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The Economics and Politics of Large-Scale Tax Reform: The Example of Employer-Paid Health Insurance Premiums

by
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I. Introduction and Setting.

"...breaking up is hard to do."

Major tax reform looms on the political and economic horizon more prominently now than in many past years. In simple terms, tax reform involves a straightforward tradeoff: a broader tax base in exchange for lower tax rates and a more simple tax structure. Yet each potential reform of the tax code generates substantial resistance: every beneficiary of any tax preference in the current tax code can foresee the immediate loss if his special exemption is removed, and the gains from lower tax rates can rapidly blur into obscurity. Thus, when tax reform is proposed, a typical response is that general reform (lower marginal tax rates) is a terrific idea, except that Tax Preference X should be retained for Special Reason A. When all such special interests are aggregated, a stalemate often emerges. Thus, breaking up existing tax preferences is often "hard to do."

This study investigates one potential major tax reform embodying precisely these characteristics: the tax exemption of employer-paid health and disability insurance. Employer-paid health insurance premiums probably will exceed $125 billion annually in 1986, and account for a very large fraction of all private health insurance in the United States. These insurance policies provide coverage for more than 175 million persons, about seven of every nine Americans. In addition, a

large amount of potential tax revenue (over $40 billion in 1986) is at stake.

The political problem of tax reform requires a balancing of many issues. Almost no major tax reform can promise to benefit uniformly all members of society, and many reforms have hidden consequences. In the case of health insurance taxation, the obvious consequences include changes in taxable income and marginal tax rates, and the potential change in revenues and profits for affected industries, including those providing both health insurance and medical care. Less obvious are the potential effects of reducing the federal deficit. Still less obvious is elimination of the welfare loss from excess health insurance, arising both from the subsidy in the insurance market and the associated consequences in medical care markets.

In recent Congressional considerations of tax reform, employer-paid health insurance premiums were subjected again to scrutiny, and (at least in the final House of Representatives version of the bill available at this writing) the current subsidy was retained entirely. This study assesses the consequences of altering the favorable tax treatment of health insurance, and addresses the question of why it seems so politically difficult to accomplish this type of reform.

To summarize the results briefly in anticipation of the detail, this study finds: (1) Special tax treatment of health insurance (compared with full taxation) has increased the aggregate health insurance premiums by at least 40% for every year since Medicare was introduced, and by at least 50% for every year in the last decade. This added insurance coverage has surely induced substantial extra demand for medical care,

probably with little if any incremental gain in health outcomes for the United States population. (2) Major tax reform -- at the extreme, elimination of the tax preference -- would greatly affect the profitability and employment in the health insurance industry, and would markedly affect also the wealth and employment of many providers of medical care. (3) Even if the tax revenue effects of a broadened tax base were offset by a reduced marginal tax rate, so as to produce no net tax revenue gain, strong patterns of winners and losers would emerge among workers in various industries. (4) The magnitude of welfare gains from reducing overinsurance (in aggregate and for most individuals) are probably swamped by the extent of wealth redistribution generated by this tax reform. Therefore, political decisions regarding this reform will likely depend on these redistributive issues, rather than upon the potential benefit as defined in classical welfare economics. Thus, unless a low-cost and politically efficient redistributive scheme could be devised to accompany this large change in the tax code, it seems unlikely that the Congress would adopt this type of major tax reform.

While this study focuses on the tax treatment of health insurance, the issues involved in tax reform seem generic to many other potential reforms, including the deductibility of interest for home mortgages and the deductibility of state and local income taxes, and the taxation of Social Security benefits. Hopefully, the insights of this study will therefore contribute both to an understanding of the health insurance issues and of other related tax reform problems.

II. Health Insurance, Current Tax Law and Proposed Reforms.

Under current law, employer-paid health and disability insurance premiums are exempt from federal income taxation.[2] In addition, insurance purchased individually is subject to partial deductibility, but at a vastly reduced level from past law; I ignore this issue here.[3] This tax preference creates a significant subsidy for health insurance vis-a-vis other goods and services in the economy, and hence for health care itself, since health insurance is structured as a subsidy to health care[4].

To analyze these features, let the after-tax insurance premium for person i in year t be:

$$(1) \quad R_{it} = (1 + L_i) * (1-t_{it}) * E(B_{it})$$

where

L_t = the loading fee (proportional insurer administrative costs)

t_{it} = the marginal tax rate of the individual i in year t

B_{it} = benefits paid by the insurance coverage for person i in year t

and E(*) is the expectation operator.

Medical benefits B (omitting the subscripts) are composed of payments for medical care received by the patient. That is, B = kpM, where k is the average coverage rate (proportion paid by insurance), p is the price of a unit of medical care, and M measures medical care services provided. Thus, pM is expenditure on medical care and (1-k)pM = CpM is the consumer's out of pocket payment, where C is the consumer's coinsurance rate. Since C acts like a price, M varies negatively (positively) with C (k).

In actual insurance plans, the coverage schedule is often highly non-linear, with deductibles, copayments, internal limits, schedules of benefits, and other restrictions on payments. Using k as a simple summary of the benefit structure suffices for this analysis.

Most private health insurance is purchased through employment groups. Even without any tax benefits, group purchase of insurance offers two major advantages to the consumer: (1) administrative and sales costs fall greatly, compared with individually-purchased insurance, and (2) at least in employer groups, the insurer can feel confident that the group exists for other purposes than purchasing insurance, so self-selection of bad risks into better insurance plans should be minimal.[5]

The loading fee -- the markup of above expected benefits -- represents the price of insurance. For group insurance plans, this loading fee (L) is about 10 to 15 percent.[6] The ratio (1+L):1 represents the rate at which consumers can purchase medical care through an insurance plan, compared with "cash on the barrel-head," ignoring any tax issues.

Since employees purchase employer-group insurance with pre-tax dollars, the ratio (1-t):1 represents an additional shift in the relative price of health insurance and hence of medical care. Where L represents "the price of insurance" directly[7], one can think of the relative price of medical care as (1-t)*(1+L) when it is purchased via tax-exempt insurance premiums. Thus, the net price of insurance is (1-t)(1+L) - 1 = L(1-t) - t, and the price of health care via insurance is (1-t)(1+L) compared with direct (non-insured) purchase. In recent years, (1-t) has averaged between .65 and .7 and, as noted previously, (1+L) has moved between 1.10 and 1.15 for group insurance. Thus it has been cheaper (by some

25 - 30%) to purchase health care through employer-paid group insurance than directly, even ignoring the risk-spreading aspects of the insurance.

We should expect consumers to purchase health insurance even without any tax subsidy. Illnesses and subsequent purchases of health care induce substantial financial risk, and consumers would normally purchase insurance against such risks. But because of the magnitude of the tax subsidy, an obvious question arises: Why would consumers ever purchase less than full coverage insurance? The answer seems to come from the group purchase arrangement: Heterogeneity among workers, combined with the observation that group insurance offers uniform coverage to those within the group, appears to limit the desirable insurance to less than full coverage (Goldstein and Pauly, 1976, Jensen, 1985).

One situation where less-than-full coverage would almost certainly be optimal arises when the distribution of expected risks is right-skewed. Suppose the distribution of expected expenses for individuals within the work force of a single firm is (for example) lognormal with a high variance, so that the mean expense considerably exceeds the median. When the median worker decides on a level of coverage, the premium depends upon the expected costs of the mean for the group. The greater the variance (and hence divergence between the median and the mean) the greater the implicit "tax" borne by the median worker in selecting health insurance coverage. In this situation, the optimal coverage for the median worker could well be less than 100%, even after accounting for the tax subsidy.

Potential Tax Reforms.

Proposed tax reforms on this issue span a broad scope of the economic and political spectrum: At one extreme, some "flat tax" proposals would leave unaltered the tax status of employer-paid health insurance.[8] At the other extreme, some proposals would tax all employer-paid insurance as income.[9] Intermediate proposals also arise, often highly non-linear in structure,[10] that would tax portions of health insurance premiums beyond specific "grandfathered" levels. The methodology of this study allows direct analysis of proportional changes in the tax deductibility of health insurance premiums, but it does not as readily allow modeling of major tax changes involving significant non-linearities.

Projecting the consequences of tax reform requires knowing how total premiums respond to the tax-price (1-t), holding constant other factors, and projection of aggregate demand when the tax-price (1-t) becomes 1.0 or any other value under consideration in the political process.

The pure efficiency consequences of this tax reform follow directly from a simple analysis: Since health insurance generates something akin to a welfare loss by reducing the price of medical care artificially, the choice of how much health insurance to purchase represents a tradeoff between risk-spreading and untoward incentive effects on health care purchases (Zeckhauser, 1970). The tax subsidy has extended the amount of health insurance. The extra insurance has induced increased demand for medical care, driving an extra wedge between the cost of producing medical care and the value to consumers qua patients. This welfare loss has been discussed previously by Feldstein (1973) and Pauly (1969), but neither provided a direct estimate of the welfare loss due to the

income tax subsidy of health insurance. Feldstein and Friedman (1977) also discuss this tax issue through a simulation (discussed further in Section VI), but do not provide direct estimates of the welfare loss itself.[11]

Tax reform does not flow automatically towards maximum efficiency. If efficiency were the sole goal of the Congress, we would not expect to find important preferences embedded in the tax code, yet casual observation suggests that such preferences abound. The political system appears to endow implicit property rights to existing tax preferences and other transfers: models of these tax benefits suggest that their removal may prove difficult.[12] To this end, I will analyze in later sections of this paper the industry-specific consequences of this potential tax reform.

III. Tax Loss from the Insurance Exemption.

Data collected to analyze the demand for employer premiums for this study include estimates of the aggregate employer premium payments (exempt from taxation) and the average marginal tax rates for the U.S. economy from 1948 - 1982. (Appendix A describes these data in more detail.) These data allow estimation of the tax loss that has arisen through time due to the exemption of employer-paid health insurance premiums from income taxation. This approach does not depend upon whether employees continue to receive their current amounts of insurance, eliminate it completely, or select any intermediate choice. Table 1 summarizes in five-year intervals the annual employer premiums, the average marginal tax rate, and their product, an estimate of the tax

loss.[13] The complete set of data for all years from 1948 - 1982 used in the analysis appears in Appendix A.

[Table 1 about here]

The values shown in Table 1 almost certainly underestimate the true tax losses. These estimates apply the average marginal rate to the annual premium payments. A more accurate analysis would correct for the fact that higher income persons have both higher marginal tax rates and higher insurance premiums. A simple correction factor, calculated from data in Mitchell and Phelps (1976) suggests that the values in Table 1 are too low by perhaps 15 percent.[14]

The estimated tax loss for years beyond 1982 contains two uncertainties. First, the average marginal tax rate is not yet known for 1983 onward. While revisions in the federal income tax law (from 1981) would drive the average marginal tax rate down (perhaps by 2 - 3 percentage points) the growth in real income will push people into higher marginal brackets. Further, the FICA tax will increase in importance both because the rate has increased steadily since 1981 and the taxable income base has expanded considerably. I also must approximate the premium data for calendar year 1985; the estimate is a simple extrapolation of the 1984 data, using a 13% annual increase that was the geometric average over previous four years.[15]

The total foregone tax revenue, when compounded to include interest payments on the federal debt or foregone additions to the Social Security trust, as appropriate, is very large: the amount at 5% compound interest of the foregone tax revenues since 1948 approaches $400 billion.

Table 1

Summary of Employer Premiums, Average Marginal Tax Rate, and Tax Loss on Employer-Paid Insurance Premiums

Year	(1) Premiums ($billions)	(2) Real Per Capita Premiums ($1982)	(3) Average Marginal Tax Rate	(4) Tax Loss ($billion) (1)x(3)
1950	$.772	$20.35	.202	$.16
1955	1.706	36.94	.240	.41
1960	3.374	60.92	.253	.85
1965	5.890	93.50	.229	1.35
1970	12.099	146.80	.272	3.37
1975	25.500	214.19	.310	7.91
1980	49.780	314.02	.362	18.02
1985	110	535	.34	37.4
1986	125	600	.34	42.5

(all 1985 and 1986 data extrapolated)

IV. Modeling of Demand for Employer Premiums

Predicting the consequences of major tax reform requires estimation of the demand for employer-paid health insurance premiums as a function of the tax price (1-t) and other relevant variables. Conceptually, demand for health insurance of the form sold in the U.S. depends upon income, net price, the relative price of medical care, and the perceived health risk of any individual (Phelps, 1973, 1976). In the group insurance setting relevant for these data, Goldstein and Pauly (1976) show that the relevant characteristics are those of the median worker (voter) in each employment group.

In the analysis that follows, I use annual aggregate data from the U.S. economy (i.e., summing across all i in Eq. (1)). Aggregation of the demands of each individual to the group level, and then by groups to the level of the economy, raises the potential problem of aggregation bias. Zellner (1969) shows regression analysis using aggregated data can be understood as estimating the mean of a distribution of random parameters of individuals. In the group insurance purchase decision, we can think of the aggregate data as reflecting the size-weighted average of the insurance chosen by median workers in each insured work group, the weights corresponding to each group's size. Average per capita figures from aggregate data should correspond well to these conceptual variables for income, the load fee imposed by insurance companies, marginal tax rates, and the relative price of medical care, the variables under study here. No relevant measures of health status arise for aggregated data such as these. The modeling takes place in this environment. Generically:

Employer Premiums = f(Real Per Capita Income, Insurance Loading Fee, Marginal Tax Rate, Relative Price of Medical Care) + e.

Exogenous variables in the system include Real Per Capita Income, Marginal Tax Rate, Relative Price of Medical Care, Labor Costs of Insurers, Office Construction Costs, and Rate of Return on Corporate Bonds. The residual error is e.

As with any aggregate time-series study, concerns arise about serial correlation of the residuals, functional form of the dependent and independent variables, and (for hypothesis testing purposes) normality of the residuals. The estimates presented below represent a choice from a broader set of estimates, some of which were not reported due to substantial serial correlation, non-normality of residuals, or predictions of aggregate demand (after varying important policy variables) that were impossible. In particular, I required that simulations of total premiums should be positive for any allowable tax price, since we can observe positive demand for health insurance even without a tax subsidy.

Estimates of the general equation included variations with (a) linear and logarithmic specification, (b) quadratic interaction terms, and (c) OLS and TSLS estimation. With great uniformity, the OLS results displayed significant autocorrelation of the residuals. Equations with untransformed dependent variables gave predictions of insurance premiums absent tax benefits that were impossible (negative). These problems remained with and without quadratic interactions of the explanatory variables.

Logarithmic specification uniformly reduced and nearly eliminated serial correlation. Further analysis of residuals in these equations showed very close-to-normal distributions, when assessed by skewness

and kurtosis measures and by inspection of the residuals. Within the logarithmic estimates, TSLS uniformly dominated OLS on grounds of serial correlation and normality of residuals. Thus, the results presented below use TSLS estimation with logarithmic transformation.

Within the class of models I estimated, quadratic interactions arose in the loading fee, but not in other explanatory variables. Table 2 presents two equations from this set. In these equations, both the loading fee and the marginal tax rate are included in a form representing a relative price of medical care via insurance vs. purchased directly: The marginal tax rate is modeled as log(1-t) and the loading fee as log(1+L).

[Table 2 about here]

The residuals from these regressions exhibit only very mild serial correlation, at worst; the Durbin - Watson statistic of 1.44 for Equation 1 sits just below the boundary of the 1% confidence interval test that does not reject the hypothesis of no serial correlation.[16]. The estimated correlation of the residuals is .20 (t = 1.26).[17] Equation 2 includes a measure of the unemployment rate, in which the serial correlation vanishes (DW = 1.88). While this result might be anticipated, since business cycles could introduce serial correlation, the estimated effect of unemployment rates on premiums is positive. Since the unemployment effect is ancillary to this paper, I do not conjecture on why this result occurs.

The residuals appear to be distributed very close to normality: In the first equation, the distribution is highly symmetric,[18] skewness = -.20 and kurtosis = 2.90 (with corresponding values of 0 and 3.00 for

Table 2

Regressions Predicting Employer Group Insurance
US Annual Data 1948 - 1982
(Logarithmic Transformations)

Variable	Equation 1	Equation 2
Per Capita Real Income ($1982)	1.367 (t=3.84)	2.00 (t=6.87)
Tax Price of Insurance (1 - Marginal Tax Rate)	-2.13 (t=3.70)	-1.82 (t=2.23)
Loading Fee* (1 + L)	5.59 (t=2.46)	4.93 (t=2.96)
Loading Fee Squared*	-22.06 (t=2.80)	-23.21 (4.02)
Relative Price of Medical Care (1982 = 1)	3.37 (t=5.92)	2.07 (t=3.97)
Fraction of Labor Force Unemployed	--	.27 (t=4.94)
Constant Term	-8.000 (t=2.49)	-12.97 (t=4.80)
R^2	.9929	.9956
F (d.o.f.)	805.46 (5,29)	1270.24 (6,28)
P	< .00001	< .00001
Durbin Watson Statistic	1.44	1.88

*Endogenous variables. Instruments include Tax Price of Insurance, Per Capita Real Income, Relative Price of Medical Care, Insurance Labor Cost Index, Office Construction Cost Index, Moody's Bond Yield Index.

a truly normal distribution). No formal hypothesis tests are available to test for non-normality using these measures. In the second equation, similar result occur, with skewness = -.21 and kurtosis = 3.73.

Interpretation of the regression is straightforward (since all variables are logarithmic) except for the quadratic term in log(loading-fee). The elasticity of premiums with respect to (1+L) is found by the linear combination $B_1 + 2*\log(1+L)*B_2$, where the B_i are coefficients on log(1+L) and $(\log(1+L))^2$ respectively. The value obviously changes with L. Evaluated at the sample mean of ln(1+L) = .119, the estimated elasticity of premiums with respect to (1+L) equals 0.32 in Equation 1 and -.61 in Equation 2. The estimated elasticity of employer-group premiums grows larger in absolute value as the loading fee rises.

To compare the premium elasticity using the loading fee with the elasticity found from the marginal tax rate requires still a further adjustment. Since the premiums embed the loading fee, the elasticity of demand for insurance benefits (B) equals the estimated elasticity minus 1.[19] Thus the implied demand elasticity for benefits is -.68 at the mean in the first equation and -1.61 in the second. By comparison, the elasticity of demand for benefits measured from the tax price is -2.13 in the first equation and -1.82 in the second. The curvature in loading-fee-based price estimates is substantial. In Equation 1, the estimated own-price elasticity for benefits is positive for small values of the loading fee, and becomes negative only for L = .11 and larger values. In recent years, however, L has increased to about an average of .14 in the last decade, and the estimated own-price response for benefits in that range of the demand curve is about -1.2, close to

the estimates from the tax price variable. Similarly, in Equation 2, the estimated own-price response is positive until L exceeds .09, and in the range of current insurance loading fees (L = .14), the estimated elasticity is -2.15.

The similarity of estimates of price responsiveness of insurance from two quite different sources of variation, particularly in equation 2, adds credence to their reliability. The tax-price (1-t) and the loading fee price (1+L) moved quite differently through this sample; the marginal tax rate (tax price) moved more or less steadily upward (downward) through time, while the loading fee price fell, then rose, with considerable annual variation. In the Equation 2, the two independent estimates of the price responsiveness are close; in the first they differ by a factor of three when evaluated at the mean, but are much closer when evaluated at current loading fees (L = .14).[20] The geometric mean of the two estimated price elasticities from the first equation is -1.19 with L evaluated at the mean), and -1.61 when evaluated at L = .14. In the second equation, the comparable value is -1.71 at the mean, and -1.68 when L = .14. Thus, for forecasting current behavior, the estimates from Equations 1 and 2 correspond quite closely, using either the tax-price or the loading fee measures of price responsiveness.[21]

Three other issues deserve discussion. First, the dependent variable may understate the growth in "insurance coverage" through time, as more people shift into insurance plans such as HMOs that offer nearly complete financial protection at lower levels of premium. This appears strictly analogous to technical improvements in the product of other industries. I have made no adjustment for such changes here.

Second, one might question the worker's perception of the incidence of the employer's share of the FICA tax. To test for the relevance of this, I created an alternative tax variable that included only the individual's personal income tax plus the individual's FICA tax (but not the employer's share). In the specification equivalent to Equation 1, the elasticity with respect to the tax-price was -2.28 (t = 3.25), compared with the elasticity in using the full tax price of -2.13 (t = 3.70). In the second equation, the tax-price elasticity using the alternative tax variable was -2.08 (t = 4.29), compared with the original equation 2 estimate of -1.82 (t = 4.31). I conclude that my results are robust with respect to the definition of tax price. This represents no real surprise, since the two variables show a correlation of .9966 in my data.

Finally, some writers, particularly Goldstein and Pauly, allude to the "preferences" of unions for fringe benefits. While the theory of wage compensation does not suggest why unions should press for a form of payment that is not otherwise desirable to workers, I have tested for the effect of unionization by including (in regressions not shown) a variable measuring the fraction of the work force belonging to labor unions. The results uniformly and strongly reject the belief that unionization matters; the union variable was never close to statistical significance in any regression. I have not presented any of these regressions here.[22]

V. Simulation of Policy Changes.

The results shown in Table 2 allow simulation of the aggregate consequences of a change in tax policy by altering the marginal tax rate. Table 3 sets forth the primary results for a sample of years ranging from 1950 to 1982. These simulations use Equation 2 from Table 2, and set the marginal tax rate to 1. Three other estimates of price responsiveness are available in these equations (the loading fee estimate from Equation 2 and both the tax price and the loading fee estimates from Equation 1) would give differing results. The loading fee estimate from Equation 2 would show very similar results to those shown here in Table 3, since the estimated price responsiveness is quite similar. The estimates in Equation 1 would bracket those shown, since the estimated tax price elasticity is larger (-2.13) and the loading fee estimate is smaller (-.67 at the mean). Equation 2 implies a somewhat greater price sensitivity for insurance demand than equation 1. I use Equation 2 because the within-equation estimates are so similar, and the serial correlation problem has been eliminated with this specification. Logarithmic estimates are retransformed into linear estimates ignoring the effect of variance on forecasts of logarithmic variables.[23]

[Table 3 about here]

For any recent year in the sample, the predicted demand for insurance in the absence of the tax subsidy falls below 60% of the actual amount. Indeed, since Medicare was enacted in 1965, the smallest percentage reduction in demand for employer paid insurance premiums would have occurred in 1967 and again in 1971 -- a 40% reduction.

Table 3
Simulation of Tax Policy Changes --
Complete Removal of Tax Subsidy

Year	Actual Premium Per Capita ($1982)	Forecast Premium Per Capita ($1982) No Tax Subsidy	Ratio
1950	$20.35	$12.81	.63
1955	$36.93	$23.20	.63
1960	$60.92	$36.33	.60
1965	$93.50	$53.48	.57
1970	$146.80	$73.55	.50
1975	$214.18	$117.82	.55
1980	$314.02	$131.76	.42
1982	$354.73	$158.82	.45
1985 (est.)*	$512	$230	.45

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*Premium is projected from 1983 level by a compound 13% growth rate. The .45 ratio applies the 1982 ratio to 1985 data.

These estimates assume that the loading fee on insurance would not change in response to an inward shift in demand for employer-paid premiums. If insurers face significant fixed costs, then equilibrium loading fees must increase to cover average total costs, further decreasing the amount of insurance demanded. The estimated price responsiveness to loading fees in both Equations 1 and 2 suggest that this would create further downward pressure on total employer-paid premiums. In this sense, the estimates in Table 3 can be considered as cautious projections of the consequences of a complete elimination of the exemption of employer paid insurance premiums from income taxation.

As earlier discussion indicated, the range of actual policy proposals to tax health insurance premiums has ranged from complete taxation (as simulated in Table 3) to no change in the law. Intermediate proposals are typically non-linear, allowing exemption of certain amounts of premiums from taxation, and then applying a full tax (or other such structures). The estimates in Table 2 cannot be used directly to predict the consequences of such policies; a micro-simulation approach would be needed.

VI. Redistribution and Welfare Effects

Tax reform reducing or eliminating the tax exemption of employer-paid premiums would produce three distinct redistributive consequences. First, even if there is no change in behavior by individuals, tax burdens would change markedly, depending upon each individual's marginal tax rate, employer payments towards health insurance, and upon the particular tax reform. Second, reduced insurance coverage would

reduce (perhaps markedly) demand for health care itself, thus reducing both employment and producer surplus in health care industries and their supplier industries. Finally, reductions in welfare losses (arising from the current subsidy) would create an overall increase in well being, shared among all consumers proportional to their health care spending and inversely proportional to their demand elasticities. Subsequent sections of this paper explore each of these issues.

A. Redistribution Ignoring Health Care Demand Shifts

Major redistributive consequences of this tax reform arise from the simple consequences of altered tax rates and taxable income. A significant amount of the overall variation would arise from differences across industries in insurance payments by employers. The Chamber of Commerce of the United States (CofC) publishes annually data allowing assessment of these inter-industry differences, the average annual insurance premium payment per employee, and the average annual income in the industry.

To highlight the cross-sectional differences in distributive outcomes, I simulate the outcome for a revenue-neutral tax change, where insurance premiums are fully taxed, but the overall marginal tax rate is reduced (equally across all brackets) by an amount that (approximately) produces no change in government receipts. This obviously ignores any change in GNP arising from the reduced marginal tax rates -- perhaps a non-trivial simplification, given the changes in marginal tax rates involved.

In the most recent year for which actual data are available (1984), the aggregate wages paid in the United States reached some $1.804 trillion. In the same year, employer premium payments reached $97.2

billion (by revised and as yet unpublished estimates from the Dept. of Commerce, National Income Accounting Division).[24] Thus, addition of those premiums to the tax base would increase taxable income by 5.4 percent. Since the average marginal tax rate for that year was approximately .35, a reduction of .054 x .35 = 1.9 percentage points is feasible without reducing tax revenue. If premiums have increased by 1986 to 6 percent of income (as seems feasible), then the revenue-neutral tax change is 2 percentage points. (Premiums have increased at about 13% annually in recent years. If this growth persisted in 1985 and 1986, and wages increased by 5% annually, then premiums will exceed 6.2 percent of wages in 1986.)

Table 4 sets forth calculations of the change in 1985 after-tax income for a worker in each of 21 industries with "average" income and insurance payments, plus summaries for manufacturing, non-manufacturing (including government) and all workers. These calculations in Table 4 rely on a survey of firms from the CofC for relative income and premium data by industry, but I use Dept. of Commerce estimates to set aggregate levels of premiums and incomes. Thus, I rely on the CofC data only to compute relative premiums across industries. To make these calculations, I have assigned a marginal tax rate to each industry's "average worker" by using the federal income tax tables, allowing $2000 in standard family deductions, and broadening the 1984 tax brackets to reflect inflation (preventing bracket creep). These estimates also impute 14.3 percent for FICA taxes, the current sum of employer plus employee shares.[25] To the extent that families have other exemptions and deductions, their marginal tax rate would be lower. Offsetting this, families with

second workers would climb into higher tax brackets than assumed in Table 4.

The differences in redistributive effects across industries due simply to changes in after-tax income appear considerable. Since a change in tax liability produces a permanent change in after-tax wealth of individuals (representing the discounted sum of all such changes to retirement), the change in wealth for the youngest workers in these industries represents approximately 10 to 20 times the annual changes described above (at real discount rates of .1 and .05 respectively). For older workers, the wealth effect is smaller, since they will retire sooner. This distinction alone represents another of the complicated redistributive features of this sort of tax reform.

For young workers with average income in such industries as primary metals (steel) and transportation equipment (autos), even a "revenue - neutral" change in tax law produces wealth losses for young workers exceeding $2000 - $3000 at a 10% discount rate. Conversely, wealth gains arise in some industries (e.g., retail trade) exceeding $1000.

For individual workers, this particular revenue-neutral tax reform is better, the lower their current employer-paid premiums and the higher the change in marginal tax rate chosen in the political process.

Even within industries, there exists considerable cross-firm variation in employer contributions to insurance. Data from the CofC survey of firms allow an estimate of the between-firm (but within-industry) variance in average premiums. For example, in fabricated metal products, the Coefficient of Variation (CoV) in average premiums is .4. For chemical firms, the CoV is .35. For banks and other financial institutions,

Table 4
Changes in After-Tax Income with
Full Taxation of Employer Health Insurance
$1986

Industry	Marginal Tax Rate (Approx.)	Annual Income Change for Revenue-Neutral Reform	Annual Income Change with no Change in MTR	Approximate Breakeven Change (Percentage Points of MTR)
Food, Bever. & Tobacco	.32	6	-450	1.8
Textiles & Apparel	.28	98	-204	1.3
Pulp, Paper, Lumber, Furn.	.32	12	-465	1.8
Printing & Publishing	.36	54	-411	1.6
Chemicals & Allied Prod.	.36	1	-504	1.9
Petroleum	.39	-90	-721	2.1
Rubber, Leather & Plastics	.32	-11	-460	2.0
Stone, Clay & Glassware	.36	-213	-670	2.5
Primary Metals	.36	-307	-746	3.0
Fabricated Metal Products	.32	-72	-527	2.2
Machinery	.36	-110	-609	2.3
Electrical Machinery	.32	-5	-460	1.9
Transportation Equipment	.36	-125	-659	2.3
Instruments	.32	18	-443	1.7
Public Utilities	.39	-36	-587	2.1
Department Stores	.28	156	-134	0.9
Wholesale & Other Trade	.32	46	-360	1.7
Banks, Financial	.32	90	-308	1.4
Insurance	.32	50	-388	1.3
Hospitals	.32	125	-287	1.3
Miscellan. Non-Manuf. & Govnm't	.36	79	-418	1.5
ALL MANUFACTURING	.36	-85	-558	2.2
ALL NON-MANUFACTURING	.32	89	-355	1.5
ALL WORKERS	.34	0	-437	1.85

the CoV is .52. For hospitals, the CoV is .49. These industries provide examples of an overall pattern of considerable within-industry variation in behavior. The variation appears lower in manufacturing industries, perhaps due to the uniformity imposed by nationally-structured union contracts.

Further variation arises within-firm due to differences in wage payments, even holding constant the insurance benefit. In general, within a given firm, where the employer health insurance contribution is often constant across a wide range of incomes of workers, tax reforms embodying reductions in marginal tax rates tend to benefit higher income workers more, since the tax relief is greater, the larger the income. As a first approximation, such a reform creates net changes in after-tax wealth according to:

(2) After tax income change = $-t*R + dt*(Y+R)$

(where t = marginal tax rate, dt = change in t, R = premium paid by employer, and Y = other income). Thus, the individual gains or loses according to whether the percentage change in his marginal tax rate dt/t exceeds or is smaller than his premiums as a function of total compensation (R/(Y+R)). For example, an individual loses if his premiums are 10% of income and the tax reform only reduces marginal tax rates by 5% (e.g., .01/.20, .02/.40) but he wins if his premiums are 4% of income with the same changes in marginal tax rates.

B. Redistribution and Welfare Effects from Changes in Medical Spending.

Several other important issues enter a more complete analysis of the overall economic consequences of this large scale tax reform: (a) The change in economic well being (consumer surplus) arising from eliminating

the subsidy to insurance, and (b) direct changes in demand for factors of production used to produce insurance and medical care. (These changes clearly affect employment and wages in these sectors.) If the Congress were to select lower marginal tax rates to accompany the broadening of the tax base, other macroeconomic effects could emerge as well. If the alternative of reduced deficits were sought, this could have its own macroeconomic implications. I do not analyze any of these macro-effects here.

The Case of Constant Medical Prices. For the moment, assume that medical care is supplied at a constant cost. The relationship between changes in premiums and changes in medical spending is best seen by returning to the simple definition of premiums set forth earlier: Premium = R = (1+L)kpM, or, in a more convenient form, R = (1+L)(1-C)pM. The total change in premiums arises from changes in the coinsurance rate C, and subsequent changes in the amount of M demanded. In general, changes in C affect M just as a normal price change (Phelps and Newhouse, 1973), except for empirically minor income effects. Let E be the demand elasticity for medical care with respect to price (or copayment). It can then be shown readily that for small change in C, the percentage change in premiums is:

(3) $\%dPrem = [(1-C) * E - C] * \%dC / (1 - C)$

with corresponding change in medical demand approximately given by:

(4) $\%dM = E * \%dC$

Recent randomized controlled trials show the relevant value for E falls in the range of E = -.2 to -.3 for an aggregate medical care good (Newhouse et al, 1981).

Consider now the required change in premiums and medical care demand to accomplish the reductions in health insurance premiums predicted from my earlier analysis, if the favored tax status of employer paid health insurance were eliminated. The time-series analysis described earlier predicts premium reductions of 55% in that circumstance. Using the relationships shown in Eqs. (3) and (4), it can be shown that if the average copayment is C = .4, then the coinsurance rate must rise from .4 to approximately .7 to accomplish a 55% decrease in premiums. The corresponding decline in medical care use would be approximately 11 percent, using the demand elasticity of -.2.

Table 5 portrays a broader range of parameters that would lead to a 55% decline in insurance premiums, using alternative values for the average coinsurance rate (C) and the medical demand elasticity E. I assume for these calculations a constant-elasticity demand for medical care of the form $M = B * (Cp)^E$. In general, the changes in quantity are (of course) larger, the larger the demand elasticity (reading down any column of Table 5) and smaller, the larger the initial coinsurance rate (reading across any row of Table 5).

The Case of Increasing Medical Costs. The more general case allows for a rising medical supply curve. The overall welfare effects of reducing the tax subsidy emerge (following Zeckhauser, 1970) from reducing the subsidy in medical markets and associated changes in risk bearing. Under non-restrictive assumptions, the overall welfare effects can be decomposed into separate effects in medical and insurance markets. I adopt this approach here, concentrating primarily on the medical market.

Table 5

Proportional Reductions in Medical Spending Needed to Achieve a 55% Reduction in Premiums (Constant Supply Price of Medical Care)

Demand Elasticity	Existing Average Coinsurance Rate		
	.2	.4	.6
-.1	10.5	5.7	3.1
-.2	18.6	10.6	5.8
-.3	25.4	15.1	8.6
-.4	30.1	18.6	10.9
-.5	34.1	22.2	13.4
-1.0	44.0	33.3	22.0

Figure 1 shows the consequences in the medical care market of taxation of health insurance premiums with a rising supply curve. The uninsured demand curve is labeled D, and (two representative cases) $D_{.6}$ and $D_{.4}$ portray (respectively) the demand curves at rates of C = .6 and C = .4.[26] Here, as taxation produces a decline in the equilibrium coinsurance rate, price falls as well as quantity, so premiums shrink faster than when medical supply curves are infinitely elastic.

[Figure 1 about here]

Welfare gains from reduced coinsurance consist of three relevant regions: One rectangular area (*) represents the new insurance payment rate (1-C) times the change in quantity. A second area is the triangle (**) just under the supply curve, representing producer surplus gained on the change in quantity. The third triangle (***) just above the demand curve represents regained consumer surplus. Together, they comprise the gains in welfare measured <u>in the medical care market</u> from reducing the tax subsidy to insurance.[27]

I have simulated the changes in quantity, price, total spending, and economic welfare (consumer plus producer surplus) under a variety of parameterizations. In these simulations, I allow the medical care demand elasticity (E) to range from -.2 to -.6 and the medical care supply elasticity (S) to range from .1 to 100 (in order-of-magnitude increments). I allow the base coinsurance rate to vary from C = .2 (very complete coverage) to C = .6.

In the aggregate U.S. health market for persons relying upon private health insurance (i.e., not counting those with Medicare or Medicaid), the average coinsurance for all personal health services is approximately

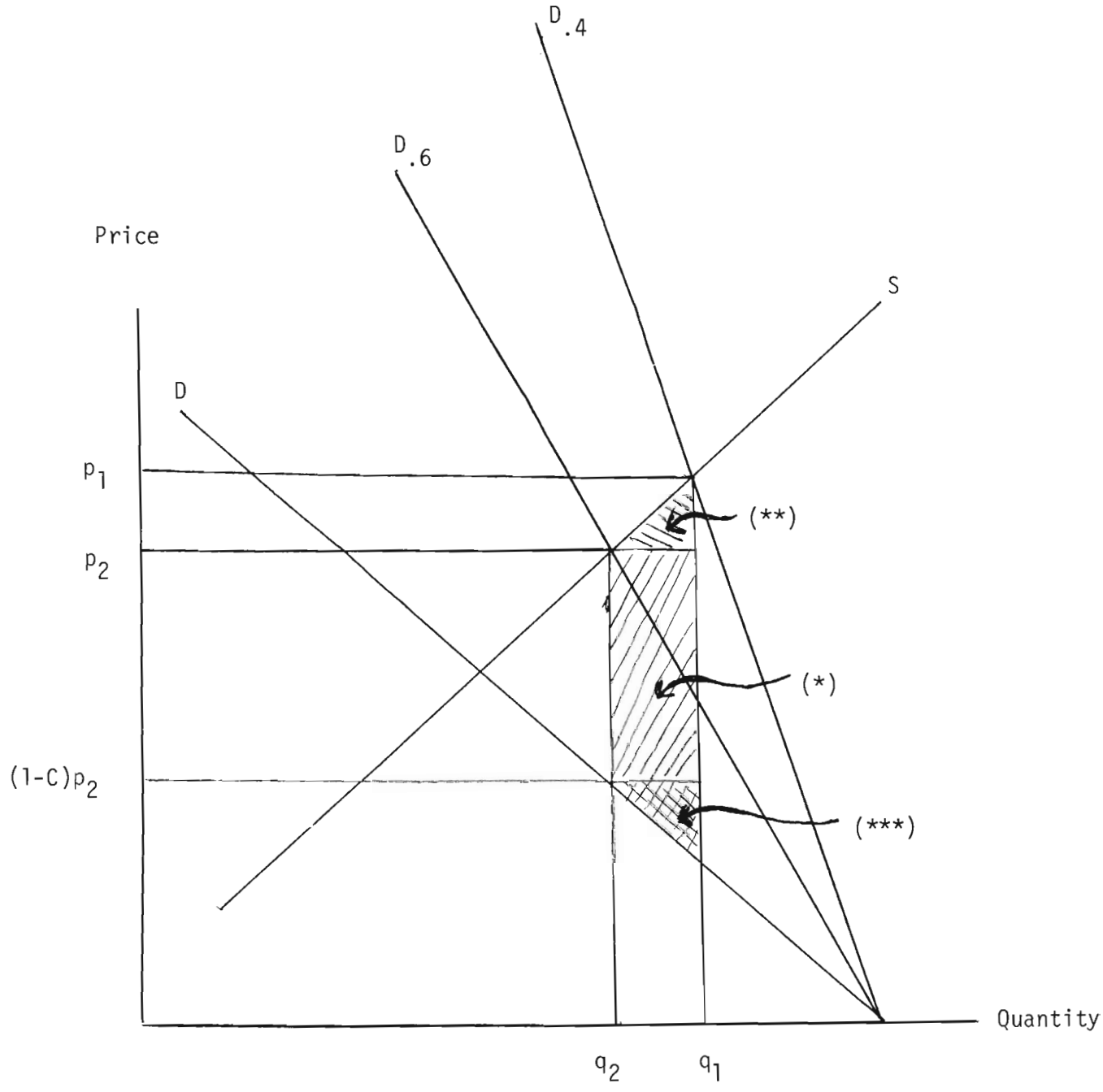

Figure 1
Welfare Gains in the Medical Market

C = .45. For hospital care, the average coinsurance is near C = .2. Physician services have an average coinsurance rate of C = .5. Drug expenses suggest that an average of C = .8 is appropriate. All of these figures are aggregate averages; marginal prices to individual consumers typically fall either closer to C = 0 (better than average coverage) or C = 1 (no coverage).

These simulations adopt the following structure: Premiums are given as $R = (1+L) * (1-C) * pM$. Medical demand, as before, is log-linear of the form $M = B * (Cp)^E$. Medical supply is $M = A * p^S$. Medical markets clear, so demand equals supply. This allows me to solve for quantity as a function of coinsurance, the parameters A and B, and the demand and supply elasticities E and S.[28] Given M, the supply equation immediately provides the price.[29]

The simulations begin with the base value of C and iterate by small increments to larger values of C (less coverage) until the premium reaches the target level of 45% of the current value. This target represents the predicted value for current values of income and prices from Equation 2, Table 2, and correspond to a full taxation of health insurance premiums. As C increases by iteration, M falls, and because of the supply curve's slope, p also falls. Thus R declines due to increases in C directly, and to medical spending (p and M) indirectly.

Tables 6a - 6c display the results of these simulations. To read these tables, consider the following example: For an initial coinsurance rate of C = .2 (Table 6a), and a supply elasticity of .1 (the upper-left entry), the new equilibrium quantity consumed would be 95% of the initial level. Price would fall to 62% of the initial level. The

product of those two (.95 x .62 = .59) indicates a 41% decrease in total medical spending. Finally, (the number below .41), welfare gains would represent 1.3 percent of initial spending.

[Tables 6 a - c about here]

Not shown in Tables 6a - 6c are the final coinsurance rates. They vary only relatively little across the various simulated parameters. When the initial coinsurance is C = .2 (Table 6a), the final rates center around C = .4, but range from C = .32 (high demand, low supply elasticity) to C = .48 (high supply, low demand elasticity). When the initial C = .4, the final rates center closely around a value of C = .6, with much less variation (C = .55 to C = .64 are the extremes). When the initial coinsurance is C = .6, the final values are very close to C = .75 in all parameterizations.

These results can be compared with those of Feldstein and Friedman (1977), who used quite different methods. Rather than basing their simulations upon observed elasticities of demand for insurance, they <u>assumed</u> a specific utility function with constant absolute risk aversion (using three alternative values for the risk parameter). For hospital care (analogous to my cases where the base C = .2, the demand elasticity is -.2), they simulate a coinsurance rate (without tax subsidy) of .44, similar to my results of C = .35 to .48. For physician spending, where the base coinsurance is nearer C = .6 and the demand elasticity somewhat larger, they simulate an equilibrium coinsurance rate of about .75, again quite close to my results. Thus, although using quite separate methods, the predictions of these two studies regarding the no-subsidy level of coinsurance appear reasonably similar.

TABLE 6a
RELATIVE DEMAND, PRICE, SPENDING
AND WELFARE CHANGES
UNDER DIFFERENT PARAMETERIZATIONS

KEY

Relative Quantity	> Relative Spending
Relative Price	Reduction
	Rel. Chg. in Welfare

Initial Coinsurance = .2

Demand Elasticity	Supply Elasticity .1	1	10	100
-.2	.95 > .41 .62 .013	.86 > .27 .86 .106	.82 > .20 .98 .19	.81 > .19 1 .19
-.4	.95 > .42 .60 .01	.80 > .36 .80 .12	.71 > .31 .97 .28	.70 > .30 1 .31
-.6	.95 > .44 .59 .01	.77 > .41 .77 .12	.65 > .37 .96 .33	.63 > .37 1 .38

TABLE 6b
RELATIVE DEMAND, PRICE, SPENDING
AND WELFARE CHANGES
UNDER DIFFERENT PARAMETERIZATIONS

KEY

Relative Quantity
> Relative Spending
Relative Price Reduction
Rel. Chg. in Welfare

Initial Coinsurance = .4

Demand Elasticity	Supply Elasticity .1	1	10	100
-.2	.97 > .28 .74 .007	.92 > .16 .92 .04	.90 > .11 .99 .06	.89 > .11 1 .06
-.4	.97 > .31 .71 .007	.87 > .24 .87 .06	.82 > .20 .98 .11	.81 > .19 1 .11
-.6	.97 > .32 .70 .007	.85 > .28 .85 .06	.77 > .25 .97 .14	.75 > .25 1 .16

TABLE 6c
RELATIVE DEMAND, PRICE, SPENDING
AND WELFARE CHANGES
UNDER DIFFERENT PARAMETERIZATIONS

KEY

Relative Quantity
> Relative Spending
Relative Price
Reductions
Rel. Chg. in Welfare

Initial Coinsurance = .6

Demand Elasticity	Supply Elasticity .1	1	10	100
-.2	.98 > .18 .84 .003	.95 > .09 .95 .01	.94 > .06 .99 .02	.94 > .06 1 .02
-.4	.98 > .20 .81 .004	.92 > .15 .92 .02	.90 >.11 .99 .04	.89 > .11 1 .04
-.6	.98 > .21 .80 .004	.90 > .18 .90 .025	.86 > .16 .98 .05	.85 > .15 1 .05

Summarizing across Tables 6a - 6c, the following conclusions emerge:

1) In almost no case does the welfare gain exceed the change in spending. The "close" cases arise when C = .2 and the supply elasticity is very large. The coinsurance condition appears relevant for the hospital market, but the supply elasticity of hospital services is almost certainly small, if for no other reason because of government restrictions on construction (Certificate of Need laws). Thus these conditions may never arise in the U.S.

2) Welfare gains are larger, the greater the initial amount of insurance coverage (small C). Only for the hospital market does the C = .2 table appear relevant.

3) Welfare gains are largest when the supply elasticity of medical care is very large, i.e., above 10. This is most relevant for goods and services like drugs, but there the baseline insurance coverage is very low.

4) Welfare gains increase, other things equal, as the demand elasticity increases in magnitude, but the differences are small compared with differences across supply elasticities.

5) When supply elasticities are small, almost all of the changes in spending arise from changes in price. In political terms, this corresponds to stable employment but falling wages for workers in the health sector.

6) When supply elasticities are large, almost all of the changes in spending arise from changes in quantity. This corresponds to large changes in health sector employment, but little change in wages for those who remain employed.

7) Demand changes are largest (obviously) when the elasticity is greatest and when the base coinsurance is largest. However, even the greatest simulated reduction in quantity demanded (falling to 63% of current levels) is quite likely not to lead to significant changes in health status of the population. This is a different way to assess the "welfare effects" than usually employed by economists, but relevant nevertheless. Economists usually assume that welfare gains can be directly measured by areas under the demand curve. The alternative approach I discuss next is biomedical: it asks how much change in health status would emerge for various changes in medical spending. Results suggest that the "standard" welfare measures are not misleading.

Evidence from a multi-year randomized controlled trial supports this claim. The recently concluded Rand Health Insurance Study (HIS) compared the health status of individuals with full coverage insurance (C = 0) to those with varying copayment levels in a randomized controlled trial extending for 3 to 5 years per enrolled household (Newhouse, 1973). Differences in medical use across these groups were large (Newhouse et al., 1981), in the range of the (maximum) 37% reduction in quantity demanded appearing in Tables 6 a - c. Yet despite the large differences in medical spending, health status differences in the different treatment groups were small or negligible, across a wide range of health status measures. Except for two categories (slightly improved vision, and very small reduction in blood pressure), the authors concluded that "the differences between the free and cost-sharing plans were sufficiently narrow to conclude that, for the average participant, any true differences would be clinically and socially negligible." (Brook et al, 1984).

Further, the few health gains found in the HIS accrued only to low-income persons, whereas the current tax treatment strongly increases the insurance coverage of high-income (but not low-income) individuals.

These results strengthen the belief that incremental medical spending in the U.S. has not produced comparable health gains to inframarginal spending. If medical resource use can vary by 30 to 40 percent with few or no important health outcome differences, as these results show, then it becomes more difficult to argue that the current tax law should continue as a method of protecting health of the citizens of the country.[30]

VII. Conclusion.

The potential redistributive consequences of this particular tax reform are immense, both because of changes in after-tax income across all workers, and because of changes in employment in the health and health insurance sectors. The welfare gains are generally much smaller, and certainly less visible to the political process. Even under the most extreme conditions found in US health care markets (C = .2), welfare gains never exceed the changes in spending, and are commonly much smaller. These results using standard economic analysis are supported by medical studies of the effects of large differences in insurance coverage (and consequent medical spending) on health outcomes.

Welfare gains, if achieved, become a coin that politicians can spend freely. Redistribution, on the other hand, giveth and taketh in a zero sum game. Thus, if welfare gains are small relative to redistributive consequences, then politicians must focus on the zero-sum aspects of

the situation. If large welfare gains were available, they could be used to create many winners from a political reform. Under most plausible choices of parameters for this problem, redistributive consequences appear to swamp welfare gains from tax reform in health insurance. Thus, redistributive issues will likely dominate the political debate.

Reductions in medical care spending would fall heavily on identifiable and relatively compact groups of providers, who have proven effective in the political arena in the past. By contrast, any welfare gains from reduced spending (small as they appear to be) would spread themselves more broadly, and are more difficult to identify. Further, this tax reform creates clear patterns of winners and losers across industries, even ignoring changes in spending in the health sector (see Table 5 and surrounding discussion).

It would therefore appear that tax reform decisions would follow the obvious redistributive effects and will likely ignore the more subtle issues that welfare economists usually discuss. The redistributive consequences are represented by large rectangles in the economists' price/quantity diagrams; the welfare gains from this tax reform are represented by (comparatively) small triangles. This provides another example of the little-known but economically important geometric theorem originally attributable to Quinn (1983): Rectangles are bigger than triangles.

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ENDNOTES

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2. Almost universally, this creates an exemption from state income taxes beyond the federal exemption. I have not analyzed state-by-state insurance demand, and have ignored the consequences of state income taxation. If anything, this causes me to understate the consequences of this tax reform.

3. See Mitchell and Vogel (1974).

4. This occurs because health insurance payments reimburse consumers for purchases of medical care, often at some fixed rate such as 80%, in exchange for a flat premium. Thus, unlike other forms of insurance that indemnify the victim of an accident or injury with a cash payment to compensate for the event, health insurance pays only when the consumer makes certain purchases, e.g., health care. This has the same economic consequence as creating a subsidy to demand for medical care. See Phelps and Newhouse (1973) for further discussion.

5. Jensen (1985) shows how some self-selection may arise within an employment group if multiple options are offered to the employee. However, the employment group eliminates much self selection simply by limiting the eligible pool to those sufficiently healthy to maintain a job.

6. By contrast, the loading fee on non-group insurance plans averages 65% to 80%. See Health Insurance Assn. of America, 1984.

7. See Ehrlich and Becker (1972) and Phelps (1973, 1976).

8. Prominent among these proposals includes the Kemp-Kasten proposal and (on the margin) the most recent proposal by the Reagan administration. The House of Representatives bill from late 1985 also adopted this stance, and drafts in the Senate available at this writing concur.

9. Most prominently, this includes the Bradley-Gephardt proposal for tax reform.

10. The first tax reform package of the Reagan administration chose such a strategy, by proposing to tax all premiums above $1200 per year for families and $840 per year for individuals. These proposals are obviously more difficult to analyze than linear modifications in the tax schedule.

11. They did provide a very rough estimate of the total welfare loss in 1970 of $8 billion, arising from a subsidy they estimate at $4 billion for that year. They include not only the welfare loss in medical markets, but also a welfare loss in labor markets from an increase in marginal tax rates.

12. Peltzman (1976) and Becker (1982) provide models predicting a well-protected structure of tax benefits. See also Quinn (1983).

13. These more recent estimates of total premiums (and hence tax expenditures) exceed considerably those in Phelps (1980), e.g. for years 1975, 1978, and 1980 ($19, $29, and $38 billion respectively). Similarly, Congressional Budget Office estimates from 1980 also show much smaller estimates of tax expenditures than I use here for comparable years (CBO, 1980).

The primary differences probably arise from data revisions: The Survey of Current Business (SCB) data now (with recent revisions) include self-insurance payments made by corporations, which have grown considerably through time, accounting for over $5 billion in annual "premiums" according to analysts I have contacted at the Dept. of Commerce. Previous estimates, relying more on health insurance industry data, omitted these payments.

14. From the Mitchell and Phelps data, I summed across the various income categories the product of (marginal tax rate) x (average employer contribution), weighted by the number of persons in each income group. This number, when compared with the calculation (using the same data) on the overall average premiums and overall average marginal tax rate, suggests a 15 percent understatement when using the aggregate figures. The data in Mitchell and Phelps are from 1970, inflated to 1975.

15. None of the regression analysis that follows uses extrapolated data.

16. The upper bound DW test statistic d_U = 1.59 for 35 observations and 5 explanatory variables. The lower bound d_L = 0.97. Comparable limits for a 5% test are 1.80 and 1.16.

Recent literature urges that researchers forego the traditional use of Cochrane-Orcutt and other differencing techniques unless the serial correlation is extreme -- .95 to .98 or larger. See Park and Mitchell (1980) and Maeshiro (1976). Since the apparent serial correlation here is small, the TSLS estimates seem the best feasible. As Park and Mitchell point out, the primary problem when serial correlation is present is the tendency to overstate precision of coefficients, rather than bias itself. Further, Blattberg (1973) shows that the test for first-order serial correlation (the Durbin Watson Statistic) is powerful against alternative, more complicated autoregressive procedures. Thus, if one corrects for first-order correlation (e.g. by differencing or the Cochrane-Orcutt approach), on the basis of a significant D-W statistic, one might produce inefficient coefficient

estimates and inconsistent hypothesis tests.

17. Park and Mitchell show that the estimate of serial correlation is probably biased downward, particularly in cases where the explanatory variables are trended (as is the case here), but no correction factor is available.

18. Values of percentiles are as follows:

Percentile	Equation 1	Equation 2
1%	-.1810	-.1662
5%	-.1769	-.0792
10%	-.1004	-.0629
25%	-.0485	-.0354
50%	-.0004	-.0076
75%	.0619	.0382
90%	.0982	.0657
95%	.1216	.1126
99%	.1738	.1245

19. To see this, define the premium as R = (1+L)B, where B is expected benefits and can be thought of as average medical expenses multiplied by the average fraction of costs covered. Then

$$(*) \qquad \frac{d\ln(R)}{d\ln(1+L)} = 1 + \frac{d\ln(B)}{d\ln(1+L)}$$

While not central to the current issue of tax reform, we can further decompose the elasticity of demand for benefits into two parts: demand for coverage (k) and the effect of the reimbursement insurance (k) on M. With constant medical price p, let B = kpM. Then

$$(**) \qquad \frac{d\ln(B)}{d\ln(1+L)} = \frac{d\ln(k)}{d\ln(1+L)} + \frac{d\ln(M)\ d\ln(k)}{d\ln(k)\ d\ln((1+L)}$$

$$(***) \qquad = \frac{d\ln(k)}{d\ln(1+L)} \left[1 + d\ln(M)/d\ln(k)\right]$$

The relationships between elasticities of demand for medical care are as follows: Let e_{Mk} = elasticity of demand for M with respect to k, and E = dln(M)/dln(p) be the own-price elasticity for medical care in the usual sense. Then $E_{Mk} = -E*[k/(1-k)]$, ignoring small income effects from purchasing the insurance policy. Thus, for example, if E = -.2 and k = .6, then the term in square brackets in (***) is 1.3.

20. Theory suggests that the elasticity with respect to the tax price (1-t) and the loading fee (1+L) should be equal (after the correction of -1 when using the loading fee variable), unless the knowledge or perceptions of the economic agents differ regarding the two sources of price variation. Because the loading fee variable is entered quadratically, the appropriate test uses the linear combination

of the coefficient on (1+L) plus twice the coefficient on $(1+L)^2$ multiplied by (1+L), minus 1. (See discussion in text for the adjustment of "minus 1.") This, of course, makes the test conditional on the value of L chosen for evaluation. In Equation 2, for example, the equality is not rejected (t = .44) when evaluated at the mean loading fee. (This tests a value of -1.61 against a value of -1.82.)

In equation 1, the test is rejected (t = 2.66, p = .01), when evaluated at the mean. When evaluated at a loading fee of .14 (average for the past decade), the hypothesis of equality is not rejected (t = .82, p = .42).

21. The reader should be alert that these estimates differ markedly from estimates published elsewhere in the literature. An Appendix addresses these other studies in detail, and suggests why the current estimates will prove more reliable and useful.

22. Measures of unionization were taken from **Statistical Abstracts**, various years. The reported data rely on unpublished figures, and after 1966, union membership data were reported only for every-other year. The last number reported was for 1978. For the odd-numbered years between actual estimates, I used the geometric mean of the two surrounding years. For the years 1979 - 1982, I projected the actual average from the past 5 years. During that period, union membership was almost absolutely stable at approximately 21.5 million members, the figure I used for 1979 to 1982.

23. The expectation of a lognormal random variable is $\exp(M + .5S^2)$ where M is the mean and S^2 is the variance of the logged variables. In my sample, the variance of the residuals is .0057. The estimates would change by less than 0.3 percent if this correction were made.

24. I acquired the estimates personally through contact with staff at the Department. The data are scheduled for publication in May, 1986. Appendix A lists the values of these data using the new estimates.

25. By the methods of Barro and Sahasakul, these marginal rates should be divided by 1.0705 to account for the tax-wedge created by the employers' share of FICA taxes. This reduces the values shown in the table by approximately 2 percentage points.

26. The demand curves rotate around the quantity intercept as coinsurance falls to zero. I ignore here a small income effect arising from higher premium payments that would move the demand curve back towards the origin. This effect is "small" empirically because the estimated income elasticity for medical care is small. See Newhouse et al. (1981).

27. Welfare changes also arise in the market for insurance itself. Feldstein (1973) argues that elimination of the tax subsidy creates a welfare loss from the added risk bearing for consumers. But in the insurance market, the subsidy from the tax system should create a

welfare loss, just as in any other market. Too much insurance will create risk-shifting and claims-processing activity where incremental costs exceed incremental value. Thus there should be still further welfare gains in the insurance market from eliminating the tax subsidy.

The magnitude of these gains is probably quite low, relative to the welfare effects in health care markets directly, since they can arise only in the part of the premium devoted to the loading fee. For group insurance, the loading fee, and hence, the welfare effects, should be an order of magnitude smaller than those arising in the medical care markets. Thus, I ignore these welfare changes in my calculations.

28. In log form,

$$\ln(M) = [S/(S-E)]*[B*C^{E}(1/A)^{(E/S)}]$$

29. $p = (M/A)^{(1/S)}$

30. A recent study by Hadley (1982) on aggregate data draws a different conclusion regarding health status and medical care. He regresses state-by-state mortality (age-specific cohorts) on Medicare spending per capita, on the assumption that Medicare spending and total spending are highly correlated. He finds that a 10% increase in spending produces a 1.5% decrease in mortality.

Appendix A
Data for the Analysis.

This study focuses on health insurance provided by employers through employer work groups as a fringe benefit. When insurance is provided through employer groups, workers often contribute at least in part towards the premium, particularly towards the insurance of other family members. In part because of the tax incentives, the proportion paid by the employer has increased markedly through time, but many groups still require contributions from the employee. Of course, the larger the tax subsidy, other things equal, the greater the insurance chosen by the median worker.

Data from the Survey of Current Business, combined with independent estimates of the average group insurance loading fee, allow calculation not only of the employer contributions -- the direct subject of study here -- but also of the payroll deductions by employees towards their group insurance coverage. Table A-1 displays these estimates.[1] The proportion of all group insurance paid through the tax-exempt vehicle of employer contributions has steadily increased through the past 3 decades, reaching a peak of 7/8ths of all work-group premiums.

[Table A-1 about here]

This Table also displays the raw data forming the dependent variable for this study: the annual aggregate insurance premiums paid by employers towards health insurance of their employees.

These data display a remarkable feature: with few exceptions, over a broad span of 35 years, the annual (nominal) growth rate has remained near 15% in these contributions, despite wide fluctuations in the underlying inflation rate, the addition of new employees to the work

force, and the relative price of medical care. Extrapolation of the most recent "certain" data to calendar year 1985 show that the annual rate of premiums almost certainly exceeds $110 billion in 1985 and $125 billion in 1986.[2] This figure represents the potential addition to the tax base if all such premium contributions were declared to be taxable income.

For policy purposes, the other important variable in this study is the average marginal tax rate. The appropriate marginal tax rate for these calculations includes (a) the federal income tax, (b) FICA taxes, if marginal, and (c) state income taxes, which are in turn subject to deduction on the federal tax form. FICA taxes in turn deserve special consideration, because they are (i) highly non-linear, and (ii) the law provides for contributions by both the employer and the employee. Currently, the FICA tax rate is 7.15% on all income up to $39,600, both for employees and employers.[3] Standard theory of tax incidence suggests that the large burden of the employer tax will fall on the employee. Recent analysis by Barro and Sahasakul (1985) shows that the appropriate marginal rate for an individual facing this combination of taxes is:

$$(A2)\quad T = t + s_s + s_e/(1+s_e)$$

where s_s is the tax rate on the employee (self), s_e is the tax rate on the employer, and t is the marginal income tax rate. If the individual's income exceeds the maximum taxable, both s_s and s_e are interpreted as zero.[4]

Barro and Sahasakul have calculated the average marginal tax rate for the US economy, including both federal income taxes and FICA taxes for 1929 - 1982, appropriately weighted by the fraction of income for which the FICA tax is marginal. These data form the source of marginal tax

rates from which I calculate the subsidy to employer-group insurance. Table A2 displays their estimates for the period 1948 - 1982, the period of this analysis. These data ignore state and local income taxation, but since state income taxes are small relative to federal income taxes, these data capture some 85 - 90 percent of all taxes levied against wage earnings, and an equivalent fraction of the tax related to health insurance.

[Table A2 about here]

To these data were added population estimates from the Census Bureau series (I use their "intermediate" estimates), disposable income data from the **Survey of Current Business** national income accounts, and estimates of the overall price level (CPI) and the relative price of medical care (medical component of the CPI). Insurance premium data were converted to per capita estimates and normalized to 1982 CPI price levels.

The insurance loading fee (markup of premiums above expected benefits) is clearly endogenous, and is estimated accordingly. Instruments to identify the loading fee included the cost of labor to the insurance industry, the costs of office building construction (as a measure of the opportunity cost of office structures of the insurance industry), and a financial rate of return measure relevant to insurance firms, an index of 120 corporate bonds from Moody's.[5]

APPENDIX B
Comparison with Previous Estimates

These results contrast markedly from some previous estimates appearing in the literature. In earlier time-series and cross-sectional studies, I investigated the demand for insurance as a function of the insurance company price (the loading fee), but ignored tax treatment of insurance, raising the possibility that both the income and price elasticity estimates contain omitted variable bias (Phelps, 1973). In the cross--sectional analysis, using families as the unit of analysis, that study found price elasticity estimates (depending only upon variation in the insurance price, not the tax price) of approximately -.4 to -.7. Variation in the insurance price was measured by variation in size of work group, reported in the insurance literature to be highly correlated with the loading fee.[6] Similar results emerged from time series estimates, calculated similarly to those in this study, but for years 1929 - 1963, and in regressions where the tax price was not included (for lack of data). Estimated income elasticities varied considerably depending upon estimation techniques chosen and between the time series and cross section work, but generally were under 0.5 and often smaller. In both the time series and cross sectional analysis, lack of the relevant marginal tax rate measures presents a potentially important omitted variable bias.

More recently, Taylor and Wilensky used a 1977 household survey to estimate demand for employer-paid premiums, finding essentially no income elasticity ($E = .02$, $t = 2.67$) and a tax-price elasticity of -.2 ($t = 3.35$). These results stand in sharp contrast to the large income

and price elasticities found in the time series study presented here.

Choosing between the cross section and time series results can be assisted by two considerations. First, strong theoretical reasons exist that the methods used by Taylor and Wilensky will of necessity create bias towards zero in the estimated coefficients in their demand equation. Second, if one attempts to simulate the time series behavior from their estimated parameters, enormous incongruities will become apparent.

Turning to the estimation issue first, the theory of demand for employer-group insurance developed by Goldstein and Pauly (1976) considers the choice of insurance as a "local public good," where the tastes of the median voter (worker) should dominate the group selection process. The wide variation within most employment groups in income (and presumably, marginal tax rates) are irrelevant to the decision process under the Goldstein-Pauly model; only the median voter's characteristics matter. When viewed in this way, the explanatory variable in the Taylor and Wilensky equations should be the income and tax rate of the median voter in the workplace where insurance was obtained. Obviously, the equivalent values for each household in the sample will measure the median voter values with great error, and the usual errors-in-variables approach predicts coefficients biased toward zero. This offers a strong a priori reason to believe that their estimates will be biased toward zero, as appears to be the case both for the income and tax-price coefficients. Pauly (forthcoming) draws these same conclusions regarding Taylor and Wilensky's work.

Goldstein and Pauly's own estimates of the demand for employer group insurance used the average (not median) pay of workers in the firm, and the size of the group as a proxy for loading fee. They found strong and significant relationships between average pay and premiums (t = 12.4) with an elasticity at the mean of .5 (after netting out effects of changes in marginal tax rate across income and consequent price effects). They also estimate an elasticity of premiums with respect to the loading rate (1+L in the notation of this paper) of -1.0. These cross sectional results stand in sharp contrast to the much smaller results obtained by Taylor and Wilensky, and are much more in accord with the time series results obtained here.

My own earlier cross-sectional work is subject to the same criticism as Taylor and Wilensky's with regard to the income elasticity estimates, since that study employed the income of the family, not the median employee in the work group. Those studies showed a doubling of the estimated income elasticity when the sample was restricted to those families where at least one insurance policy had been chosen outside the workplace setting, i.e. where individual income would be the relevant variable, suggesting that the problem is important.

Turning to the second point, if one compares the Taylor and Wilensky results to the actual time series data, their small income and price responsiveness seem even more puzzling. If one begins at almost any earlier date (say, 1950, 1960 or 1970) and computes the per-capita real premium (or even the premium adjusted for medical costs), one sees large increases through time in the actual data. See Table A-1 for the data series. Yet application of the tax-price and income elasticities

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estimated by Taylor and Wilensky with actual changes in per capita income and marginal tax rates would predict only a small change in premiums. As Barro and Sahasakul's data show (see Table A-2) the proportional change in the tax price in 1950-1980 was about 20-25%; from 1960-1980, the increase was about 15%. If the tax-price elasticity of -.2 and the near-zero income elasticity estimates of Taylor and Wilensky are correct, then the change in real premiums should be at most 5 percent due to tax-price effects, and almost nothing due to income effects. Yet the actual increase in premiums per capita -- **adjusted for medical cost levels** -- has was 800% between 1950 and 1980, 255% for 1960-1980, and 76% for 1970-1980. Thus their estimates and log-linear model cannot explain the observed time series.

Most recently, a further cross-sectional study of the demand for insurance was undertaken by Holmer (1984). He used data from federal employees, a group where multiple options of insurance are offered to each employee, and derived forecasts of demand under different taxation scenarios. His estimated price elasticity of -.2, again, stands in sharp contrast to the time series estimates in this paper. Two issues appear relevant. First, he estimated the income and marginal tax rates for his sample from socio-demographic characteristics of the head of household, thus introducing possible measurement error. Perhaps more important is the structure of the federal employees' benefit choice that he used for analysis: employees pay for the better plans out of pocket. Whenever this occurs, the marginal tax rate is generally irrelevant, since the employee will pay tax on the income, and can

deduct the premium payments only under substantially limiting conditions.

In summary, this past work provides a wide array of estimates, varying by an order of magnitude in the estimated price elasticities and income elasticities. The smaller estimates uniformly arise from cross-sectional work where the measures of price and income depended on the individual, rather than the employment group. The larger estimates uniformly depended upon aggregated data or cross-sectional studies where median worker characteristics of work groups were employed as explanatory variables. As such, these estimates seem theoretically more desirable, and correspond more closely to those obtained in the time series studies presented here.

Table A-1
Employer-Paid Premiums and Apparent Employer Contribution Share

Year	Actual $ (Millions)	Real Per Capita Premiums ($1982)	Employer Share
1948.	460.	12.60	.67
1949.	572.	15.53	.64
1950.	772.	20.35	.69
1951.	990.	23.73	.68
1952.	1107.	25.48	.66
1953.	1303.	29.23	.65
1954.	1454.	31.94	.65
1955.	1706.	36.94	.66
1956.	2058.	43.17	.66
1957.	2440.	48.66	.72
1958.	2721.	51.96	.74
1959.	3038.	56.58	.72
1960.	3374.	60.92	.70
1961.	3747.	66.06	.69
1962.	4188.	72.04	.69
1963.	4551.	76.33	.70
1964.	5182.	84.70	.70
1965.	5890.	93.50	.72
1966.	6410.	97.65	.74
1967.	6869.	100.52	.77
1968.	8408.	116.58	.76
1969.	9931.	129.19	.79
1970.	12099.	146.80	.79
1971.	13661.	157.59	.78
1972.	16163.	179.00	.77
1973.	18311.	189.33	.78
1974.	21105.	195.04	.81
1975.	25500.	214.18	.83
1976.	32025.	252.27	.78
1977.	38754.	284.49	.86
1978.	44114.	298.58	.84
1979.	51293.	309.43	.81
1980.	59555.	314.01	.82
1981.	68790.	325.51	.82
1982.	80328.	354.72	.82
1983	89370.	381.50	.82
1984	97168.	410.70	.81

Table A-2
Average Marginal Tax Rates for the US Economy

Year	Income Tax Rate	SS Tax Rate	Effective Average MTR**
1948	.18	.006	.186
1949	.175	.005	.180
1950	.196	.007	.202
1951	.231	.009	.240
1952	.251	.008	.259
1953	.249	.008	.257
1954	.222	.010	.231
1955	.228	.012	.240
1956	.232	.012	.245
1957	.232	.013	.246
1958	.229	.013	.242
1959	.236	.016	.252
1960	.234	.018	.253
1961	.240	.017	.257
1962	.244	.017	.260
1963	.247	.018	.265
1964	.221	.017	.238
1965	.212	.016	.229
1966	.217	.016	.245
1967	.223	.027	.250
1968	.252	.031	.283
1969	.261	.031	.292
1970	.243	.029	.272
1971	.239	.029	.268
1972	.242	.032	.274
1973	.250	.041	.291
1974	.257	.048	.305
1975	.263	.047	.310
1976	.273	.046	.319
1977	.281	.047	.328
1978	.310	.047	.357
1979	.289	.057	.346
1980	.304	.057	.362
1981	.313	.063	.376
1982	.293	.066	.359

*From Barro and Sahasakul, "Average Tax Rates from Social Security and the Individual Income Tax," Univ. of Rochester Working paper No. 14, June, 1985
**Col. 3 = Col. 1 + Col. 2. May not add due to rounding.

ENDNOTES FOR APPENDICES

1. The **Survey of Current Business** provides annual estimates of employer contributions and total benefits paid. Overall premium and benefit data for group insurance (HIAA, Source Book of Health Insurance Data, various issues) allow calculation of the average loading fee for group insurance in any year. (I use reported premiums and benefits for commercial group insurance plus total premiums and benefits from Blue Cross and Blue Shield plans to calculate this loading rate. This overstates slightly the group loading rate, since a small portion of the Blues' business is individual insurance, with a higher loading fee than groups, yet I attribute all of their business to group insurance.) I multiply the employer-group benefits figure by the HIAA-based loading fee figure to arrive at an estimate of the total premiums paid towards employer groups. The ratio of employer payments to total payments shows the contribution patterns through time.

Two independent checks on these calculations are possible. First, various issues of the **Social Security Bulletin** have arrived at independent estimates of employer group premiums (employer plus employee). Surveys from the US Chamber of Commerce (**Employee Benefits**, various years) provide estimates of the employer contributions and payroll deductions as a percent of payroll. These allow calculation of an independent estimate of the sharing rate between employers and employees. In general, the agreement in estimates from these different methods is very good.

2. These numbers extrapolate the most recent known data (for 1984) of $98 billion premiums at 13% per year, reflecting the annual growth rate over the past 5 years.

3. The tax is scheduled to rise to 7.65% by 1990, with an income ceiling of $51,600. Thus the proportion of income covered by the FICA tax will rise (unless considerable inflation occurs without any corresponding adjustment in the taxable income ceiling) and the marginal tax rate will rise by over 1 percentage point, since both the employers' and employees' rates will rise. The income base will grow at approximately 5.5% annually (nominal) over this five year period.

4. For self-employed individuals, the tax collapses to
$T = t + s_{se}$
where s_{se} is the rate for self=employed persons.

5. For a partial series of years, an index of "returns to insurance industry investment" is available. While incomplete, this series shows (a) an average return markedly below either the stock or bond series from Moody's and Standard and Poor's, but (b) very highly correlated with the Moody's bond series over the entire period ($R^2 = .75$). Since the Moody's index is available for the entire period of study, I use it as the measure of the cost of capital of the insurance industry.

6. Holmer conjectured in his 1984 article that the earlier cross-sectional studies of Phelps (1973, 1976) would produce biased estimates of the price responsiveness of demand for insurance, because they relied upon variation in the size of employment group to produce variation in the loading fee. Relying on a conjecture by a former government actuary, Holmer argued that "when sellers were in the process of introducing major medical plans, these plans were only offered to the larger groups. This sort of rationing by group size ... could account for a large part of the estimated premium-group size relationship." He further conjectures that "If this were the case...the absolute value of the price elasticity would be biased upward, perhaps by a substantial amount."

Holmer introduced no evidence to quantify the magnitude of this potential bias, and its importance seems refuted both in Phelps earlier work (which found similar price elasticities for total premiums as well as individual coverage parameters from **policies other than major medical insurance** such as maximum hospital payment, number of hospital days covered, maximum surgical payment, etc.) and the price sensitivity estimated in cross section by Goldstein and Pauly (work group size, for a later year, and tax price), as well as the time series estimates presented here.

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