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TAXES AND FRINGE BENEFITS OFFERED BY EMPLOYERS

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ABSTRACT

Using cross-sectional data for blue and white collar workers for U.S. cities, we examine how the tax treatment of fringe benefits affects whether employers offer benefits. Differences in state-level income taxes cause variation across places in the tax incentives for fringe benefits. We find that employers respond to tax incentives to offer fringe benefits, especially to blue collar workers. The tax incentives affect both the probability of basic benefits, such as medical coverage, and more "marginal" benefits, such as vision and dental coverage. Higher taxes also reduce the amount of explicit cost sharing for some benefits between employers and employees.

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Taxes and Fringe Benefits Offered by Employers

I. Introduction

In the current debate on reforming health care financing, both expanding and curtailing tax-advantaged health insurance have been proposed.[1] A key ingredient in analyzing these proposals is the extent to which employer-provided benefits respond to tax policy. U.S. tax law encourages firms to provide fringe benefits for which the cost of the benefits are deductible to the employer but not taxable to the employee. The tax incentives can work on two distinct margins. First, as hoped for by those proposing more tax incentives, the tax treatment of fringe benefits encourages employer-provided insurance plans. Therefore, increasing the tax incentives might increase the number of insured Americans. Second, as feared by those wanting to limit the tax-advantages for health insurance, once enrolled in an employer-provided insurance plan, workers have an incentive to have generous insurance plans. This extra insurance can come in several different forms: lower deductibles, lower copayments, or coverage of more medical procedures. Overinsurance is one explanation that has been given for the rapid increase in health care costs (see Feldstein and Friedman, 1977).

To measure how fringe benefits respond to tax policy, we examine regional variation in the percentage of workers offered different benefits (e.g., health insurance,

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[1] Editorials in The New York Times ("A Tax Cap for Health Reform," December 22, 1992) and The Washington Post ("Who Pays for Health?," January 29, 1992) call for limiting the tax advantage of fringe benefits. The Congressional Budget Office's (1994) report summarizes some of the possible changes in the tax system.

pensions, and dental insurance) from their employers. Since we have data on various benefits, we can examine both the probability of basic health coverage and the structure of additional benefits. The tax-advantage of fringe benefits varies within the U.S. because state income tax rates vary across states. This regional variation in tax rates helps to identify econometrically the relationship between taxes and fringe benefits without some of the difficulties of using either time series data or data on firms or individuals. We return to the econometric advantages of regional data below.

Our results suggest that tax incentives affect both the margin of how many benefits or how much insurance firms offer rather as well as whether they offer basic medical insurance. For example, for blue collar workers a one percentage point increase in the tax rate increases the percentage of workers offered medical insurance by 1.8 percentage points and the percentage offered vision coverage by 1.5 percentage points. However, since more than 90% of the workers in the sample are offered basic medical coverage but only roughly one-third are offered vision coverage, the effects of larger changes in tax incentives may be concentrated heavily on more "marginal" benefits.

We also test whether the frequency of explicit cost sharing between employers and employees depends on the tax rate. Since employee contributions do not always receive the same tax advantage as employer contributions, higher tax rates encourage firms to arrange compensation packages such that fringe benefits are entirely financed by the firm. For blue collar workers, our results not only suggest that an increase in personal tax rates increases the percentage of workers offered life insurance but also

induces a substitution of employer financing for employee contributions.

The paper is organized as follows. In section II, we discuss the incentive effects of the tax treatment of fringe benefits and previous empirical studies relating taxes and fringe benefits. In section III, we present our econometric model, discuss the construction of our data, and consider the advantages of using regional-level data. In section IV, we present our results. In section V, we conclude with a discussion of the policy implications of our results.

II. The Taxation of Fringe Benefits and Previous Studies

A comprehensive income tax base would not distinguish between different forms of compensation. In contrast, federal and state income tax systems exclude some non-wage compensation from the individual income tax base. Excluded forms of non-wage compensation include group medical insurance and life insurance. The exclusion of these benefits from taxable income distorts workers' demand for different types of compensation and, hence, different types of consumption. Furthermore, this exclusion encourages the consumption of a particular good (fringe benefit) only if it is financed in a particular fashion (through the employer-provided plan).

These benefits may be financed through employer contributions, employee contributions (i.e., salary reductions) or a combination of the two. At the employer-level, these benefits are taxed symmetrically to wages: employer contributions are deductible from the firm's tax base. If the employer follows certain Internal Revenue Service (IRS) rules, salary reductions allow employees to buy insurance without

paying income taxes on the cost of the insurance. For 1989, 25 percent of employees who paid for part of their insurance were able to contribute pretax dollars (U.S. Bureau of Labor Statistics, 1990). Even in plans with employee contributions, there are substantial tax advantages since the employer pays the bulk of the premiums: for individual coverage, Zedlewski (1992) estimates that 43 percent of employers pay the entire premium and employers pay 85 percent of overall health insurance premiums.[2] Combining these statistics suggests that employers who require some worker contribution still pay 74 percent of total health insurance premiums.[3] Thus, from the employee's perspective, both non-contributory (i.e., entirely employer-financed) plans and contributory plans have significant tax advantages.

Since the employer's contribution is deductible from the firm's taxable income, the tax advantage for fringe benefits comes from the exclusion of employer contributions and, in some cases, employee contributions from the employee's taxable income. The size of the tax advantage depends on the employee's marginal income tax rate. For the portion of premiums that are excluded from taxable income, employees face an effective price of insurance of one minus their marginal tax rate times the price of the insurance. The tax adjustment, one minus the marginal tax rate,

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[2] One would expect that employer contributions to benefits would be offset by a compensating reduction in money wages. For a general survey on equalizing differences in wages, see Rosen (1986). Evidence on equalizing differences for employer-provided benefits is mixed. In a recent example, Gruber (1992) finds a substantial wage offset using data around mandated changes in benefits.

[3] That is, if workers in 43 percent of firms do not pay premiums, then workers in the remaining 57 percent of firms must pay 26 percent of their premiums for the average employer's share of premiums to equal 85 percent.

is commonly referred to as the "tax price" of the fringe benefit. With graduated income tax rates, the tax advantage increases with the employee's income.

We focus on the employer's decision to offer a benefit in part because we have data on benefits offered instead of the number of workers who actually take a benefit. However, since the worker only gets the tax advantage if the employer offers the benefit, the decision whether to offer a benefit is an integral part of the tax effect. The firm's decision to offer a benefit depends on the demands of its various workers. The more workers who want a benefit, the more likely a firm is to offer the benefit. Employee demand for a benefit depends on the marginal utility of receiving the benefit. In turn, employee demand for employer-provided benefits, rather than buying the benefit outside of the employer, depends on the size of the tax advantage and the advantages of group policies. Since the tax advantage increases with the personal tax rate, the pressure on a firm to offer a benefit should increase with the number of workers with higher marginal tax rates. As the tax rate increases (either for all workers of a firm or for a subset of workers), a firm would be more likely to offer a benefit. Since employees at a firm face different tax rates and have different preferences for insurance, a firm's decision to offer a benefit is a collective choice problem (see Goldstein and Pauly, 1976). As discussed below, the collective choice aspect of employer-provided benefits creates problems for measuring the tax incentives facing a firm.

Previous empirical work on how the tax system affects fringe benefits concentrates on three types of data: (1) time-series aggregate data; (2) cross-

sectional (or panel) data on firms; and (3) cross-sectional data on individuals. The time-series studies (see, for example, Long and Scott, 1982, Vroman and Anderson, 1984, and Turner, 1987b) typically find that the tax system encourages non-wage compensation but the effect is relatively small. The major problem confronting time-series analysis is controlling for non-tax factors that might affect the demand for fringe benefits. For example, it is difficult to disentangle the variation in taxes from other changes in supply and demand conditions for health insurance. Also, the time-series approach is limited to a single tax rate for each year. Variation in this tax rate needs to capture changing incentives at the firm-level for an employer to start offering a fringe benefit. Since the firm's decision depends on the demands of workers with different incomes and tax rates, the amount of fringe benefits may depend on the distribution of tax rates rather than just a measure of the average tax rate.

Relative to the time-series analyses, studies using cross-sectional data find that taxes have economically significant effects on the choice between fringe benefits and wages. The challenge for cross-sectional work is appropriately measuring variation in tax incentives at either the firm or individual level. At the firm-level, the tax incentive depends on the distribution of the employees' tax rates. Across firms, this tax incentive varies because some firms have workers with higher tax rates than other firms. Unfortunately, if one only considers federal taxes in a single year, employees' tax rates across firms are determined by income levels of the employees. This creates a standard problem for "tax price regressions": are the tax effects econometrically identified with a single cross-section of data? Feenberg (1987)

discusses this problem for the case of charitable giving. Since tax rates are a non-linear function of income, measured tax effects may really be non-linearities in how income affects the demand for fringe benefits. Individual-level data suffer from the same identification problem for tax effects and also ignores the public goods dimension of fringe benefits: an employer's decision to offer a benefit depends on the tax rates of the individual and of the individual's co-workers.

Fortunately for studies of cross-sectional data, income tax rates vary by state. This state-level variation is an important feature for econometrically identifying the tax effects. Woodbury (1983), Adamche and Sloan (1985), Sloan and Adamche (1986), Hirsch and Rufolo (1986), Turner (1987a) and Woodbury and Hamermesh (1992) all use regional variation in tax rates to help identify their models.[4] Each paper incorporates state tax rates differently. For example, Turner imputes each family's marginal total income tax rate (combining federal and state taxes) based on each family's characteristics. In contrast, Woodbury and Hamermesh use the sum of the marginal federal and state income and payroll tax rates for the median faculty member at each college for which they have data. As discussed below, we use a similar method for calculating the regional variation in marginal tax rates.

Turner (1987a) and Woodbury and Hamermesh (1992) are the closest predecessors of our work. Following Turner, we go beyond examining the major benefits (pensions, life and health insurance) to explore the margin of how many

[4] One alternative to regional variation in tax rates is changes over time in the Federal tax treatment of health insurance premiums of the self-employed. Gruber and Poterba (1994) exploit this variation using a "differences-in-differences" estimation strategy and find that the demand for insurance is sensitive to tax-induced changes in the price of insurance.

benefits workers receive. Turner finds that taxes play a larger role in the number of benefits rather than in the presence of the three major benefits. Like Turner, we examine a variety of fringe benefits but we use aggregate data rather than a sample of individuals which does not capture the effects of tax rates of each family's co-workers. Aggregate data have the advantage of isolating the tax effect on the employer's decision rather than using tax rates of each family.

Woodbury and Hamermesh examine the employee benefits of academics across the U. S. and find that the percentage of compensation received as fringe benefits is responsive to the tax price of benefits. Like Woodbury and Hamermesh, we explore the regional variation in fringe benefits and use differences in state tax rates. Woodbury and Hamermesh use panel data which has the advantage of using changes in federal tax rates to help identify tax effects. Relative to Woodbury and Hamermesh, we use a broader sample of workers and focus on the percentage of workers offered benefits rather than the percentage of compensation coming as fringe benefits. More importantly, our data allow us to examine the composition of fringe benefits rather than just the dollar value of benefits.

III. Empirical Model and Data

Most previous work with cross-sectional data tries to explain the variation in either the dollar value or the share of non-wage compensation in total compensation. We depart from this tradition in part because regional data on expenditures are not available. Instead, we focus on the fraction of workers in a region who are offered

each benefit. The fraction of workers offered a benefit has at least one advantage over expenditure data. Expenditures depend on the cost of the benefit which may vary across places. However, workers who receive a benefit in a place where the benefit is expensive may also place a higher dollar value on the benefit. This endogeneity between the cost of the benefit and an individual's valuation of the benefit may confound results based on cost measures of fringe benefits. For example, health insurance prices may vary across regions because the cost of health care varies. Employees in areas with high health care costs may value health insurance highly because their potential medical care is expensive. The fraction of workers covered is less susceptible to this endogeneity problem.

This study is unique in using regionally-aggregated data rather than national aggregate, firm-level or individual data. By grouping employers within a labor market, the variation in our data is from differences across labor markets rather than within a labor market. Within a regional labor market, some employers may offer generous benefits packages to attract workers who prefer non-wage compensation. Other firms in the region may offer few benefits but compensate with higher wages. While tax incentives would affect each firm's level of fringe benefits, benefits may vary within a region as workers choose the firm with the wage and benefit package that best suits their tastes. By using regional data, our approach captures how the tax system affects the average level of benefits in the region.

The data on fringe benefits are from the U.S. Bureau of Labor Statistics' (BLS) Occupational Compensation Surveys (formerly called Area Wage Surveys) for 1988-

1992. While the surveys come from different years, each region is surveyed once in the five year period. Most of the observations are city-level averages, though for less populated states the unit of observation may be a region within the state or the whole state. Unfortunately, earlier surveys do not include comparable information on fringe benefits. The BLS surveys a sample of establishments with more than 50 workers in the region. The surveys include the percentage of blue and white collar workers offered different fringe benefits. We use data on medical insurance, life insurance, pensions, dental insurance, vision plans, coverage of hearing and drug or alcohol rehabilitation. Some of these latter benefits can be provisions within the firm's medical coverage. For the first three benefits, we also have information on whether the benefit is financed entirely by the employer.[5]

We limit our analysis to a subset of the regions surveyed by the BLS for two reasons. First, not all surveys include data on fringe benefits. Second, and more importantly, we exclude regions that span more than one state or that might have a substantial number of commuters from a different state (e.g., Washington D.C.). Excluding these regions makes it easier to calculate the appropriate tax rate for each region.

For each fringe benefit, we estimate separate least squares regressions for the natural logarithm of the ratio of the odds of a worker being offered a benefit to the

[5] As noted above, the tax rules for employee contributions to fringe benefits depend on whether the firm's plans meet certain IRS rules. However, all workers covered by entirely employer-financed plans receive the tax advantage.

odds that a worker is not offered each benefit in the region.[6] Using the "log-odds" ratio, rather than the percent of workers offered a benefit, has the advantage that the dependent variable is not truncated, so the error term does not violate assumptions of the linear model. The regression equation for each health-related fringe benefit is:

$$LN \frac{p_i}{100 - p_i} = \alpha + X_{i,k}B_k + \gamma\ PRICE_i + \delta\ PRICE_i*TAX_i + \varepsilon_i \qquad (1)$$

where p_i is the percent of white or blue collar workers offered the benefit in the region, $X_{i,k}$ is a vector of k demographic variables, $PRICE_i$ captures regional variation in the cost of benefits, TAX_i measures the tax advantage of fringe benefits, and ε_i is the error term. Details on the explanatory variables are below. The subscript i denotes regions and the subscript k indexes the demographic variables. The coefficients to be estimated are α, B_k (a vector), γ, and δ, the effect of the tax incentive. The measure of the tax incentive is interacted with the price variable since the after-tax cost of a benefit is one minus the marginal tax rate times the price of the benefit. If taxes encourage benefits, δ would be positive.

Each observation in the regressions is weighted by:

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[6] This "log-odds" specification is the group data equivalent of a logit regression for data on individual employees or firms. Of the 2352 region-benefit observations used in the regressions of equations (1) and (3), 14 observations had 100 percent of the workers covered and 4 observations had 0 percent of workers covered. To prevent the logarithm of the odds ratio from being undefined, these observations are given values of 99.99 percent and 0.01 percent.

$$\text{weight}_i = \left(\frac{POP_i}{p_i(1 - p_i)} \right)^{\frac{1}{2}} \qquad (2)$$

where POP_i is the 1990 population of the region. Weighting by population places relatively more importance on more populated areas and corrects for heteroscadasticity induced by each region's variables using different population sizes. The weight includes $p_i(1 - p_i)$ to place less weight on observations that are near the end of the possible range of probabilities. See Maddala (1983, p. 29) for details on the econometric specification.

The main explanatory variable of interest is the tax incentive to compensate workers with fringe benefits instead of money. In constructing this variable, we want to capture the regional variation in income tax rates. As discussed above, previous papers emphasize the importance of state income taxes as a source of exogenous variation in the tax incentives for employer-provided benefits. Since the tax incentive for a given firm depends on the marginal tax rates of all of its employees, it is difficult to create precise measures of the tax incentive.[7] One advantage of using regional data is that it is relatively easy to link regional data on fringe benefits with interstate variation in income tax rates.

We use the total marginal tax rate at the state level for 1990. This tax rate is

[7] One hypothesis is that firms respond to the demands of the workers as if the workers could vote on whether the firm should offer a benefit. Under this framework, the tax rate of the decisive voter would be the critical tax rate for measuring the tax incentive facing the firm. The decisive voter may be the voter with median preferences (which with some added restrictions, would be the worker with the median income) or certain blocks of workers (e.g., managers) may have more influence on the firm's decisions than other groups of workers.

the sum of the federal and state tax rates.[8] We report results using tax rates calculated for a representative household taken as a married couple with $40,000 of state and Federal taxable income that itemizes its deductions. The tax rates capture differences in state rates and state tax rules regarding the deductibility of Federal income taxes from state taxable income. By assuming both Federal and state taxable income of $40,000, our tax rates do not capture some subtle interstate differences in the definition of taxable income. However, since these differences are unlikely to change the marginal tax rate of the representative household,[9] we believe our tax rate estimates capture the regional variation in income taxes applying to wage income.

To measure the regional variation in the cost of health-related benefits, we include area factors for calculating insurance premiums for small firms (fewer than fifty employees) in each region.[10] The area factors, denoted as $PRICE_i$ in equation (1), are adjustment factors for regional differences in the costs of buying a standard

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[8] See Bogart and Gentry (1992) for more details on the construction of state-level marginal income tax rates (though their tax rates are specific to capital gains income). Unlike some previous studies (Turner, 1987a and 1987b, and Woodbury and Hamermesh, 1992), we ignore any incentives created from non-wage compensation being excluded from the payroll tax base for Social Security for two reasons. First, it is unclear whether the payroll tax should be included because excluding fringe benefits from the payroll tax base also lowers future Social Security benefits (see Sloan and Adamche, 1986). Second, since Social Security is a federal program, including the payroll tax would only change the level of the tax variable without affecting the regional variation.

[9] For example, for 1990, 30 of the 41 states with broad-based income taxes had top brackets beginning at or below $30,000 (Advisory Commission on Intergovernmental Relations, Significant Features of Fiscal Federalism). Thus, fairly large changes in taxable income would typically not change the representative household's marginal state tax rate.

[10] We are grateful to Lee Hart of The Prudential for providing this data. While larger firms face similar variation in costs, they may negotiate individually with the insurance company or choose to self-insure.

insurance policy. They control for region-specific differences in insurance company loss ratios (ratio of claims to premiums) for health insurance after controlling for differences in industry, benefits included in the policy and demographics of the firm. The firm pays a premium equal to the national premium times the area factor. The area factors are for 1993 policies (historical data are not available). Area factors vary by three-digit zip code. We include the area factors for the general delivery zip code in the city or, when a general delivery zip code is not available, a centrally located zip code in the region (or a large city within the region).

In addition to the tax variable, we control for various factors that might affect the level of fringe benefits in a region. Since the age structure of the population may affect demand for fringe benefits, we include the percent of the population between the ages of 35 and 44 and the percent of the population between ages 55 and 64 from the 1990 Census. Under the hypothesis that a better educated workforce might have a higher demand for fringe benefits, we include the percent of the population over age 25 with more that twelve years of schooling in 1980 from the 1980 Census. Since our dependent variable includes government workers, the fraction of the labor force employed by the government might affect fringe benefits since government workers are more likely to receive basic benefits packages than private sector workers (see, for example, U.S. General Accounting Office, 1992). We include the state-level fraction of manufacturing workers who belonged to a union in 1989 since unions have typically bargained for more generous fringe benefits. Even though white collar workers are less likely to unionize, we include this variable in the regressions for white

collar workers because of the collective choice nature of the decision to offer fringe benefits.

Since the Occupational Compensation Surveys are staggered across years, we include a set of dummy variables for the year of the survey to capture any national level trends in fringe benefits. To avoid multicollinearity, we omit the year dummy for 1988. The staggered feature of the data also makes it difficult to measure consistently the regional variation in the tax incentive for fringe benetits. Fortunately, there were no major shifts in federal tax rates between 1988 and 1992. In order to get a snapshot of the variation in state tax rates, we use tax rates for 1990. Two things mitigate any adverse effects of using tax data from a single year. First, decisions about fringe benefits are long-term decisions of employers. It is not practical for a firm to change its benefits package every year. Thus, the fraction of workers offered a benefit should respond to long-run tax incentives. Second, state tax systems rarely change.

Since we do not have a price variable for life insurance and pensions, we estimate the following equation without a price variable for these benefits:[11]

$$LN \frac{p_i}{100 - p_i} = \alpha + X_{i,k}B_k + \delta TAX_i + \varepsilon_i . \qquad (3)$$

The hypothesis that higher tax rates increase employer-provided benefits suggests that the coefficient on the tax variable should be positive.

[11] Since all firms can invest pension contributions in the same capital markets, the price of pension plans should not vary across regions. For life insurance, the cost could vary by region or by firm depending on the age structure of the population. However, we do not have estimates of regional variation in mortality.

The tax incentive to offer benefits depends on how the employer finances the benefits. As discussed above, for some plans that require employee contributions, the employee's contribution is not tax advantaged. In this case, higher personal tax rates give firms an incentive to arrange compensation packages such that fringe benefits are entirely firm- financed. To test whether taxes affect the decision of how to finance a benefit conditional on the employer offering the benefit, we estimate the following equation for medical and life insurance:[12]

$$LN \frac{f_i}{100 - f_i} = \alpha' + X_{i,k} B_k' + \delta' TAX_i + v_i \qquad (4)$$

where f_i is the percent of workers with the benefit entirely financed by the employer in region i conditional on being offered the benefit, v_i is the error term and other variables are defined above. The variable, f_i, is 100 times the ratio of the percent of workers with the benefit entirely financed by the employer to the percent of workers offered the benefit in region i. The regressions are weighted similarly to equations (1) and (3). If taxes affect how benefits are financed, then higher tax rates should lead to a larger fraction of employees receiving benefits having their benefits financed entirely by the employer. Of course, rearranging the method of financing benefits may result in a change in other forms of compensation (e.g., less money compensation) which is not controlled for in the regression.

Table 1 presents summary statistics of the dependent and explanatory

[12] Since typical contributory retirement plans (e.g., 401(k) plans) allow employees to contribute pre-tax dollars, the tax rate should not affect a firm's choice between types of pension plans.

variables. Typically, a higher percentage of white collar workers receive a benefit than blue collar workers, though anti-discrimination rules prevent the differences from being too large. Across the two types of workers, the pattern of benefits offered is similar: health insurance and life insurance are the most common benefits while vision and hearing coverage are the least common.

IV. Results

Blue Collar Workers. In table 2, we present estimates of equation (1) for health-related benefits and equation (3) for non-health-related benefits for blue collar workers. For nine of the ten regressions (the exception is hearing coverage), the coefficient on the tax variable is positive and statistically significant at the five percent significance level (using a two-tailed test) in eight of the regressions indicating that the income tax system encourages fringe benefits. In the log-odds specification, the effect of changing an exogenous variable on the probability of benefit coverage depends on the level of the probability.[13] We evaluate the effects of exogenous variables at the mean probability of each benefit. Evaluated at the mean area factor (price) of 0.67, a one percentage point reduction in the marginal tax rate would reduce the percentage of workers offered medical insurance by 1.84 percentage points, dental insurance by 1.18 percentage points, vision coverage by 1.47 percentage points, and drug and alcohol abuse treatment by 0.56 percentage points. Thus, taxes affect both basic

[13] A change in an exogenous variable changes the probability by approximately the coefficient multiplied by the probability times one minus the probability. Thus, a unit change in an exogenous variable affects a low or high probability by less than a probability that is close to 0.5.

benefits and the degree of generosity of the benefits package.

In addition to the tax effects on health-related benefits, the results indicate that the tax rate affects how many workers are offered life insurance and pension benefits. A one percentage point increase in the tax rate increases the percentage of workers offered life insurance by 0.83 percentage points and the percentage offered pension plans by 0.89 percentage points. Taxes have a larger effect on the percentage of workers offered life insurance and pensions entirely financed by the firm: a one percentage point increase in the tax rate increases the percentage of workers with employer-financed life insurance by 1.21 percentage points and employer-financed pensions by 1.33 percentage points. We return to the differences between contributory and non-contributory plans in the discussion of table 4.

Overall, the model explains a considerable portion of the regional variation in employer-offered benefits. The adjusted R^2's range from 0.26 to 0.79. The coefficients on other variables in the regressions conform with their expected signs and some are statistically significant. For example, The percent of workers offered benefits typically increases with unionization at the state level. The coefficient on price is negative except for the hearing benefits regression. For medical insurance, a one standard deviation increase in the area factor, reduces the percent of blue collar workers offered health insurance by 6.3 percentage points which suggests that firms' decisions to offer benefits are sensitive to the cost of the benefits.[14]

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[14] This change is evaluated at the mean percent offered medical benefits and the mean tax rate.

White Collar Workers. Table 3 has results for equations (1) and (3) for white collar workers. Relative to the results for blue collar workers, these results do not lend strong support to the hypothesis that taxes are important determinants of whether firms offer fringe benefits. While seven of the ten coefficients on the tax variables are positive, the coefficients for white collar workers are typically not statistically significant at the five percent level. All of the tax coefficients except one are smaller (in absolute value) than their counterparts for blue collar workers. Furthermore, the regressions for white collar workers have less explanatory power than the regressions for blue collar workers, as evidenced by the lower adjusted R^2's for most of the benefits.

Overall, the results suggest that taxes may be less important for white collar workers than for blue collar workers and variables other than those included in the regressions may be important for white collar workers. Since white collar workers are more likely to have higher tax rates than blue collar workers, it is surprising that the tax variable is more important for blue collar workers. However, varying the income level (and hence tax rate) of the representative household does not reverse this pattern. One possible explanation of the lower predictive power for white collar is that white collar workers are a smaller, more diverse group of employees within each region.

Sensitivity Analysis. These results are robust to two types of alternative specifications. To conserve space, we do not report these results in tables. First, to explore the validity of our measure of the price of health benefits, we estimated different specifications of equation (1). For health-related benefits, the qualitative

results are similar for regressions without the price variable (i.e., equation (3)) and for regressions with separate price and tax variables but no interaction between the two variables.

Second, to check whether the tax variable captures regional variation in income taxes, we used two types of alternative tax variables: (1) we constructed marginal tax rates for alternative representative households; and (2) state income tax collections per $100 of state personal income for 1990 (from the Advisory Commission on Intergovernmental Relations' Significant Features of Fiscal Federalism). Specifically, we considered three different representative households: (1) a family of four with adjusted gross income of $35,000 taking the standard deduction and exemptions; (2) a single person with adjusted gross income of $28,000 taking the standard deduction; and (3) a family with itemized deductions and taxable income of $100,000. The second alternative tax variable is an average state income tax rate. Replacing the marginal tax rate for families with $40,000 of taxable income in equations (1) and (3) with these alternative tax variables yields qualitatively similar results to those in tables 2 and 3 although the coefficients are less statistically significant with the average tax rate measures.[15]

Financing Major Fringe Benefits. Since in some plans employee contributions are not tax-advantaged, higher personal income tax rates give employers an incentive to use non-contributory plans to provide benefits. Therefore, conditional

[15] Since the state average tax rate is not a total of Federal and state taxes, for the regressions with the average tax rate, we estimated a model with the separate price and tax variables without an interaction.

on a firm offering benefits, higher tax rates should increase the chance that a firm either meets the IRS rules for employee contributions to be tax-advantaged or to not require employee contributions for benefits. Table 4 presents the regression results from equation (4) for medical and life insurance.

For blue collar workers, the tax rate coefficient is statistically insignificant for medical insurance but positive and statistically significant at the five percent significance level for life insurance. These results indicate that an increase in income tax rates induces a substitution from contributory plans to non-contributory plans for life insurance. For example, a one percentage point increase in the tax rate increases the percentage of workers whose life insurance is entirely financed by the employee by 1.6 percentage points. Recall from table 2 that an increase in the tax rate increases the likelihood of coverage for both medical and life insurance for blue collar workers. This substitution is in addition to the increased frequency of benefits. This substitution suggests that higher taxes reduce the amount of explicit cost sharing between employees and employers for benefits. The lack of cost sharing between employees and employers may contribute to rapidly increasing health care costs. The unionization variable has a statistically significant positive effect on the fraction of firms that entirely finance benefits.

For white collar workers, the tax rate coefficient for neither medical nor life insurance is statistically significant. The explanatory power of the regressions for white collar workers is much lower than that of the regressions for blue collar workers. As with the results in tables 2 and 3, taxes seem more important for blue collar

workers than white collar workers. Also consistent with the results in tables 2 and 3, the results are robust to using alternative measures of the tax incentives.

V. Policy Implications and Conclusion

Using regionally-aggregated data on fringe benefits offered by employers and interstate variation in tax rates, we offer new evidence on the effects of income taxes on the level of fringe benefits offered by employers. Overall, our results are consistent with previous cross-sectional studies of the effects of taxes on fringe benefits. Unlike other studies (except Turner, 1987a), we identify both the margin of whether an employer offers basic benefits and the margin of how many benefits the employer offers. Taxes seem important on both margins. We also estimate whether taxes affect how firms elect to finance fringe benefits and whether taxes affect the amount of explicit cost sharing between employers and employees. Our main empirical findings are:

- Higher income taxes increase the utilization of fringe benefits. This increase is both economically and statistically significant for blue collar workers. The results are less pronounced for white collar workers.
- Taxes have a similar effect on "marginal" benefits such as vision coverage and dental insurance and whether workers are offered basic medical insurance.
- Higher income taxes induce some substitution from contributory plans with explicit cost sharing towards non-contributory (entirely employer-finance) plans with no explicit cost sharing. This substitution is consistent with firms financing fringe benefits in a way that minimizes their employees' taxes.

Our estimates suggest that tax rates affect the level and types of benefits

offered by employers as well as the choice of how these benefits are financed. Many current proposals are geared at limiting or capping the tax advantages of fringe benefits. These proposals call for either a limited exclusion (or credit) of fringe benefits at the level of the personal income tax or a cap on the amount that employers can deduct for fringe benefits per employee from firm level income. The advantage of these proposals is that they maintain a tax subsidy for basic medical insurance without subsidizing excessive fringe benefits. Since our results suggest that taxes affect both basic benefits as well as more "marginal" benefits, these policies may curtail the offering of more "marginal" fringe benefits without greatly influencing how many people are offered basic coverage. While we cannot offer direct evidence on the levels of copayments and deductibles, the results are consistent with these policies affecting the amount of insurance individuals have, rather than whether individuals have any insurance at all. However, our results are estimated using a relatively small amount of variation in the tax rates, so it is difficult to extrapolate the effects of these proposals since these policies may have substantial effects on the pre-tax price of insurance and medical care. With this caveat in mind, the results suggest that these policies would have their intended effect of reducing the number of people with overly generous benefits packages; the alternative policy of eliminating the special tax treatment of all fringe benefits might affect the how many people receive basic coverage.

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Table 1: Summary Statistics				
	Mean	Stan. Dev.	Minimum	Maximum
Fringe Benefits: Blue Collar				
Health Insurance	89.4	8.4	61	100
Health Entirely Firm-Funded	48.5	15.4	14	84
Dental	67.2	15.4	16	93
Vision	33.6	18.9	1	75
Hearing	19.8	14.4	0	62
Drug/Alcohol	80.5	10.7	53	99
Life Insurance	89.6	6.4	67	99
Life Entirely Firm-Funded	73.1	11.5	40	94
Pension	67.4	13.5	40	93
Pension Entirely Firm-Funded	59.6	14.3	28	87
Fringe Benefits: White Collar				
Health Insurance	95.9	5.7	72	100
Health Entirely Firm-Funded	46.0	14.2	20	85
Dental	76.6	15.7	22	98
Vision	34.6	19.6	0	79
Hearing	18.3	14.6	0	65
Drug/Alcohol	86.9	11.2	50	99
Life Insurance	96.0	4.8	61	100
Life Entirely Firm-Funded	81.9	10.0	42	98
Pension	78.7	12.3	35	98
Pension Entirely Firm-Funded	70.4	12.8	33	94
Explanatory Variables				
Marginal Tax Rate	0.311	0.0193	0.28	0.345
Population Ages 35-44	15.2	1.3	11.3	18.7
Population Ages 55-64	8.1	1.2	4.5	11.0
Gov't workers per 100	6.76	2.54	4.12	16.54
Unionization	19.9	12.7	2.4	51.6
High School Education	69.1	7.7	41.3	83.7
Area Factors for Health Ins.	0.67	0.28	0.37	2.12

Table 2: Fringe Benefits for Blue Collar Workers
Dependent Variable: $Ln(p/(100 - p_i))$ where p_i = percentage of workers offered each benefit

	Medical	Medical from firm	Dental	Vision	Hearing	Drug & Alcohol	Life	Life from firm	Pension	Pension from firm
Constant	10.03*	-1.50	-2.36*	-6.35*	-19.35*	-2.31	-1.46	-2.79*	-2.77*	-2.99*
	(2.92)	(0.77)	(0.89)	(1.14)	(1.64)	(1.20)	(1.67)	(1.12)	(1.11)	(1.05)
Pop35	-0.035	0.15*	0.076	0.13*	0.70*	0.10	0.062	0.070	0.037	0.053
	(0.17)	(0.043)	(0.049)	(0.066)	(0.11)	(0.067)	(0.065)	(0.045)	(0.044)	(0.042)
Pop55	0.15	-0.029	-0.133*	-0.093	0.37*	0.036	0.24*	0.090	0.12*	0.11*
	(0.18)	(0.045)	(0.053)	(0.069)	(0.12)	(0.071)	(0.071)	(0.048)	(0.047)	(0.045)
Educat12	-0.064*	-0.0040	0.048*	0.051*	0.021	0.030*	-0.019	0.0001	-0.0068	-0.0018
	(0.029)	(0.008)	(0.009)	(0.012)	(0.021)	(0.012)	(0.012)	(0.008)	(0.008)	(0.008)
Gov't workers	-0.098	-0.022	-0.077*	-0.072*	0.13*	-0.051	0.042	0.0020	0.0082	-0.0063
	(0.085)	(0.023)	(0.026)	(0.035)	(0.066)	(0.034)	(0.031)	(0.022)	(0.022)	(0.021)
Union89	-0.018	0.028*	0.020*	0.027*	0.041*	0.018*	0.0044	0.023*	0.028*	0.026*
	(0.015)	(0.004)	(0.005)	(0.007)	(0.013)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)
Price	-11.38*	-2.90*	-2.30	-2.47	1.50	-2.23				
	(3.91)	(0.96)	(1.17)	(1.56)	(2.82)	(1.56)				
Price * Tax	28.94*	8.07*	7.97*	9.86*	-2.15	5.29				
	(12.24)	(3.04)	(3.64)	(4.90)	(9.12)	(4.82)				
Tax Rate							8.88*	6.16*	4.03*	5.52*
							(3.84)	(2.62)	(2.60)	(2.48)
# of obs.	108	108	108	108	105	107	108	108	108	108
Adj. R^2	0.28	0.57	0.53	0.52	0.79	0.26	0.35	0.40	0.47	0.49

Coefficients are estimated using weighted least squares with the weights described in the text. * denotes coefficients that differ from zero at the 5 percent significance level (two-tailed test). The regressions also include year dummies for the year of the survey.

Table 3: Fringe Benefits for White Collar Workers
Dependent Variable: $Ln(p/(100 - p_i))$ where p_i = percentage of workers offered each benefit

	Medical	Medical from firm	Dental	Vision	Hearing	Drug & Alcohol	Life	Life from firm	Pension	Pension from firm
Constant	9.45*	-0.93	-3.59*	-17.92*	-24.17*	-2.04	-1.16	-1.58	-2.25	-1.72
	(3.95)	(0.90)	(1.33)	(2.17)	(2.26)	(1.45)	(4.18)	(1.65)	(1.35)	(1.25)
Pop35	0.15	0.075	0.072	0.43*	0.59*	0.15	0.19	0.038	-0.0020	0.048
	(0.22)	(0.049)	(0.072)	(0.14)	(0.14)	(0.081)	(0.15)	(0.066)	(0.053)	(0.050)
Pop55	0.35	-0.054	-0.11	-0.16	0.10	-0.0028	0.38*	0.12	0.14*	0.13*
	(0.22)	(0.052)	(0.079)	(0.15)	(0.16)	(0.081)	(0.17)	(0.070)	(0.057)	(0.053)
Educat12	-0.086*	-0.0015	0.064*	0.12*	0.11*	0.029*	-0.040	0.012	0.017	-0.0043
	(0.039)	(0.009)	(0.013)	(0.024)	(0.027)	(0.014)	(0.029)	(0.012)	(0.010)	(0.009)
Gov't workers	-0.063	0.059*	-0.031	-0.0046	0.067	-0.070	-0.018	0.016	0.045	-0.0014
	(0.11)	(0.026)	(0.038)	(0.077)	(0.091)	(0.041)	(0.074)	(0.031)	(0.025)	(0.025)
Union89	0.051*	0.013*	0.014*	0.029*	0.073*	0.021*	0.043*	0.018*	0.027*	0.019*
	(0.017)	(0.005)	(0.007)	(0.014)	(0.016)	(0.008)	(0.014)	(0.006)	(0.005)	(0.005)
Price	-11.50*	0.80	0.16	2.27	10.53*	-0.63				
	(5.46)	(1.16)	(1.70)	(3.51)	(3.97)	(1.81)				
Price * Tax	23.29	-1.87	1.65	-4.18	-30.25*	1.63				
	(17.38)	(3.65)	(5.27)	(11.01)	(12.75)	(5.55)				
Tax Rate							8.66	2.51	2.98	2.07
							(9.43)	(3.82)	(3.18)	(2.95)
# of obs.	108	108	108	108	105	107	108	108	108	108
Adj. R^2	0.44	0.28	0.38	0.67	0.70	0.25	0.32	0.16	0.40	0.35

Coefficients are estimated using weighted least squares with weights described in the text. * denotes coefficients that differ from zero at the 5 percent significance level (two-tailed test). The regressions also include year dummies for the year of the survey.

Table 4: Form of Financing Fringe Benefits
Dependent Variable: $Ln(f_i/(100 - f_i))$
where f_i = 100*Percentage of workers offered benefit entirely financed by firm divided by the percentage of workers offered benefit

	Blue Collar		White Collar	
	Medical	Life	Medical	Life
Constant	-0.51 (0.90)	-2.26* (1.06)	-0.62 (1.39)	1.15 (1.83)
Pop35	0.12* (0.046)	0.052 (0.054)	0.11 (0.055)	0.12 (0.072)
Pop55	-0.046 (0.042)	-0.054 (0.050)	-0.12* (0.057)	-0.026 (0.075)
Educat12	-0.0039 (0.0063)	-0.0010 (0.0074)	-0.0089 (0.0090)	-0.0087 (0.012)
Gov't workers	-0.039 (0.026)	-0.090* (0.030)	0.025 (0.030)	0.0015 (0.039)
Union89	0.028* (0.0048)	0.035* (0.0056)	0.011* (0.0050)	0.026* (0.0066)
Tax Rate	-0.66 (2.72)	10.96* (3.20)	1.92 (3.23)	-2.56 (4.25)
# of obs.	108	108	108	108
Adj. R^2	0.51	0.51	0.19	0.11

Coefficients are estimated using weighted least squares as described in the text. * denotes coefficients that differ from zero at the 5 percent significance level (two-tailed test). The regressions also include year dummies for the year of the survey.