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How elastic is the firm's demand for health insurance?

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Abstract

We investigate the impact of tax subsidies on the firm's decision to offer insurance, and on conditional firm spending on insurance. We do so using the micro-data underlying the Employment Cost Index, which has a major advantage for this exercise: the matching of very high quality compensation data with information on a sample of workers in the firm. We find that, overall, there is a moderately sized elasticity of insurance offering with respect to after-tax prices (−0.25), and a larger elasticity of insurance spending (−0.7). We also find that the elasticities are driven primarily by small firms, for whom the elasticity is larger. And we find that there is significant value added to this employer-based data: replicating methods from standard micro-data sources in our data lead to misleading estimates of these key parameters. Our simulation results suggest that major tax reform could lead to an enormous reduction in employer-provided health insurance spending.

Keywords: Health insurance; Tax subsidies

1. Introduction

The dominant feature of the health insurance market in the U.S. is the provision of private health insurance through the workplace. In 1998, 91% of the privately insured non-elderly population, representing 65% of the total non-elderly population, received their

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insurance through the workplace (EBRI, 2000). There are a number of reasons why health insurance may naturally be provided through the workplace in the U.S. There may be substantial economies of scale in administering insurance which increases the value of pooling mechanisms. Workplaces provide a natural pooling mechanism along dimensions largely exogenous to health status. And, finally, the U.S. tax code subsidizes health insurance purchase through the firm relative to the non-group market by excluding the value of that insurance from an individual's income, a tax exclusion estimated to cost more than $100 billion in foregone federal, state and local tax revenues in 1999 (Sheils and Hogan, 1999).

This tax subsidization of employer-provided insurance has been criticized along a number of dimensions. First, relative to a flat credit, a deduction for health insurance expenditures is regressive, providing the largest tax break for the most well off employed persons. Second, the tax system subsidizes insurance purchases over purchases of other goods, distorting individuals towards increased insurance purchase; some (e.g. Feldstein, 1973) have claimed that this leads to 'overinsurance' and, perhaps, ultimately to excess cost inflation in the health care sector.

While the first of these criticisms is unassailable, assessing the validity of the second requires understanding the impact of the tax subsidy to employer-provided insurance on the amount and nature of employer-provided insurance. As a result, over the past 25 years a large number of articles have assessed the responsiveness of employer-provided insurance to its after-tax price. Unfortunately, this literature has led to a wide range of estimates, from roughly zero to almost −6.

This wide range likely reflects two important limitations of the previous literature. One is that many articles in this literature have been unable to control for confounding factors correlated with both the after-tax price of insurance and the demand for insurance; this limitation has been addressed to some extent by more recent work. The second is that all of the work in this literature has either used data at the level of the firm, or at the level of randomly selected workers in firms (through individually based micro-data sets). The disadvantage of the first of these is that we do not observe the characteristics of the workers to whom the firm is responding. The disadvantage of the second is that, with any workforce heterogeneity, the firm may not be responding solely to the demand of the randomly observed worker. While this weakness has been recognized, it has not been effectively addressed, due to the well-known (and well-lamented) absence of data with information on both firm benefits provision and details on a sample of workers in that firm.

In this paper we address these difficulties by drawing on an excellent data source that provides high quality information on insurance offering, insurance spending, and, most importantly, information on the distribution of characteristics of workers in each firm. These are the micro-data of the National Compensation Survey, which underlie the well-known Employment Cost Index (ECI) measure of inflation. We match these data, from the 1983 through 1995 period, to information on the tax subsidy to insurance faced by the workers. This tax subsidy varies across workers of different income levels, over time, and across states, providing substantial exogenous variation in the after-tax price of insurance. And we use this unique information on the workers within a firm to create firm-specific tax subsidy measures that more closely correspond to the appropriate firm subsidy.

We have four findings of interest. First, we estimate that there is a moderately sized response of firm offering, and an even more elastic response of firm insurance spending, to after-tax prices. Our central estimates indicate that the elasticity of firm offering with respect to the tax price of the median worker is −0.25 and that the elasticity of firm spending conditional on offering is −0.7. Second, we also find that the responsiveness of firm offering and conditional spending is larger for small firms. Third, we show that estimates from alternative approaches, which are feasible in traditional micro-data sources, lead to misleading conclusions about parameter values. This suggests that it is important that data such as these be used for estimating the impact of taxes on benefits decisions. Finally, we present simulations to show that our estimates imply sizable impacts of tax reform on health insurance offering and spending in the U.S.; for example, our results imply that complete removal of the tax subsidy to health insurance spending would lead to about 15 million fewer workers being offered health insurance, and a total reduction in insurance spending on the order of 45 percent.

Our paper proceeds as follows. Section 2 reviews the literature on the elasticity of employer-provided health insurance, highlighting the value added from our approach. Section 3 provides a brief theoretical discussion of the appropriate specification of the tax incentives in our firm data. Section 4 introduces our data source, and discusses the empirical strategy. Section 5 presents our results. Section 7 presents simulations of the impact of tax reform on insurance offering and spending, given our results. Section 8 concludes.

2. Previous literature

The previous literature on the elasticity of employer-provided insurance has proceeded along two parallel tracks, one focusing on the elasticity of insurance offering, and the other focused on the elasticity of insurance spending. There are several approaches to estimating the elasticity of insurance offering by firms. The first is to use variation in the premiums faced by firms to identify their price sensitivity (Feldman et al., 1997; Marquis and Long, 1999). A key problem with this approach, however, is that one only observes premiums for the firms that do offer insurance, and they must be imputed to firms that do not. Thus, instruments must be found that are correlated with the price of insurance but not firm demand, and previous articles have not used firm characteristics that are likely to meet this criterion (e.g. whether the firm is unionized); as a result, the estimated elasticities have varied from −0.1 to −6.

The second approach is to use variation in tax rates across cities or states to identify the price elasticity of offering, in essence asking whether those firms with higher tax-related subsidies to insurance purchase are more likely to offer insurance (Liebowitz and Chernew, 1992; Gentry and Peress, 1994; Royalty, 2000). The estimates in this literature range from −0.63 to −2.9. These types of studies have the advantage that differences across cites and states in tax rates should be independent of insurance offering decisions. But they may not be entirely independent: cities and states with substantial taste for insurance may be the ones that offer the largest tax breaks, which would lead to a strong relationship between price and offering. This criticism is addressed in recent work by

Finkelstein (2002), who studies the removal of the large (25%) tax subsidy to supplemental private health insurance in Quebec in 1993, and finds an elasticity of −0.42 to −0.54 for employer offering. But it is somewhat unclear how to apply the elasticity of offering of supplemental insurance for a national health insurance scheme to the decision of U.S. firms to offer full private health insurance plans.

A third approach comes from running small-scale subsidy pilot programs for small businesses and evaluating the response of firms to subsidized prices (Helms et al., 1992; Thorpe et al., 1992). These pilot programs have the advantage of essentially providing a randomized intervention. The estimated elasticities have varied across sites, ranging from −0.1 to −1.1, although they in general tend to be quite low. But it is unclear whether the small elasticities estimated here are because of the temporary experimental nature of these subsidies; firms may be reticent to set up insurance plans based on subsidies that will only last for a short time. There could be much larger responses to more permanent changes in the after-tax price of insurance.

A final issue with this literature is that, with firm level data, one does not observe the characteristics of the employees to which the firm is responding in making its benefits decisions. This is important because the after-tax price of insurance for these employees depends on their characteristics. Consider two firms of identical size in different states, one of which has only low wage workers, and one of which has only high wage workers. By using the state tax rate on the average worker, an analysis using cross-state tax differences will misstate the price impacts due to progressive state tax structures. Similarly, analyses that use premium differences across firms will misstate the effective price differences by using the tax rate for some representative worker. For example, the price difference between a low wage firm with low premiums and a high wage firm with high premiums is much smaller than would be captured by assuming constant tax rates in both firms. This is not surmounted by the approach taken in Royalty (2000) of looking at the worker level. In this case, the characteristics of a randomly selected worker are well known, but this worker may not well represent the set of relevant workers for the firm's fringe benefit decision.

One article that attempts to address both the identification and 'marginal worker' issues is Gruber and Poterba (1994). They study how the self-employed responded to the Tax Reform Act of 1986, which introduced a subsidy to the insurance purchases of the self-employed. This 'natural experiment' provides exogenous variation in the after-tax price of insurance. Moreover, for the self-employed, there is no issue of deciding who is the marginal worker. They find significant increases in the insurance coverage of the self-employed relative to the employed over this period, with an implied price elasticity of as large as −1.8. Unfortunately, it is unclear how generalizable these results are to firms, who must aggregate the preferences of all their workers in making benefits decisions.

Another literature of relevance is studies of the elasticity of insurance spending to its (after-tax) price. Estimates of this elasticity come from three types of studies. The first is time series evidence on how total spending on employer-provided health insurance responds to changes in federal tax rates presented in Long and Scott (1982), Vroman and Anderson (1984), and Turner (1987). These studies typically yield estimates of the price elasticity of demand between 0 and −0.5. But the results are hard to interpret, as there are many things changing in the time series data; for example, the fact that health insurance coverage fell in the 1980s may be the result of declining marginal tax rates, but it may also be the result of a shift in the job base towards service sector jobs that are less likely to provide insurance.

A second set of studies, including Phelps (1973), Taylor and Wilensky (1983), Woodbury (1983), Holmer (1984), and Sloan and Adamache (1986), analyze cross-sectional data on individuals or firms and ask whether those with higher tax-related subsidies to insurance purchase spend more on insurance coverage. But a potential problem with these studies is that differences across individuals in their tax rates arise in part from differences in the underlying behavior of individuals or firms, such as differences in labor supply, family structure, or the nature of the workforce. It is impossible to tell whether differences in observed insurance coverage are due to taxes or these behavioral differences. A wide range of estimates emerge from these studies; Pauly (1986) summarizes the consensus range as -0.2 to in excess of -1.0.[1]

Moreover, once again, all of these studies suffer from the major problem noted above: they either use the characteristics of some average or representative worker in a firm, or they select random workers and assume that they represent the firms they work for. We address these concerns below.

3. Theory

How should tax subsidization impact the firm's decision to offer health insurance? What emerges clearly from almost any parameterization of the firm is that, as the tax subsidy rises (as tax rates are higher), firms will spend more on health insurance. But what is less clear is the functional form through which this will operate.

The best discussion of this issue in the context of benefits provision is in Goldstein and Pauly (1976). They conclude that the equilibrium benefits determination could arise in one of two ways. One is through the collective choice of the existing set of workers, through an insider/outsider or union mechanism. In this case, through standard voting arguments, the benefits chosen will reflect the tastes of the median worker. The second is through the choices of employers, whose goal is to minimize their total labor costs, and will therefore design their benefits packages to reflect the average preferences of their workers.

If the minimization of labor costs determines the decision about health insurance, the firm will use a simple average of worker preferences only in a very special case. To see this, consider the general case of Cobb–Douglas utility:[2]

$$U(C_i, H) = C_i^a H^{1-a}, \tag{1}$$

[1] Woodbury and Hammermesh (1992) attempt to overcome these types of problems by analyzing all fringe benefit expenditures around the Tax Reform Act of 1986 in a panel data set of colleges and universities, using the variation in federal and state taxes in this era. They conclude that tax reform substantially reduced the demand for fringes, with an estimated elasticity in excess of -2. But this is not focused on health insurance spending per se, so it is difficult to disentangle the impact on health insurance.

[2] We are grateful to Roger Gordon for suggesting this modeling approach.

where C_i is the consumption of person i, and H is the quality of health insurance coverage, which we assume does not vary within the firm. This utility is maximized subject to

$$C_i = Y_i + (1 - t_i)W_i, \tag{2}$$

where Y_i is non-labor income, t_i is the tax rate, and W_i is wage income for worker i.

In this model, if H increases, the drop in W_i that leaves utility unaffected satisfies

$$\delta W_i/\delta H = -(1-a)C_i/[a(1-t_i)H]. \tag{3}$$

For a given workforce, the firm cares about its total cost of labor, $\sum(W_i + H)$. Thus, an increase in H lowers labor costs if

$$[(1-a)/(aH)]\text{avg}(C_i/(1-t_i)) > 1. \tag{4}$$

So that the cost-minimizing level of H therefore equals

$$[(1-a)/a]\text{avg}(C_i/(1-t_i)). \tag{5}$$

For this model, it is clear that, as taxes rise, H rises as well. But it rises in proportion to worker consumption, which will be related to worker earnings. Thus, this model suggests not using a simple average tax rate, but an average weighted by worker earnings because workers with higher earnings are willing to forego more consumption for the same increase in H. A straight average would only be justified by a linear model of preferences across consumption and health care expenditures.

Thus, the appropriate functional form for the firm's tax incentives is unclear. As a result, we will consider below the sensitivity to several different specifications.

4. Data and empirical strategy

4.1. Data

The data used for the empirical analysis are from the Bureau of Labor Statistics' Employment Cost Index (ECI). The ECI measures three-month changes in total compensation per hour for U.S. workers. Thus, the ECI micro-data contain detailed information on employers' costs for nonwage as well as wage compensation, including the employer's cost for health insurance. All private workers outside of agriculture are in the ECI universe, as are workers in state and local government. The data used here are for June of each calendar year from 1983 through 1995, with values multiplied by annual hours when necessary to represent annual measures.

The ECI is a survey of jobs within establishments. Like any index number program, the ECI must define a good that it can price in successive periods. For each establishment in the survey, the ECI chooses four, six, or eight workers randomly from an employee list. The number depends on the establishment's size. The establishment is then asked which jobs the chosen employees hold, and these jobs become units of observation in the sample. The job refers to the most detailed job classification recognized by the establishment. In other words, the ECI largely defers to the supplier of its data, the establishment, to define what is considered the same labor service over time. The ECI collects average data for the group of employees who hold each sampled job; for example, earnings are the average earnings for all workers in that job.

Our data set contains 203,836 jobs from 48,605 establishments. By year, the sample size ranges from about 10,000 jobs in 2500 establishments for the earlier years to nearly 20,000 jobs in 5000 establishments for the later years. Although the ECI includes part-time jobs, we restrict our analysis to full-time jobs, which are defined as jobs with annual hours worked of at least 1500. We do this in an attempt to restrict our analysis to eligible workers, because if the sampled worker for a given job is part time and thus ineligible for insurance, the job will be coded as not offered insurance. In addition, since we impute total income based on earnings, including part-time workers will reduce the precision of our imputation.

Some establishments end up with fewer than four jobs in the sample because there is no resampling when multiple workers in the same job are selected. The job is merely counted once for each time is it chosen. Thus, establishments with fewer sampled jobs do not necessarily have data collected for a lower proportion of their employment. They may just have their employment concentrated in fewer jobs. Indeed, using newer BLS data with information on both the number of jobs sampled and the total coverage of employees by the sampled jobs, we find that coverage actually declines slightly as the number of sampled jobs rises.

Although the ECI data have a number of advantages for our purposes, they have one important weakness: we do not have any data on worker demographics, non-earned taxable income, or other features of tax responsiveness (e.g. whether the worker itemizes). Therefore, we augment the ECI data with data on individual workers from the Current Population Survey (CPS), and with data on family taxes from the Statistics of Income data (SOI). Effectively, we treat the average data for each job in the ECI as if they represent the earnings and employer's cost for health insurance of an individual worker. We then impute tax rates to the 'workers' in our sample in five steps.

First, for each ECI observation, we create four states of the world: married, non-itemizer; married, itemizer; single, non-itemizer; and single, itemizer. Second, we impute to each observation in each state of the world the other elements of taxable income using demographic and income information from the CPS and itemization information from the SOI. For the CPS we use data on industry, occupation, wages, and state to impute spousal earnings (for the two cases where the 'worker' is married) and non-earned taxable income (using separate models for those married and single). For the SOI, which is a dataset with information on all elements of taxable income and taxes paid for a nationally representative sample of workers in each year, we use information on earnings and state of residence to impute the average amount itemized, conditional on itemizing.[3]

An important consideration for such a match is that wages will reflect firm spending on health insurance and other benefits such as pensions. Gruber (2000) reviews the literature on the incidence of health insurance costs and concludes that there is strong evidence for full, or close to full, shifting to wages. Thus, by using observed wages in the CPS and ECI

[3] We actually divide the SOI data by total earnings, so we first impute other earnings on to the ECI observations from the CPS, and then do the matching to SOI information.

data, we would systematically mismatch other income as the cost of health insurance or other correlated benefits varied.[4] At the same time, we do not know the cost of benefits for each worker in the CPS data; we only know if they are covered by health insurance or pensions on their job.

Therefore, to workers in the CPS covered by health insurance and/or pensions on their job, we match the average cost of health insurance and/or pension coverage in their industry/region/year cell from the ECI. We then do a ‘full earnings match’ to the ECI data, using reported wages plus imputed health insurance/pension costs in the CPS to create compensation categories, and creating corresponding compensation categories in the ECI using wages plus actual health insurance costs. While mitigating measurement error, this solution of course introduces a natural endogeneity bias into our measure of tax rates, since health insurance costs is our dependent variable; this is one reason for the instrumental variables strategy that we pursue below.

For each observation in each state of the world, we then compute the marginal tax rate. We do this using the NBER’s TAXSIM model, which inputs information on the major elements of taxable income and computes both a federal and state marginal tax rate.[5] We then use the CPS and SOI data to impute the odds of being married (the CPS) and of itemizing (SOI). Finally, we compute a weighted average marginal tax rate by taking the odds of being married and itemizing as the weights to average the tax rates from these four states of the world.

For the marginal decision on insurance spending, it is the worker’s actual marginal rate on the next dollar of earnings that is relevant. But, for the decision to offer insurance, it is the marginal rate over the next X dollars that is relevant, where X is the amount that the firm will spend on insurance. With a single bracket linear tax, there would be no distinction between these concepts. But, with a progressive tax, they may differ, particularly before TRA 86 when the federal income tax system had 14 brackets. We therefore compute the marginal rate for the firm’s spending decision as the rate over the next $1000 dollars. However, the marginal rate for the offering decision equals the rate over the next X dollars, where X is the average employer cost for health insurance among jobs with a plan in the same year and census division.

Our key regressor is the tax-price of insurance for each worker, which is computed as

$$TP = \frac{(1 - \tau_{\mathrm{f}} - \tau_{\mathrm{s}} - \tau_{\mathrm{ss}} - \tau_{\mathrm{mc}})}{(1 + \tau_{\mathrm{ss}} + \tau_{\mathrm{mc}})}, \tag{6}$$

[4] For example, suppose that non-labor income is positively correlated with true marginal product, and that reported wages equal true marginal product less the cost of health insurance for those covered by insurance. In this case, for any wage cell the mean of non-labor income will average the non-labor income that corresponds to that level of marginal product (for those workers who do not have health insurance) with the higher non-labor income that corresponds to that level of marginal product plus the cost of insurance (for those workers who do have insurance). Thus, there will be systematic measurement error in the assignment of non-labor income: those with health insurance will systematically be assigned non-labor income which is too low, and those without health insurance will be systematically assigned non-labor income which is too high.

[5] For more information about TAXSIM, see Feenberg and Coutts (1993). A public use version of TAXSIM is available at www.nber.org/taxsim.

Table 1
Sample descriptive statistics

Variable	Mean	Standard deviation
Plan offered	0.910	0.286
Annual cost	2038.2	1622.8
Log annual cost	7.460	0.828
Weighted average tax price	0.634	0.046
Annual earnings	23,238.5	16,297.5
<100 employees	0.4401	0.4964
100–999 employees	0.3439	0.4750
1000+ employees	0.2161	0.4116
One job sampled	0.1156	0.3198
Two jobs sampled	0.1425	0.3496
Three jobs sampled	0.1575	0.3643
Four jobs sampled	0.1516	0.3587
Five jobs sampled	0.1132	0.3168
Six jobs sampled	0.1028	0.3037
Seven jobs sampled	0.0807	0.2723
>Seven jobs sampled	0.1306	0.3428
Number of establishments	48,690	48,690

Table presents means of ECI sample used for insurance offering regression; see text for description of data.

where τ_f is the federal income tax marginal rate, τ_s is the state income tax marginal rate, τ_{ss} is the marginal payroll tax rate for the OASDI program, and τ_{mc} is the marginal payroll tax rate for the Medicare HI program.[6] We differentiate the latter two programs because, beginning in the early 1990s, the taxable maximum for the HI program was increased above that for the OASDI program (and was eventually removed altogether); the marginal rate is zero above the taxable maximum for payroll taxation. For the cases where individuals are itemizers, our TAXSIM calculations incorporate the fact that state taxes are deductible against federal tax bills.

Our dependent variables are insurance offering or spending. For the former, we use a dummy variable which measures whether the firm offers health insurance to any of its workers. A small share of firms in our data set report offering insurance to some full-time workers and not to others, but the reason for this occurring is unclear, since (due to anti-discrimination statute) health insurance is always offered to all eligible workers, and non-eligible workers are not supposed to be coded as not offered. But our results for insurance offering are relatively insensitive to how we treat firms that offer to only some full-time workers and not others. For spending, we use the log of annual spending on health insurance, averaged over all jobs in the firm. We exclude establishments with average insurance spending of less than $100 per worker; our results are not very sensitive to this exclusion.

[6] The reason that the payroll tax rate is additive in the denominator is that the employer is indifferent between purchasing one dollar of benefits or paying wages of $1/(1+\tau_{ss}+\tau_{mc})$, since each dollar of wages requires a payroll tax payment as well.

Table 1 presents the means for our sample.[7] On average, 91% of the workers in our sample are offered health insurance, with an annual average cost of $2038 (in $1993 and including zeros for no plan). The average median tax price in our sample is 0.644. The typical worker has annual earnings of $23,239 (in $1993). More than two-fifths of the firms in our sample have fewer than 100 employees, and about one-fifth have 1000 or more employees. Although the ECI intends to collect data for at least four jobs per establishment, about 42 percent of our sample are from establishments with three or fewer observations. This is due in part because we exclude part-time jobs, but it is also because the ECI does not resample if it selects the job more than once. Following the ECI, we weight these multiple hits by their frequency in calculating firm averages.

The high insurance offering rate in our data is notable. But this reflects the facts that: (a) our sample is restricted to full-time workers, (b) our sample is implicitly employee-weighted, rather than establishment-weighted, and (c) we assume by construction that if a worker participates in health insurance on the job, all workers participate. Employee weighting is appropriate if the goal is to assess the impact of tax changes on the overall health insurance coverage of the U.S. workforce, and we are unable to incorporate employee takeup due to data limitations. Accounting for these factors, our estimates are very similar to the widely cited estimates from the BLS' Employee Benefits Survey or the Employee Benefits Supplement to the Current Population Survey.

4.2. Empirical strategy

We use the data described above to estimate models of the form

$$INS_{ijt} = \alpha + \beta_1 TP_{ijt} + \beta_2 X_{ijt} + \beta_3 \delta_j + \beta_4 \tau_t + \beta_5 \delta_j \tau_t + \varepsilon, \tag{7}$$

where i indexes firms, j indexes states, and t indexes years; INS is either insurance offering or log of insurance spending; TP is the tax price, as defined above; X is a set of firm-level controls (see below); and δ_j and τ_t are a full set of state and year dummies, respectively.

This model controls in a non-parametric way for the factors that enter into the construction of the tax rate, which may also be determinants of the demand for insurance by the firm, by including a full set of dummies for industry, occupation, firm size, number of sampled workers, state, year, and earnings; in each case, we use dummies for each category that was used to match the data to the CPS for imputing taxable income.[8] For earnings and occupation, since we are using an average across the workers in the firm, we control for the average values of each categorical value in the regression (e.g. the percentage of workers in the firm in each earnings category). Because the mean of the offering variable is very close to one, we estimate this model as a probit.

Even in this framework, however, one might be concerned that interactions of the variables used to create the tax measure (hours, industry, occupation, earnings, state, and

[7] Although the data are already self-weighted to represent the universe of workers, our means are weighted by ECI weights designed to replicate benchmarked totals. We do not weight the regressions below since the weights are simply a function of industry and firm size, which are controlled for in the regressions.

[8] In particular, we used 12 industry categories, nine occupation categories, 10 earnings categories, a full/part time (greater than or equal to 35 h vs. less than 35 h), and 51 states (including Washington, DC).

year) could be simultaneously correlated with the demand for insurance, biasing our estimates in an indeterminate manner. Moreover, as is clear from the above description, there is considerable measurement error in our computed tax prices, which could bias our estimates towards zero. And there is direct endogeneity bias to our tax measure due to matching CPS characteristics based on health insurance coverage and spending levels.

To address these issues, we instrument the tax price with a 'simulated' tax price, which is computed as a function only of state, year, and 10 earnings groups (corresponding to the 10 deciles in each year's earnings distribution). In particular, we first divide our sample into deciles of earnings, and then compute the average for each decile of earnings and other elements of taxable income. We then assign these 10 averages to each state, and compute marginal income and payroll tax rate for each of the 510 earnings group*state cells in each year.[9] These tax rates are then used to compute a simulated tax price which instruments the actual tax price in our regressions. This instrument varies only by state, year, and earnings group, as well as interactions of these variables. Thus, by including full sets of dummies for the earnings categories, states, and years, we are clear that the source of identification of our model is *only* interactions of states, earnings groups, and years. In addition, since it is possible that state tax policy is correlated with demand conditions that drive insurance coverage, we include in our model a full set of state*year interactions.

These interactions provide substantial variation in tax rates, due to three sources. The first is differences across states at any point in time in the progressitivity of their tax structures. The second is changes over time in the structure of federal taxation, which have differential impacts along the income distribution. And the third is changes in state taxation, as they have relative impacts across income distribution (the average effects of changes in state taxation are captured in the state*year interactions).

Our instrument is more precisely the earnings-weighted mean simulated tax price for the firm. Our first stage fit is, as to be expected, very precise, with a *t*-statistic on the excluded instrument of 40–55.[10] Finally, once again, a potential identification issue arises from the fact that health insurance costs are shifted to wages. By using observed wages to create our instrument, we potentially bias our estimates against finding a responsiveness of health insurance to taxation: as health insurance spending rises, wages fall, lowering tax rates. At the same time, in creating the instrument, we cannot add the firm's cost of health insurance directly back into wages to address this problem, since this would make the instrument a direct function of the dependent variable, and might therefore worsen the bias unless shifting is exactly 100%. We therefore have explored the sensitivity of our findings to an alternative instrument which addresses this identification concern in earlier work, adding on to wages imputed health care costs (under a full shifting assumption). We found similar results from this approach, suggesting little bias from wage shifting.

[9] We also use the earnings group*state average marriage probabilities and itemization probabilities to average our four cases.

[10] For the offering probit, we estimate the model in two steps, first predicting the tax price, and then estimating the probit as a function of the predicted tax price. This results in somewhat understated standard errors as we do not account for the imprecision in the first stage in our second stage estimate. The bias to our standard errors is trivially small, however, as the first stage fit is so tight; estimates for the OLS case suggest that correcting such bias would raise the standard errors by less than one percent of their value.

5. Results

5.1. Basic tax price regression

We begin our analysis by considering the impact of the earnings-weighted mean tax price on firm offering and insurance spending. The first row of Table 2 shows the tax price coefficient, the standard error, the associated marginal probability effect from the probit, and the implied elasticity. The first column shows the coefficients from the probit regression on insurance offering, while the second column shows the coefficients from the log spending regression.

In fact, we find significant negative coefficients for both the firm's decision to offer insurance, and the amount of spending conditional on offering. The coefficient in the offering equation indicates that, for every unit increase in the tax price, the offering rate drops by 0.357 percentage points. At the means of our sample, this implies an elasticity of offering of −0.249. This estimate is in the middle of the previous range of findings for firms offering elasticities.

We also find that each unit increase in the tax price lowers insurance spending by 1.051 log points, for an implied elasticity at the mean of −0.708, which is in the middle to high end of the previous literature. Of course, given the fact that offering is changing simultaneously, this estimate cannot be interpreted purely as the change in spending among those firms offering insurance; it also confounds any changes in the set of firms offering. But if, as seems likely, those firms who drop insurance as the tax price rises are the ones who are spending the least on insurance, then this will bias our estimates in a positive fashion, suggesting that we are understating the response of spending among those firms offering. In any case, such a bias is likely to be small.[11]

The table also shows the coefficients on some of the control variables in the regression. We find that insurance offering rises with firm size, as does insurance spending (except for somewhat higher levels in the very smallest firm sizes, perhaps reflecting high loading factors on insurance for the smallest firms). Examining the pattern of industry dummies, we see that health insurance offering is most likely in Durable Goods Manufacturing, Wholesale Trade, Finance, Insurance, and Real Estate, Professional Services, and Public Administration; spending is highest in Mining (the omitted category) and Durable Manufacturing. Even conditional on our firm size categories, insurance offering rises by number of jobs sampled, which is likely picking up additional firm size gradations. The table does not show the coefficient estimates for the earnings categories, which are included as equally weighted averages, earnings-weighted averages, and for the job with the median tax price in the establishment. In combination, they suggest the level of spending increases steadily as the jobs from the higher average earnings categories become

[11] For example, in 1995, the last year of our sample, the mean spending on insurance among those offering was \$2038 per year (in \$1993). Suppose that the firms that drop insurance were spending \$1500 per year, considerably less than average. And suppose further that we were evaluating a 10% change in the tax price, a considerable change for our sample period. Then our dropping effect would only impart a positive bias of 0.09 to our elasticity estimate of −0.71.

Table 2
Coefficient estimates

	Plan offered	Log annual cost
Weighted average of tax price	−4.422	−1.051
	(2.097)	(0.510)
	[−0.357]	
	{−0.249}	{−0.708}
10–24 employees	0.445	0.006
	(0.036)	(0.012)
25–99 employees	0.881	−0.042
	(0.038)	(0.011)
100–499 employees	1.286	−0.021
	(0.046)	(0.012)
500–999 employees	1.375	0.061
	(0.085)	(0.014)
1000–9999 employees	1.745	0.049
	(0.099)	(0.013)
10,000 + employees	1.752	0.054
	(0.324)	(0.018)
Construction	−0.033	−0.252
	(0.156)	(0.031)
Durable	0.746	0.062
	(0.170)	(0.031)
Non-durable	0.411	−0.099
	(0.170)	(0.032)
TCPU	0.503	−0.093
	(0.163)	(0.031)
Wholesale trade	0.780	−0.123
	(0.160)	(0.031)
Retail trade	0.459	−0.361
	(0.158)	(0.032)
FIRE	0.788	−0.178
	(0.165)	(0.032)
Business services	−0.031	−0.361
	(0.160)	(0.032)
Personal services	0.107	−0.440
	(0.171)	(0.041)
Entertainment	0.547	−0.111
	(0.194)	(0.038)
Professional services	0.722	−0.210
	(0.162)	(0.032)
Public administration	1.623	−0.104
	(0.204)	(0.033)
Union	0.963	0.382
	(0.079)	(0.008)
Two jobs sampled	0.386	−0.093
	(0.036)	(0.011)
Three jobs sampled	0.631	−0.061
	(0.041)	(0.011)
Four jobs sampled	0.613	−0.022
	(0.048)	(0.011)

(continued on next page)

Table 2 (*continued*)

	Plan offered	Log annual cost
Five jobs sampled	0.818	−0.037
	(0.067)	(0.012)
Six jobs sampled	0.747	−0.013
	(0.077)	(0.013)
Seven jobs sampled	0.794	0.002
	(0.108)	(0.013)
Seven jobs sampled	1.649	0.000
	(0.199)	(0.013)
Number of establishments		
	48,690	44,483

The first column shows coefficients from probit for insurance offering; the second column shows coefficients from log cost regression. Standard errors are in parentheses, the implied marginal probability effects (for probit regression) are in brackets, and the implied elasticities are in braces. The omitted categories are establishments with fewer than 10 employees, establishments from mining, and with one job for the establishment in the sample. The regressions also include equally weighted and earnings-weighted averages of the earnings and occupation dummy variables for the establishment, year dummy variables, state dummy variables, and all interactions between the year and state dummy variables.

more prevalent in the establishment. The probability of offering is the lowest when workers from the first two earnings categories are the more prevalent.

5.2. Alternative tax price measures

In Table 3, we consider the use of alternative measures of the firm-wide tax prices, rather than the earnings-weighted mean. In the model presented above, the particular weighting of the mean tax price depends on the form of worker preferences, so it is

Table 3
Alternative tax price measures

	Plan offered	Log annual cost
Basic result from Table 2	−4.422	−1.051
	(2.097)	(0.510)
	[−0.357]	
	{−0.249}	{−0.708}
Equally weighted tax price	−4.353	−1.174
	(2.023)	(0.502)
	[−0.354]	
	{−0.249}	{−0.745}
Log earnings-weighted tax price	−4.352	−1.025
	(2.030)	(0.503)
	[−0.352]	
	{−0.247}	{−0.656}

Plan Offered Equation is Probit; Log Cost is OLS. Standard errors are in parentheses, the implied marginal probability effects are in brackets, and the implied elasticities are in braces. Table shows coefficients on tax price only; regressions include all controls shown in Table 2 and footnote to that table.

important to assess how sensitive our results are to alternative weighting functions. In the second row of Table 3 (the first row of the table repeats our basic results from Table 2 for comparison purposes), we show the results from using an equally weighted average of tax prices. Our basic pattern of results is not sensitive to the alternative. Using an equally weighted average gives the same estimated offering elasticity of −0.25, and increases the log spending elasticity slightly to −0.745. The third row shows the impact of using a log earnings-weighted average; this also has a small effect on the results relative to the base case. Overall, then, our conclusions are robust to the weighting function used.

5.3. Shifting to employees?

The data from the ECI on spending provide information only on employer spending on health insurance, on average across all employees. This raises the important issue that some of the reaction of employer spending to tax changes may be shifting the costs of insurance to their employees through premium sharing. As discussed in Gruber and McKnight (2002), there has been a significant rise in employee premium-sharing over this sample period, with the share of employers paying all of the cost of health insurance falling from almost half to about one-third.

In some firms, employee premiums are also paid on a pre-tax basis, and in this case there is no reason why tax changes should induce increased premium sharing, since the decision over who pays premiums is tax neutral. But, in the majority of firms where employee contributions are not made on a pre-tax basis, tax reductions will level the playing field between employee and employer payments, and could lead to a shifting of premium payments to employees. We cannot distinguish in our data true reductions in the generosity of insurance provided to employees from this type of premium shift.

We can, however, use existing evidence to roughly assess the impact of premium shifting on our elasticity of insurance spending. In 1996, one year after the last year of our sample, firms paid 75% of the costs of insurance on average (Kaiser Family Foundation, 2000). In addition, during our sample period, about a third of employees made contributions on a pre-tax basis. Estimates in Gruber and McKnight (2002) suggest that such elasticity of employee premium sharing with respect to the tax price is on the order of −1. This suggests that the elasticity of employer spending with respect to the tax price due to premium sharing alone is roughly −0.17. This back of the envelope calculation therefore suggests that about 23% of our estimated spending elasticity is due to premium sharing, and that the elasticity of total insurance spending is on the order of −0.58.

5.4. Large vs. small firms

If firm offering of insurance is responsive to its tax price, this responsiveness is likely to manifest itself most strongly among small firms. Thus, in Table 4, we examine the variation in our results when we divide the sample by firm size.

In fact, unsurprisingly, we find that the sensitivity of insurance offering to its tax price is largely driven by small establishments, those with fewer than 100 employees. For them, we estimate an elasticity of offering over −0.5. For medium size establishments, we estimate an elasticity of offering of −0.128, but it is not significant; for large establish-

Table 4
Results by firm size

	Plan offered	Log annual cost
Small firms (<100)	−4.504	−2.085
	(2.146)	(0.882)
	[−0.688]	
	{−0.537}	{−1.342}
Medium firms (100–999)	−4.207	−0.037
	(8.427)	(0.857)
	[−0.195]	
	{−0.128}	{−0.024}
Large firms (1000+)	–	−0.724
		(0.836)
		{−0.445}

Plan Offered Equation is Probit; Log Cost is OLS. Standard errors are in parentheses, the implied marginal probability effects are in brackets, and the implied elasticities are in braces. Table shows coefficients on tax price only; regressions include all controls shown in Table 2 and footnote to that table. Because virtually all establishments with at least 1000 employees offer a health insurance plan, the coefficients for the offering equation are not identified.

ments we are unable to estimate an elasticity of offering because the mean is so close to one.

Interestingly, we also find that conditional spending on insurance is more sensitive to its price for the smallest establishments. For small establishments, the elasticity of spending is −1.342, while it is close to zero for medium size establishments and −0.445 for large establishments. And, if anything, this gradient understates the true differential by firm size, since the higher offering elasticity for small firms likely causes some positive bias to the conditional spending elasticity. Thus, the overall elasticity of insurance spending is much larger for small firms than for their larger counterparts.

6. Comparing to alternative approaches

We have highlighted in this paper the advantages of our unique data source, which are quite large in theory. But one important question is: how large are these advantages in practice? Are there approaches using more typical micro-data sources on workers that can yield the same pattern of results as we present from this ECI data?

To answer this question, we have replicated in the ECI data two common approaches that might be taken with micro-data sources on workers such as the Current Population Survey. The first is to simply use the tax price for a given worker as the tax price for analysis, as in Royalty (2000). To replicate this type of approach in our data, we have selected a random sample of ‘workers’ in our data (actually jobs), rather than firms, choosing the sample size so that it is the same as for our firm-level regressions (in order to provide comparable results). We choose 20 different random samples, and estimate the elasticities in each, to assess any sensitivity of the results to the sample chosen.

Doing so, we find that the estimated elasticities of offering are much larger with this alternative methodology, and the estimated elasticities of conditional spending are much lower. Our estimated offering elasticity has a mean of −0.67, with a small range of variation between −0.60 and −0.71. This is well above our estimates using firm-level data presented earlier. Our estimated spending elasticity, however, averages −0.07, only a fraction of the elasticity estimated earlier, with a range from −0.48 to 0.46. So it appears that, for insurance spending, choosing a random sample of workers and estimating elasticities based on that random sample does not give the same answer as using firm-level information on tax incentives.

An alternative approach, in the absence of true firm data, is to use worker data to create 'simulated' firms based on characteristics such as industry, firm size, and firm location. To the extent that these simulated firms approximate the characteristics of true firms in these cells, this can provide an aggregation mechanism that can be used to make firm-wide tax incentives. In practice, however, this approach fails miserably. We have assessed a number of different approaches to combining workers by these characteristics to make synthetic firms. The estimated elasticities of offering and spending are wildly sensitive to how the synthetic firms are constructed. For offering, our mean estimated elasticity is −0.15, with a range from −0.8 to 0.4. For log spending, our mean estimated elasticity is positive at 0.5, with a range from −0.7 to 2.7. Thus, it appears that having data on true, rather than synthetic, firms is necessary to obtain reliable estimates of tax price sensitivities.

7. Policy simulations

The findings reported here have important implications for not only how benefits decisions are made, but also for the implications of tax reform for employer provision of health insurance. In this section, we provide some simulation evidence to document the implications of our results for the effects of tax reform on health insurance. It is worth noting that these simulations use our estimates from models that use within state-year variation in tax subsidies. As a result, they do not include any market reaction to subsidies to the price of insurance. So these should be viewed solely as a partial equilibrium approximation to the full general equilibrium impacts of insurance reform.

We consider three possible reforms. In each case, we use the data from the last year we have available (1995, converted to $1993) and re-estimate our tax price variables under the reformed tax law regime. We then compute, for each firm in our sample, the offering rate and spending level under the old and new regimes. Finally, we take the difference between the baseline and post-reform offering rates and spending levels, and express these differences as a percent of baseline. We use the parameter estimates from Table 4 to allow the effects to vary by establishment size (since our estimated offering/spending effects differ so much by size). We assume no large establishments will stop offering health insurance because of the tax reforms.

The results of this exercise are presented in Table 5. The rows correspond to the three reforms we consider. The first column shows the percentage change in the tax price induced by the reform. The remaining columns show the percentage change in offering,

Table 5
Policy simulations

	Change in median tax price (%)	Change in plan offered (%)	Change in annual cost (%)	Total change in annual cost (%)
No tax subsidy	57.6	−15.5	−28.6	−45.0 (−$999)
No income tax subsidy	36.8	−9.7	−20.0	−30.4 (−$675)
10% tax cut	3.7	−1.0	−2.4	−3.5

Table reports results from policy simulations described in text. The policy simulations are based on the coefficient estimates by establishment size in Table 4 and the 1995 sample of 4051 establishments.

conditional spending, and total spending (assuming that the firms that reduce offering were spending the mean amount before dropping out), as well as the effects on dollars of total spending.

We first consider the most radical reform: complete inclusion of the health insurance spending in the individual tax base for both income tax (both state and federal) and payroll tax purposes. This is a very significant change in the tax-price of insurance; as the first row of the table shows, the median tax price rises by over 50 percent. We find that this has sizeable impacts on both firm offering and insurance spending decisions. Insurance offering falls by nearly 15.5 percent, and conditional spending falls by 28.6 percent. Assuming that those who stop offering were spending the mean amount, this results in a reduction in total spending on insurance of 45 percent, or nearly $1000. These enormous effects follow naturally from the radical change in the price of insurance.

Of course, this simulation involves a projection that is vastly out of sample, so it is clearly possible that the responses would be smaller for such a large change. But it is also possible that the responses would be larger. After all, in our data, there is no variation in offering among large firms; it is possible in a world without a tax subsidy that some large firms would decide to forgo the provision of insurance to their employees.

We next consider a reform that does not tax employer-provided health insurance in the payroll tax base, but does include it in the state and federal income tax bases. This raises the tax price by over one-third. Correspondingly, there are smaller, but still quite large, responses of offering and conditional spending: offering falls by nearly 10 percent, and conditional spending falls by 20 percent, for a fall in total spending of about 30 percent.

Finally, we consider a reform that is within the variation in our sample, a 10 percent cut in all income tax rates, which is comparable to recent tax reform passed by Congress. This would raise the tax price by only 3.7 percent. Offering falls by 1.0 percent, and conditional spending by 2.4 percent; total spending falls by 3.5 percent. Thus, even this very modest tax reform could have a non-trivial impact on the spending of employers on health insurance in the U.S.

8. Conclusions

The central behavioral parameter for estimating the impact of fundamental changes to the tax treatment of health insurance is the firm's elasticity of demand for health insurance. Unfortunately, the large body of past work in this area has been unable to deliver a consistent, and perhaps even a convincing, estimate of this critical parameter. This is largely because of the absence of the 'right' data for this exercise, and related difficulties in deriving an empirical framework that can deliver cleanly identified estimates of the relevant elasticities. We have attempted to address this deficiency by using data from the ECI, which include information not only on firm insurance offering and spending, but also data on the distribution of workers within the firm.

We estimate that firms are fairly responsive to tax prices in their benefits decisions. We obtain central estimates of the elasticity of firm offering of about -0.25 and of conditional insurance spending of -0.7. We also estimate that small firms are particularly responsive to taxes in their offering decisions, while larger size firms are more sensitive in their spending decisions. And we find that alternative approaches yielding more commonly available micro-data yield misleading estimates of the elasticities of insurance offering or spending.

Our estimates have important implications for tax policy towards firm benefits provision. Most importantly, they suggest that the tax subsidy towards employer-provided health insurance is a critical force holding together the employer-provided insurance system. Without this subsidy, we estimate, both employer offering and spending would be dramatically lower than they are today. Our findings do suggest that the majority of the impact of changes in tax policy towards health insurance would be on the level of spending on insurance, not on firm provision of insurance. This is an important conclusion because one of the major benefits claimed for removing the tax exclusion is that it would lead to a reduction in inefficiently high spending, while the major concern about this policy is that it could lead to sizeable reductions in insurance coverage. Our findings suggest that the impact on insurance coverage is likely to be small relative to the reduction in spending.

Nevertheless, the reductions in employer-provided insurance offering that we estimate are non-trivial. For a reform that removes the income tax subsidy to insurance (while maintaining the payroll tax subsidy), we estimate that offering would fall by almost 10 percent. There are currently 155 million workers and dependents covered by employer-provided health insurance (EBRI, 2000). A 10 percent reduction in coverage of this population is therefore 15 million persons, which amounts to almost 40% of the size of the current pool of uninsured. A critical question for future research is whether the persons who lose their employer-provided coverage will find coverage from other sources, such as the non-group market, or through spouses. In addition, one limitation of our work for analyzing policies such as removing the entire exclusion of employer-provided insurance from taxes is that there may be more substantial responses to major policy changes such as this than there are to the minor variation in tax rates used in our analysis.

It is also important to get inside the black box of 'total spending' on insurance and understand which elements of spending are responding so elastically to tax prices. Gentry and Peress (1994), in their cross-sectional study, do find that elements of insurance which are likely to be more elastically demanded, such as dental and vision care, were more elastic with respect to tax price differences. Further work of this nature, particularly focusing on the choice of form of insurance (traditional fee for service vs. managed care), is a high priority.

Finally, it would be useful to understand the corresponding impact of tax policy on the provision of other fringe benefits by the firm. Is the provision of health insurance more or less tax sensitive, for example, than the provision of pension benefits? Ultimately, data such as the ECI data used here can allow us to assess the sensitivity of the entire compensation package to taxation.

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