

The Effect of Tax-Based Savings Incentives on the Self-Employed

by

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Abstract

The U.S. individual income tax allows employers to make tax-preferred contributions to qualified pension plans for their employees and, in the case of the self-employed, on their own-behalf. We examine the effect of this tax preference on the self-employed's preferred compensation mix between taxable income and tax-preferred savings. We use a panel of sole proprietors constructed from the Statistics of Income individual income tax files for tax years 1985, 1989 and 1993. We find that taxes have a substantial effect on the preferred compensation mix of the self-employed. This finding is surprisingly robust to a number of alternative specifications. The study has several advantages over previous studies. For example, by focusing on the self-employed there is less ambiguity about whose utility is being maximized.

1. Introduction

There is growing concern among policy-makers about the ability of the U.S. pension system to meet the demands that the impending retirement of the baby-boom population will place on it. To help ensure that Americans have adequate retirement savings the U.S. federal income tax allows employers to make tax-preferred contributions to qualified pension plans for their employees and, in the case of the self-employed, on their own-behalf. By lowering the after-tax price of retirement savings with respect to taxable compensation, this tax preference encourages employees, including the self-employed, to accept a greater share of total compensation in the form of pension savings.¹

In this study we attempt to gauge the effect of this tax preference on the self-employed's contributions to qualified retirement plans. Following Woodbury and Hamermesh (1992), we estimate a regression equation derived from individual utility maximization. We estimate this equation using data obtained from a sample of federal income tax returns spanning three major tax reforms in 1986, 1990 and 1993. We find that taxes have a substantial effect on the self-employed's preferred compensation mix. Furthermore, this result is surprisingly robust to a number of alternative specifications.

¹Since compensation in the form of contributions to tax-preferred savings plans are not taxable, the net-of-tax price of a one dollar contribution, relative to ordinary taxable wage income is $(1-t)$, where t is the marginal tax rate on ordinary income. An increase in the tax rate, holding all other things constant, decreases the price of contributions relative to ordinary income. The resulting change in relative prices encourages individuals to accept a higher share of compensation in the form of tax preferred savings. The income effect from the tax rate increase discourages making such contributions. In other words, there are two offsetting effects from a change in the tax rate. The evidence suggests that the substitution effect dominates the income effect in which case the ordinary price effect is negative. In our discussion below, we assume the price effect is negative, however, the reader should be aware that the price effect could be positive or negative depending upon which effect is greater.

There are a number of advantages to focusing on the self-employed in this context. First, there are about 10.5 million sole proprietors in the U.S., however, little is known about the effect of tax-based savings incentives on them.² Focusing on the self-employed may also provide a useful way to gauge the general efficacy of tax-based savings incentives. Since self-employment presumably offers greater autonomy in decision-making and higher than average income, the self-employed may have a greater ability to achieve their preferred compensation mix than the typical salaried employee.³ Hence their behavioral response may provide an upper bound estimate of the potential effect of tax incentives on retirement savings. Furthermore, by comparing estimated elasticities obtained from our sample of sole proprietors with and without employees, we may be able to gauge the effect of non-discrimination rules. Non-discrimination rules are designed to ensure that the employer does not treat themselves or their highly compensated employees more generously than their rank and file employees.

In addition, individual tax data have distinct advantages over those used in previous studies. Previous studies, of which Woodbury and Hamermesh (1992) is an excellent example, by necessity rely upon establishment level data to measure the effect of taxes on the preferred mix of compensation. These data require assumptions about the collective choice process and the appropriate measures of certain variables, particularly the tax-price and income. In the case of the self-employed, however, there is less ambiguity about whose utility is being maximized and, as a

² See the *Statistical Abstract of the United States*, 1998.

³ 1996 Statistics of Income tax return data indicate that the average income of the self employed (where the self employed are defined to be those taxpayers who file a self employment tax schedule [Schedule SE] with their 1040), was \$61,534, while the average income of the rest of the population was \$34,753.

result, the appropriate income and marginal tax rate measures to employ. Furthermore, tax data include information on other important sources of income, particularly income from capital, that are not typically available in conventional data sets. Thus tax data allow us to precisely calculate the individual's marginal tax rate using detailed tax calculators as well as after-tax income. Finally, these data straddle several major tax reforms which provide the necessary exogenous variation in the after-tax price of contributions to qualified retirement plans.

The paper proceeds as follows. In Section 2, we provide a brief description of the federal income tax treatment of retirement savings by the self-employed and the tax law changes during the sample period. In Section 3, we describe the econometric model, the data and the construction of the variables used in our analysis. We discuss our empirical results in Section 4 and Section 5 concludes with a summary of our results.

2. Background

In this section, we briefly review the literature on tax-based savings incentives. Then, we review the laws and institutions governing contributions to tax-preferred savings plans by the self-employed. Then we summarize relevant aspects of the three major tax bills enacted during the period spanned by our data. We conclude this section with a discussion of recent trends in tax-preferred pension savings.

A Brief Review of the Literature

There is a rather extensive literature on tax-based savings incentives. This literature addresses three issues: (1) the net effect of tax-based savings incentives on private and national savings; (2) the substitutability of assets in tax-based savings plans and ordinary savings; and (3)

the effect of these incentives on government revenue. Based upon their review of this literature, Engen, Gale and Scholz (1996) conclude that tax-based savings incentives have not had a substantial effect on private or national savings. They reach this conclusion, at least in part, because the evidence indicates that people perceive IRA's and other tax-preferred plans as good substitutes for ordinary savings. Hence, they conclude that contributions to tax-preferred savings plans are less likely to be new savings. Finally, the evidence is mixed on the government revenue effect of tax-based savings incentives. The effect depends upon whether tax-based savings incentives induce sufficient new savings, and investment, to grow the economy by an amount sufficient to make up the lost revenue from providing the incentives.

A related literature [Long and Scott, 1982; Woodbury and Bettinger, 1990; Woodbury and Hamermesh, 1992; and Barth, Cordes and Friedland, 1985] tries to account for historical trends in fringe benefits as a share of total compensation. Employer contributions to employee pensions comprise a large proportion of fringe benefits. Although our study may be relevant to issues (2) and (3) above, our empirical strategy has more in common with the approach taken in the fringe benefits literature.

In the post-war period fringe benefits were a growing share of total compensation. The growth in benefits is attributed to rising incomes, changing tax laws, unions, scale economies and other sources.⁴ In the 1980's, however, this trend was reversed and fringe benefits as a share of total compensation began to decline. In a seminal study, Woodbury and Hamermesh (1992) estimate an almost ideal demand (AID) equation for the share of benefits in total compensation using establishment level data on faculty salaries. Their data exploit the natural experiment

⁴ Woodbury and Hamermesh (1992) provide a review of this literature.

provided by TRA '86 to estimate the effects of taxes on the preferred compensation mix. They find that taxes have a substantial effect on the form of compensation. Based on their analysis of faculty salaries, they conclude that the positive effect on fringe benefits of rising incomes in the 1980's was offset by the negative effect of the increase in the after-tax relative price due to declining marginal tax rates.⁵

As previously noted, however, estimates obtained with establishment level data are vulnerable to criticism for three reasons. First, they require an assumption about the collective choice mechanism. This assumption raises uncertainty about the appropriate measures of income and the tax rate. Second, such data often lack information on non-wage income, particularly from interest, dividends and capital gains. Third, they may lack the necessary information on other income, filing status, number of dependents, and itemized deductions to precisely estimate effective marginal tax rates.

Tax-Preferred Pension Plans

In general, there are two types of retirement plans for the self-employed, Keogh plans and Simplified Employee Pension Plans (SEP's). Like traditional employer provided plans, Keogh plans can be structured as either defined benefit plans (DB) or defined contribution plans (DC). SEP's are generally considered DC plans. DB plans specify the yearly benefit level which the participant will receive upon retirement. Subject to certain limitations, the employer then

⁵ Other potential explanations for the decline of fringe benefit coverage in the 1980's are the increasing proportion of females and minorities in the labor force, the decline of unionization and the shift of employment to the Sunbelt. See, for example, Woodbury and Bettinger (1990) for a discussion of the decline in fringe benefit coverage in the 1980's.

contributes the amount necessary to achieve that level of benefit.⁶ A DC plan can be either a profit sharing plan or money purchase plan. In either case, the employer contributes a limited percentage of the employee's compensation, up to a fixed dollar amount. The cumulative stock of money in the plan is then available to the participant upon retirement.⁷ The self-employed taxpayer is treated as an employee of himself for purposes of the plan. The self-employed can have more than one type of plan; however, contributions to all plans cannot exceed the overall limitations.

Tax Legislation Enacted from 1985 through 1993

During the period spanned by our sample (1985-1993), the laws governing retirement plans for the self-employed and the contribution incentives facing the self-employed changed several times and in opposite directions.

The Tax Reform Act of 1986 (TRA '86) decreased the top marginal tax rate from 50 percent to 33 percent. This rate reduction significantly increased the price of tax-preferred pension plans. It also tightened the IRA eligibility rules. Furthermore, TRA '86 also established and tightened a host of non-discrimination rules which are designed to ensure that employers, including the self-employed, do not treat themselves or their highly compensated employees more favorably than rank and file employees. Non-discrimination rules include a variety of specified

⁶ In 1985, the employer was limited to contribute the lesser of \$90,000 or 100 percent of the employee's total compensation. The maximum contribution cap is indexed.

⁷ Individuals, and sole proprietors, are also subject to various federal "penalty" excise taxes which apply to qualified retirement plans, including a 10 percent tax on early distributions, and a 50 percent tax on excess accumulations in qualified retirement plans. During the period under study, they were also subject to a 15 percent tax on excess distributions from qualified retirement plans to an individual during the calendar year. However, this tax was repealed in the Tax Reform Act of 1997. See Shoven and Wise (1996) for an interesting discussion of how these "penalty" excise taxes interact with the federal income and estate and gift taxes and the behavioral consequences thereof.

tests (e.g., ratio percentage test, average benefit test and percentage coverage test) which must be applied when determining qualification for, and coverage under, a qualified retirement savings plan. In an attempt to level the playing field, TRA '86 established a cap of \$200,000 on the amount of compensation which can be considered in determining benefit amounts; an excise penalty of 10 percent on excess contributions; and limits on allowable IRA contributions for taxpayers participating in qualified retirement plans.

The Omnibus Budget Reconciliation Act of 1990 (OBRA '90) increased the marginal tax rate on ordinary income from 28 percent to 31 percent for taxpayers with taxable incomes over \$100,000 or \$190,000, depending upon their filing status. In addition, the 33 percent rate, or "bubble," was eliminated for taxpayers with taxable incomes between \$60,000 and \$190,000, depending upon their filing status.⁸ However, it created two new bubbles due to the phase-out of personal exemptions and itemized deductions.

The Omnibus Budget Reconciliation Act of 1993 (OBRA '93) imposed a 36 percent rate on taxable incomes over \$70,000 or \$150,000, depending upon filing status. In addition, OBRA '93 imposed a 10 percent surtax on individuals with taxable incomes in excess of \$250,000 and raised the taxable maximum for hospital insurance contributions to infinity. In summary, TRA '86 increased the tax-price of pension contributions for high income individuals; OBRA '90 decreased

⁸ OBRA '90 also increased the "penalty" excise tax on employer reversions of qualified plan assets to employers from 15 percent to 20 percent, or 50 percent if the employer does not maintain or establish a qualified replacement plan. This Act also increased the flat-rate per-participant premium from \$16 to \$19, payable with respect to each single-employer defined benefit retirement plan covered under title IV of the Employee Retirement Income Security Act (ERISA).

the tax-price for some and increased it for others; and OBRA '93 decreased the tax- price for high income individuals.

Trends in Pension Savings

In addition to national trends, Table 1 provides information on the share of tax-preferred pension contributions in after-tax compensation for our sample of sole proprietors measured in three different ways. Column 2 shows the share based on Keogh contributions; column 3 shows the share based on the Keogh Contribution and the Self Employment Tax (SECA) contribution; and column 4 shows the share based on Keogh, SECA and own and spouse's IRA contributions. All four series exhibit the same pattern. In 1989 the share of contributions is less than that observed in 1985, while the share in 1993 is greater than in 1989.

The down-then-up pattern in Table 1 is consistent with changes in the price of contributions due to enacted tax legislation during this period. After a tax hike (cut) the price of tax-preferred savings decreases (increases). Therefore, everything else held constant, the individual should prefer a greater (smaller) share of total compensation in the form of tax-preferred savings after a tax increase (decrease). Since TRA '86 decreased the top marginal rate, the price of contributions increased between 1985 and 1989, at least for high income individuals, and, as shown in Table 1, the share of contributions in total compensation decreased. And vice versa, between 1989 and 1993 the price decreased as a result of tax rate increases due to OBRA '90 and '93 and the share increased. Although this pattern is suggestive, we turn to our multivariate analysis to shed further light on this issue.

3. The Estimation Strategy

This section begins with a description of our econometric model. Then we proceed with a description of the data used to estimate the model and the construction of the variables.

The Econometric Model

The econometric specification is derived from individual utility maximization. The sole proprietor's utility is assumed to be a function of total after-tax business income, which includes taxable income and tax-preferred contributions to qualified retirement plans. Thus the observed mix of taxable and tax-preferred income depends on the individual's relative costs of providing ordinary taxable income and tax-preferred retirement savings and certain individual characteristics, including preferences and income.

Following Woodbury and Hamermesh (1992), this optimization problem gives rise to a system of share equations which define demand for income and retirement savings as follows:

$$S_{it} = \alpha A_{it} + \alpha B_i \ln[C_t/P_t] + \alpha \Gamma_i \ln[p_{it}/p_{jt}] + \alpha \Pi_i X_t + \alpha u_{it}$$

where the i and j index the types of compensation (income and retirement savings in our context); t indexes the year ($t = 1985, 1989$ and 1993); S_i is the i^{th} form of compensation in net (after-tax) compensation, C ; and p_i is the price of the i^{th} form of compensation. The price index P is approximated by $\ln[P_t] \approx \sum_i S_i \ln[p_i]$. The vector X includes age, age-squared, marital status, number of dependents, industry and year.⁹ These are included to help control for heterogenous

⁹ We would like to be able to control for the age of the business because new entrepreneurs may prefer to invest a higher share of earnings in their new enterprise to “get the business going.” Since we do not have information on the age of business, we hope that the

tastes as well as potential life-cycle and business cycle effects. Finally, we assume u_{it} is a normally distributed error term.¹⁰

Two potential problems arise when estimating this specification. First, if there is unobserved heterogeneity in the choice of compensation mix across individuals, there may be serial correlation in the error term as well as correlation between the error term and the independent variables. As a result, the parameter estimates may be biased. In order to remove any unobserved individual fixed effect in the rate of pension contributions, we estimate the model in first differences. Specifically, we estimate

$$\Delta S_{it} = \alpha A_i + \beta \Delta \ln[C_t/P_t] + \gamma \Delta \ln[p_{it}/p_{jt}] + \pi X_t + \Delta u_{it}$$

where Δ indicates the first difference of the succeeding variable.

Second, an increase in tax-preferred savings reduces taxable income which may, in turn, effect the price of tax preferred savings. Consequently, the tax price may be endogenous (see, for example, Feenberg, 1987) which could bias the estimates. In order to account for the potential endogeneity of the tax price and compensation, we estimate the model using Two Stage Least Squares (TSLS). In order to estimate TSLS, however, it is necessary to have an instrument for

proprietor's age serves as a partial control, albeit imperfect.

¹⁰ This model adapts Deaton and Muellbauer's (1980) almost ideal demand system to the decision problem of the self-employed individual. This system of equations is derived directly from the theory of utility maximization, but the generality of the associated expenditure function allows substantial flexibility in the functional form of the estimating equation. Finally, the system can be estimated using Ordinary Least Squares (OLS) and the parameters of the income and price variables can be transformed to provide income and price elasticities, respectively.

the potentially endogenous variable. A valid instrument must be correlated with the potentially endogenous variable and uncorrelated with the error term.

We construct an instrumental variable for the tax price that takes advantage of the most prominent feature of our data: the exogenous change in tax rates due to tax legislation enacted during this period.¹¹ First, we compute each individual's tax price in 1989 (1993) using the data and tax law for 1989 (1993). Next we compute each individual's marginal tax rate using the data for 1985 (1989), inflated to 1989 (1993) levels, but employing the tax law for 1989 (1993). Clearly, the change between the 1985 (1989) and 1989 (1993) tax rates computed in this fashion is due entirely to modifications in the tax code. Essentially, this procedure removes the endogenous component of tax rate movements from $\Delta \ln(\text{TAXPRICE})$, leaving only the part due to the exogenous change in the tax law associated with TRA '86, OBRA '90 and OBRA '93.

Furthermore, since tax-based savings incentives permit the self-employed to achieve a given level of after-tax income with a lower amount of total net-business income, income may be endogenous too. Therefore, we use after-tax capital income as our measure of income. For this purpose capital income is defined as the sum of taxable and tax exempt interest, dividends, net long-term capital gains and net S-Corporation and rental income. We calculate the tax liability attributable to capital income by taking the product of total tax liability and the proportion of taxable capital income in total taxable income. The construction of these instruments is discussed

¹¹ Several studies on the behavioral effects of individual income taxes have used the Tax Reform Act of 1986 to identify the tax-price. See, for example, Woodbury and Hamermesh (1992), Feldstein (1993), Auten and Carroll (1995), Eissa (1995) and Carroll *et al.* (1996). See Feenberg (1987) for a discussion of the issues involved in the identification of tax price models.

in greater detail in Appendix I. Prior to estimating the regressions with instrumental variables, however, we implement a Hausman-Wu test to assess whether endogeneity is indeed a problem.¹²

Construction of the Sample and the Variables

Our sample consists of data from the Statistics of Income (SOI) individual tax files for 1985, 1989 and 1993. The resulting panel consists of 15,468 returns of individual filers who report non-zero Schedule C business income in all three years.¹³ The data contain detailed information on a taxpayer's income and deductions, as reported on IRS Form 1040 and many of the associated schedules. We use this information to construct the variables used in this analysis, in particular the share of tax-preferred retirement savings in total after tax compensation $\Delta[\text{SHARE}_i]$; the change in the log of real income $\Delta[\ln(\text{INCOME}_i)]$; and the change in the log of the relative price of tax-preferred savings $\Delta[\ln(\text{TAXPRICE}_i)]$.

Following Woodbury and Hamermesh (1992), we construct two versions of the dependent variable; one treatment assumes SECA is a tax and the other an actuarially fair benefit. In the SECA-as-a-benefit treatment the numerator of SHARE_i includes contributions to Keogh, SEP, and own and spousal IRA's as well as Social Security contributions. The denominator is the sum of earned income (i.e., wages, sole proprietorship income, farm income and partnership income)

¹² See Wu (1973).

¹³ We should point out two caveats which should be kept in mind when interpreting the results. First, some aspects of the Statistics of Income sampling criteria (e.g., higher income individuals are sampled with greater probability), as well as our own restrictions (e.g., taxpayers must have positive business income in all three years) might imply that our results cannot be generalized to the self employed population as a whole. Second, that despite the benefits of panel estimation, there are some inherent problems with panels based on SOI data. For example, the young and high income taxpayers have a higher probability of being sampled in consecutive periods. Furthermore, it is difficult to interpret changes in income, deductions and tax rates for those getting married or divorced during the period spanned by the panel.

and the employer's Social Security contribution for wages less the tax attributable to earned income. In contrast, the SECA-as-a-tax treatment does not include Social Security contributions in the numerator, and the denominator is reduced by Social Security contributions. We compute last dollar marginal tax rates using detailed tax calculators that include the tax rate schedule and the many implicit rates induced by the phase-outs of certain deductions and credits. Since contributions to tax-preferred savings plans by the self-employed are not deductible for purposes of calculating the SECA tax, the marginal tax rates are identical in both treatments.

There are a number of sample exclusions which also should be noted. First, the structure of $\Delta[\text{SHARE}]$ and $\Delta \ln(\text{INCOME})$ require that we exclude 4,778 observations with incomes less than or equal to zero. Second, we exclude 1,292 returns subject to the alternative minimum tax (AMT),¹⁴ Third, we exclude 122 returns with anomalous observations of SHARE; those less than zero or greater than one. Finally, we exclude 229 returns in which the primary filer is over 71 because they are required by law to begin making withdrawals. The resulting sample consists of 9,047 returns.

Table 2 reports the means and standard deviations for two samples: SECA as a tax (column 1) and SECA as a benefit (column 2). Note there is a difference in the number of observations between the two treatments of SECA. The denominator of SECA as a tax is reduced

¹⁴ The alternative minimum tax (AMT) is a parallel tax which some taxpayers are subject to for a variety of reasons. The AMT essentially has its own tax base and tax rate schedule. Although the tax calculators for each individual year can capture the impact of the AMT on the tax price for fringe benefits, it is not clear how to accurately construct a tax-price instrument for the subset of taxpayers who switch on and off the AMT (i.e., those who are subject to the AMT in some years but not in others). Thus, we exclude AMT taxpayers from our sample. However, we re-estimated our canonical specifications using our sample augmented by observations which are subject to the AMT in every year. In other words, we only eliminate observations that switch on and off the AMT. Our basic results are unchanged.

relative to the value for SECA as a benefit by employer and employee contributions to FICA and SECA (see Appendix I). Further, the numerator is reduced by both FICA and SECA contributions. As a result 3,582 additional returns are excluded because the share variable is non-positive. The resulting sample consists of 5,465 returns.

Examining Table 2, we see that the average age in the SECA-as-a-tax sample is approximately 47 years old; 90 percent are married; and the average number of dependents is approximately 1.23. In contrast, the SECA-as-a-benefit sample is, on average, slightly younger; they are slightly less likely to be married; and have, on average, fewer dependents. Likewise the distributions by principle business activity is generally the same in both samples. Although the first-differences of share, the log of real income and the log of the tax-price are difficult to interpret, they are provided in Table 2 for the reader's convenience. Again, in the SECA-as-a-benefit sample the mean values of these three variables are somewhat lower than in the SECA-as-a-tax sample.

4. The Empirical Results

We focus on the model estimated in first differences because we believe that it has a number of attractive features. As previously noted, estimating the model in first-differences removes the mean value of each variable between any two years which helps to eliminate potential bias from unobserved heterogeneity. First differences also permits us to construct a suitable instrument for the potentially endogenous tax-price.

Table 3 provides the OLS and TSLS coefficients and associated standard errors for both treatments of SECA. We begin by discussing the OLS estimates treating SECA as a tax which are

reported in column 1 of Table 3. Focusing on the economic variables, the income and tax price have the expected signs and are statistically significant. More specifically, the estimated coefficient for $\Delta\ln(\text{INCOME})$ is equal to 0.002 with a standard error equal to 0.38×10^{-3} . The estimate for $\Delta\ln(\text{TAXPRICE})$ is equal to -0.012 (S.E. = 0.009). Turning to the taste variables, the number of dependents and marital status have a negative and statistically significant effect, while age is positive and statistically significant. The estimated coefficient on age-squared is negative and statistically significant, indicating that the effect of age is non-linear. Finally, the year dummy variable is negative and statistically significant, while the industry dummy variables are statistically insignificant.

The OLS estimates treating SECA as a benefit, which are reported in column 3, are rather disappointing, in particular, most of the estimated coefficients are statistically insignificant. But, as previously noted, $\Delta\ln(\text{INCOME})$ and $\Delta\ln(\text{TAXPRICE})$ are potentially endogenous. In order to check for endogeneity we implement a Hausman-Wu test. In both equations the joint test rejects exogeneity of $\Delta\ln(\text{INCOME})$ and $\Delta\ln(\text{TAXPRICE})$ at the 1 percent level. Specifically, the chi-square statistic is equal to 110.32 for the specification treating SECA as a tax and 326.12 treating SECA as a benefit. Consequently, we re-estimate both equations using TSLS.

Column 2 of Table 3 reports the TSLS estimates, treating SECA as a tax. As before, the estimated coefficient for $\Delta\ln(\text{INCOME})$ is positive and statistically significant. In fact, the magnitude of the estimate is virtually unchanged compared to its OLS counterpart. Similarly, the estimated coefficient for $\Delta\ln(\text{TAXPRICE})$ is negative and statistically significant, but more than twice its OLS counterpart in absolute value. In contrast to their OLS counterparts, the TSLS estimates treating SECA as a benefit, reported in column 4, have the expected signs and are

statistically significant. More specifically, the estimated coefficients for $\Delta\ln(\text{INCOME})$ and $\Delta\ln(\text{TAXPRICE})$ are 0.001 (S.E.= 0.26×10^{-3}) and -0.061 (S.E.=0.008), respectively. Both equations exhibit similar patterns for the remaining variables as well.

Now we examine the economic significance of our estimates. Accordingly, we transform the estimated regression coefficients reported in Table 3 into elasticities.¹⁵ These elasticities and their associated standard errors are reported in Table 4 for all four specifications. Since there is evidence of endogeneity of the tax-price and income, we believe the TSLs estimates are superior. Furthermore, in our opinion it is more likely that the self-employed perceive SECA to be a tax than a benefit. Therefore, we focus the discussion on the TSLs estimates obtained by treating SECA as a tax. Nevertheless, Table 4 provides the OLS and TSLs estimates treating SECA as a benefit.

Examining the TSLs estimates treating SECA as a tax, which are reported in column 3, we see that the own-price elasticity of demand for tax-preferred compensation ($\eta_{f,t}$) is equal to -1.454 (S.E.=0.272). This implies that a 1 percent increase in the price of contributions results in a 1.454 percent decrease in tax-preferred compensation. The income elasticity of demand for tax-preferred compensation ($\eta_{f,y}$) is 1.037 (S.E.=0.015). Similarly, the income elasticity of demand for taxable compensation ($\eta_{w,y}$) is equal to 0.998 (S.E. = 0.4×10^{-3}). Based on these estimates, a 1 percent increase in income, for all practical purposes, leads to a 1 percent increase in each form of compensation.

¹⁵ See Woodbury and Hamermesh (1992) for a description of the formulas used to compute the elasticities and associated standard errors.

The cross-price elasticity of demand for taxable income with respect to the price of contributions ($\eta_{w,f}$) is equal to 0.028 (S.E. = 0.013). This suggests a 1 percent increase in the price of tax-preferred compensation results in a 0.028 percent increase in the demand for wage compensation. Finally, the marginal rate of substitution between these two forms of compensation ($\sigma_{w,f}$) is equal to approximately 1.479 (S.E.=0.262). A value greater than one indicates that these two forms of compensation are easy substitutes.

Alternative Specifications

In order further to test the robustness of our results, we also tried a number of alternative specifications. First, TRA '86 tightened the rules on deductibility of contributions to IRA's. To ensure that our elasticity estimates are not simply an artifact of the new IRA regime, we excluded IRA contributions from the numerator of share and re-estimated all four specifications. These estimates have the expected signs and are statistically significant. For example, treating SECA as a tax, the TSLS estimates of the marginal rate of substitution is equal to 2.61 (S.E. = 0.566); the own-price elasticity equals -2.487 (S.E. = 0.579); and both income elasticities are approximately equal to 1.0 and statistically significant.

In an attempt to account for the fact that the tax-price of contributions should include any future taxes when distributions are taken, we re-calculate the tax price assuming that taxpayers discount the value of future distributions to their net-after-tax present value. This calculation requires assumptions about the age of retirement; the average annual rate of return on

contributions; the discount rate; and the expected future marginal tax rate on distributions. We find that these estimates have the expected sign and are statistically significant.¹⁶

Some Issues Related to the Sample

Before concluding, we should note some important issues related to our sample. First, in order to ensure that changes in marital status due to marriage or divorce are not substantially affecting the results, we re-estimate all four specifications on the subsample of taxpayers who do not change filing status throughout the period. The resulting subsamples consist of 5,060 returns for SECA as a tax and 8,294 returns for SECA as a benefit. The magnitude of the results are essentially unchanged, although the standard errors of some of the estimated coefficients are larger, particularly in the SECA-as-a-tax regressions.

Second, many of the returns in our sample receive wage income, thus we can not exclude the possibility that they or their spouse participate in an employer provided tax-preferred retirement plan. Clearly, participation in such a plan could affect their willingness to establish and contribute to a Keogh or SEP plan. Estimating the model in first differences may help alleviate

¹⁶ Clearly, these estimates require a number of rather heroic assumptions regarding the rate of return, discount rate, tax rate on distributions, etc. Also, alterations in these assumptions could obviously affect the estimates. For example, taxpayers that believe their future tax rates will be higher upon retirement than their current rate would contribute a lower rate than those one anticipate a lower rate. Furthermore, there is likely to be considerable unobserved variation among individuals in the appropriate rate of return, age of retirement, etc. In order to address these potential concerns, we also estimate a specification in which we simply interact the conventional change in the log of the tax-price with the age of the primary filer. Again, the estimated elasticities in all four specifications have the expected signs and are statistically significant. Finally, we also include state dummy variables in our canonical specifications reported in Table 3 to control for state taxes, different rates of unionism, etc. Our results are essentially unchanged.

this concern. Nevertheless, the fact that many of the self-employed receive wage income is a source of legitimate concern.

Thus, we re-estimate all four models on the subsample of 767 (1,473) returns, treating SECA as a tax (benefit), that do not report wage income on IRS Form 1040. The estimated elasticities are reported in rows 1 and 2 in the upper and lower panels of Table 5. For comparison's sake, we also provide Woodbury and Hamermesh's (1992) estimated elasticities in the column labeled W&H in the upper panel of Table 5. Examining the TSLS estimates treating SECA as a tax, which are reported in row 2 of the upper panel, we find that our basic results are unchanged. For example, both income elasticities are approximately equal to 1.0; the own-price elasticity of demand is negative and significant; and the marginal rate of substitution is greater than 1.0 and statistically significant. But, the substitution and own-price elasticity estimates are substantially larger than our previous estimates, specifically 3.569 (S.E. = 1.331) and -3.333 (S.E.=0.528), respectively.

Similarly, estimates treating SECA as a benefit obtained from the no-wage subsample, which are reported in row 2 of the lower panel, have the expected signs and are statistically significant. They are also larger than their Table 4 counterparts, however, the increase is not nearly as dramatic as in the SECA-as-a-tax case described above.

A third issue with the full sample is that the self-employed may have employees. As previously noted, non-discrimination rules effectively require that an employer making contributions to a qualified plan on his own-behalf offer a comparable plan to his employees. Thus non-discrimination rules may influence the self-employed's decision to establish and contribute to

a Keogh or SEP plan. Furthermore, it raises the issue of collective choice and whose utility is being maximized.

In order to address this concern, we re-estimate all four specifications on the subsample of 3,608 (6,227) returns treating SECA as a tax (benefit) which do not report a wagebill deduction on their Schedule C. These estimates are reported in rows 3 and 4 of the upper and lower panels of Table 5. Again, focusing on the TSLS estimates treating SECA as a tax, which are reported in row 4 of the upper panel, we observe the same pattern. Now, however, the estimated elasticities are more in line with their Table 4 counterparts. For example, as before, both income elasticities are approximately equal to 1.0; the own-price elasticity of demand is approximately equal to -1.5; and the marginal rate of substitution is equal to about 1.5. The SECA-as-a-benefit estimates, reported in rows 4 and 5 of the lower panel, by and large exhibit the same patterns and magnitudes.

Finally, we re-estimate all four specifications on the subsample of 386 (849) returns without wages or employees and report these results in rows 5 and 6 of Table 5. In short, these estimates have the expected signs and are statistically significant. But, the magnitudes are similar to those obtained in the no-wage subsample. For example, in row 6 of the upper panel, we see that the TSLS estimate of own-price elasticity treating SECA as a tax is equal to -3.207 (S.E.=0.698) and 3.450 (S.E. = 1.471) for the elasticity of substitution.

Some comments follow from the results reported in Table 5. First, given that the self-employed, particularly those without employees and therefore not subject to non-discrimination rules, have greater autonomy in their decision making, one would expect that the self-employed could more readily adjust their compensation mix in response to changing tax incentives than the

typical institution with many employees. For this and other reasons, it is interesting to compare our estimates with those obtained with establishment level data.

Thus, comparing our TSLS estimates treating SECA-as-a-tax obtained from the no-wage and no-employee sub-sample with those obtained by Woodbury and Hamermesh (1992), we find that our estimates of the marginal rate of substitution, the own-price elasticity of tax-preferred compensation, and income elasticity of demand for taxable compensation are somewhat larger, in absolute value, than theirs. These higher estimates support the notion that the greater autonomy enjoyed by the self-employed provides them with more flexibility in adjusting their compensation to changing tax incentives.

One must be cautious, however, not to over interpret such results. In particular, with the exception of the above mentioned elasticities, our estimated elasticities are generally lower than theirs. Most notably, their income elasticity for tax-preferred compensation is more than double ours. When we exclude observations with wages, however, this pattern is largely reversed. Thus, rigid comparison of the two sets of estimates is complicated, since our estimates vary somewhat among our sub-samples. Further, Woodbury and Hamermesh's (1982) estimates may be subject to measurement error in the independent variables, particularly the price and income variables, for the reasons previously noted. Finally, it should be noted that Woodbury and Hamermesh (1982) include contributions to health insurance in their measure of tax-preferred compensation, while we do not.¹⁷

¹⁷ Since contributions to health insurance do not appear to be as readily substitutable for wage income as pension contributions, some differences in our estimates may be understated. See Woodbury and Huang (1991) for further discussion of the substitutability of health insurance, wages, and pension contributions.

Overall, the two sets of estimates are fairly similar. In our opinion, this lends support to Woodbury and Hamermesh's conclusion that a substantial amount of the decline in the share of fringe benefits in total compensation in the 1980's is attributable to the Reagan era tax cuts.

It also interesting to compare the TSLS estimates from the no-wage sample with those from the no-wage and no-employees sample. Any difference in the estimates between these two samples could be attributable to the effect of non-discrimination rules. In other words, sole proprietors with employees, and therefore subject to non-discrimination rules, may not be able to adjust their compensation mix in response to changing tax incentives as readily as those without employees. Nevertheless, the estimates are remarkably similar. This offers some suggestive evidence that the non-discrimination rules do not seem to unduly influence the preferred compensation mix of the self-employed.¹⁸ Perhaps the self-employed are able to use own and spousal IRA's to achieve their tax-preferred retirement savings goals or the rules are not that onerous at least for the sole proprietors in our sample. Alternatively, employees may influence the decision to establish a plan but not the level of contribution once the decision to establish a plan has been taken. Measuring the effect of non-discrimination rules, if any, is a very interesting issue and certainly worthy of further research.

¹⁸We tried a number of alternative specifications in order to identify an effect from nondiscrimination rules on the sole proprietor's contribution rate. For example, we included an a dummy variable for sole proprietor's with employees in the pooled sample as well as interacting the dummy variable with the tax rate. Nevertheless, we are not able to demonstrate a statistically significant effect.

5. A Summary of Our Findings

In this paper, we focus on the effect of federal income taxes on the sole proprietor's preferred mix of compensation among ordinary taxable income and tax-preferred contributions to qualified retirement plans. We use tax return data for a sample of sole proprietors for the period 1985 through 1993. This period spans several changes in federal tax law, affecting individual rates and thus the after-tax price of retirement savings. These exogenous changes in rates help us identify the tax-price. Furthermore, individual tax data allow us to measure the after-tax price of contributions and after-tax income more precisely. Having the necessary exogenous variation and precise measures of income and tax rates is crucial for obtaining consistent estimates of the desired income, own- and cross-price elasticities.

We find that taxes have a substantial effect on the preferred mix of compensation. Controlling for endogeneity of income and the tax-price, our findings are surprisingly robust to a number of alternative specifications. In fact, the magnitudes of our estimated elasticities are generally consistent with those obtained by Woodbury and Hamermesh (1992), particularly for the no-wage sample. Thus our findings support their conclusion that tax reductions in the 1980's account for a substantial amount of the decline in the share of fringe benefits in total compensation.

Unfortunately, this study does not have any direct bearing on whether tax-based savings incentives create new savings. But, if Engen et al. (1996) are correct and assets in tax-preferred savings plans are good substitutes for other savings, then these incentives may not induce much, if any, new savings. Rather, they simply provoke portfolio re-allocations. Absent significant new savings, high own-price and substitution elasticities of the order of magnitude obtained here

suggest that the government may lose a significant amount of revenue as individuals re-shuffle existing savings in response to tax incentives without the benefit of stimulating additional savings, investment, economic growth and the resulting growth in government revenues.

APPENDIX I

Variable Construction

We estimate the j^{th} share equation for individual i in time period t using the following difference equation:

$$\Delta S_{jit} = A_j + B_j \Delta \ln[C_{jit} / P_{jit}] + \Gamma \Delta \ln[p_{jit} / p_{kit}] + \Pi_j X_{jit} + \Delta u_{jit}$$

where j indicates tax favored pension contributions, k indicates other compensation; Δ indicates the first difference of the succeeding variable; and the letters A , B , Γ , and Π are parameters to be estimated. The population we are examining are taxpayers with positive schedule c business income (BIL) in all three years of the sample (1985,1989,1993). The construction of the variables are described below.

The Dependent Variable

1. Social Security Contributions Treated as Taxes ¹⁹

$$S_{jit} = (PEN_{it}) / (TATC_{it})$$

where: S_{jit} is individual i 's share of tax-preferred contributions to qualified pension plans,

or PEN_{it} , in total after tax compensation, $TATC_{it}$.

$$PEN_{it} = [KEOGH_{it} + SEP_{it} + IRA_{it,own} + IRA_{it,spouse}]$$

¹⁹In addition to the standard income tax, most workers are required to make payments, based on their wages, to the Social Security Trust Fund, up to an indexed maximum dollar amount, or cap. These Social Security contributions are made to three separate accounts: the Old Age Survivors Insurance (OASI) Trust Fund, the Disability Insurance (DI) Trust Fund, and the Hospital Insurance, (HI) Trust Fund. Employers are also required to contribute on behalf of the employee. In an analogous manner, the self-employed are required to pay a certain percent of net income (where net income is defined to be income from sole proprietorships, farm income, and Schedule K partnership income) to the Social Security Trust Fund. Since the self employed individual essentially acts as both the employer and employee, he is required to pay both an employee and employer contribution to the Social Security Trust Funds.

where: $KEOGH_{it}$ is the individual's reported contribution to a Keogh account;

SEP_{it} is the reported contribution to a self-employed pension (SEP) account;

$IRA_{it,own}$ is the primary taxpayer's reported contribution to an individual account; and

$IRA_{it,spouse}$ is the reported contribution to the spouse's individual retirement account.

$$TATC_{it} = WAS_{it} + FIL_{it} + BIL_{it} + SCHK_{it} - ETAX_{it} - EESECA_{it} - ERSECA_{it} - EEFICA_{it}$$

where: WAS_{it} is reported wages and salaries;

BIL_{it} is reported net Schedule C income;

FIL_{it} is reported net Schedule F income;

$SCHK_{it}$ is partnership and S-corporation income;

$ETAX_{it}$ is the reported federal individual income tax liability associated with earned income;

$ERSECA_{it}$ is the employer portion of the SECA contribution;

$EESECA_{it}$ is the employee's portion of the SECA contribution;

$EEFICA_{it}$ is the employee's contribution to FICA; and

$ERFICA_{it}$ is the employer's contribution to FICA.

The taxpayer's reported wages and net-income from Schedules C, F, and K are obtained directly from the taxpayer's Form 1040 and the associated schedules. The other variables used to construct $TATC_{it}$ are constructed as follows.

In 1985 and 1989:

If $CAP^{OASDHI}_t > WAS_{it}$, then $ERFICA_{it} = EEFICA_{it} =$

$$[1/2 \times OASDI_t \times WAS_{it}] + [1/2 \times HI_t \times WAS_{it}],$$

if $CAP^{OASDHI}_t \leq WAS_{it}$, then $ERFICA_{it} = EEFICA_{it} =$

$$[1/2 \times OASDI_t \times CAP^{OASDHI}_t] + [1/2 \times HI_t \times CAP^{OASDHI}_t],$$

and 0 otherwise.

In 1993:

If $CAP^{OASDI} > WAS_{it}$, then $ERFICA_{it} = EEFICA_{it} =$

$$[1/2 \times OASDI_t \times WAS_{it}] + [1/2 \times HI_t \times WAS_{it}],$$

if $CAP^{OASDI} \leq WAS_{it} \leq CAP^{HI}$, then $ERFICA_{it} = EEFICA_{it} =$

$$[1/2 \times OASDI_t \times CAP^{OASDI}] + [1/2 \times HI_t \times (WAS_{it} - CAP^{OASDI})],$$

if $WAS_{it} > CAP^{HI}$, then $ERFICA_{it} = EEFICA_{it} =$

$$[1/2 \times OASDI_t \times CAP^{OASDI}] + [1/2 \times HI_t \times (CAP^{HI} - CAP^{OASDI})].$$

In 1985 and 1989:

If $CAP^{OASDHI}_t > WAS_{it} + SECINC_{it}$, then $ERSECA_{it} = EESECA_{it} =$

$$[1/2 \times (OASDI_t - CRED_t) \times \max\{0, SECINC_{it}\}] +$$

$$[1/2 \times HI_t \times \max\{0, SECINC_{it}\}]$$

if $CAP^{OASDHI}_t \leq WAS_{it} + SECINC_{it}$, then $ERSECA_{it} = EESECA_{it} =$

$$[1/2 \times (OASDI_t - CRED_t) \times \max\{0, (CAP^{OASDHI}_t - WAS_{it})\}] +$$

$$[1/2 \times HI_t \times \max\{0, (CAP^{OASDHI}_t - WAS_{it})\}]$$

and 0 otherwise.

In 1993:

$$\begin{aligned} &\text{If } CAP^{OASDI}_t > WAS_{it} + SECINC_{it}, \text{ then } EeSECA_t = ErSECA_{it} = \\ &[1/2 \times OASDI_t \times \max\{0, SECINC_{it}\}] + [1/2 \times HI_t \times \max\{0, SECINC_{it}\}] \\ &\text{if } CAP^{HI}_t \geq WAS_{it} + SECINC_{it} \geq CAP^{OASDI}_t, \text{ then } EeSECA_t = ErSECA_{it} = \\ &[1/2 \times (OASDI_t) \times \max\{0, (CAP^{OASDI}_t - WAS_{it})\}] + \\ &[1/2 \times HI_t \times \max\{0, SECINC_{it}\}] \\ &\text{if } CAP^{HI}_t < WAS_{it} + SECINC_{it}, \text{ then } EESECA_t = ERSECA_{it} = \\ &[1/2 \times (OASDI_t) \times \max\{0, (CAP^{OASDI}_t - WAS_{it})\}] + \\ &[1/2 \times HI_t \times \max\{0, (CAP^{HI}_t - WAS_{it})\}]. \end{aligned}$$

where: $OASDI_t$ is the combined employer and employee Old Age Survivor's and Disability Insurance tax rate in year t; or $OASDI_t = 0.114, 0.1212, \text{ or } 0.124$ when $t = 1985, 1989, \text{ and } 1993$, respectively;

HI_t is the combined employer and employee Hospital Insurance tax rate in year t; or $HI_t = 0.027, 0.029, \text{ or } 0.029$ when $t = 1985, 1989, \text{ or } 1993$, respectively;

$CRED_t$ is the sole proprietor SECA credit, or $CRED_t = 0.023 \text{ or } 0.02$, when $t = 1985 \text{ and } 1989$, respectively.

CAP^{OASDI}_t is the OASDI taxable maximum amount in year t; or \$39,600, \$48,000, or \$57,600 when $t = 1985, 1989, \text{ and } 1993$, respectively;

CAP^{HI}_t is the HI taxable maximum amount in year t, or \$39,600, \$48,000, and \$135,000, when $t = 1985, 1989, \text{ and } 1993$, respectively; and

$SECINC_{it} = BIL_{it} + FIL_{it} + PART_{it}$, where $PART_{it}$ is partnership income.

Note 4: Employers make a FICA contribution on behalf of their employees. Throughout the analysis, we assume that employees bear the burden of the employer's contributions in the form of lower wages. That is, the employee bears the burden of both the employer and employee portions of the FICA tax. However, for the calculation of total after tax compensation (treating Social Security payments as taxes), the employee's contribution to FICA, but not the employer's contribution, must be subtracted from total compensation, since reported wages (WAS_{it}) include the employee contribution to FICA but do not include the employer contribution to FICA.

$$ETAX_{it} = PCNTE_{it} \times TAX_{it}$$

If $TOTINC_{it} > EARNED_{it} > 0$, then $PCNTE_{it} = EARNED_{it} / TOTINC_{it}$, and

if $EARNED_{it} \Rightarrow TOTINC_{it}$, then $PCNTE_{it} = 1$, and otherwise

$PCNTE_{it} = 0$.

where: TAX_{it} is the total federal income tax liability reported on IRS Form 1040;

$EARNED_{it} = (WAS_{it} + FIL_{it} + BIL_{it} + SCHK_{it})$; and

$TOTINC_{it}$ is the sum of wages (WAS_{it}), net Schedule C income (BIL_{it}), net Schedule F income (FIL_{it}), taxable interest, ($INTST_{it}$) reported on Form 1040, dividends (DBE_{it}) reported on Form 1040, net long-term capital gains or losses ($NLTGL_{it}$) reported on the Form 1040, and Schedule E income reported on Form 1040 ($SCHE_{it}$). $SCHE_{it}$ includes rental income, royalty income, and partnership and S-corporation income.

Note 6: $PCNTE_{it}$ is not computed for observations in which $TOTINC_{it}$ is less than or equal to zero.

2. Social Security Contributions Treated as Benefits

$$S_{jit} = (PEN_{it} + SECA_{jit} + FICA_{jit}) / (TATC_{jit})$$

$$PEN_{it} = [KEOGH_{it} + SEP_{it} + IRA_{it,own} + IRA_{it,spouse}]$$

$$TATC_{jit} = WAS_t + FIL_t + BIL_t + SCHK_t + ERFICA_{it} - ETAX_t$$

where: SECA and FICA represent the sum of the employer *and* employee contributions for FICA and SECA, as defined above.

Note 7: The employer FICA contribution must be added into total compensation, since employer and employer SECA, and employee FICA, are already included in WAS_{it} and BIL_{it} .²⁰

Note 8: When constructing the independent variables, the differenced variables, and the instruments in “the Social Security Contributions as Taxes” versus “Social Security Contributions as Benefits” analyses, the relevant specifications of the share variable and after tax compensation are utilized.

²⁰Recall that the employer's FICA contribution is already excluded from wages.

The Independent Variables

\mathbf{X}_{it} is a vector of demographic variables, including the age of the primary filer (AGE), age-squared (AGE-SQUARED), the number of dependents (DEPENDENTS), and dummy variables for marital status (MARRIED), year (YEAR), and industrial sector.

$\mathbf{C}_{it} / \mathbf{P}_{it}$ is defined as real after-tax capital income,

where: C_{it} is capital income ($CAPINC_{it}$) less the amount of total reported tax liability attributable to capital income ($CAPTAX_{it}$).

$CAPINC_{it}$ is equal to the sum of taxable interest ($INTST_{it}$), tax exempt interest ($TXINTST_{it}$) reported on Form 1040, dividends (DBE_{it}), net long-term capital gains ($NLTGL_{it}$), and reported Schedule E income *net* of partnership and S-corporation income ($SCHE_{it} - SCHK_{it}$),

$$CAPTAX_{it} = (TAX_{it} - ETAX_{it})$$

$\ln P_{it}$ is the weighted average tax price of total compensation, in log form, or $\ln P_{it} = \sum S_{jit} \times \ln(p_{jit})$. Note: $p_{jit} = 1 - LMTR_{jit}$, as defined below.

p_{jit} / p_{kit} is the relative tax-price of contributing to a tax-favored retirement account.

where: p_{kit} is the price of taxable compensation, which serves as the numeraire in our analysis. Accordingly, we set this equal to 1.

p_{jit} is the tax price of contributing to a Keogh, SEP, or IRA; or,
 $p_{jit} = 1 - LMTR_{jit}$,

where: $LMTR_{jit}$ is the last dollar ordinary federal individual marginal income tax rate, computed as follows. Using detailed tax calculators developed at the U.S. Treasury, we recompute each taxpayer's federal individual income tax liability ($TAX_{it,BIL+100}$) by adding \$100 to reported net business income (BIL_{it}). Then we subtract the reported federal tax liability (TAX_{it}) from this recalculated amount, and divide the quantity by 100; or, $LMTR_{jit} = [(TAX_{it,BIL+100} - TAX_{it})/100]$.

Intuitively, this is the change in the income tax rate resulting from a small change in Schedule C income, or the marginal income tax rate associated with Schedule C income.

DIFFERENCED VARIABLES

The difference of the variables defined above, regardless of whether SECA is treated as a tax or benefit, are computed as follows:

- $\Delta S_{jit} = [S_{jit} - S_{ji(t-4)}]$, for $t = 1989$ and 1993 ;
- $\Delta \ln[\mathbf{p}_{jit} / \mathbf{p}_{kit}] = \ln[1 - LMTR_{jit}] - \ln[1 - LMTR_{ji(t-4)}]$, for $t = 1989$ and 1993 ; and
- $\Delta \ln[\mathbf{C}_{it} / \mathbf{P}_{it}] = \ln[\mathbf{C}_{it} / \mathbf{P}_{it}] - \ln[\mathbf{C}_{it-4} / \mathbf{P}_{it-4}]$, for $t = 1989$ and 1993 .

INSTRUMENTS

The last dollar marginal tax rate is potentially endogenous. Therefore, we construct instruments for the last dollar marginal tax rates for both treatments of SECA. We construct an instrumental variable that takes advantage of the most prominent features of our data: the exogenous changes in marginal tax rates due to changes in federal tax law.

The instrument for the last dollar marginal tax rate is computed as follows. After adjusting 1985 income to conform with 1989 tax law, we use the CPI-U to inflate the taxpayer's 1985 attributes to 1989 levels, and calculate their tax liability using 1989 tax law. Then, we add \$100 to their 1985 reported net Schedule C income in 1989 dollars, and re-compute their tax liability. Then we compute a "synthetic" 1989 marginal tax rate for each observation by taking the difference between these two measures of tax liability and dividing by \$100 (ie. in a manner analogous to the computation of the last dollar marginal tax rate described above). The "synthetic" 1993 marginal tax rate is computed in a similar manner, except 1989 attributes are inflated, using the CPI-U, to 1993 levels.

Because the 1985 (1989) data reflect the behavior and incentive structure present in 1985 (1989), the marginal tax rates computed using 1985 (1989) data but 1989 (1993) law reflect only the exogenous, statutory changes in the tax rate, rather than the endogenous changes in the marginal tax rate (resulting from the behavioral response to the changes in the law; that is, his behavioral response to the statutory tax rate changes effect the level of his taxable income and deductions, and which can effect his marginal tax rate).

Let $XMTR_{it}$ stand for the "synthetic" 1989 (1993) marginal tax rate. We compute the instrument for $\Delta \ln[\mathbf{p}_{jit} / \mathbf{p}_{kit}]$, called $\Delta \ln[ITP_{jit}]$, as follows:

$$\Delta \ln[ITP_{jit}] = \ln[1 - XMTR_{it}] - \ln[1 - MTR_{it-4}], \text{ for } t=1989 \text{ and } 1993.$$

Thus, this procedure removes the endogenous, behavioral component of tax rate movements from $\Delta \ln[ITP_{jit}]$, leaving the exogenous component which is due to the change in the tax law associated with TRA '86, OBRA '90, and OBRA '93.

The instrument for the variable $\Delta \ln[C_{it}/P_{it}]$, called $\ln(ICP_{it})$, is computed as follows.

$$\ln(ICP_{it}) = \ln[C_{it}/(IP_{it})] - \ln[C_{it-4}/P_{it-4}], \text{ for all } t=1989,1993$$

where: $\ln[IP_{it}]$ is computed as $\ln[IP_t] = \sum S_{jit} * \ln(1 - XMTR_{jit})$

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Table 1

The Share of Fringe Benefits in Total Compensation

	National Totals	Share of Keogh Contribution Only	Share of Keogh and SECA Contribution	Share of Keogh, SECA, Own, and Spouse's IRA Contributions
Share of Fringe Benefits in Total Compensation: 1985	16.64%	6.50%	15.27%	18.70%
Share of Fringe Benefits in Total Compensation: 1989	16.57%	3.35%	13.08%	15.07%
Share of Fringe Benefits in Total Compensation: 1993	17.98%	4.25%	15.20%	17.16%

Source: Department of Commerce, Bureau of Economic Analysis.

Note: The national share of fringe benefits in total compensation also includes employer contributions to health insurance.

Table 2

Means and Standard Deviations

Variable	Full Sample	
	SECA as a Tax	SECA as a Benefit
Δ Share	-0.02 [0.11]	-0.57×10^{-3} [0.09]
$\Delta \ln(\text{Income})$	0.64 [3.77]	0.47 [3.66]
$\Delta \ln(\text{TaxPrice})$	0.05 [0.19]	0.04 [0.18]
Age	47.04 [10.34]	45.76 [11.02]
Age Squared	2319.3 [992.42]	2215.8 [1,036.80]
Dependents	1.23 [1.23]	1.21 [1.24]
Marriage Indicator	0.9 [0.29]	0.86 [0.34]
Mining	0.06 [0.23]	0.05 [0.21]
Construction	0.05 [0.22]	0.09 [0.28]
Manufacturing	0.02 [0.15]	0.03 [0.16]
Transportation	0.02 [0.15]	0.03 [0.17]
Wholesale Trade	0.02 [0.14]	0.02 [0.13]
Retail Trade	0.09 [0.29]	0.11 [0.31]
Finance	0.12 [0.32]	0.1 [0.30]
Service	0.52 [0.50]	0.48 [0.50]
Other	0.01 [0.11]	0.01 [0.11]
Year	0.5 [0.50]	0.51 [0.50]
Number of observations	5,465	9,047

Standard deviations are provided in square brackets.

Table 3
Regression Coefficients
First-Differences of the AID Equation for Share of Pension Contributions
(Full Sample)

Coefficient	SECA as a Tax		SECA as a Benefit	
	OLS	TOLS	OLS	TOLS
Constant	-0.021 [0.027]	-0.026 [0.027]	0.023 [0.015]	0.004 [0.015]
$\Delta \ln(\text{Income})$	0.002 [0.38*10 ⁻³]	0.002 [0.38*10 ⁻³]	0.001 [0.26*10 ⁻³]	0.001 [0.26*10 ⁻³]
$\Delta \ln(\text{TaxPrice})$	-0.012 [0.009]	-0.026 [0.012]	0.002 [0.006]	-0.061 [0.008]
Age	0.003 [0.001]	0.003 [0.001]	0.2*10 ⁻³ [0.001]	0.001 [0.001]
Age Squared	-0.37*10 ⁻⁴ [0.12*10 ⁻⁴]	-0.38*10 ⁻⁴ [0.12*10 ⁻⁴]	0.26*10 ⁻⁵ [0.71*10 ⁻⁵]	0.67*10 ⁻⁵ [0.71*10 ⁻⁵]
Dependents	-0.002 [0.001]	-0.002 [0.001]	-0.001 [0.001]	-0.001 [0.001]
Marriage Indicator	-0.027 [0.005]	-0.027 [0.005]	-0.014 [0.003]	-0.014 [0.003]
Mining	0.008 [0.008]	0.009 [0.008]	-0.003 [0.006]	0.003 [0.006]
Construction	0.012 [0.008]	0.012 [0.008]	0.012 [0.005]	0.013 [0.005]
Manufacturing	0.005 [0.010]	0.006 [0.010]	-0.008 [0.007]	-0.006 [0.007]
Transportation	0.003 [0.011]	0.004 [0.011]	0.010 [0.006]	0.012 [0.006]
Wholesale Trade	-0.010 [0.011]	-0.009 [0.011]	-0.010 [0.008]	-0.007 [0.008]
Retail Trade	0.011 [0.007]	0.011 [0.007]	0.010 [0.004]	0.012 [0.004]
Finance	-0.008 [0.006]	-0.007 [0.006]	-0.005 [0.004]	-0.001 [0.004]
Service	0.002 [0.005]	0.003 [0.005]	-0.001 [0.004]	0.002 [0.004]
Other	-0.009 [0.014]	-0.008 [0.014]	-0.007 [0.009]	-0.004 [0.009]
Year	-0.032 [0.004]	-0.029 [0.004]	-0.032 [0.002]	-0.021 [0.002]
Number of observations	5,465	5,465	9,047	9,047

Standard errors are provided in square brackets.

Table 4

Estimates of Substitution, Uncompensated Price, and Income Elasticities
 First-Differences of the AID Equation for Share of Pension Contributions

Elasticity*	SECA as a Tax		SECA as a Benefit	
	OLS	TOLS	OLS	TOLS
$\sigma_{w,f}$	1.222 [0.167]	1.479 [0.262]	0.984 [0.039]	1.527 [0.085]
$\eta_{f,f}$	-1.211 [0.175]	-1.454 [0.272]	-0.988 [0.045]	-1.458 [0.062]
$\eta_{w,f}$	0.013 [0.010]	0.028 [0.013]	-0.002 [0.007]	0.071 [0.010]
$\eta_{w,y}$	0.998 [0.4*10 ⁻³]	0.998 [0.4*10 ⁻³]	0.998 [0.000]	0.998 [0.000]
$\eta_{f,y}$	1.036 [0.015]	1.037 [0.015]	1.010 [0.002]	1.010 [0.002]
Number of obs	5,465	5,465	9,047	9,047

Standard errors are provided in square brackets.

* Definitions of the notation used to indicate estimated elasticities reported in Tables 4 and 5 are as follows:

$\sigma_{w,f}$ marginal rate of substitution between taxable and tax-preferred compensation.

$\eta_{f,f}$ own-price elasticity of demand for tax-preferred compensation.

$\eta_{w,f}$ cross-price elasticity of demand for taxable compensation with respect to the price of tax-preferred compensation.

$\eta_{w,y}$ income elasticity of demand for taxable compensation.

$\eta_{f,y}$ income elasticity of demand for tax-preferred compensation.

Table 5

Estimates of Substitution, Uncompensated Price, and Income Elasticities
on Alternative Samples

Elasticity	SECA as a Tax						
	W & H*	No Wages		No Wagebill		No Wages/No Wagebill	
		OLS	TOLS	OLS	TOLS	OLS	TOLS
$\sigma_{w,f}$	2.641 [0.351]	2.336 [0.606]	3.569 [1.331]	0.977 [0.228]	1.465 [0.344]	1.913 [0.649]	3.450 [1.471]
$\eta_{f,f}$	-2.651 [0.359]	-2.216 [0.628]	-3.333 [1.362]	-0.980 [0.239]	-1.445 [0.357]	-1.826 [0.695]	-3.207 [1.517]
$\eta_{w,f}$	0.318 [0.034]	0.125 [0.036]	0.241 [0.056]	-0.001 [0.012]	0.023 [0.016]	0.093 [0.062]	0.247 [0.080]
$\eta_{w,y}$	0.672 [0.020]	0.995 [0.002]	0.996 [0.002]	0.998 [0.001]	0.998 [0.001]	0.994 [0.003]	0.995 [0.003]
$\eta_{f,y}$	2.701 [0.431]	1.045 [0.025]	1.041 [0.028]	1.047 [0.022]	1.047 [0.022]	1.052 [0.037]	1.043 [0.037]
Number of obs	1,477	767	767	3,608	3,608	386	386

Elasticity	SECA as a Benefit						
		No Wages		No Wagebill		No Wages/No Wagebill	
		OLS	TOLS	OLS	TOLS	OLS	TOLS
$\sigma_{w,f}$		1.537 [0.108]	2.169 [0.237]	0.991 [0.050]	1.554 [0.095]	1.581 [0.148]	2.408 [0.316]
$\eta_{f,f}$		-1.456 [0.122]	-1.991 [0.258]	-0.994 [0.057]	-1.484 [0.103]	-1.490 [0.171]	-2.186 [0.347]
$\eta_{w,f}$		0.083 [0.019]	0.180 [0.031]	-0.001 [0.009]	0.072 [0.011]	0.093 [0.029]	0.224 [0.045]
$\eta_{w,y}$		0.998 [0.001]	0.998 [0.001]	0.999 [0.4*10 ⁻³]	0.998 [0.4*10 ⁻³]	0.998 [0.001]	0.999 [0.001]
$\eta_{f,y}$		1.012 [0.005]	1.009 [0.005]	1.010 [0.003]	1.010 [0.003]	1.011 [0.007]	1.007 [0.007]
Number of obs		1,473	1,473	6,227	6,227	849	849

Standard errors are provided in square brackets.

* Column 6 of Table 4 in Woodbury and Hamermesh (1992).