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# TAX INCENTIVES AND CHARITABLE GIVING: EVIDENCE FROM A PANEL OF TAXPAYERS

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## 1. Introduction

There has been a great deal of interest among students of tax policy in the effect of individual income tax on the level and distribution of charitable giving in the United States. The empirical work on this question has focused on the elasticity of charitable contributions with respect to the tax-defined 'price' of giving, where the price is the net cost to the taxpayer per dollar of giving. Beginning in 1975, Martin Feldstein and his associates published a number of studies suggesting that this elasticity is generally greater than one in absolute value.[1] These findings imply that the level of charitable giving is quite sensitive to tax policy. As an illustration, Feldstein and Taylor (1976, p. 1218) calculated that charitable giving in 1970 would have been 26 percent less had contributions not been deductible in that year. In addition, these elasticity estimates imply that charities will gain more in contributions from tax incentives than the Treasury will lose in revenues. Subsequently, other econometric studies have produced estimates that are of the same order of magnitude.[2]

To date, all of the econometric studies on this question using samples of individuals[3] have had to rely on cross-section data. The purpose of the current paper is to present estimates of the price and income elasticities of

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[1]See Feldstein (1975a, 1975b), Feldstein and Clotfelter (1976), Feldstein and Taylor (1976), Boskin and Feldstein (1977).

[2]See Abrams and Schmitz (1978), Fisher (1977), Dye (1977), and Reece (1979).

[3]Taussig (1967), Feldstein and Clotfelter (1976), Feldstein and Taylor (1976), Boskin and Feldstein (1977), Dye (1977), and Reece (1979).

charitable giving using a new panel of taxpayers. These panel data offer three distinct advantages. First, they allow the estimation of a model based on changes in giving over time that reduces the possibility of omitted variables bias and aids in the identification of separate price and income effects, both of which are troublesome in cross-section estimation. Secondly, because the data include observations over time, it is possible to examine dynamic aspects of giving behavior. Thirdly, they allow the computation of permanent income based on several years. For the sample of low- and middle-income taxpayers examined in the paper, estimates of short-run price and income elasticities are lower than estimates produced by cross-section models, although most estimated long-run elasticities are similar to previous estimates.

Section 2 of the paper discusses modifications of the basic model of giving developed in previous studies. Section 3 describes the panel data used in the present paper. Section 4 discusses problems associated with the specification of the price of giving and the selection of a sample. Section 5 presents estimates using the panel data, and section 6 contains concluding remarks.

## 2. Evaluating cross-section estimates of charitable giving

Econometric studies of charitable giving have employed a number of different specifications of the demand for giving, and these are compared in detail elsewhere.[4] Since the purpose of the present paper is to compare cross-section equations with models examining giving over time, I use as the basic estimating equation the most common of these specifications, the log-linear form:

$$G = AY^{\alpha}P^{\beta}\,\mathrm{e}^{\phi x}\,\mathrm{e}^{u}, \tag{1}$$

where $G$ is charitable giving, $Y$ is net income, $P$ is the price of giving, $x$ is a vector of household characteristics, and $u$ is an error term. In order to take the logarithm of the dependent variable, a transformation is required to make the dependent variable nonzero. In the present paper, \$10 is added to all reported values of giving.[5] Net income ($Y$) is defined as adjusted gross

[4]See, for example, Feldstein (1975a, 1975b) and Clotfelter and Steuerle (1979).

[5]Other transformations are suggested and compared by Boskin and Feldstein (1977). They favor adding \$10 because this transformation avoids the steepest portion of the logarithm function and because taxpayers are likely to omit some informal donations made over the year in calculating their deductible contributions. Even if taxpayers reporting zero contributions were treated as giving nothing, the very small number of such taxpayers (about 6 percent of the sample's itemizers) imply that an estimation procedure that explicitly accounts for the zero observations, such as Tobit, will yield estimates that are close to those obtained by applying ordinary least squares. As an illustration, Tobit estimation was applied to the 1970 sample and yielded a price elasticity of $-1.23$, compared to $-1.16$ for ordinary least squares. On the other hand, in samples where there are many zero observations, such as in the disaggregated data analyzed by Reece (1979), Tobit analysis is quite appropriate.

income ($AGI$) minus taxes that would be owed if no contributions had been made. The price of giving is the absolute value of the derivative of net income minus giving with respect to giving. For itemizers who give cash, this price is one minus the marginal tax rate; for taxpayers who do not itemize, it is one.[6]

Once the basic equation is estimated, the effects of a tax change may be simulated, as Feldstein and Taylor (1976) have done, by applying the estimated coefficients to the hypothetical changes in income and tax price that would be embodied in such a change. Where $G_0$ and $G_1$ are the before- and after-change values of giving, eq. (1) implies that changes in tax price and income, denoted similarly, will yield the new level of giving if $X$ is unchanged:

$$G_1 = \left(\frac{Y_1}{Y_0}\right)^{\alpha} \left(\frac{P_1}{P_0}\right)^{\beta} G_0. \tag{2}$$

More generally, if eq. (1) is a complete model of giving behavior, it implies for any one individual that changes in giving are related to changes in price, income, and other variables. Where variables are observed in years $t-2$ and $t$, the ratio of giving in the two years is

$$\frac{G_t}{G_{t-2}} = B\left(\frac{Y_t}{Y_{t-2}}\right)^{\alpha} \left(\frac{P_t}{P_{t-2}}\right)^{\beta} \exp\left[\phi(x_t - x_{t-2})\right] e^{v}, \tag{3}$$

where $B$ is an intercept allowing for a time trend and $v$ is an error term equal to the difference between the error terms in the respective cross-section equations. Although Feldstein and Taylor (1976) have estimated a similar equation explaining changes in contributions for broad income classes, it has previously been impossible to estimate such an equation for individuals. With the panel data employed in the present paper, however, eq. (2) can be estimated for a sample of individual taxpayers.

Estimates from eq. (3) offer several advantages over previous cross-section estimates. First, as stressed by Feldstein and Taylor (1976, pp. 1208–1210), the use of changes over time in price and income rather than their levels enhances the ability of a linear regression model to identify the separate price and income effects. Effective tax schedules change over time due to changes in the tax code, so price changes over time are more independent of changes

[6]Gifts of appreciated assets require additional attention to the ratio of capital gains to total value of gifts since capital gains for such gifts are not included in taxable income. See, for example, Feldstein and Taylor (1976). In the present paper such gifts are ignored because high-income households are excluded from the sample and because allowing for such gifts does not greatly affect estimates of the price elasticity in previous studies.

in income than are price and income in a cross-section relationship. Thus, a specification that can combine price and income observations taken over time will enhance the identification of separate price and income elasticities. Eq. (3) is one such specification with this attribute.

The second advantage in examining changes in giving behavior lies in the possibility that cross-section estimates may be subject to omitted variable bias. The literature in social psychology on altruism and charitable giving suggests that there are a host of personal and community characteristics that affect charitable behavior. Not only are age, marital status, and income important, but such behavior also depends on personal norms of behavior and on relationships with family and peer group members.[7] Unfortunately, the data employed in econometric studies of charitable giving typically are not rich enough to capture these important determinants of individual giving. Only the studies having survey data have included any more than a few explanatory variables, and those fail to measure some of the possibly most important determinants of individual giving. As is well known, if the omitted variables — this 'individual effect' — are correlated with included variables, the coefficients of such included variables are likely to be biased. Short of developing a data set with these unmeasured variables, one approach to this problem is to observe changes in individual behavior over time. If, for example, the vector $x$ in eq. (1) can be separated into a vector of variables that may change over time ($x^*$) — such as marital status and family size — and a vector of variables that typically do not change ($x^{**}$) — such as attitudes towards giving — the coefficients of interest can be estimated without observing the unchanging variables by substituting the change in $x^*$ for the change in $x$ in eq. (3). In effect, one can remove the unique 'individual effect' for each taxpayer by taking differences.

Another reason for examining changes in giving is to analyze the dynamics of individual giving behavior. As noted above, estimates based on cross-section data are employed in simulating the changes in giving that are likely to result from changes in tax policy. Yet there is no evidence on which to judge the appropriateness of applying the estimates from such cross-section models to dynamic simulation problems. As Kuh (1959, p. 212) has emphasized, estimates based on cross-section data are typically subject to different biases than those based on time-series data, so there may be serious problems in using cross-section estimates in dynamic applications. In this vein, Morgan et al. (1977, p. 174), Nelson (1977, p. 1507), and Zellner (1977, p. 1520) all have warned of the possible danger in using cross-section

[7]For a comprehensive survey of the psychological literature on altruism, see Krebs (1970). Given currently available data, it is impossible to test all of the hypotheses suggested by this literature in a comprehensive econometric model of giving. Instead, the purpose of taking differences is to minimize the bias that results from the omission of such factors.

estimates of charitable giving to simulate the dynamic effects of changes in tax policy. There may well be lags in personal giving behavior that would make it important to recognize dynamic aspects of giving. It may take time for an individual to adjust to a new 'long-run' level of giving either because of habit or because giving is affected by solicitations by charitable organizations, which in turn are a function of past giving. Such behavior is suggested, for example, by the finding of Morgan et al. (1977, p. 194) that, holding constant age and several other demographic variables, taxpayers who recently started itemizing gave less than long-standing itemizers and, to a lesser extent, that nonitemizers who had recently been itemizers gave more than long-standing nonitemizers. If such response lags are important, coefficients estimated using eq. (3) will tend to be lower than the corresponding long-run parameters. In this case an alternative model featuring explicit recognition of lags in giving would be appropriate. One such model assumes an exponential coefficient of adjustment $\gamma$:

$$\frac{G_t}{G_{t-2}} = \left(\frac{G_t^*}{G_{t-2}}\right)^{\gamma}, \tag{4}$$

where $G_t^*$ is the long-run level of giving determined by price, income, and other variables as in eq. (1). A value of $\gamma$ less than one implies that personal giving does not adjust immediately to tax-induced changes in tax price or net income; only where $\gamma$ is close to one will long-run equations be accurate in predicting short-run changes in giving. In order to estimate eq. (4), it is necessary to include lagged giving in a regression explaining current giving, a modification that is possible on the individual level only with panel data.

## 3. Data

The data used in the present paper consist of tax return and social security information for itemizers who were included in the Treasury's Panel Study of Income Tax Filers. The panel itself was drawn randomly, by social security number. Because inclusion was insured if a household filed a tax return and because new taxpayers tended to enter the sample as old ones left it, attrition appears to be less serious than in many panels.[8] Comparisons of mean values with larger, stratified samples indicate that the panel is quite representative of the entire population of taxpayers.[9] Although up to seven years of tax

[8] Data on three major groups are under-represented: the very poor, who may drop out of the sample in a year if they file no return; women who change marital status, who are excluded in years they are married since selection depends on the household head's social security number; and individuals who illegally file no tax return, who are numerically unimportant.

[9] For example, averages for 1970 based on the *Statistics of Income* sample and this panel, respectively, are: \$7,943 and \$7,954 for wages and salaries; \$4,960 and \$4,979 for business or professional income; \$675 and \$695 for interest; and \$8,504 and \$8,562 for adjusted gross income. See Bristol (1977, table 3).

return information are available for each taxpaying unit, detailed itemized deductions (including charitable contributions) are recorded only for 1968, 1970, 1972, and 1973. In addition to tax return data, information on age and several other demographic variables for the taxpayers in the sample was available. Marginal tax rates were calculated by a model that simulates tax law in the various years covered by the panel data.[10] Because the sample was drawn randomly, the number of high-income tax returns is quite low. For example, out of 7063 returns with itemized deductions in 1970, only 88 had average adjusted gross incomes (*AGI*s) over the period 1967–73 (in 1970 dollars) of $50,000 or more. For this reason the estimates given in this paper are based on a sample of low- and middle-income taxpayers, those with average *AGI*s between $2000 and $50,000 in 1970 dollars.[11]

Beside the small number of high-income households covered, the major disadvantage of the panel data used here is that only itemizers can be examined. In contrast, the Survey Research Center data used by Boskin and Feldstein (1977) and Dye (1977) contains information on contributions by nonitemizers as well. There are, however, several important advantages in using this panel. First, changes over time in giving and other variables may be observed for individuals. Secondly, the longitudinal data allow permanent income to be approximated much more readily than with data on one or two years. Thirdly, the availability of detailed information from income tax returns allows exact measurement of marginal tax rates, reflecting such important features as income averaging and optional forms of deductions. This tax information allows explicit consideration of the extent to which itemization (and thus tax price) may be endogenous with respect to giving, a point that has previously not received explicit consideration in empirical studies of giving.

## 4. Defining the price of giving

Two problems arise in defining the tax-defined 'price' in econometric studies of charitable giving. The first, noted by Feldstein (1975a), is the likelihood of simultaneity bias. In theory, the demand for giving is a function of the marginal price of giving ($P^*$) and other variables ($Z$):

$$G = G(P^*, Z). \tag{5}$$

However, this price is itself a function of the amount of giving since deductions are subtracted in calculating taxable income. In previous studies

[10] For a description of how marginal tax rates were calculated, see appendix A.

[11] By comparison, Boskin and Feldstein (1977) use households with current income in 1974 from $1000 to $30,000 and Dye (1977) takes households between $1000 and $50,000.

of charitable giving this actual price has been replaced by a 'first-dollar' price — the price that would have applied if no contributions had been given — in order to obtain consistent estimates. This is the approach adopted in the current paper.[12]

There is, however, a second problem associated with the definition of the price of charitable giving. This concerns the treatment of taxpayers who would not have found it advantageous to itemize if they had made no contributions. Such 'borderline' itemizers would face a first dollar price of one if other itemized deductions remained constant. In most previous econometric studies of charitable giving it is an implicit or explicit assumption that, if such taxpayers exist, there are very few of them and, consequently, that the decision to itemize can be assumed to be exogenous.[13] Since this assumption is plainly incorrect for some taxpayers, it is important to consider in more detail the proper definition of tax price for use in econometric studies of giving.

Table 1 presents a classification of itemizers in the panel in 1970 according to itemization and taxability status and first-dollar prices.[14] Six basic cases for itemizers are distinguished. As would be expected, the most common is the 'basic' itemizing case, with price below one over the entire relevant range of giving. This case accounted for 88 percent of all itemizers. Probably the most surprising finding of this tabulation, however, is that for over 6 percent of itemizers in 1970 charitable contributions provided the margin that made itemization more attractive than not itemizing. Although these itemizers as a group faced about the same average tax price as 'basic' itemizers, their first-dollar prices are virtually all one. It is also worth noting that, because of the comparatively higher levels of required deductions in order to itemize, the proportion of such 'borderline' itemizers is even higher in 1968 and 1972. In 1972, for example, borderline itemizers represented 13.9 percent of all itemizers. Cases II and IV imply prices of one on the first and last dollars of giving even though deductions are itemized. In the sample of itemizers in 1970, these cases accounted for 3 percent of itemizers. Finally, apparently 'irrational' itemizers (case VII) and itemizers on the borderline of taxability

[12]One alternative to the use of first-dollar price in ordinary least squares equations is the use of instrumental variables estimation with the first-dollar price as an instrument for the actual price. When these two methods were compared for the present sample, estimated coefficients were very close.

[13]See, for example, Boskin and Feldstein (1977, p. 352), and Dye (1977, p. 317).

[14]In these calculations two principal assumptions are made. First, it is assumed that a taxpayer will not itemize if he could have a lower tax liability by using the percentage standard deduction or the low-income allowance. The only exception is for taxpayers who did in fact itemize and pay taxes when they could have saved by not itemizing. Such apparently 'irrational' behavior may be quite rational when state income taxes or other considerations are taken into account. Secondly, other itemized deductions are assumed to be constant. To the extent that the timing of certain deductions is discretionary, however, a reduction in contributions might be accompanied by an adjustment in other itemized deductions.

Table 1

Description, frequency, and average prices for classes of returns, 1970 sample.

| | Description | Typical first-dollar price ($P_1$) | Typical last-dollar price ($P_2$) | Number of returns | Percent of itemizers | Average values of $P_1$ | Average values of $P_2$ | Average values of $(P_2-P_1)$ |
|---|---|---|---|---|---|---|---|---|
| I | *Actual nonitemizer* | $P_1=1$ | $P_2=1$ | 7,634 | — | 1.0[a] | 1.0[a] | 0.0 |
| | *Actual itemizer* | | | | | | | |
| | Nontaxable | | | | | | | |
| II | Nontaxable if $G=0$ | $P_1=1$ | $P_2=1$ | 210 | 3.0 | 1.000 | 1.000 | 0.000 |
| | Taxable if $G=0$ | | | | | | | |
| III | $I \geqq S$ if $G=0$ (would remain itemizer) | $P_1<1$ | $P_2=1$ | 61 | 0.8 | 0.859 | 0.987[b] | −0.128 |
| IV | $I<S$ if $G=0$ (most likely switches to *LIA* or *SD*) | $P_1=1$ | $P_2=1$ | 8 | 0.0 | 1.000 | 0.991[b] | 0.009 |
| | Taxable | | | | | | | |
| | $I \geqq S$ (rational) | | | | | | | |
| V | $I \geqq S$ if $G=0$ ('basic' case) | $P_1<1$ | $P_2<1$ | 6,219 | 88.1 | 0.779 | 0.782 | −0.003 |
| VI | $I<S$ if $G=0$ ('borderline': would switch to *LIA* or *SD*) | $P_1=1$ | $P_2<1$ | 471 | 6.7 | 0.993[c] | 0.787 | 0.206 |
| VII | $I \leqq S$ ('irrational') (assume would remain itemizer) | $P_1<1$ | $P_2<1$ | 94 | 1.3 | 0.823 | 0.824 | −0.002 |
| | Total | | | 14,697 | 100.0 | | | |

*Note:* $I$=itemized deductions; $SD$=standard deduction; $LIA$=low-income allowance; $S=\max(SD, LIA)$; If $I \geqq S$ and return is taxable, it is beneficial to be an itemizer.

[a]Not calculated.

[b]For a few taxpayers, actual tax liability was under $1, thus marginal tax rate was a small positive number although reported tax was zero. Most of these taxpayers had tax credits which most likely would have covered all tax liability.

[c]For a few taxpayers at the margin of itemization, the $10 of contributions used to calculate tax price was sufficient to change that status and thus result in a price not equal to one.

(case III) comprise about 1 percent each of itemizers in 1970. For the latter group, the first-dollar price of giving is less than one, but it jumps to one when tax liability goes to zero. In summary, table 1 indicates that there are important exceptions to the usual case in which itemization is exogenously determined and price is everywhere less than one for itemizers.

Two implications follow from the finding that the number of borderline itemizers is in fact not negligible. First, in samples containing both itemizers and nonitemizers, it is incorrect to assume that all taxpayers who actually itemized *would* have been itemizers without their charitable deduction. To do so results in understatements of the first-dollar price for borderline itemizers. Because such itemizers tend to be relatively big givers, the absolute value of the estimated price elasticity would tend to be upward biased. In their studies of a sample of low- and middle-income households, both Boskin and Feldstein (1977) and Dye (1977) are forced to use *reported* itemization status, rather than the status in the absence of giving, in calculating prices. Since itemization is a function of giving for some part of their sample,[16] this procedure could well account for the unusually large price elasticities estimated in those two studies.[17]

The second implication of endogenous itemization is that estimates based on samples of itemizers only may be subject to sample selection bias. To illustrate, if the true giving equation is $G = X\beta + u$, where $X$ is a vector of explanatory variables, $\beta$ is a vector of coefficients, and $u$ is an error term, the conditional expectation of giving for the population is $\mathrm{E}(G_i \mid X_i) = X_i\beta$. However, the comparable expectation for itemizers only is

$$\mathrm{E}(G_i \mid X_i, I_i > S_i) = X_i\beta + \mathrm{E}(u_i \mid I_i > S_i), \tag{6}$$

where $I_i$ is an individual's possible itemized deductions and $S_i$ the maximum of the standard deduction and the low-income allowance.[17] For borderline itemizers, contributions will tend to be unusually large given their first-dollar price of one due to the fact that such itemizers, in essence, are included in the sample by virtue of these relatively large contributions.[18] At the same time, similar taxpayers making smaller contributions and thus choosing not to itemize would be excluded from the sample. The result of including all

[16]In 1972, 13.9 percent of the itemizers in the panel sample would have found it more advantageous to be nonitemizers if they had made no contributions.

[17]Boskin–Feldstein and Dye obtain price elasticities of −2.54 and −2.25, respectively, compared to a range of −1.09 to −1.28 in seven other econometric studies of giving undertaken since 1975. See Clotfelter and Steuerle (1979, table 1).

[17]For a discussion of sample selection bias see Heckman (1979).

[18]In the 1970 sample, itemizers in group III gave an average of 9.7 percent of their *AGI* and those in group VII gave 6.1 percent, compared to 2.7 percent for 'basic' itemizers (group V).

itemizers would then be a positive correlation between the first-dollar price and the error term.[19] In order to avoid the resulting positive bias to the price elasticity, taxpayers whose taxability or itemization status would be affected if they made no contributions — i.e. groups III, IV, and VI — are omitted from the basic estimates below.

Since this approach differs from a previous analysis using tax return data, the study by Feldstein and Taylor (1976), it is instructive to note the difference. In calculating price, Feldstein and Taylor made the implicit assumption that all of the itemizers in their sample would have continued to itemize even if allowable deductions were to fall below the standard deduction. This inclusion of borderline itemizers with a modified first-dollar price avoids the sample selection bias noted above, but it also introduces an element of simultaneity since itemization is not strictly exogenous. For comparison, estimates using this modified first-dollar price are presented below. Although this modification has a significant effect on the estimates using the present sample, comparisons of the two approaches using a tax file such as Feldstein and Taylor used — where borderline itemizers are much less important — show little difference.[20]

## 5. Estimation results

Before turning to the estimation of models (3) and (4) involving giving over time, it is useful to present cross-section estimates comparable to those in earlier studies. Specifications used by Feldstein and Taylor (1976) and Boskin and Feldstein (1977) were re-estimated for comparison, and the results are summarized in appendix B. They indicate that, despite differences among the samples in size, average income level, and the quality of the tax data, the estimates are broadly similar between samples. However, they also suggest that the estimates of price and income elasticities — as suggested by the differences between the two models presented — are sensitive to the particular specification used, especially the omission of the marital status dummy. In the remainder of this paper, therefore, the basic estimating equation includes all available variables that may affect charitable giving. In addition to price, income, age, and marital status, the number of dependents (*DEP*) is included in order to reflect differences in family composition. The estimated equation based on this specification for 1972, using a first-dollar

[19] In fact, there would be an opposing effect for the much smaller group III itemizers — itemizers whose contributions caused them to reduce taxable income to zero. For the sample as a whole, selection-induced correlation between the first-dollar price and the error term would tend to be positive.

[20] For a description of this sample see Clotfelter and Steuerle (1979).

price with restricted sample, is:

$$\ln(G+10) = \underset{(0.533)}{-0.524} + \underset{(0.069)}{0.534}\ln Y - \underset{(0.365)}{1.401}\ln P + \underset{(0.056)}{0.040}\,MRD + \underset{(0.040)}{0.365}\,(\text{age }35\text{–}54) + \underset{(0.054)}{0.598}\,(\text{age }55\text{–}64) + \underset{(0.076)}{0.674}\,(\text{age }65+) + \underset{(0.013)}{0.057}\,DEP,$$

$$N=4396; \quad R^2=0.154. \tag{7}$$

The estimated price elasticity is $-1.401$, which is similar to earlier estimates using cross-section data. However, the standard error is relatively large, implying a 95 percent confidence interval of about $-0.7$ to $-2.1$. The income elasticity of 0.534 is comparatively low. Giving increases with age[21] and with the number of dependents in the family.

Equations of the form of (7) were estimated with net income replaced by estimates of permanent and transitory components of income. Where $\ln \widehat{AGI}_{it}$ is the predicted value from a regression, estimated for individual $i$, of the logarithm of $AGI$ on a time trend[22] and $D_{it} = \ln AGI_{it} - \ln \widehat{AGI}_{it}$ is a transitory income component, the comparable equation was estimated to be:

$$\ln(G+10) = \underset{(0.531)}{-1.150} + \underset{(0.068)}{0.610}\ln \widehat{AGI} + \underset{(0.094)}{0.171}\,D - \underset{(0.390)}{0.929}\ln P + \underset{(0.056)}{0.011}\,MRD + \underset{(0.054)}{0.351}\,(\text{age }35\text{–}54) + \underset{(0.075)}{0.596}\,(\text{age }55\text{–}64) + \underset{(0.075)}{0.685}\,(\text{age }65+) + \underset{(0.013)}{0.058}\,DEP$$

$$N=4396; \quad R^2=0.159. \tag{8}$$

This form yields a smaller price elasticity and a somewhat larger income elasticity for permanent income. The elasticities of permanent and transitory

[21] This may reflect differences in wealth or, as the work of Reece (1979) has suggested, imputed income from home ownership, which is, of course, a reflection of wealth held in owner-occupied housing.

[22] Equations were estimated for each taxpayer of the form: $\ln AGI_{it} = b_{1i} + b_{2i}\,(t-1966) + u_{it}$, $t = 1967$–$73$, where the coefficients $b_{1i}$ and $b_{2i}$ are computed for each individual. It was impossible to use net income as a basis for permanent income because data on contributions were not available for every year. For an interpretation of the coefficients in this equation and an application to the study of income instability, see Mirer (1974). Since it is fitted for the last observation in the 7-year period, $\ln AGI_{it}$ for 1973 may not be a reliable estimate of permanent income.

components are significantly different, with the effect of transitory income fluctuations being relatively small.[23] These qualitative results apply to other years as well. Estimated price elasticities in equations including current income range from −0.863 for 1970 (S.E. = 0.322) to −1.401 for 1972 (S.E. = 0.365). In equations with permanent income, price elasticities are uniformly smaller, ranging from −0.433 for 1970 (S.E. = 0.339) to −0.929 for 1972 (S.E. = 0.390). Despite the general comparability of the present data with those used in earlier studies, therefore, the inclusion of permanent and transitory components income results in reductions in the estimated price elasticities.

### 5.1. Explaining changes in giving by individuals

Taking all itemizers in both 1970 and 1972 who did not change marital status and using the first-dollar price in a restricted sample, eq. (3) was estimated by taking logarithms. The estimated equation is presented below:[24]

$$\begin{aligned}
&\ln(G+10)_{72} - \ln(G+10)_{70} \\
&= \underset{(0.051)}{0.124} + \underset{(0.060)}{0.403}\,(\ln Y_{72} - \ln Y_{70}) \\
&\quad - \underset{(0.304)}{0.333}\,(\ln P_{72} - \ln P_{70}) - \underset{(0.045)}{0.009}\,MRD - \underset{(0.033)}{0.124}\,(\text{age } 35\text{–}54) \\
&\quad - \underset{(0.042)}{0.132}\,(\text{age } 55\text{–}64) - \underset{(0.058)}{0.194}\,(\text{age } 65+) - \underset{(0.022)}{0.008}\,(DEP_{72} - DEP_{70}), \\
&N = 3422; \qquad R^2 = 0.047. \qquad (9)
\end{aligned}$$

Compared to eq. (7) and previous estimates, both the implied income elasticity (0.403) and the price elasticity (−0.333) are quite a bit smaller, with the latter being significantly different from −1.0. The age dummies suggest that, although the level of giving increases with age, the rate of increase declines with age. Neither the number of dependents nor marital status are significant in explaining rates of change in giving.

Price and income elasticities implied by similar equations are shown in table 2. Note that permanent income as defined here is a dynamic concept, and changes in permanent income are proportional to the secular growth in

[23]Since the transitory component in eq. (8) is the logarithm of the ratio of current *AGI* to predicted *AGI*, the equation could be rewritten to yield a permanent *AGI* elasticity of 0.439 and a current *AGI* elasticity of 0.171.

[24]Age dummies in all equations using data for two years are based on the taxpayer's age in the later years. The addition of variables for age, marital status, and number of dependents has little effect on the estimated income and price elasticities. In an equation containing only an intercept and change in log values of income and price, the estimated price elasticity was −0.213 (with a standard error of 0.293) and the income elasticity was 0.444 (0.058).

Table 2

Price and income elasticities estimated from log-change model.[a]

| | Sample size | Equations with current net income: Price | Equations with current net income: Income (ln $Y$) | Equations with permanent income and transitory deviation[b]: Price | Permanent income (ln $\widehat{AGI}$) | Deviation $D$ |
|---|---|---|---|---|---|---|
| 1968–70 | 4105 | −0.388 | 0.449 | −0.289 | 0.566 | 0.372 |
| | | (0.269) | (0.053) | (0.281) | (0.067) | (0.053) |
| 1970–72 | 3422 | −0.333 | 0.403 | −0.179 | 0.532 | 0.332 |
| | | (0.304) | (0.060) | (0.318) | (0.080) | (0.059) |
| 1972–73 | 3456 | −0.451 | 0.241 | −0.429 | 0.054 | 0.230 |
| | | (0.265) | (0.051) | (0.278) | (0.114) | (0.049) |

[a]Equations are of the form of eq. (9). Groups III, IV, and VI are excluded.
[b]See eq. (10) and text for definition.

an individual's $AGI$ over the seven-year period. The estimated elasticities for current income are smaller than those obtained in most previous studies, all being significantly less than 0.6. Elasticities associated with permanent income are slightly higher and those for the transitory component of income slightly lower. The price elasticity estimates, however, are markedly different from those obtained in most previous studies. All are significantly different from −1.0 and none are significantly different from zero. These estimates imply that, in their behavior over time, individuals do not show the kind of price sensitivity that is implied by cross-section equations. Not only do these implied price elasticities differ from previous cross-section estimates, they are also quite different from Feldstein and Taylor's (1976, p. 1212) price elasticity of −1.4 based on class-wide changes in giving between 1962 and 1970. It is worth noting, however, that a replication of the Feldstein–Taylor estimation procedure for the periods 1962–75 and 1970–75 yielded price elasticities generally smaller than one in absolute value.

However, because they differ so much from previous estimates of the tax price elasticity of charitable giving, the findings presented in table 2 call for close scrutiny. Several explanations for the difference suggest themselves. First, these low price elasticities may simply be an artifact of the particular data set used in this study, with its composition of low- and middle-income itemizers. This explanation seems unlikely, however, because of the similarity in the results of re-estimating previous models with these data. Secondly, as suggested above, the difference in estimates may be due to bias caused by the omission of variables or to lack of identification of price and income effects in the cross-section equations explaining levels of giving. In this case, the results would provide the basis for doubting the previous high elasticity estimates. Finally, these differences may be due to another kind of specification error, such as that suggested by the presence of lags in individuals' adjustment to new levels of giving. In this case the previous estimates may be correct when interpreted as long-run elasticities but inappropriate for simulating short-run dynamic effects of tax changes. This notion may also explain Schwartz's (1970) generally low price and income elasticities when he used aggregate time series data rather than the cross-section data used in other studies.

### 5.2. Partial adjustment model

Where long-run giving is taken to be a function of the same variables given in eq. (8), a partial adjustment specification based on eq. (4) was estimated for 1972:

$$\begin{aligned}\ln(G+10) = & -1.576 + 0.466 \ln Y - 0.241 \ln P - 0.089\, MRD \\ & \quad (0.469)\ (0.068) \qquad (0.301) \qquad (0.053) \\ & \qquad\qquad [0.870] \quad [-0.450] \\ & + 0.090\,(\text{age } 35\text{–}54) + 0.206\,(\text{age } 55\text{–}64) + 0.210\,(\text{age } 65+) \\ & \quad (0.041) \qquad\qquad (0.058) \qquad\qquad (0.076) \\ & + 0.026\, DEP + 0.460 \ln(G+10)_{70} \\ & \quad (0.010) \qquad (0.052) \\ & \hat{\gamma} = 0.540; \quad N = 3422; \quad R^2 = 0.556. \end{aligned} \tag{10}$$

Instrumental variables estimation was used because of the presence of the lagged dependent variable.[25] In this equation the coefficient of adjustment [$\gamma$ in eq. (4)] is estimated to be slightly more than one-half, implying that only about half of the percentage difference in long-run giving caused by a tax policy change will be realized over a two-year period and that 90 percent of the difference would not be realized for about six years. The age dummies have the same general pattern of effects as in eq. (7), marital status is again insignificant, and the number of dependents is positive and significant.

The price and income elasticities implied by equations of the form of (10) are shown in table 3. The equations imply short-run price elasticities less than one in absolute value but, except for (3.2), imply long-run elasticities that are quite consistent with estimates from cross-section analyses.[26] Why

[25] See Balestra and Nerlove (1966) for a discussion of inconsistency associated with such models. Instruments for $\ln(G+10)_{70}$ included the right-hand side exogenous variables plus the log of age and the 1970 values of the number of dependents and the logarithms of the lagged values of $P$, $Y$, $AGI$, and $D$.

[26] Where the logarithm of long-run giving is:

$$\ln G_t^* = a + b_1 \ln Y + b_2 \ln P + \sum_i C_i X_i$$

Table 3

Price and income elasticities estimated from incomplete adjustment model.[a]

| | Price | | Net income | | Coefficient of adjustment ($\gamma$) |
|---|---|---|---|---|---|
| | Short-run | Long-run[b] | Short-run | Long-run[b] | |
| (3.1) 1968–70 | −0.938 | −1.549 | 0.423 | 0.698 | 0.609 |
| | (0.302) | (0.511) | (0.061) | (0.115) | (0.049) |
| (3.2) 1970–72 | −0.241 | −0.450 | 0.466 | 0.870 | 0.540 |
| | (0.301) | (0.559) | (0.068) | (0.151) | (0.052) |
| (3.3) 1972–73 | −0.487[c] | −1.337 | 0.243[c] | 0.667 | 0.371[c] |
| | (0.231) | (0.649) | (0.055) | (0.173) | (0.050) |

[a]Equations are of the form of eq. (10) and are estimated by instrumental variables. Groups III, IV, and VI are excluded. See text.

[b]Approximate long-run price and income elasticities.

Where g is the estimated coefficient of lagged giving, the approximate mean and variance of $\beta_i/(1-g)$ are:

$$E\left(\frac{\beta_i}{1-g}\right) \approx \frac{\hat{\beta}_i}{(1-\hat{g})} + \frac{\operatorname{cov}(\hat{\beta}_i, \hat{g})\sqrt{\operatorname{var} g}\sqrt{\operatorname{var} \beta_i}}{(1-\hat{g})^2} + \frac{\hat{\beta}_i \operatorname{var} \hat{g}}{(1-\hat{g})^3};$$

$$\operatorname{var}\left(\frac{\beta_i}{1-g}\right) \approx \frac{\operatorname{var} \hat{\beta}_i}{(1-\hat{g})^2} - \frac{2\hat{\beta}_i \operatorname{cov}(\hat{\beta}_i, \hat{g})\sqrt{\operatorname{var} \hat{g}}\sqrt{\operatorname{var} \hat{\beta}_i}}{(1-\hat{g})^3} + \frac{\hat{\beta}_i^2 \operatorname{var} \hat{g}}{(1-\hat{g})^4}.$$

See Lindley (1965), p. 135).

[c]Short-run elasticities and coefficients of adjustment in eq. (3.3) refer to a one-year period and are thus not strictly comparable to parameters based on a two-year time period.

eq. (3.2) yields such low price elasticities is unclear. The implied long-run income elasticities are close to earlier estimates of the income elasticity, but the short-run response is much smaller. The equations based on the restricted sample are therefore consistent with the view that previous cross-section equations yield long-run elasticities. As such, these elasticities cannot properly be applied in simulating short-run effects of changes in tax policy.

These estimates appear to be consistent with previous suggestions that changes in price and income affect an individual's contributions only with a lag. Another way this lagged effect may be shown is by comparing the price sensitivity of taxpayers who have recently become itemizers with that of taxpayers who have previously itemized. The findings of Morgan et al. that

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and the change in the logarithm of current giving is:

$$\ln G_t - \ln G_{t-2} = \gamma (\ln G_t^* - \ln G_{t-2}),$$

the long-run income and price elasticities are $b_1$ and $b_2$ while the short-run elasticities are $\gamma b_1$ and $\gamma b_2$.

new itemizers give less relative to income than former itemizers may be consistent with this notion, but differences in price may also be responsible for such results. This hypothesis was tested directly using the current data by comparing the implied price elasticity of new itemizers, defined as taxpayers who had not itemized in any of the three previous years, with other itemizers. For each year tested (1970, 1972, and 1973), the price elasticities of the two groups are significantly different from each other, but in each case the implied price elasticity for new itemizers is positive. A more satisfactory specification includes a dummy variable for new itemizers in the basic cross-section equation. These equations imply that new itemizers give some 40–50 percent less than former itemizers. When this dummy variable is included in basic cross-section equations including current income, estimated price elasticities increase slightly; for example, the price elasticity in the equation for 1970 increases from $-0.863$ (S.E. $=0.322$) to $-1.148$ (S.E. $=0.320$). Similarly, when this basic equation is fit for a sample excluding new itemizers, the estimated price elasticity rises from $-0.863$ to $-1.053$ (S.E. $=0.332$).[27] These findings indicate that former itemizers do appear to be more price sensitive than new itemizers, which could be a reflection of a lagged response in giving. Such lags may also be responsible for the unusually low estimates shown in table B3 in appendix B of the price elasticity in 1970, a year in which many taxpayers itemized for the first time.

A final model that was examined combines the partial adjustment model and the log-change model, i.e. eq. (9), with a lagged dependent variable. If it could be estimated, this combined model would permit the determination of long- and short-run elasticities within a model based solely on changes. Unfortunately, it was impossible to obtain sufficiently good instruments for the lagged change in $\ln G$ to produce reliable estimates, although the resulting point estimates are close to those from other models examined in the paper.[28]

## 6. Conclusion

This paper seeks in two ways to add to our knowledge about how the income tax affects charitable giving. First, the analysis focuses on itemizers who are on the borderline of itemization, those who would probably not itemize were it not for their charitable giving. In a sample of itemizers with low- and middle-incomes, such taxpayers are surprisingly numerous. The paper argues

[27]Quite similar results are obtained in equations with permanent income.

[28]In an equation comparable to (9), estimated long-run price and income elasticities were $-0.734$ (S.E. $=0.459$) and 0.481 (S.E. $=0.343$), respectively, and the estimated coefficient of adjustment was 0.806 (S.E. $=0.098$). The poor first-stage fit resulted in a negative $R^2$ for the second-stage equation.

that their inclusion with their true first-dollar price would result in a positive bias to the price elasticity. While this bias may be quite small where the number of borderline itemizers is small (in a sample dominated by high-income taxpayers, for example), in the present case it justifies dropping the borderline itemizers altogether.

Secondly, the paper presents estimates of models of individual giving behavior made possible by the availability of a new panel of tax return data. Having observations over time for the same taxpayers allows one to observe the effect of changes in income and tax price, as well as the effect of their levels, on giving. When previously estimated equations are re-estimated with cross sections of these data, the results are similar enough that it is reasonable to believe the panel data are not dramatically different from previously used samples. Two basic models are estimated in the paper. First, changes in the logarithm of giving are explained, in part, by changes in the log of income and price. The resulting estimates imply much lower income and price elasticities than those produced by previous studies. Secondly, an incomplete adjustment model implies that individual giving adjusts to new long-run levels of giving only with a lag, implying that short-run income and price elasticities are smaller than the corresponding long-run parameters. If cross-section estimates approximate long-run elasticities, as Kuh (1959) and others have argued, it is therefore inappropriate to use elasticities estimated from cross-section equations to simulate short-run changes in charitable giving. Only as an indication of long-run effects of policy would such simulations be appropriate. The price of giving is nevertheless found to be a significant determinant of charitable giving. Since the estimates are based on a sample composed entirely of itemizers, these findings provide further evidence that the price effect of taxes is more than just an 'itemization effect'.[29]

## Appendix A: Calculation of taxes and marginal tax rates for the seven-year panel

When it is necessary to determine either tax liabilities under hypothetical conditions (e.g. when contributions are zero) or marginal tax rates, individual tax liabilities must be recalculated. For this purpose a program was developed that computes Federal income tax for the years 1967–73 using tax return data available for the panel. The program incorporates changes over the period in exemptions, the percentage standard deduction, the low-income allowance (formerly the minimum standard deduction), income averaging, tax credits, and tax and surcharge rates as well as the introduction of and changes in the alternative tax, the maximum tax on earned income, and the

[29]See Dye (1977) and Boskin and Feldstein (1977) for a discussion of this hypothesis.

minimum tax. Thus hypothetical tax liabilities may be calculated simply by changing some variable of interest and recomputing income tax.

Marginal tax rates are determined by computing tax liability twice, once at the point of interest and once \$10 away from that point in the variable of interest, and then dividing the difference by \$10. For example, the actual marginal tax rate on wage income for a taxpayer who is not subject to the maximum tax is simply (tax $(TY+10)-\text{tax}\ (TY)/10$, where tax $(\cdot)$ is the tax function and $TY$ is the initial value of taxable income. (Since an increase in wages would raise the ratio of earned income to $AGI$, the application of the maximum tax would imply a more complex change in taxable income, which is taken into account for taxpayers to whom it applies.) Another example is the calculation of the marginal tax rate used in defining the tax price of contributions. For a taxpayer who would itemize if contributions were zero, the marginal tax rate applicable to the 'first dollar' of giving is

$$(\text{tax}\ (TY)-\text{tax}\,(TY-10)/10,$$

where $TY$ is taxable income if no contributions were given. Note that the marginal rate is taken 'down', which is consistent with an increase in contributions from zero. One complication in both of these calculations, accounted for in the program, is the reduction in the effective marginal rate for taxpayers subject to the minimum tax. A change in the total of the two taxes for an increase in $AGI$ or charitable contributions is less than it would be in the absence of the minimum tax.

Finally, two pieces of tax return information not available on the panel require special assumptions. First, the previous years' taxable income, necessary in the calculation of tax for income averaging, is not included in the panel data. For the years 1971–73, most income averagers show values of taxable income for four previous years. Unfortunately, the definitions of taxable income may not correspond to the values required by income averaging, due to change in tax status over time. Therefore, an iteration procedure was used to obtain the average taxable income in the four previous years that was uniquely consistent with the amount of tax that was saved due to income averaging — an amount that was available for all income averagers. The approximations were refined so that, when used to calculate actual taxes, they would differ by no more than \$2 from actual tax paid.[30] A second approximation was required in calculating the maximum tax on earned income. The basis of the calculation, 'earned income', is sometimes subject to allocation of income from small businesses. Individuals may include up to 30 percent of income from small businesses that use significant capital, but professionals can include all of such income. A similar

[30]Gerald Auten is responsible for developing this iteration procedure.

iteration procedure was used to calculate earned net income for these taxpayers using the maximum tax.

## Appendix B: Estimates based on previous models

It is useful for comparison to present new estimates based on previously published models. Two previous studies seem particularly appropriate for comparison with estimates for the current sample: Feldstein and Taylor (1976) and Boskin and Feldstein (1977).[31] The former study uses tax return data (for 1970) like that used in the present study, but the sample is stratified to include more high-income households. The latter study, limited to households with income between \$1000 and \$30,000, covers an income range similar to that covered in the panel, but it differs from the present study in that it includes nonitemizers as well as itemizers and relies on approximations rather than exact tax return data in calculating marginal tax rates.

Both of these models were re-estimated for each of three years using the present sample. The estimated coefficients other than price and income had the same signs and were generally quite close in magnitude to the previously published estimates. Equations for 1972 are compared to previous estimates in tables B1 and B2. As for price and income, the comparable estimates are presented together in table B3. Three regularities in the panel estimates are apparent. First, for each model, estimated price elasticities using modified first-dollar price for itemizers for whom itemization is not exogenous (groups III, IV, and VI) are larger than those estimated for samples that exclude these itemizers. The difference generally applies to all specifications presented in the paper, and it is consistent with the notion that the assumption of exogenous itemization for borderline itemizers biases the price elasticity in a negative direction. Secondly, the price elasticities estimated using the Boskin–Feldstein model are smaller than those obtained using the Feldstein–Taylor model, despite the relatively high elasticity (−2.54) obtained in the former study. Finally, price elasticities implied by the 1970 sample tend to be the smallest among the four years. One explanation for this difference is that, because of the growth of itemization, itemizers in 1970 included an unusual number of former nonitemizers. If contributions by such taxpayers are slow to adjust to itemization, the observed price sensitivity could be reduced.

[31]Dye (1977) uses the same data as Boskin and Feldstein and sets \$50,000 rather than \$30,000 as the upper income limit. However, his basic equation includes several variables not available in the present study and thus cannot be re-estimated.

Table B1

Comparison of Feldstein–Taylor basic estimates with equations estimated for panel data, 1972 (dependent variable: $\ln(G+1)$).

| | Feldstein–Taylor | Panel, 1972: Restricted sample | Panel, 1972: Modified first dollar |
|---|---|---|---|
| $\ln P$ | −1.419 | −1.314 | −3.280 |
| | (0.070) | (0.459) | (0.421) |
| $\ln Y$ | 0.768 | 0.781 | 0.368 |
| | (0.023) | (0.087) | (0.077) |
| Married | 0.317 | 0.104 | 0.245 |
| | (0.048) | (0.077) | (0.069) |
| Age 65+ | 0.443 | 0.331 | 0.488 |
| | (0.038) | (0.096) | (0.080) |
| Intercept | −2.580 | −2.659 | 0.731 |
| | (0.201) | (0.682) | (0.606) |
| $R^2$ | 0.404 | 0.102 | 0.091 |
| $N$ | 15,291 | 4396 | 5187 |

Table B2

Comparison of Boskin–Feldstein basic estimates with equations estimated for panel data, 1972 (dependent variable: $\ln(G+10)$).

| | Boskin–Feldstein | Panel, 1972: Restricted sample | Panel, 1972: Modified first dollar |
|---|---|---|---|
| $\ln P$ | −2.54 | −0.678 | −1.828 |
| | (0.28) | (0.305) | (0.284) |
| $\ln Y$ | 0.69 | 0.668 | 0.438 |
| | (0.06) | (0.054) | (0.049) |
| Age 35–54 | 0.46 | 0.389 | 0.408 |
| | (0.07) | (0.039) | (0.037) |
| Age 55–64 | 0.75 | 0.552 | 0.607 |
| | (0.09) | (0.053) | (0.049) |
| Age 65+ | 0.86 | 0.598 | 0.769 |
| | (0.09) | (0.074) | (0.064) |
| Intercept | −2.17 | −1.462 | 0.497 |
| | (0.49) | (0.446) | (0.404) |
| $R^2$ | 0.30 | 0.150 | 0.138 |
| $N$ | 1,621 | 4,396 | 5,187 |

Table B3. Previous estimates compared to estimates using panel data.

| Specification | | Feldstein and Taylor[a] | | Boskin and Feldstein[b] | |
|---|---|---|---|---|---|
| Dependent variables | | ln(G+1) | | ln(G+10) | |
| Independent variables | | ln P, ln Y, *MRD*, age 65+ | | ln P, ln Y, age 35–54, age 55–64, age 65+ | |
| Sample | | Itemizers, 1970 Tax File | | low- and middle-income households, 1974 | |
| | | *Elasticity estimates* | | | |
| | | Price | Income | Price | Income |
| *Basic estimates in original study*[c] | | −1.419 (0.070) | 0.768 (0.023) | −2.54 (0.28) | 0.69 (0.06) |
| *Estimates using panel data* | | | | | |
| A. *Groups III, IV, and VI excluded* | | | | | |
| 1968 | 5420 | −1.671 (0.428) | 0.930 (0.074) | −0.829 (0.257) | 0.787 (0.040) |
| 1970 | 6316 | −0.836 (0.419) | 0.956 (0.070) | −0.423 (0.248) | 0.765 (0.038) |
| 1972 | 4396 | −1.314 (0.459) | 0.781 (0.087) | −0.678 (0.305) | 0.668 (0.054) |
| 1973 | 4620 | −1.243 (0.450) | 0.903 (0.091) | −0.289 (0.290) | 0.807 (0.056) |
| B. *Modified first dollar price for groups IV and VI*[d] | | | | | |
| 1968 | 6053 | −2.902 (0.403) | 0.643 (0.068) | −1.670 (0.243) | 0.597 (0.037) |
| 1970 | 6847 | −1.948 (0.400) | 0.738 (0.066) | −1.180 (0.237) | 0.620 (0.036) |
| 1972 | 5187 | −3.280 (0.421) | 0.368 (0.077) | −1.828 (0.284) | 0.438 (0.049) |
| 1973 | 5274 | −3.185 (0.428) | 0.407 (0.084) | −1.518 (0.280) | 0.487 (0.052) |

[a] Feldstein and Taylor (1976). Price accounts for Federal and state taxes.
[b] Boskin and Feldstein (1977).
[c] Eq. (2.1) in Feldstein and Taylor and (1) in Boskin and Feldstein.
[d] It is assumed that itemizers in groups IV and VI would have been itemizers if they had made no contributions.

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