for Individual Health Insurance in California." *Health Services Research*, vol. 39, no. 5, 1547-1570.

[11] Marquis, M. S., and J. L. Buchanan. (1992). ''Subsidies and National Health Care Reform: The Effect on Workers Demand for Health Insurance Coverage.'' *Health Benefits and the Workforce*. Washington, DC: U.S. Dept. of Labor.

[12] Marquis, M. S., and S. H. Long. (1995). ''Worker Demand for Health Insurance in

the Non-Group Market.'' *Journal of Health Economics*. 14 (1): 47–63.

[13] Manning, W.G., 1998. The logged dependent variable, heteroscedasticity, and the retransformation problem. *Journal of Health Economics.* 17, 283–295

[14] Pauly, M., and B. Herring. (2001). ''Expanding Coverage via Tax Credits: Trade-offs and Outcomes.'' *Health Affairs* 20 (1): 9–26.

[15] Selden, Thomas. (2009). "The Impact of Increased Tax Subsidies on the Insurance Coverage of Self-Employed Families: Evidence from the 1996-2004 Medical Expenditure Panel Survey." *Journal of Human Resources.* 44(1):115–139.

[16] U.S. Census Bureau, Current Population Survey (CPS), 2000 to 2008 Annual Social and Economic Supplements. Web site:
http://www.census.gov/hhes/www/hlthins/historic/hihistt1.xls

[17] Weber, Michael and Victoria L. Bryant. (2005). "The 1999 Individual Income Tax Return Edited Panel." in *2005 Proceedings of the American Statistical Association.* Alexandria, VA: American Statistical Association.

Tables

Table 1: Sample Characteristics of Self Employed Returns

	All Returns	Returns Claiming Self-Employed Health Insurance Deduction All Years
Sample Size	14,354	1,692
Percent of Returns Claming Health Insurance Deduction	38.02%	100.00%
	(0.485)	(0.000)
Self-Employed Health Insurance Deduction Amount	1,611	4,432
	(2868)	(3252)
Relative Price of Health Insurance	1.246	1.161
	(0.114)	(0.125)
Tax Price of Health Insurance	0.909	0.828
	(0.055)	(0.094)
Income Less Than 100% FPL	0.341	0.057
	(0.474)	(0.233)
Income Between 100- 200% FPL	0.227	0.105
	(0.419)	(0.306)
Income Between 200- 300% FPL	0.112	0.125
	(0.316)	(0.331)
Income Between 300- 400% FPL	0.073	0.074
	(0.261)	(0.263)
Income Between 400- 500% FPL	0.043	0.064
	(0.204)	(0.244)
Income Above 500% FPL	0.203	0.575
	(0.402)	(0.495)
Mean Age of Primary Tax Filler	45.4	48.7
	(9.2)	(8.9)
Number of Children	0.822	0.502
	(1.148)	(1.039)
Filing Status		
Single	0.398	0.555
	(0.490)	(0.497)
Married Filing Jointly	0.417	0.414
	(0.493)	(0.493)
Married Filing Singly	0.022	0.000
	(0.147)	(0.002)
Head of Household	0.162	0.031
	(0.369)	(0.205)

Note: Data from the 1999-2004 Edited Panel of tax returns.
Standard deviations are in parentheses. All means are calculated using sampling weights.

Table 2: Sample Characteristics for Key Dependent and Independent Variables by Year

Dependent and Independent Variables \ Year	1999	2000	2001	2002	2003	2004
			All Returns			
Fraction of Returns Claiming Self-Employed Health Deduction	0.360	0.373	0.379	0.384	0.379	0.406
	(0.480)	(0.483)	(0.485)	(0.486)	(0.485)	(0.491)
Self-Employed Health Insurance Deduction Amount	1,164	1,388	1,512	1,660	1,830	2,128
	(2,070)	(2,449)	(2,656)	(2,858)	(3,199)	(3,650)
Relative Price	1.254	1.254	1.259	1.256	1.225	1.223
	(0.097)	(0.100)	(0.100)	(0.104)	(0.134)	(0.138)
Tax Price	0.920	0.919	0.919	0.917	0.890	0.885
	(0.079)	(0.081)	(0.081)	(0.088)	(0.118)	(0.121)
			Returns That Claim Self-Employed Health Deduction All Years			
Fraction of Returns Claiming Self-Employed Health Deduction	1.000	1.000	1.000	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Self-Employed Health Insurance Deduction Amount	3,264	3,658	3,991	4,679	5,296	5,707
	(2,097)	(2,512)	(2,678)	(3,148)	(3,657)	(4,203)
Relative Price	1.173	1.170	1.184	1.184	1.122	1.131
	(0.099)	(0.103)	(0.116)	(0.115)	(0.145)	(0.147)
Tax Price	0.847	0.845	0.842	0.844	0.789	0.799
	(0.070)	(0.073)	(0.071)	(0.083)	(0.117)	(0.119)

Note: Data from the 1999-2004 Edited Panel of tax returns. Standard deviations are in parentheses. All means are calculated using sampling weights.

Table 3: Simple Difference Estimates Pre- and Post- 2002

	No Controls			With Controls		
	Pre	Post	Difference	Pre	Post	Difference
Take-up						
Overall	0.371	0.392	0.021	0.379	0.379	0.000
High Tax	0.709	0.747	0.038	0.475	0.507	0.032
Low Tax	0.263	0.271	0.008	0.348	0.337	-0.011
Difference			**0.030**			**0.043**
Amount						
Overall	3,638	5,501	1,864	3,066	4,576	1,510
High Tax	4,060	6,236	2,177	4,060	4,883	1,804
Low Tax	2,843	4,119	1,275	3,242	4,174	932
Difference			**901**			**872**

Note: Data from the 1999-2004 Edited Panel of tax returns.

Table 4: Self-Employed Health Insurance Deduction: Take-up – Base Specification and Alternative Samples

	All Returns (Weighted) (1)	All Returns (Unweighted) (2)	Any SE Income (3)	Majority SE Income (4)	Exclusively SE Income All years (5)
Relative Price	-0.136**	-0.142***	-0.090***	-0.123***	-0.274***
	(0.056)	(0.035)	(0.029)	(0.043)	(0.095)
Age Squared	0.305***	0.219***	-0.049	0.128	0.355**
	(0.105)	(0.071)	(0.059)	(0.090)	(0.177)
Income Between 100-200% FPL	0.046***	0.036***	0.029***	0.041***	0.048*
	(0.013)	(0.011)	(0.008)	(0.010)	(0.026)
Income Between 200-300% FPL	0.099***	0.081***	0.050***	0.078***	0.056*
	(0.018)	(0.013)	(0.010)	(0.014)	(0.034)
Income Between 300-400% FPL	0.120***	0.101***	0.049***	0.104***	0.110***
	(0.022)	(0.015)	(0.012)	(0.017)	(0.040)
Income Between 400-500% FPL	0.169***	0.130***	0.058***	0.142***	0.155***
	(0.024)	(0.017)	(0.013)	(0.019)	(0.044)
Income Above 500% FPL	0.142***	0.102***	0.046***	0.114***	0.113**
	(0.026)	(0.016)	(0.014)	(0.021)	(0.044)
Year Dummy 2000 (relative to 1999)	-0.019	-0.017*	0.010	-0.011	-0.010
	(0.013)	(0.009)	(0.007)	(0.011)	(0.026)
Year Dummy 2001 (relative to 1999)	-0.031	(0.021)	0.023*	-0.013	-0.003
	(0.021)	(0.015)	(0.012)	(0.018)	(0.037)
Year Dummy 2002 (relative to 1999)	-0.056*	-0.037*	0.032*	-0.024	-0.043
	(0.030)	(0.021)	(0.017)	(0.026)	(0.052)
Year Dummy 2003 (relative to 1999)	-0.090**	-0.065**	0.036	-0.039	-0.090
	(0.039)	(0.028)	-0.022	(0.034)	(0.068)
Year Dummy 2004 (relative to 1999)	-0.103**	-0.071**	0.051*	-0.033	-0.142*
	(0.049)	(0.035)	(0.028)	(0.042)	(0.085)
Implied Elasticity	**-0316****	**-0.333*****	**-0.341*****	**-0.314*****	**-0.503*****
	(0.130)	**(0.081)**	**(0.111)**	**(0.109)**	**(0.174)**
Number of Observations	14,354	14,481	61,395	28,485	3,738

Note: Data from the 1999-2004 Edited Panel of tax returns. The coefficients are based on a fixed effect model for taking the self-employed health insurance deduction controlling for the following covariates: first dollar relative price, age squared, number of children, income, filing status dummies (single, married filing jointly, married filing separately, head of household, widower and other) and year dummies. The take-up elasticity of demand is calculated at the mean relative price in the sample and the standard deviation of the take-up elasticity is calculated using the delta method.
* implies significant at 10%; ** implies significant at 5%; *** implies significant at 1%

Table 5: Self-Employed Health Insurance Deduction: Take-up - Differences in Price Variable

	Relative Price (1)	Relative Price No FE (2)	Tax Price (3)	Tax Price No FE (4)
Price	-0.136**	-0.270***	-0.396***	-0.890***
	(0.056)	(0.092)	(0.080)	(0.126)
Income Between 100- 200% FPL	0.046***	0.138***	0.030**	0.095***
	(0.013)	(0.018)	(0.013)	(0.017)
Income Between 200- 300% FPL	0.099***	0.312***	0.072***	0.241***
	(0.018)	(0.026)	(0.018)	(0.027)
Income Between 300- 400% FPL	0.120***	0.385***	0.086***	0.296***
	(0.022)	(0.031)	(0.023)	(0.033)
Income Between 400- 500% FPL	0.169***	0.496***	0.128***	0.396***
	(0.024)	(0.034)	(0.025)	(0.038)
Income Above 500% FPL	0.142***	0.540***	0.091***	0.406***
	(0.026)	(0.031)	(0.027)	(0.036)
Age		0.137*		0.138*
		(0.079)		(0.079)
Age Squared	0.305***	-0.125	0.287***	-0.128
	(0.105)	(0.089)	(0.105)	(0.088)
Number of Children		-0.001		-0.004
		(0.009)		(0.009)
Filing Status: Joint		0.038*		0.043*
		(0.023)		(0.023)
Filing Status: Head of Household		-0.244***		-0.254***
		(0.045)		(0.046)
Filing Status: Other		-0.023		-0.016
		(0.024)		(0.024)
Constant		0.125		0.658***
		(0.211)		(0.214)
Implied Elasticity	**-0.316*** (0.130)**	**-0.629*** (0.216)**	**-0.667*** (0.134)**	**-1.498*** (0.213)**
Number of Observations	14,354	14,354	14,354	14,354

Note: Data from the 1999-2004 Edited Panel of tax returns. The coefficients are based on a fixed effect model for taking the self-employed health insurance deduction controlling for the following covariates: first dollar relative price, age squared, number of children, income, filing status dummies (single, married filing jointly, married filing separately, head of household, widower and other) and year dummies. The take-up elasticity of demand is calculated at the mean relative price in the sample and the standard deviation of the take-up elasticity is calculated using the delta method.
* implies significant at 10%; ** implies significant at 5%; *** implies significant at 1%

Table 6: Self-Employed Health Insurance Deduction: Take-up - By Family Type

	Married with Children (1)	Married No Children (2)	Single with Children (3)	Single No Children (4)
Relative Price	-0.086	0.034	-0.271**	-0.206**
	(0.103)	(0.118)	(0.126)	(0.102)
Age Squared	0.242	0.129	0.322	0.321**
	(0.187)	(0.354)	(0.397)	(0.159)
Income Between 100- 200% FPL	0.051*	0.127***	0.003	0.037*
	(0.027)	(0.037)	(0.026)	(0.020)
Income Between 200- 300% FPL	0.130***	0.196***	-0.013	0.080***
	(0.035)	(0.050)	(0.053)	(0.025)
Income Between 300- 400% FPL	0.168***	0.193***	0.031	0.099***
	(0.044)	(0.052)	(0.066)	(0.032)
Income Between 400- 500% FPL	0.242***	0.282***	-0.015	0.142***
	(0.048)	(0.054)	(0.072)	(0.038)
Income Above 500% FPL	0.219***	0.248***	-0.039	0.108***
	(0.049)	(0.057)	(0.083)	(0.040)
Income Between 100- 200% FPL	0.051*	0.127***	0.003	0.037*
	(0.027)	(0.037)	(0.026)	(0.020)
Implied Elasticity	**-0.165**	**0.067**	**-1.364****	**-0.591*****
	(0.198)	**(0.230)**	**(0.636)**	**(0.294)**
Number of Observations	5,535	2,951	1,488	4,380

Note: Data from the 1999-2004 Edited Panel of tax returns. The coefficients are based on a fixed effect model for taking the self-employed health insurance deduction controlling for the following covariates: first dollar relative price, age squared, number of children, income, filing status dummies (single, married filing jointly, married filing separately, head of household, widower and other) and year dummies. The take-up elasticity of demand is calculated at the mean relative price in the sample and the standard deviation of the take-up elasticity is calculated using the delta method.
* implies significant at 10%; ** implies significant at 5%; *** implies significant at 1%

Table 7: Self-Employed Health Insurance Deduction: Amount of Insurance – Base Specification and Alternative Samples

	All Returns (Weighted) (1)	All Returns (Unweighted) (2)	SE All Years: Claim Deduction Some Years (3)	SE Some Years: Claim Deduction All Years SE (4)	SE Some Years: Claim Deduction Some Years (5)
Relative Price	-4,980***	-6,983***	-3,963***	-2,002***	-2,306***
	(1076)	(1022)	(935)	(647)	(600)
Age Squared	8,516***	6,912***	6,844***	5,708***	5,642***
	(1567)	(1790)	(1444)	(1295)	(1239)
Income Between 100-200% FPL	-373*	-596	-163	-97	-123
	(225)	(452)	(175)	(159)	(123)
Income Between 200-300% FPL	-16	-48	-84	22	-51
	(250)	(471)	(193)	(182)	(143)
Income Between 300-400% FPL	-197	-551	22	377*	305*
	(394)	(542)	(264)	(224)	(171)
Income Between 400-500% FPL	-682*	-740	-336	252	161
	(399)	(559)	(276)	(234)	(180)
Income Above 500% FPL	-767*	-1,289**	-250	-34	45
	(449)	(540)	(342)	(261)	(215)
Year Dummy 2000 (relative to 1999)	-407*	-50	-231	-145	-54
	(210)	(239)	(180)	(149)	(138)
Year Dummy 2001 (relative to 1999)	-824**	-72	-480	-182	-174
	(323)	(384)	(295)	(248)	(236)
Year Dummy 2002 (relative to 1999)	-992**	-131	-560	-222	-239
	(463)	(550)	(422)	(369)	(349)
Year Dummy 2003 (relative to 1999)	-1,529**	-416	-1,038*	-292	-418
	(623)	(733)	(562)	(498)	(467)
Year Dummy 2004 (relative to 1999)	-1,932**	-349	-1,219*	-391	-481
	(751)	(914)	(695)	(608)	(575)
Implied Elasticity	**-0.733*** **	**-1.028*** **	**-0.634*** **	**-0.306*** **	**-0.374*** **
	(0.159)	**(0.151)**	**(0.150)**	**(0.099)**	**(0.098)**
Number of Observations	1,692	1,692	2,305	6,094	7,882

Note: Data from the 1999-2004 Edited Panel of tax returns. The coefficients are based on a fixed effect model for the amount of self-employed health insurance deduction controlling for the following covariates: relative price (instrumented with the first dollar relative price), age squared, number of children, income, filing status dummies (single, married filing jointly, married filing separately, head of household, widower and other) and year dummies. The elasticity of demand is calculated at the mean relative price in the sample and the standard deviation of the elasticity is calculated using the delta method.

* implies significant at 10%; ** implies significant at 5%; *** implies significant at 1%

Table 8: Self-Employed Health Insurance Deduction: Amount of Insurance - Differences in Price Variable

	Relative Price (1)	Relative Price No FE (2)	Tax Price (3)	Tax Price No FE (4)
Price	-4,980***	-5,808***	-7,781***	-7,343***
	(1076)	(1368)	(1849)	(2597)
Income Between 100-200% FPL	-373*	130	-493**	-35
	(225)	(582)	(247)	(587)
Income Between 200-300% FPL	-16	1,047	-381	730
	(250)	(749)	(294)	(809)
Income Between 300-400% FPL	-197	1,415*	-598	953
	(394)	(809)	(422)	(882)
Income Between 400-500% FPL	-682*	274	-1,186***	-348
	(399)	(749)	(416)	(852)
Income Above 500% FPL	-767*	894	-1,225***	592
	(449)	(734)	(468)	(836)
Age		-399		-556
		-1,710		-1,709
Age Squared	8,516***	1,454	9,201***	1,572
	(1567)	(1894)	(1669)	(1888)
Number of Children		578**		568**
		(228)		(243)
Filing Status: Joint		2,922***		2,901***
		(495)		(502)
Filing Status: Head of Household		7,415***		7,498***
		(293)		(330)
Filing Status: Other		430		268
		(645)		(685)
Constant		6,424		6,617
		(4032)		(4268)
Implied Elasticity	**-0.733*** (0.159)**	**-0.854*** (0.202)**	**-0.816*** (0.195)**	**-0.770*** (0.273)**
Number of Observations	1,692	1,692	1,692	1,692

Note: Data from the 1999-2004 Edited Panel of tax returns. The coefficients are based on a fixed effect model for the amount of self-employed health insurance deduction controlling for the following covariates: relative price (instrumented with the first dollar relative price), age squared, number of children, income, filing status dummies (single, married filing jointly, married filing separately, head of household, widower and other) and year dummies. The elasticity of demand is calculated at the mean relative price in the sample and the standard deviation of the elasticity is calculated using the delta method.

* implies significant at 10%; ** implies significant at 5%; *** implies significant at 1%

Table 9: Self-Employed Health Insurance Deduction: Amount of Insurance - By Family Type

	Married with Children (1)	Married No Children (2)	Single with Children (3)	Single No Children (4)
Relative Price	-4,157	-6,134**	-14,314	511
	(2586)	(2945)	(14124)	(689)
Age Squared	3,856	6,065	76,097**	5,709***
	(5451)	(3820)	(31929)	(1213)
Income Between 100-200% FPL	-931	903*	992	252
	(700)	(475)	(2524)	(161)
Income Between 200-300% FPL	-747	647	2,955	184
	(723)	(673)	(2287)	(195)
Income Between 300-400% FPL	841	-615	1,880	322
	(1252)	(752)	(1325)	(342)
Income Between 400-500% FPL	390	-1,791**		656**
	(1159)	(775)		(330)
Income Above 500% FPL	311	-1,939**	2,093	721*
	(1111)	(820)	(1530)	(392)
Implied Elasticity	**-0.446**	**-0.784****	**-4.770**	**0.171**
	(0.278)	**(0.377)**	**(4.728)**	**(0.231)**
Number of Observations	660	504	30	498

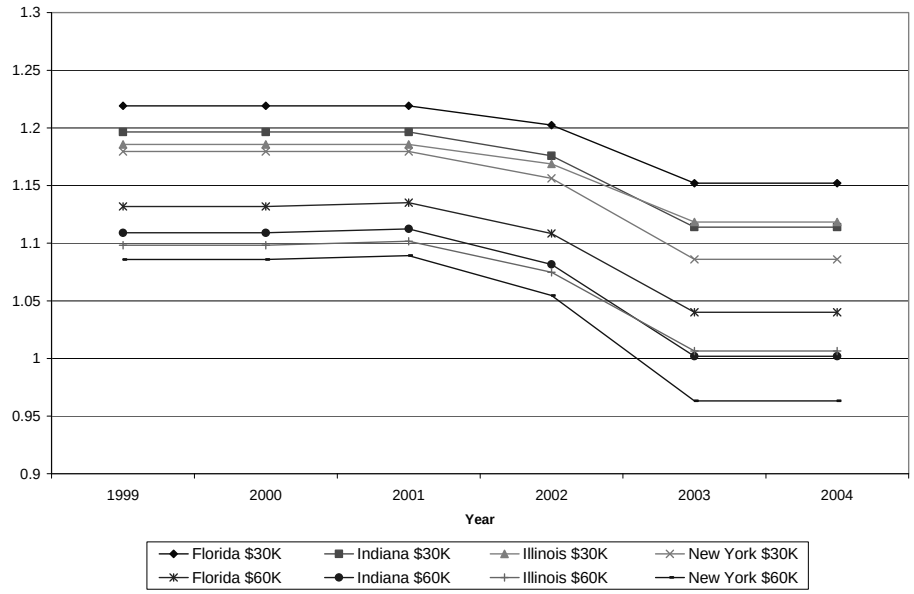
Note: Data from the 1999-2004 Edited Panel of tax returns. The coefficients are based on a fixed effect model for the amount of self-employed health insurance deduction controlling for the following covariates: relative price (instrumented with the first dollar relative price), age squared, number of children, income, filing status dummies (single, married filing jointly, married filing separately, head of household, widower and other) and year dummies. The elasticity of demand is calculated at the mean relative price in the sample and the standard deviation of the elasticity is calculated using the delta method.

* implies significant at 10%; ** implies significant at 5%; *** implies significant at 1%

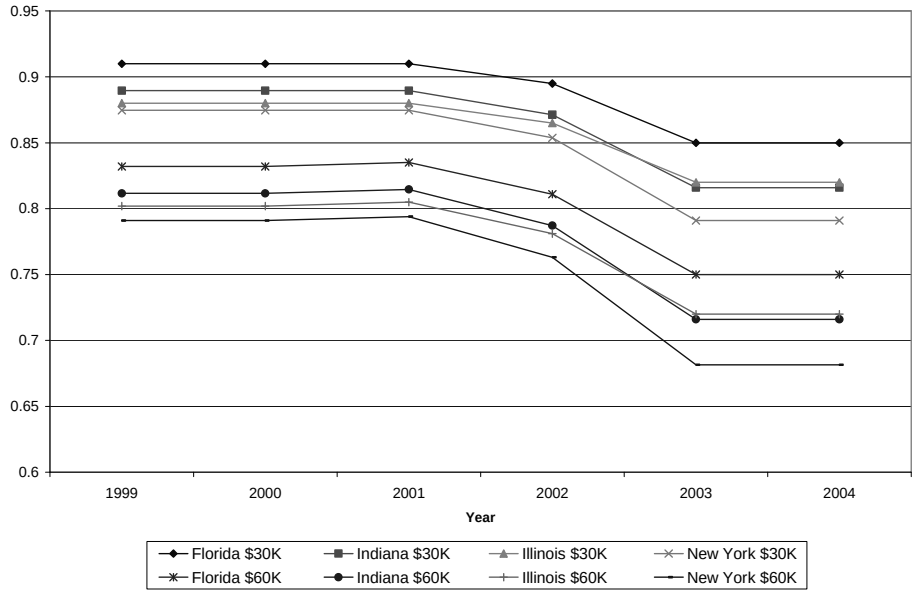
Figures

Figure 1: Prices by State and Income Level

(a) Relative Price



(b) Tax Price



Notes: All taxpayers are assumed to be married filing jointly, report either $30,000 or $60,000 in taxable income, and claim the standard deduction. The load factor is assumed to be .4, and the share of share of health expenditures that is paid as part of a health insurance premium is assumed to be .8.