Distinguishing Transitory and Permanent Price Elasticities of Charitable Giving with Pre-Announced Changes in Tax Law

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Abstract:

This paper develops and applies a new estimation technique for distinguishing transitory and permanent price and income elasticities of charitable giving using panel data. Twelve-year individual averages of income and deductions are combined with information on legislated changes in tax schedules, to construct instruments for permanent price and income variation. Unlike the previous literature, pre-announced changes in tax law are used to identify transitory variation, and fixed-effects are used to control for unobserved heterogeneity. The timing of giving is found to be significantly more responsive to tax incentives than is the long-run level of giving.

JEL Classifications: H24, H31, D12, D91

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Introduction

The U.S. personal income tax provides a valuable incentive for charitable giving, in the form of a deduction from taxable income, and has done so continuously since just four years after its inception in 1913. For taxpayers whose total itemized deductions (such as charitable giving, home mortgage interest, and state income tax payments) exceed a standard deduction ($7,350 for a married couple filing jointly in 2000), the price of one dollar of charitable giving is effectively reduced to one minus the marginal tax rate.[1]

The charitable deduction provides an alternative method, other than direct government spending, for increasing the provision of public goods and achieving redistribution towards the needy.[2] Given that in the U.S., government provision of public goods and the degree of redistribution are decided by representatives of the majority, the tax incentive is sometimes justified as way of providing a greater role for minority preferences and direct individual choice. Other potential advantages are that that individuals may be better at the margin than government at selecting and monitoring public good activities, and that an individual may get more utility from making a contribution to the public good of his or her choice than from making tax payments. On the other hand, the charitable deduction makes the taxpaying process more complicated and administratively costly, provides a convenient opportunity for evasion, and may subsidize some contributions that are more like private than public goods. Moreover, the presence of the charitable deduction requires that marginal income tax rates be higher than they would otherwise have to be to raise the same revenue. Thus, the deduction may be viewed as effecting a transfer away from less-charitable households, towards more-charitably inclined households and/or the charities they support.[3] To the extent that the transfer becomes a windfall to givers, it may be horizontally inequitable, capriciously redistributing income based on tastes.[4] Although the transfer itself may not represent a deadweight loss, it may also impose some efficiency costs by raising marginal tax rates.[5] These are some of the reasons why many proposals for fundamental tax reform, such as the Flat Tax, would do away with the deduction.[6]

The price-elasticity of charitable giving is an important piece of information for evaluating the desirability of the charitable deduction. It determines to what extent the incentive is effective at increasing giving, or is merely a windfall to givers. A price elasticity of negative one is a critical value, because at that point the additional charity induced by the incentive just offsets the loss of government revenues. A price elasticity of zero is also critical, as it would imply that the incentive has no effect on giving, and accomplishes little but to complicate the tax code and redistribute income towards charitable people. Between these two critical values, some of the transfer goes to charities, and some goes as windfall to charitable households; a larger absolute elasticity implies more of the transfer is actually going to charities. Because of the many, varied pros and cons of the deduction, it may be impossible to establish an exact threshold that the price elasticity of giving must achieve for it to be a desirable policy. Still, a higher price elasticity clearly strengthens the case for the deduction, while a lower price elasticity weakens it.

The relevant elasticity for evaluating the effectiveness of the charitable deduction is the elasticity of long-run giving with respect to a long-run, or "permanent," change in price. Empirically, this can be very difficult to distinguish from the response to a temporary difference between current and expected future prices, or from responses to permanent or transitory variation in disposable income. In addition to the strong policy relevance of the permanent price elasticity, all of these transitory and permanent price and income elasticities are interesting in their own right as evidence on a particular aspect of consumer behavior, and are useful for government revenue estimation and planning by charitable organizations. The purpose of this paper is to overcome the many econometric challenges to consistent estimation of each of these elasticities.

A central econometric difficulty that this paper addresses is how to distinguish transitory from permanent price variation. In cross-sectional data, we only observe the current price a taxpayer faces in a given year. Many previous studies have examined the relationship between current price and current charitable giving in cross-sectional data, and generally found a strong association in the expected negative direction. However, an important variable is omitted from such a specification: the expected future price of giving. If the current price is different from the expected future price, and if people are willing to respond by changing the timing of their giving, then estimates that involve only the current price would give a biased impression of what we are most interested in, the permanent price elasticity.

There are three major reasons why differences between current and expected future prices are likely to be both common and important. First, there are random fluctuations in income. If current income is believed to be temporarily high, this will push the taxpayer into a higher tax bracket than normal, creating a temporarily low price. This creates a strong incentive to intertemporally substitute some extra giving today for less tomorrow. Second, taxpayers have an incentive to intentionally time their other deductions and realizations of income along with charitable giving. For instance, if someone decides to make a large contribution to charity this year, they will have an incentive to also realize a large capital gain, which will push them into a higher tax bracket and reduce the price of giving. This sort of transitory price variation is worth distinguishing from the first type, because in this case price may be endogenously determined in response to charity, which would lead to inconsistent estimates of the response of charity to a truly exogenous price change. The third sort of variation occurs because changes in tax law are often pre-announced or gradually phased in over time. In recent U.S. history, there have been many years where current and known future marginal tax rates at a given income level differed substantially because of enactment and gradual implementation of new tax laws. For these three reasons, the association between current prices and current giving may simply represent intertemporal substitution of giving, or endogenous timing of other income and deductions, and does not necessarily tell us anything about the effectiveness of the tax incentive at increasing the long-run level of giving.

For the same reasons, current and expected future or "permanent" income may frequently differ, and we might expect the responsiveness of giving to each to differ as well. Households might be expected to smooth charitable giving across transitory income fluctuations, as they would with any other type of consumption according to Friedman's (1957) permanent income hypothesis. In that case, the cross-sectional income elasticity would be a mixture of a higher permanent elasticity and a low or zero transitory elasticity. Similarly, if income is measured with error, and measured income is more variable than true income, then we would expect giving to be more responsive to a persistent measure of income than to current measured income. On the other hand, charitable giving might conceivably be used to help smooth other consumption, perhaps because liquidity constraints, imperfect capital markets, and uncertainty make this less costly to the individual than borrowing. In that case, giving might be responsive to current income even after controlling for permanent income.

Another set of challenges involves separately identifying tax-price and income effects, and controlling for unobservables. The marginal tax rate is largely just a nonlinear function of income. In a given year, this function is the same for everyone, except for some variation introduced by factors such as marital status, which may have an independent influence as well. In addition to the obvious problems of collinearity arising from this, Feenberg (1987) has emphasized the potential for inconsistency. Price may serve as a proxy for some arbitrary and unknowable nonlinear effect of income, or for some unobservable variables that are associated in a nonlinear way with income. For example, suppose variables that are unobservable in our data set, such as personal generosity, religiosity, or education, are each related to current income by some arbitrary nonlinear function. It is easily recognized that this could bias estimates of the income effect. Since price is a nonlinear function of income, moreover, it may also serve as a proxy for the nonlinear relationship between these omitted variables and income. In this case the price coefficient would be inconsistently estimated even after controlling for current income and/or some proxy or instrument for permanent income. To the extent that these omitted variables are time-invariant for an individual, the price effect could be consistently estimated using a fixed-effects specification on panel data, provided there is sufficient time-series variation in tax law to provide identification.[7]

This paper uses a panel of U.S. individual income tax returns spanning the major tax law changes between 1979 and 1990, which allows me to address all of these problems through a two-stage-least-squares fixed-effects approach. The marginal tax rate at the highest levels of income was reduced from 70 percent to 50 percent by a 1981 act, lowered again to 28 percent by a 1986 act, and then raised to 31 percent by a 1990 act. Marginal rate changes varied greatly in magnitude across the population, depending on one's starting level of income. Average tax rates were also reduced, particularly for upper-income groups, by the 1981 act, but were affected very little by the 1986 act. This provides time-series changes in both tax-price and disposable income that are independent of changes in pre-tax income and vary significantly across individuals, so that they can be distinguished from year effects. The estimation procedure uses information on individual average income and deductions over 12 years, together with known changes in the tax schedules, to construct exogenous instruments for changes in long-run tax-price and disposable income. Moreover, because the changes in tax rates were pre-announced and phased-in over time, there was a large and clear divergence between current and expected tax rates in half of the years in the sample. I utilize this feature of the tax reforms to construct instruments for transitory variation in price and disposable income. The results suggest that aggregate charitable giving has a negative but probably small permanent price elasticity, and a large negative transitory price elasticity. In other words, taxpayers are found to be significantly more willing to change the timing of their giving than to change their long-run level of giving in response to tax incentives.

Previous literature

A voluminous literature measuring the elasticity of charitable giving using cross-sectional data generally found a large price elasticity and moderate income elasticity. These studies often regressed the log of charitable giving on the logs of tax-price and income, sometimes using the "first dollar" tax rate on charitable giving (i.e., the marginal rate evaluated at zero dollars of giving) as either an instrument or a proxy for the "last dollar" marginal rate. Clotfelter (1985) summarized this literature, pointing to the estimate in Clotfelter and Steuerle (1981) of a price elasticity of -1.27 and an income elasticity of +0.78 as typical. A more recent review is provided in Steinberg (1990), who notes some more mixed results. To varying degrees, these cross-sectional studies suffered from all four of the econometric problems discussed above. For example, the high price elasticity could represent a mixture of a high responsiveness to transitory price variation and endogenous timing of other income and deductions, with a low permanent price elasticity. Auten, Cilke, and Randolph (1992) found that the price elasticity estimates from these cross-sectional models significantly over-predicted the response of charitable giving to the tax changes of the 1980s, and suggest that the failure of these models to distinguish between transitory and permanent effects in estimation could be to blame. Clotfelter (1990), however, using somewhat different techniques and data, contends that the traditional cross-sectional estimates provided reasonably good predictions of responses to tax changes during the 1980s.

The state-of-the-art panel study on this subject to date is Randolph (1995).[8] Randolph estimates a dynamic and flexible model of charitable giving on a very large, confidential Treasury Department panel data set which heavily over-samples high-income taxpayers and spans the years 1979-88. He uses a modified instrumental variables approach to attempt to separate out transitory and permanent income and price effects, and to remove the effects of potential endogeneity arising from the effect of charitable giving, and the joint timing of other deductions, on the tax rate. Randolph's results suggest giving is extremely responsive to transitory price variation, but is influenced little, and possibly in an unexpected positive direction, by permanent price variation. The elasticity with respect to transitory fluctuations in income is small but positive, while the elasticity with respect to permanent income is found to be close to one.

My approach improves on Randolph's methodology in a number of critical dimensions. Randolph's instrument set is inefficient, as it does not use known information about the tax schedules. It also becomes collinear when differenced from individual means, leading him to use a random-effects specification, which will only be consistent if the unobserved individual effects are uncorrelated with the regressors. The approach used in this paper utilizes all of the information on exogenous changes in tax law that was in a taxpayer's information set at any given time, and is able to accommodate fixed-effects. Moreover, Randolph's procedure cannot address transitory variation in price or disposable income introduced by pre-announced changes in tax law. Instead of utilizing this important source of identification, he actually omits transition years from estimation, and attempts to separately identify permanent and transitory effects based on how current income differs from average income in "normal" years. The consistency of this approach requires the difference between current and average income to be uncorrelated with true permanent income and with the error in the giving equation, neither of which is likely to be the case. In addition, Randolph's method for converting coefficient estimates into representative elasticities yields results that are very different from aggregate elasticities that are most relevant for policy purposes. This paper shows how to calculate the appropriate aggregate elasticities and demonstrates that it can make a substantial difference in interpreting the results. The advances in this paper may have other applications as well, as an approach similar to Randolph's has been used to study transitory and permanent tax effects in other contexts, such as capital gains realizations (Burman and Randolph 1994b, Koch 1994).

Barrett, McGuirk, and Steinberg (1997) analyze the effect of marginal tax rates on charitable giving using the 1979–1986 portion of the public-use individual tax return data used in the present paper. Using a log-log specification, their findings are similar to the main results reported by Randolph. The long-run permanent price elasticity is found to be –0.47 and the transitory price elasticity is estimated at –1.40. They examine the possibility of habit formation in giving, by including lagged giving in the specification, and they conclude that the habit formation effect is very small. Their estimation procedure suffers from a few shortcomings that are addressed in this paper. First, they use the "first dollar" marginal tax rate (assuming zero charitable giving) as a proxy variable, rather than using a more appropriate instrumental variables approach. They also fail to account for the possible endogeneity arising from joint timing of charity with discretionary income realizations and deductions. They do allow for expected changes in tax schedules to affect current giving by treating the next period's marginal tax rate as a proxy for the expected permanent rate. However, this presumes that intertemporal substitution can only occur across consecutive years, and is also subject to bias from measurement error and possible serial correlation of transitory income variation across years. In addition, their data do not span the Tax Reform Act of 1986, which serves as a useful natural experiment. The present paper will address all of these problems.

Auten, Sieg, and Clotfelter (2000) analyze the same panel data used by Randolph, extended forward to 1990. They apply a sophisticated and flexible econometric approach for modelling transitory and permanent income and price variation, adapting a technique from the literature on testing the permanent income hypothesis. Their approach also controls for unobserved heterogeneity by first-differencing the data. In contrast to most other panel studies, their estimates of the permanent price elasticity are closer to those found in the traditional cross-sectional literature, and their transitory price elasticity estimates are small. A serious drawback of their approach, however, is that they do not explicitly model the effects on people's expectations of pre-announced changes in future tax rates arising from tax reforms. Such changes played a very important role during the time period they study, and their estimates are likely to be biased as a result. For example, as discussed below, there was a large observed spike in giving for high-income people during 1986, which corresponds to the fact that people knew in advance that their tax rates would be reduced significantly in the future due to the Tax Reform Act of 1986. This spike should thus be attributed to transitory variation between the current and expected future price in 1986. But the Auten, Sieg, and Clotfelter approach does not do this, because their methodology does not account for the fact that the future changes in tax rates were already announced in 1986. As a result, their procedure treats the ensuing drop in giving by high-income people between 1986 to 1987 as a long-run response to an unexpected persistent decline in the marginal tax rate starting in 1987. This would bias the permanent price elasticity upwards. One major contribution of my paper is to develop a methodological approach that addresses exactly this problem.

Historical changes in tax law and aggregate charitable giving

To provide some background, this section will briefly review the changes in the U.S. personal income tax which occurred between 1979 and 1990, which provide an extremely useful source of identification for studying charitable giving behavior. It will also review how aggregate giving changed over this period, demonstrating the apparent importance of timing effects and offering some perspective.

The key elements of the tax changes over the sample period are summarized in Table 1. There were dramatic and persistent changes in the structure of marginal tax rates over this period, and the size of these changes varied greatly depending on income level. The Economic Recovery Tax Act of 1981 (ERTA81) reduced the rate in the top bracket from 70 percent to 50 percent, and eventually cut marginal rates in brackets below that by about 23 percent of their former levels.[9] The reduction in the top rate was larger than that for other rates, and inflationary bracket creep offset some of the decline in marginal rates for people below the top bracket, until indexing of brackets (also enacted in ERTA) was implemented after 1984. For these and other reasons, the change in both marginal and average rates was larger for the very highest-income people than for others. The Tax Reform Act of 1986 (TRA86) eventually collapsed 14 or 15 tax brackets (depending on filing status) with a top rate of 50 percent, into just two brackets of 15 and 28 percent (plus a 33 percent "bubble" bracket due to the phase-out of personal exemptions over a certain income range). The resulting change in marginal tax rates varied greatly depending on income level, with extremely large reductions benefiting those with the very highest incomes, successively smaller reductions applying to moderately high-income people, and little change or an increase for low- and middle-income taxpayers. Because of offsetting changes in the tax base, such as elimination of certain itemized deductions that were used mainly by upper-income people, there was little change in average tax rates after 1986. The Omnibus Budget Reconciliation Act of 1990 (OBRA90) increased the top rate from 28 to 31 percent, and also enacted a limitation on itemized deductions that could increase the price of giving in certain income ranges, both taking effect in 1991.[10]

A second important feature of these tax changes is that they were enacted and announced in the year prior to when they began to take effect, and they were usually phased-in gradually over time. As a result, in half of the years in the sample period, the current tax-price of charitable giving was known to differ from the future tax-price in a systematic way. The rate reductions in ERTA81 were announced in August 1981, but were to be phased-in gradually from 1982 through 1984. The enactment of TRA86 occurred in October 1986, when it was known that there would be a transitional top rate of 38.5 percent in 1987, and a different tax schedule with a top rate of 28 percent in 1988 and thereafter. OBRA90 was signed into law in November 1990, to be implemented beginning in 1991. In 1981, 1986, and 1990, there was room to adjust end-of-year giving in response to the sometimes very large divergence between the current and future tax rates. In 1982, 1983, and 1987, there was a known difference between the current and future rate throughout the year, due to gradual implementation of a past reform. An important distinction in my paper, also noted in Table 1, will be between the current year, indexed by *t*, and the next future year in which the currently announced tax law is phased-in completely, indexed by *s*. For example, when *t* is 1986, *s* is 1988.

Figures 1 through 3 and Table 2 present some illustrative aggregate time-series evidence on how the tax-price of giving, average tax rates, and charitable giving changed between 1979 and 1990, for people with incomes above and below $100,000 in constant 1990 dollars. These are based on the 1979 through 1990 IRS public use individual tax return files, which are very large cross-sectional data sets of tax returns which heavily over-sample high income people (a weight is applied to make the results nationally representative). A consistent definition of income is used across the years, and capital gains are excluded from both income and tax liability calculations.[11] Figure 1 also removes anyone whose total itemized deductions, excluding charitable giving (which is endogenous) and state and local sales tax deductions (which were disallowed after 1986), is less than the 1990 standard deduction, in constant dollars. This should largely remove the effects of people whose contributions became unobservable, as the 1990 standard deduction is the largest in real dollars over the sample period.

Figure 1 illustrates the nature of the tax-price changes. For those above $100,000, there was a large rise in the tax-price of giving over the period, from an average of 0.47 in 1979 to 0.67 in 1990. Prices for taxpayers with incomes below $100,000 were comparatively small, on average. Average tax rates, pictured in Figure 2, also changed very little for those below $100,000, with a decline of about 2 percentage points due to ERTA81 and not much change otherwise. On the other hand, people with incomes above $100,000 saw their average tax rates decline substantially due to ERTA81; they fell from 27.6 percent to 21.6 percent between 1981 to 1984. In contrast, average tax rates for high-income people declined only slightly following TRA86, despite large cuts in marginal rates. This is useful because it greatly reduces the collinearity between average and marginal rate changes. The large difference in changes in average and marginal rates between the high- and middle-income groups is also critical for identification, as is the large variation in changes within each of these groups, not pictured here. People with little or no change in tax rates effectively serve as a very large control group. Good identification of transitory income and price effects arises because some years had large temporary deviations between anticipated and current values for both average tax rates (due to ERTA81) and marginal tax rates (due to both ERTA81 and TRA86), and because these too affected upper-income people more than others.

Figure 3 provides suggestive evidence that charitable giving, and particularly its timing, is sensitive to its tax-price. It depicts charitable contribution deductions as a percentage of pre-tax income (excluding capital gains) for each income group. While the group below $100,000 exhibited very little change in giving, the story is different for the upper-income group. First of all, they exhibit a surge in giving in 1981, and a large spike in giving in 1986, which are consistent with timing of giving in response to knowledge that its price would be increasing in the future. The gradual declines between 1982 and 1984, and 1987 to 1988, are also consistent with timing in response to the phase-in of lower tax rates (higher prices). There is also some support for the notion that long-run giving is sensitive to prices, as giving by high-income people declined somewhat by 1984, spiked up again probably due to timing, and then hit its lowest level throughout the post-1986 period. As tax-prices converged for the low- and high-income groups over the sample period, so too did charitable giving a percentage of income.

A key lesson to draw from Figure 3 is the importance of distinguishing between responses to transitory and permanent variation in prices. The large apparent timing response in 1986 suggests that even in a year without an expected change in tax law, random fluctuations in income which cause someone to have an unusually low or high tax price that year could cause a large amount of intertemporal substitution of giving. Failure to distinguish this could give us a misleading impression of the long-run response of giving to a long-run change in price.

Theoretical model and empirical specification

In keeping with previous empirical work in this area, charitable giving is treated here as a consumption good, which provides some utility to the giver; this is sometimes called the "warm glow" model of charity (Andreoni 1987). The demand for charitable donations by givers has been modeled in the literature as a function of its tax-price, disposable income, and several demographic characteristics, using a variety of functional forms. My empirical specification will be based on Deaton and Muellbauer's (1980) flexible "almost ideal demand system" (AIDS). Randolph (1995) motivates a tractable dynamic version of this functional form using a very simple model of consumer choice between the goods "current giving" and "future giving," which I will briefly sketch here.

Consider the following two-period consumer optimization problem,

$$\begin{aligned} &\max \quad U(g_{i1}, g_{i2}, C_{i1}, C_{i2}) \\ &subject\,to: \\ &P_{i1}g_{i1} + \left(\frac{1}{1+r}\right)P_{i1}*g_{i2} + C_{i1} + \left(\frac{1}{1+r}\right)C_{i2} = Y_{i1} + \left(\frac{1}{1+r}\right)Y_{i1}* \end{aligned} \quad (1)$$

where g_{it} is charitable giving by individual *i* at time *t*, C_{it} is other consumption, *r* is the interest rate, and P_{it} is the relative price of charitable giving, which equals $1 - \tau'_{it}$, where τ'_{it} is the marginal tax rate. Throughout the paper, a "*" indicates the expectation at time t of future "permanent" value of a variable. The "permanent" value can change when new information arrives, such as enactment of a tax reform. In order to approximate the true nonlinear budget constraint caused by taxes with the more tractable linear constraint above, income is defined as "modified after-tax income," Y_{it}, where:

$$Y_{it} = y_{it} - \tau_{it} - g_{it}\tau'_{it}, \quad (2)$$

Here, y_{it} is pre-tax income and τ_{it} is income tax payments. The last term above is included to adjust for the fact that infra-marginal giving may be deducted at higher rates than the marginal rate in a progressive tax structure. This is analogous to the "virtual income" familiar from the analysis of labor supply under a progressive tax schedule.[12]

When framed as in (1) above, the problem of deriving a demand equation for charitable giving becomes similar to that of any other consumer good. Deaton and Muellbauer's "almost ideal demand system" is a flexible functional form that serves as an approximation to the demand equations derived from a reasonably general class of expenditure functions. In this context, the Deaton-Muellbauer specification would be:

$$w_{i1} = \frac{g_{i1}P_{i1}}{E_i} = g_1 \ln P_{i1} + g_2 \ln\left(\frac{1}{1+r}\right)P_{i1}* + g_3 \ln E_i \quad (3)$$

where E_i is the present value of total expenditures, and ω_{it} is the share of total expenditures devoted to charity.

A number of adjustments need to be made to specification (3) for the purposes of this application. First, because information on total expenditures is not available in the tax return data used in this paper, income must be used instead.[13] Second, both current (Y_{it}) and permanent (Y_{it}*) modified after-tax income are included in lieu of expenditures as explanatory variables. Current income may have some effect on giving even after controlling for permanent income. Households may not smooth their consumption perfectly over time due to borrowing constraints or uncertainty, and charitable giving might be more sensitive to current income than other types of consumption if it is viewed as less of a necessity or more of a durable good. Both current and permanent income are included in the specification to test this hypothesis.

Other influences on charitable giving are controlled for in the specification as follows. An individual-specific intercept (α_i) is included to control for unobservable time-invariant individual characteristics, such as personal generosity, education, and religiosity. A time intercept (α_t) is added to control for aggregate factors that change in the same way for everyone over time, such as the state of the economy and government spending on public goods. The time intercept absorbs the effects of the *average* changes in tax prices, incomes, and other variables over time. Results thus depend entirely on how relative changes in individual giving respond to relative changes in prices and income over time. A vector $\mathbf{X}_{it}$ of observable demographic variables is also included. In the public-use tax data, these are limited to a dummy variable equal to one if married, a dummy equal to one if the primary taxpayer or spouse is aged 65 or over, and the number of personal exemptions (other than for age or blindness), which approximates household size.[14] These adjustments to the almost ideal demand system yield an equation of the form:

$$w_{it} = \frac{g_{it} P_{it}}{Y_{it}} = a_i + a_t + \mathbf{X}_{it} b + g_1 \ln P_{it} + g_2 \ln P_{it}* \\ + g_3 \ln Y_{it} + g_4 \ln Y_{it}* + e_{it}, \quad (4)$$

where ε_{it} is a random error term. Note that interest rates are absorbed into the time intercepts, assuming they are constant across individuals in a given year. To ease interpretation, this can be re-written as:

$$w_{it} = \frac{g_{it} P_{it}}{Y_{it}} = a_i + a_t + \mathbf{X}_{it} b + d_1 \ln(P_{it} / P_{it}*) + d_2 \ln P_{it}* \\ + d_3 \ln(Y_{it} / Y_{it}*) + d_4 \ln Y_{it}* + e_{it}, \tag{5}$$

where $\delta_1 = \gamma_1$, $\delta_2 = \gamma_1 + \gamma_2$, $\delta_3 = \gamma_3$, and $\delta_4 = \gamma_3 + \gamma_4$. In this form, δ_1 measures the effect of a temporary difference between the current and expected future price. δ_2 measures the effect of an equal proportional change in both the current and future expected price, and thus measures the long-run response to a change in the permanent price. Analogous interpretations apply to δ_3 and δ_4 for income.

This will serve as my basic empirical specification. Randolph makes an additional *ad hoc* adjustment to the almost ideal demand system to introduce some extra flexibility. To the right hand side of equation (5) above, he adds:

$$d_5 [\ln(P_{it} / P_{it}*)]^2 + d_6 [(\ln P_{it})(\ln P_{it}*)] \tag{6}$$

This will allow elasticities to vary depending on the level of one's price. Results from this extended specification are also presented in the empirical section as a sensitivity analysis.

The primary empirical results of interest will be elasticities. An important consideration in interpreting the results will be how to convert the estimated coefficients from the AIDS specification (5) into elasticities. The elasticities take the form:[15]

Permanent price elasticity:

$$e_{g,P*} = \frac{P*}{g} \frac{\partial g}{\partial P*}\Big|_{d(P/P*=0)} = \frac{d_2}{w} - 1 \tag{7}$$

Transitory price elasticity:

$$e_{g,P} = \frac{P}{g}\frac{\partial g}{\partial P}\Big|_{dP^*=0} \quad = \quad \frac{\delta_1}{\omega} \quad -1 \tag{8}$$

Permanent income elasticity:

$$e_{g,Yd^*} = \frac{Yd^*}{g}\frac{\partial g}{\partial Yd^*}\Big|_{d(Yd/Yd^*=0)} \quad = \quad \frac{\delta_4}{\omega} \quad +1 \tag{9}$$

Transitory income elasticity:

$$e_{g,Yd^*} = \frac{Yd^*}{g}\frac{\partial g}{\partial Yd^*}\Big|_{d(Yd/Yd^*=0)} \quad = \quad \frac{\delta_3}{\omega} \quad +1 \tag{10}$$

The elasticities in this AIDS specification vary depending on the share (ω) at which they are evaluated, which can significantly affect our interpretation of the results. Note that this differs from the more commonly used log-log specification, which restricts the elasticities to be constant across the population. For policy purposes, we are often interested in the elasticity of aggregate charitable giving with respect to a uniform incremental percentage change in price across a population. In particular, this is what is relevant for the "critical revenue elasticity" discussed in the introduction, and is also what has generally been reported in the previous literature. We may also be especially interested in the elasticity applying to a particular group. For instance, the aggregate elasticity of giving in the population of high-income taxpayers (say, those with incomes above $100,000) is especially interesting, because changes in tax law frequently affect the marginal tax rates of this group without having much effect on the rates of the rest of the population.

When the specification allows the elasticity to vary across individuals as this one does, an aggregate elasticity can be constructed for a given sample by calculating the elasticity for each individual at their own share of giving, and computing a giving-weighted mean of these elasticities. The formula for this "aggregate elasticity" is simply:[16]

$$e_a = \frac{\sum_i e_i g_i}{\sum_i g_i} \qquad (11)$$

In the AIDS specification, it can be shown[17] that for a given price level, elasticities calculated according to equation (11) are exactly identical to the elasticity evaluated at a single value of ω, the aggregate expenditure on giving as a share of aggregate expenditure (income), which I will call the "aggregate share" (ω_a):

$$w_a = \frac{\sum_i g_i P}{\sum_i Y_i} \qquad (12)$$

The equivalence of the two approaches is related to the feature of the AIDS that it allows aggregation across consumers, i.e. it is consistent with a representative consumer model. When prices vary across the population, this relationship will no longer be exact, but in the empirical results section below, I find the results are very similar either way.

Randolph's paper emphasizes elasticities evaluated at a single point, the "giving-weighted mean share." These are meant to be representative of aggregate elasticities, but are actually very wide of that mark. The giving-weighted mean share is defined as:

$$\tilde{w} = \frac{\sum_i \left[g_i \left(\frac{g_i P_i}{Y_i} \right) \right]}{\sum_i g_i} \qquad (13)$$

This is not equivalent to (12), and in my data turns out to be substantially larger. For example, in my data set, which is based on a random sample of taxpayers, the giving-weighted mean share is 0.077, which is fairly close to Randolph's value of 0.085 (see Table 1.3). But the aggregate share (which is not reported in Randolph) is only 0.023 in my sample. Even for observations with income above $100,000 in my sample, the aggregate share is only 0.026, so the difference is probably not due to the greater concentration of high-income individuals in Randolph's sample. As we will see in the results section, this can make a major difference in the interpretation of the results.

Econometric methodology

The problems of separately identifying transitory and permanent price and income effects, removing endogeneity, and controlling for unobserved time-invariant characteristics are all handled in this paper in a fixed-effects two-stage-least-squares framework. Transitory variation in both price and disposable income are identified entirely based on changes in tax law over time, which is very likely to be a truly exogenous source of variation.

Let *t* be the current year, and let *s* be either the current year or the next year in which the latest announced tax law is fully implemented. For example, when *t* is 1986, *s* is 1988 (see Table 1.1 for a complete listing). Although we cannot directly observe people's expectations about the "permanent" price of giving, the price at period *s* can be viewed as a measure of the expected permanent price with error. The period *s* tax price reflects the full implementation of any prospective changes in tax schedules that were already set into law as of period *t*. I assume the relationship can be approximately represented as:

$$\ln P_{is} = \ln P_{it} * + m_{Pis} + v_{Pis} \qquad (14)$$

P_{is} is the actual price that the taxpayer ends up realizing in future year *s*, and $P_{it}*$ is the taxpayer's expectation at time *t* of what the future price will be. The μ_{Pis} term represents variation in P_{is} induced by random fluctuations in income, and the v_{Pis} term represents variation caused by intentional timing of income and deductions. Assuming both these terms are mean-zero, we are faced with a standard instrumental variables problem. We need an instrument correlated with the $\ln P_{it}*$ but uncorrelated with μ_{Pis}, v_{Pis}, and ε_{it}, conditional on $\mathbf{X}_{it}$, α_i and α_t.

The instrument I construct for this purpose is $\ln P_s(\overline{M}_{is})$ -- the log price function based on the known year s tax schedules, evaluated at an "averaged" measure of taxable income $\overline{M}_{is}$ which is purged of transitory fluctuations, timing, and endogeneity. $\overline{M}_{is}$ is based on 12-year individual averages[18] of pre-tax income and deductions (other than charitable), adjusted for known features of the year *s* definition of taxable income such as the value of personal exemptions, whether long-term capital gains are excludable from income, and whether state and local sales tax deductions are allowed. It will be defined more precisely in the data section below.[19]

Transitory price variation can be addressed similarly. It can be broken down into the following components:

$$\ln(P_{it} / P_{it}*) = \left[\ln P_t(M_{it}*) - \ln P_s(M_{is}*)\right] + \mu_{Pit} + \nu_{Pit} \tag{15}$$

The first component on the right hand side represents the systematic difference between current and future prices that is due to a pre-announced change in tax law. $M_{it}*$ and $M_{is}*$ are the expectation at time *t* of "permanent" taxable income, under year *t* and year *s* law, respectively. Note that that $\ln P_s(M_{is}*)$ is equivalent to $\ln P_{it}*$. As above, the other two components μ_{Pit} and ν_{Pit} represent variation in the current tax price arising from random income fluctuations and intentional timing, respectively.

The transitory price deviation $\ln(P_{it}/P_{it}*)$ is not directly observable, again because $P_{it}*$ cannot be observed. In this case $\ln(P_{it} / P_{is})$ can be viewed as measure of the transitory price deviation, with error. It, in turn, can be decomposed into:

$$\ln(P_{it} / P_{is}) = \left[\ln P_t(M_{it}*) - \ln P_s(M_{is}*)\right] + (\mu_{it} - \mu_{is}) + (\nu_{it} - \nu_{is}) \tag{16}$$

Combining (7) and (8) and yields:

$$\ln(P_{it} / P_{is}) = \ln(P_{it} / P_{it}*) - \mu_{Pis} - \nu_{Pis} \tag{17}$$

where μ_{Pis} and ν_{Pis} are once again mean zero random and endogenous variation. Here we need an instrument which is correlated with $\ln(P_{it}/P_{it}*)$ but not with ε_{it} nor with the endogenous ν's. In addition, the instrument must be uncorrelated with the μ's, since inclusion of a μ-correlated variable in the instrument set would lead to inconsistent estimates of the permanent effect. This leaves only variation caused by systematic pre-announced changes in the tax schedule as the basis for a valid instrument. The instrument constructed for transitory variation in price is $[\ln P_t(\overline{M}_{it}) - \ln P_s(\overline{M}_{is})]$, that is, the difference between year *t* and year *s* marginal tax rates due entirely to legislated changes in the tax schedules, evaluated at the aforementioned "averaged" measures taxable income.

An exactly analogous procedure is used to construct instruments for permanent and transitory variation in modified after-tax disposable income, based on average tax rates. The instrument for permanent income is $\ln(1\text{-}ATR_s(\overline{M}_{is}))$, where $ATR_s(.)$ is the pre-announced period-*s* average tax rate function. The instrument for transitory income variation is $[\ln(1\text{-}ATR_t(\overline{M}_{it})) - \ln(1\text{-}ATR_s(\overline{M}_{is}))]$. In addition, two additional instruments are included which are based on the log of individual mean pre-tax income, interacted with dummies for the latter two expected-tax regimes (1981-1985 and 1986-1990). These are denoted $d_2\ln(\bar{y}_i)$ and $d_3\ln(\bar{y}_i)$, respectively. (Note that pre-tax income, *y*, differs from taxable income, *M*, because of a variety of adjustments, deductions, exclusions, and exemptions; further details are provided in the data section). This is intended to capture any other changes in tax law which are not easily modeled in my other instruments but which changed across the different tax regimes in a way that depended on one's level of income.[20]

To summarize, the estimation procedure is fixed-effects two-stage-least-squares on the following equation:

$$w_{it} = \frac{g_{it}P_{it}}{Y_{it}} = a_i + a_t + \mathbf{X}_{it}b + d_1\ln(P_{it}/P_{is}) + d_2\ln P_{is} + d_3\ln(Y_{it}/Y_{is}) + d_4\ln Y_{is}* + e_{it}, \tag{18}$$

where P_{is} and Y_{is} are viewed as measurements, with error, of expected permanent price (P_{it}*) and expected permanent disposable income (Y_{it}*), respectively. Similarly, P_{it}/P_{is} and Y_{it}/Y_{is} are viewed as measurements with error of the transitory variation in price (P_{it}/P_{it}*) and transitory variation in disposable income (Y_{it}/Y_{it}*), respectively. The set of excluded instruments for these four endogenous and erroneously measured variables are:

- $\ln P_s(\overline{M}_{is})$
- $[\ln P_t(\overline{M}_{it}) - \ln P_s(\overline{M}_{is})]$
- $\ln(1\text{-}ATR_s(\overline{M}_{is}))$
- $[\ln(1\text{-}ATR_t(\overline{M}_{it})) - \ln(1\text{-}ATR_s(\overline{M}_{is}))]$
- $d_2\ln(\bar{y}_i)$
- $d_3\ln(\bar{y}_i)$

The full set of excluded instruments replaces the set of endogenous / measured-with-error variables on the right-hand-side in each of the first-stage regressions for predicting the endogenous / measured-with-error variables, as is standard in 2SLS.[21] [22]

Randolph's approach contrasted

The estimation procedure used in Randolph's 1995 paper is summarized briefly here to highlight the key differences. His instruments for the permanent variables, denoted $\mathbf{Z}_{it}$*, are limited to $\ln(\bar{y}_i)$, $d_2\ln(\bar{y}_i)$, and $d_3\ln(\bar{y}_i)$, which are the log of average pretax income, and its interactions with a dummy for the period between ERTA81 and TRA86, and a dummy for the period after TRA86, respectively. These are intended to serve as instruments for both permanent price and permanent income, based on the idea that marginal and average tax rates each changed across the three major tax regimes in a way that depended on one's level of income. No specific tax schedule information is used, which sacrifices considerable efficiency. There could be a bias problem as well if there is some residual endogeneity in the instruments or if there is small sample instrumental variables bias.[23]

The first-stage regressions are performed by ordinary least squares, and an adjustment for random-effects is applied in the second stage. Randolph does not use a fixed-effects approach because his model becomes perfectly collinear when individual dummies are included (or, equivalently, when the data are differenced from individual means). Randolph’s primary instrument, $\ln(\bar{y}_i)$, does not change over time for an individual, so its effect is indistinguishable from the individual-specific constant used in fixed-effects estimation. It has no exogenous variation that would enable us to separately identify its effects from those of any unobserved time-invariant influences. A fixed-effects version of his model could be estimated if $\ln(\bar{y}_i)$ (as well as age) were omitted, but this would make an already weak instrument set that much weaker. Unlike fixed-effects, a random-effects specification requires that any time-invariant unobserved influences must be uncorrelated with the included regressors, meaning that its consistency is no more robust to omitted variables than a cross-section estimate, and it is only potentially more efficient. As discussed above, we might expect this to bias our estimates of price effects even after controlling for income, as price may serve as a proxy for a non-linear relationship between income and omitted time-invariant characteristics.

Randolph constructs $\ln \hat{P}_{it}*$ and $\ln \hat{Y}_{it}*$ by regressing *current-year* (*t*) log price and income, on α_t, $\mathbf{X}_{it}$ and $\mathbf{Z}_{it}*$, based on the idea that current-year price and modified-after-tax income are measures of their permanent values with error. Using the current-year values as measures of expected permanent values, however, causes problems when there are pre-announced changes in tax law. In "transition years" such as 1981, 1982, 1983, 1986, or 1987, the current price can no longer be thought of a measure of the permanent price with error. The current price in those years is known to differ systematically and significantly from the expected permanent price. This systematic component of the difference is strongly correlated with one's level of income, and thus the instruments $\mathbf{Z}_{it}*$, which will cause inconsistent estimates. Recognizing this, Randolph chooses to omit all the transition years (except for 1983) from his sample.[24]

Instead of utilizing transitory variation introduced by pre-announced changes in tax law to identify transitory effects, Randolph relies on fluctuations of current income around its long-run average level for an individual. The predicted transitory components of price and income are constructed by regressing $\ln P_{it}$ and $\ln Y_{it}$ on α_t, $\mathbf{X}_{it}$, $\mathbf{Z}_{it}*$, plus a separate set of "transitory" instruments, denoted **($\mathbf{Z}_{it}$-$\mathbf{Z}_{it}$*)**. Transitory instruments include: $\ln(y_{it}/\bar{y}_i)$, $d_2\ln(y_{it}/\bar{y}_i)$, and $d_3\ln(y_{it}/\bar{y}_i)$, that is, the difference between current and average pre-tax incomes, interacted with the tax-regime dummies.

These transitory instruments are excluded from the first stage regressions for the permanent values. While this differs from orthodox 2SLS estimation, Burman and

Randolph (1994a) do derive the asymptotic properties of this approach and demonstrate the conditions under which it is consistent. The main additional condition this requires beyond the standard 2SLS assumptions is that the difference between current and average income must be uncorrelated with the true values of permanent income and price. This condition is unlikely to be met, as in many cases a difference between current and average income will indeed contain information about permanent changes in income, as for example when someone receives an unexpected promotion. In that case, Burman and Randolph show that the estimated transitory income and price elasticities will be biased towards the corresponding permanent effects.[25]

As in standard 2SLS, this approach also requires that the instruments be uncorrelated with the share equation error term ε_{it}. This is also unlikely to be the case with the difference between current and average pre-tax income. The instrument will be endogenous when income is timed jointly with charitable giving in order to minimize taxes, for example when a large capital gain which would push someone into a higher tax bracket is timed to coincide with a large charitable donation. This would be expected to bias the estimated transitory price elasticity upward in absolute value.

Data

My study utilizes the Ernst & Young / University of Michigan 1979-90 panel of individual tax returns. This data set is a smaller, public-use version of the very large, confidential Treasury data set used by Randolph (1995). Unlike the Treasury panel, which heavily over-samples upper-income individuals, the public-use panel is a purely random sample of returns drawn based on the last four digits of the social security number (SSN) of the primary taxpayer (the one listed at the top of the return). One SSN group was sampled in all 12 years of the panel, and a second was sampled in all years except 1982, 1984, and 1986. The missing observations in these years are missing for purely random reasons (a different SSN), so this should not affect the results.

The sample selection techniques follow those of Randolph and much of the previous literature. The sample is limited to taxpayers who are present in every year (excepting the random SSN omissions in 1982, 1984 and 1986), and whose itemized deductions, excluding charitable giving, exceed the standard deduction or zero-bracket-amount in each of those years. Non- itemizers are excluded because their charitable giving is unobservable in the data. The main sources of omission from my selected sample are: having an income too low to be required to file a tax return in any of the years; getting married and reporting one's spouse's social security number at the top of the return; death; having total itemized deductions in at least one year that fall below the standard deduction; and having itemized deductions excluding charitable deductions that fall below the standard deduction. As a result, the sample has a higher average income, more males, more married couples, and fewer very young and very old people than the population at large.[26] Controlling for income, age, and marital status reduces the likelihood that these factors will bias the results. The exclusion of people who would not have itemized in the absence of charitable giving is intended to select the sample on an arguably more exogenous variable, "other deductions." Focusing on the class of people who have consistently high "other deductions" greatly mitigates the problem of people who have unusually large positive or negative realizations of the error term in the giving equation being pushed into or out of the sample, which would cause selection bias. To the extent that "other deductions" are correlated with the error term in the giving equation (for instance due to joint timing of charity and other deductions), there could be some residual selection bias, but its direction is unclear.

Table 3 provides descriptive statistics for my sample, and compares it to the confidential Treasury Department panel of returns used by Randolph. My sample includes 17,145 observations. There are 1,638 individual taxpaying units included in the sample, 837 of which are followed for all 12 years, and 801 followed for 9 years. Because of the selection on itemization status, this sample has a disproportionate number of higher-income people and a higher average income than a random sample. There are 2,845 observations, or 16.6 percent of the total, with incomes above $100,000 in constant 1990 dollars. The confidential Treasury data, on the other hand, has over 50,000 observations and an average income of nearly $470,000. Also note from Table 3 that 96.8 percent of the observations in my sample have positive charitable giving. Because the proportion of zeros is so small, any bias resulting from censoring is likely to be small as well. As a result, I follow most previous research in this literature by estimating a linear model rather than a tobit, which would make a fixed-effects 2SLS specification very difficult to estimate consistently. As a sensitivity analysis, Randolph (1995) estimates a 2SLS tobit model (excluding the random effects for tractability), and finds that the results are almost identical to the regular 2SLS results.

Tax computations are derived from a tax calculator which incorporates all relevant aspects of the federal tax code, including such features as the alternative minimum tax, the maximum tax on personal income that pertained through 1981, and the limitation on itemized deductions which would take effect in 1991 (for calculating P_{is} in 1990).[27] The tax-price of giving is also adjusted for the fact that gifts of appreciated assets benefit not only from deductibility, but also from avoidance of a possible capital gains tax burden. This is done in a way that follows the conventions in the literature. The price is defined as:

$$P_{it} = 1 - T'_{it} - f_{it} a \iota_t T'_{it}, \tag{19}$$

where the marginal tax rate is T'_{it}, calculated taking into account all aspects of tax law. The ratio of gifts of appreciated assets to total giving, f_{it}, is the average by income class, calculated in Auten, Cilke, and Randolph (1992). The share of the total value of appreciated assets that are capital gains, multiplied by the ratio of the present value of tax revenues from capital gains realizations, relative to what they would be if taxed on an accrual basis, is represented by a, and is assumed to be 0.5.[28] The fraction of net long-term capital gains realizations that are included in AGI, ι_t, is 0.4 until 1986 and 1 thereafter.

The data do not allow state income taxes to be taken into account in this analysis. For confidentiality reasons, the IRS deletes information on state of residence from the public-use dataset for upper-income taxpayers. Most other previous analyses, including Randolph's, also ignore state income taxation.[29] To the extent that people live in the same state over time and state tax rates remain constant over time, the effects of state tax rates should largely be absorbed into the fixed effects.[30]

Pre-tax income (y_{it}) is defined consistently across the years, following the definition used by Auten, Cilke, and Randolph (1992). This income measure adds back in to adjusted gross income such items as excluded long-term capital gains, IRA and Keogh deductions, dividend exclusions, the two-earner exclusion of the early 1980s, and disallowed passive losses post-TRA86, and makes several other small adjustments.[31] Throughout the analysis, all dollar amounts are converted to constant 1990 dollars.

The measure of "averaged" taxable income ($\overline{M}_{it}$) used to construct my tax-rate instruments is based on the individual mean level of pre-tax income using all years in the data set, with subtractions for year-specific personal exemptions and individual-mean levels of certain exclusions and non-charitable deductions. The measure incorporates major statutory changes in the definition of taxable income. For example, a twelve-year individual average of capital gains realizations is calculated, and 60 percent of this average is excluded from taxable income in years up to and including 1986, when this exclusion was allowed. Further detail is provided in the endnotes.[32]

As discussed above, the income measures which enter into the regression equation are “modified after-tax income (Y)” for years *t* and *s*, where $Y_{it} = y_{it} - \tau_{it} - g_{it}\tau'_{it}$, and Y_{is} is defined analogously. The total income tax payment τ_{it} is calculated taking all relevant aspects of the tax law into account. The average tax rates that are used as instruments for after-tax income are calculated as follows. Year *t* tax law is applied to $\overline{M}_{it}$ and year *s* tax law is applied to $\overline{M}_{is}$ to calculate total tax liability. These tax liabilities are then divided by the 12-year individual mean level of pre-tax income to construct the average tax rate instruments.

Results

Coefficient estimates

Table 4 presents coefficient estimates from equation (18) above, estimated by fixed-effects 2SLS according to the procedure outlined in the econometric methodology section, relying entirely on tax law variation across time and individuals to identify the transitory and permanent price and income effects. When interpreting the price and income parameters, note that a coefficient of zero implies a price elasticity of negative one, or an income elasticity of one. To see the intuition behind this, consider that the dependent variable, ω_{it}, equals ($g_{it}P_{it}/Y_{it}$). If the price elasticity is negative one, a one-percent increase in P leads to a one-percent decline in g, so the dependent variable ω remains unchanged.

As Table 4 shows, the permanent price coefficient is positive and different than zero at approximately .07 level of significance, which means that the permanent price elasticity is different from one in the direction of zero. The transitory price coefficient is not significantly different from zero, meaning that the transitory price elasticity is not significantly different from one. The F-value for the hypothesis that the permanent and transitory price coefficients are the same is 4.398, which means we can reject this hypothesis at the .036 significance level. This suggests that distinguishing between the transitory and permanent effects of price is indeed important.

The permanent income coefficient is negative and significantly different from zero, while the transitory income coefficient is not significantly different from zero. This suggests that the permanent income elasticity is significantly different from one in the direction of zero, and that the transitory income elasticity is not significantly different from one. The hypothesis that the permanent and transitory income effects are the same cannot be rejected, however, as the F-value for that is only 1.025.

Being aged 65 or over is estimated to raise the share of one's income devoted to charity by 0.41 of a percentage point, a result that is significantly different from zero at approximately the .10 level. Marriage is found to increase the charity expenditure share by 0.52 of a percentage point (e.g. from 2.0 percent to 2.52 percent), with strong statistical significance. The number of exemptions is found to have no effect. The age and exemption results are consistent with the findings in Randolph (who had continuous age information in his data set, and found a positive effect). The marriage result is different, however, as he found a negative and insignificant effect. The year dummy coefficients suggest that the charity expenditure share increases steadily and significantly over the sample period, which probably results from the increasing age in the balanced panel over time.

The first stage regressions are presented in Table 5. Large and very statistically significant coefficients on the instruments for each of the endogenous variables support the notion that they have reasonable explanatory power.

Elasticity estimates for main specification

Elasticity estimates for the main specification are shown in the first part of Table 6. The first row shows the elasticities evaluated at a single point, where ω is equal to 0.023, the sample value of aggregate expenditures on charity as a share of aggregate modified disposable income (ω_a). The second row shows the aggregate elasticity (e_a) calculated taking into account the individual elasticities of all 17,145 observations in my sample and calculating the giving-weighted mean of elasticities, as in equation (11) above. This can be interpreted as the percentage change in aggregate giving that would occur among the population of consistent itemizers in response to a uniform one percent increase in price for everyone.[33] As expected in an AIDS framework, elasticities and standard errors are virtually identical when they are calculated by either of these two methods.[34]

The permanent price elasticity is estimated to be -0.29, but with a rather large standard error of 0.39. This point estimate has the expected sign, and is low by comparison with the price elasticities typically found in cross-sectional studies. Its difference from zero is not statistically significant, but its difference from one is significant at the .10 level. This suggests that at least part of the transfer from less-charitable to more-charitable households effected by the deduction ends up as a windfall to the more-charitable types, rather than going to charities.

The transitory price elasticity, on the other hand, is estimated at -1.15, with a standard error of 0.60, which is significantly different from zero at about the .06 level. A considerably larger point estimate for the transitory than for the permanent price elasticity is consistent with the apparent importance of timing effects displayed in the aggregate data illustrated back in Figure 3, and again supports the notion that distinguishing between them is important in empirical work.

The permanent income elasticity is estimated at 0.44, with a standard error of 0.16, which is in the expected direction and significantly different from both zero and one. That it is less than one implies that in the absence of other influences such as the tax incentive, we would expect to see lower- and middle-income people spending larger shares of income on charity than those with upper-incomes. Most previous studies have found the income elasticity to be below one, although 0.44 is on the low side of the literature.

The transitory income elasticity, on the other hand, is estimated at 0.79, with a standard error of 0.40. This suggests that people do not smooth their giving over income fluctuations, as the permanent income hypothesis would suggest. Rather, giving appears to be quite sensitive to current income. Although this would be considered a rather high transitory income elasticity for most types of consumer goods, charity is also quite different from other types of goods. It is certainly plausible that when individuals find themselves with some temporary unexpected good fortune, they would be more in the mood to share it with others through charity.

As noted above, the difference between the coefficients for the transitory and permanent income effects is not statistically significant, so not too much should be made of their difference from each other, as opposed to from zero or one. Also note that caution is order because the instruments for the income effects in this specification are likely to be weakly correlated with true variation in transitory and permanent income over time, unlike the instruments for price effects. In this particular econometric specification, identification of the income effects comes almost entirely from statutory changes in average tax rates. Variation in average tax rates was smaller and affected fewer observations than was the case for marginal tax rates. Moreover, while taxes completely determine the price of giving, average tax rates are only one component affecting disposable income. Essentially, what this finding means is that when it was announced in 1981 that average tax rates for high-income people would be gradually reduced over the next few years, high-income people did not respond by immediately increasing their charitable giving (controlling for price effects), and then keeping it at that level. Rather, they let their giving increase gradually over time along with their disposable income. The reason for this identification strategy is that a fixed-effects framework requires all of the identification of income effects to come from *changes* in permanent and transitory income over time. Determining when a change is temporary and when it is permanent is very difficult in a relatively short panel, and average tax rates may be the only source of change which can clearly be identified as one or the other.

The third row of Table 6 displays aggregate elasticities calculated by applying the aggregate elasticity formula (11) only to observations in the sample with incomes above $100,000, in constant 1990 dollars. These can be interpreted as the percentage change in aggregate giving that would occur within this upper-income group in response to a 1 percent change in price (or income) that only applied to this group. Elasticities may differ for the upper-income population because its members have somewhat higher ω's on average. For the "main" specification shown here, however, the elasticities evaluated this way are almost exactly the same as those for the overall sample.

Row 4 in Table 6 shows elasticities evaluated at a single point, Randolph's giving-weighted mean share of 0.085. Randolph suggested this share would produce elasticities representative of the aggregate response. When evaluated at this point, the price elasticities move close to negative one, the income elasticities move close to positive one, and standard errors decline substantially. For example, the permanent price elasticity becomes -0.81 with a standard error of 0.10. Unfortunately, these elasticities are not representative of the aggregate elasticity at all. They are not very informative, except perhaps of the behavior of a small number of individuals who give an unusually large share of their incomes to charity. These are mainly included for purposes of comparison with Randolph's results (presented below), and to illustrate the large difference this makes for interpretation.

The second section of Table 6 displays elasticities for a model that extends the main specification by adding square and interaction terms, $d_5[\ln(P_{it}/P_{is})]^2 + d_6[(\ln P_{it})(\ln P_{is})]^2$, to equation (18). This is analogous to the functional form used by Randolph. The extended functional form is more flexible, but places difficult demands on the data in a fixed effects model. In order to identify the way elasticities differ across taxpayers with different prices, we require observations on changes in price across all price levels. Since the exogenous changes in tax law over this sample period affected people with high marginal tax rates (low prices) almost exclusively, there is little information with which to identify how the elasticity might differ for people with low marginal rates (high prices).

The aggregate elasticities in this specification are considerably different from those found using the standard "almost ideal" functional form. In particular, the price elasticities and their standard errors both increase substantially. The permanent price elasticity is -0.915 with a standard error of 0.517, and the transitory price elasticity becomes -2.366 with a standard error of 1.209. Income elasticities do not change as dramatically relative to the previous specification, with a small increase in the transitory income elasticity and a small decrease in the permanent elasticity. The next row shows the elasticities for people with incomes above $100,000. Here, most notably, the permanent price elasticity falls in magnitude to -0.40, with a standard error of 0.39, a result more consistent with the results in the first specification. The transitory price elasticity also becomes a bit smaller, at -1.964, with a standard error of 1.056.

The smaller price elasticities for high-income people arise largely because this specification allows the elasticities to vary with the level of one's price. In this specification, upper-income people, who have lower prices, are estimated to be *less* sensitive to price changes than those with high prices. Since statutory changes did not significantly affect the tax-prices of low- and middle-income people over this sample period, we have little basis for estimating how their responsiveness to price changes differs from that of upper-income people. Therefore, we should probably be more confident in the elasticity estimates of the first specification, and the similar elasticities from the second specification that pertain to upper-income people, than in the aggregate elasticities from the second specification. Intuitively, what this specification tells us is that people who began with a marginal tax rate of, say, 40 percent had a proportionately larger response to their change in tax rates than did people who started at a tax rate of, say, 50 percent. The functional form then extrapolates this to a very large elasticity for the vast majority of people who started with lower marginal tax rates, and then had little or no change in their rates over time. Such a linear extrapolation to a population for whom we cannot directly identify the elasticity (because there was no change in their tax rates) may not be justified. Still, the conclusion from specification (1) that the permanent price elasticity appears to be fairly low should be tempered somewhat by the -0.915 point estimate for the aggregate elasticity in this more flexible specification.

The third panel of Table 6 returns to the functional form of the first specification, but adds one element of Randolph's approach. A set of instruments based on the difference between current and average income is added to the first stage regressions for transitory price and income, but is excluded from the first stage regressions for permanent price and income. As in Randolph, this instrument set includes the difference between the logs of current and average pre-tax income, and its interactions with dummies for the tax regimes between ERTA81 and TRA86 and post-TRA86. In this case, it also includes the portions of current year log price and log(1-ATR) which are due to the difference between current and average pre-tax income.[35] The consistency of the transitory elasticities in this approach requires these instruments to be exogenous and uncorrelated with permanent changes in price or income. The estimates in this specification still retain many important differences from Randolph's approach, such as controlling for fixed-effects, using specific tax schedule information to construct the instruments, and utilizing pre-announced changes in tax law to help identify the transitory effects.

Under this specification, the permanent price elasticity becomes slightly larger, at -0.39, with a standard error of 0.26. The transitory price elasticity increases dramatically relative to specification (1), to -2.52, with a standard error of only 0.20. The permanent income elasticity is reduced to 0.12, and the transitory income elasticity falls sharply to -0.45.

Our confidence that the permanent price elasticity is close to the true elasticity should be increased by the fact that the estimate in this specification is close to that in the main specification, but more precisely estimated. According to the asymptotic derivations of Burman and Randolph (1994a), even if the special conditions for the consistency of the transitory effects in this specification are violated, the estimates of the permanent effect should still be consistent.

Why did the transitory price elasticity change from negative 1.15 to negative 2.52 between specifications (1) and (3)? One possibility is that adding information about income fluctuations to the first-stage regression for transitory price increased efficiency considerably, and the former transitory elasticity was imprecisely estimated. A second possibility would be that people are more responsive to transitory price variation when it is caused by random fluctuations in income than when it is caused by pre-announced changes in tax law. A third possibility is that the estimates in specification (3) are inconsistent. We should be more confident in the exogeneity of the instruments in specification (1), since they rely entirely on variation induced by changes in tax law. One possible source of inconsistency in specification (3) would occur if the difference between current and average income were correlated with permanent income. However, Burman and Randolph (1994a) show that this should bias the transitory elasticity towards the corresponding permanent elasticity, which is the opposite of what is happening here. Another potential source of inconsistency is that the difference between current and average income may be endogenously related to giving due to joint timing decisions such as realization of capital gains. This would be expected to bias the elasticity towards a more negative value, and thus seems like a more likely explanation for the potential bias in (3). The large difference between the transitory estimates in (1) and (3) thus may be a lesson in the importance of addressing the problem of endogeneity arising from intentional joint timing of income and giving.

The large decline and change in sign for the transitory income elasticity is harder to explain. Correlation between permanent income and the difference between current and average income could explain part of it, as it would bias the estimate towards the permanent effect, which is lower in the specifications presented so far. However, it falls past the permanent elasticity. The endogeneity introduced by joint timing decisions might push it in a negative direction. Greater precision due to including more information could also be partly responsible.

Replication of Randolph

Table 7 displays elasticities based on Randolph's estimates of his full model, for comparison with my results, and also shows my replication of Randolph's model on the public-use data. The first row shows the preferred elasticities presented in Randolph's paper, which are evaluated at the giving-weighted mean share of 0.085 and the giving-weighted mean price of 0.65 from his sample. These appear to be sensible estimates, with a permanent price elasticity of -.51, and transitory price elasticity of -1.55, a permanent income elasticity of 1.1, and a transitory price elasticity of 0.58. The second row displays elasticities which are based on Randolph's coefficients, but are constructed by calculating individual elasticities for each observation in my sample and computing the giving-weighted mean. As discussed above, this should be much more representative of the elasticity of aggregate giving in response to a uniform change in price. Evaluated in this way, the permanent price elasticity is *positive* 0.78, the transitory price elasticity a very large negative 3.12, the permanent income elasticity a positive 1.53, and the transitory income elasticity of -0.60. When the aggregate elasticity is evaluated only using observations with incomes greater than $100,000 in my sample, the elasticities are qualitatively similar, suggesting that the difference does not arise mainly from differences in the average incomes in the samples. Randolph also presents elasticities calculated at a lower share (0.039) and price (0.56), the unweighted means in his very high-income sample. These are shown in the fourth row, and should be closer to the aggregate elasticity for his sample than row one. These imply an insignificant permanent price elasticity of -0.08, and a large transitory price elasticity of -2.27.

My main specification, which requires considerably less restrictive conditions for consistency, provides a more plausible point estimate of the aggregate permanent price elasticity, the main result of interest, than does the Randolph approach. Referring back to Figure 3, it does appear from the aggregate data that long-run charitable giving does have at least some responsiveness to long-run price in the expected direction, based on the persistently lower giving by high-income people after 1986.

To examine whether the differences in my results are driven by differences in samples, the second panel of Table 7 presents the results of my exact replication of Randolph's technique on the public-use panel. The replication elasticities follow the same general pattern as Randolph's and differ in the same general ways from the results of my main specification. The main difference is a transitory price elasticity that, while large (-1.20 for the aggregate), is substantially smaller than Randolph's (-3.12 for the aggregate). The permanent price elasticities also tend more towards the negative direction in my sample; the aggregate permanent price elasticity for those with incomes over $100,000 is 0.42 based on Randolph's coefficient estimates, and -0.16 based on the coefficients from my replication. This suggests that some portion of the difference between the results of my approach and Randolph's may be driven by sample differences.

Other sensitivity analyses

Table 8 provides a few additional sensitivity analyses. All elasticities are aggregate elasticities evaluated over the whole sample. In the first row are elasticities from estimating my main specification by random-effects rather than fixed-effects. Also, log average pre-tax income is added as an instrument (it differences out in fixed-effects and so could not be used there). The permanent price elasticity is higher than in fixed-effects, at -0.56, with a standard error of 0.21. The transitory price elasticity is smaller, at -0.74, with a standard error of 0.53. The permanent and transitory income elasticities are both very close to one. The large permanent income elasticity seems to suggest that giving is more sensitive to cross-sectional variation in disposable income than to changes in average tax rates. However, the Hausman chi-square statistic for fixed- versus random-effects is 68.5, which strongly rejects the hypothesis of a consistent random-effects estimator.

In the second row, estimates are shown from my main specification (again with fixed-effects), excluding the years 1980 and 1985. In these years, my assumption that people view the current tax law as permanent until a new law is passed is particularly questionable. By the end of 1980, Ronald Reagan had already been elected President on a platform of major tax cuts. In 1985, there was considerable discussion of a tax reform, which was mainly intended to reduce marginal rates, and there was some consideration of eliminating the charitable deduction altogether. Although this sort of talk in Washington is usually heavily discounted, with good reason, in this case the talk of reform did eventually result in a major reform. In both of these cases, we might expect peoples' expectations about the permanent tax rate to be in flux. However, there is no objective way of telling what their expectations might have been, so I address the problem in this specification by simply eliminating the problematic years. It turns out that the results are not particularly sensitive to elimination of these years from the sample. The elasticities, shown in the last row of Table 8, are quite similar to those in my main specification.

The third and fourth rows present results from a static version of the model, which does not distinguish between transitory and permanent effects. Instruments for price and disposable income are the same as their actual values, except that charitable giving is set to zero in the tax calculations, to avoid that source of endogeneity. Thus the price instrument is the "first-dollar" tax-price of charitable giving, which is the instrument typically used in much of the literature. The third row presents fixed effects estimates and the fourth presents pooled cross-sectional results. The price elasticity is -1.40 for fixed effects and -1.25 for cross-sectional, which is very close to what was typically estimated in traditional cross-sectional studies. This suggests that the differences in my price elasticity estimates from the traditional literature are mainly due to intentional differences in technique rather than sample or functional form differences. The income elasticity in the static pooled-cross section specification is 0.64, also very close to typical traditional estimates. For fixed effects, the income elasticity is -0.16, again suggesting less responsiveness to changes in income than to its average level.

Conclusion

This paper has laid out a procedure for consistently estimating transitory and permanent income and price elasticities which utilizes changes in tax law for identification. The principal contributions relative to the previous literature are: (1) this procedure adapts a dynamic specification to take account of anticipated changes in tax rates caused by pre-announced or phased-in changes in tax law; (2) it allows one to control for fixed effects, which makes its consistency more robust to unobserved variables; (3) it makes much more efficient use of information about how tax schedules and the definition of taxable income changed over time, which provide a useful and exogenous source of variation in price and income; and (4) it demonstrates the importance of how coefficient estimates are translated into elasticities.

The model is estimated on a twelve-year panel of tax returns, and yields a permanent price elasticity of -0.29, and a transitory price elasticity of -1.15. The standard errors on each of these estimates is large due to the relatively small sample size of the publicly-available data. However, alternative specifications which should also produce consistent estimates of the permanent price elasticity also find it to be in the neighborhood of -0.3 to -0.4, and have smaller standard errors which make the estimate different from zero at reasonable levels of significance. These results are more likely to be consistent than those in the recent literature. Suggestive evidence is also found that endogeneity arising from joint timing of income and charitable giving, which is eliminated by my procedure, is empirically important. Overall, my results confirm the importance of distinguishing timing effects from long-run effects in empirical demand analysis.

Table 1. Summary of changes in tax law, 1979-1990

t (current year)	s (next year when currently enacted tax law is fully phased-in)	Summary
1979	1979	o Top marginal tax rate of 70%
1980	1980	
1981	1984	o ERTA enacted in August 1981. Top rate reduced to 50% effective 1982. All other rates reduced by 5% of former level in '82, 10% in '83, and 10% in '84.
1982	1984	
1983	1984	
1984	1984	
1985	1985	
1986	1988	o TRA86 enacted in October 1986. Top rate reduced from 50% in '86 to 28% in '88 with transitional 38.5% top rate in '87.
1987	1988	
1988	1988	
1989	1989	
1990	1991	o OBRA90 enacted in November 1990. Top rate increased to 31% effective in '91. Limitation on itemized deductions is introduced which can increase the price of giving in certain income ranges, also effective in '91.

Table 2. Charitable giving and tax rates in IRS cross-sectional data, by income class, 1979-90

	Charitable giving as a percentage of income		Price of charity (1-marginal tax rate)		Average tax rate		Number of observations	
Year	Income $100,000 or below	Income above $100,000	Income $100,000 or below	Income above $100,000	Income $100,000 or below	Income above $100,000	Income $100,000 or below	Income above $100,000
1979	2.142	3.717	0.731	0.474	0.122	0.266	54,789	58,769
1980	2.122	3.867	0.715	0.456	0.129	0.276	43,252	48,800
1981	2.220	4.153	0.704	0.459	0.131	0.273	34,025	41,262
1982	2.225	3.754	0.727	0.512	0.119	0.246	18,924	29,400
1983	2.226	3.366	0.748	0.548	0.111	0.216	23,370	49,121
1984	2.310	3.551	0.765	0.598	0.109	0.218	21,852	25,972
1985	2.335	4.180	0.754	0.567	0.108	0.209	25,517	42,660
1986	2.390	5.250	0.755	0.567	0.108	0.206	19,724	29,672
1987	2.354	3.125	0.767	0.612	0.109	0.217	25,984	28,471
1988	2.405	2.681	0.779	0.672	0.110	0.202	19,008	36,586
1989	2.506	2.800	0.778	0.669	0.112	0.200	21,117	27,319
1990	2.506	2.645	0.780	0.673	0.112	0.198	23,116	29,059

Source: population-weighted tabulations from the IRS Individual Model Files, 1979-90. Income is in constant 1990 dollars, defined consistently across years, and excludes capital gains. Only returns with itemized deductions, less charity and sales taxes, greater than the 1990 standard deduction (in constant dollars) are included. See text for details.

Table 3. Panel descriptive statistics

	Treasury panel used by Randolph	Public-use panel used in this paper
Years included	79-80,83-85,88	1979-1990
Total observations	51,146	17,145
Observations with income>$100,000		2,845
Individual taxpaying units	8,524	1,638
Individual units in '82, 84, 86		801
Unweighted means		
Pre-tax income (y)		84,846
Modified after-tax income (Y)	469,620	68,856
Charitable giving (g)	44,486	2,385
Charity > $0	0.960	0.968
Age 65 or above		0.054
Married	0.860	0.864
Exemptions (family size)	3.300	3.246
Tax price of giving (P)	0.590	0.698
Charity share (w=gP/Y)	0.056	0.021
Giving-weighted means		
Tax price of giving	0.650	0.653
Tax price of giving, incomes > $100,000		0.597
Charity share	0.085	0.077
Aggregate charity share		
All observations		0.023
Observations with income > $100,000		0.026

All dollar amounts are in constant 1990 dollars. My sample includes observations who are present in every year (aside from the years 1982, 1984, and 1986, when half of the observations were randomly omitted from the public-use data) and whose itemized deductions, excluding charitable giving, exceed the standard deduction in each year.

Table 4. Coefficient estimates for main specification (equation 18)

	Coefficient	Standard error
lnP-lnP* (coefficient=delta1)	-0.0034	(0.0135)
lnP* (coefficient=delta2)	0.0160	(0.0088)
lnY-lnY* (coefficient=delta3)	-0.0047	(0.0091)
lnY* (coefficient=delta4)	-0.0127	(0.0036)
Age 65 dummy	0.0041	(0.0025)
Number of exemptions	-0.0001	(0.0003)
Marriage dummy	0.0052	(0.0021)
Year 1980	0.0004	(0.0010)
Year 1981	0.0016	(0.0014)
Year 1982	0.0014	(0.0013)
Year 1983	0.0044	(0.0010)
Year 1984	0.0051	(0.0012)
Year 1985	0.0058	(0.0010)
Year 1986	0.0056	(0.0014)
Year 1987	0.0068	(0.0011)
Year 1988	0.0072	(0.0011)
Year 1989	0.0085	(0.0011)
Year 1990	0.0095	(0.0012)

Table 5. First-stage regressions for main specification

	Dependent variable			
	lnPs	lnPt-lnPs	lnYs	lnYt-lnYs
lnPs evaluated at mean taxable income	0.4382	-0.0053	-0.3140	0.0222
	(0.0170)	(0.0150)	(0.0563)	(0.0442)
lnPt-lnPs evaluated at mean taxable income	-0.0929	0.4709	-0.2398	-0.0338
	(0.0203)	(0.0180)	(0.0674)	(0.0529)
ln(1-ATRs) evaluated at mean taxable income	0.1481	-0.2091	3.7704	-0.4155
	(0.0454)	(0.0402)	(0.1508)	(0.1185)
ln(1-ATRt) -ln(1-ATRs) evaluated at mean taxable income	0.3783	0.2321	0.0175	2.6701
	(0.0678)	(0.0600)	(0.2250)	(0.1768)
d2 x log average pretax income	0.0048	-0.0024	0.0949	0.0010
	(0.0038)	(0.0034)	(0.0126)	(0.0191)
d3 x log average pretax income	0.0595	-0.0152	0.1825	0.0191
	(0.0049)	(0.0043)	(0.0163)	(0.0128)
Age 65 dummy	0.0507	0.0277	-0.2758	-0.0446
	(0.0056)	(0.0050)	(0.0186)	(0.0146)
Number of exemptions	-0.0041	0.0023	0.0080	0.0002
	(0.0011)	(0.0010)	(0.0037)	(0.0029)
Marriage dummy	-0.0415	0.0039	0.1050	0.1224
	(0.0048)	(0.0043)	(0.0160)	(0.0126)
Year 1980	-0.0096	-0.0037	0.0130	-0.0052
	(0.0031)	(0.0028)	(0.0104)	(0.0082)
Year 1981	-0.0465	0.0181	-1.0224	-0.0332
	(0.0417)	(0.0369)	(0.1385)	(0.1088)
Year 1982	-0.0474	0.0226	-1.0619	-0.0189
	(0.0419)	(0.0370)	(0.1389)	(0.1091)
Year 1983	-0.0509	0.0306	-1.0277	-0.0307
	(0.0419)	(0.0370)	(0.1390)	(0.1092)
Year 1984	-0.0512	0.0317	-1.0421	-0.3536
	(0.0419)	(0.0371)	(0.1391)	(0.1093)
Year 1985	-0.0576	0.0317	-0.9896	-0.2439
	(0.0419)	(0.0370)	(0.1389)	(0.1091)
Year 1986	-0.6514	0.1618	-1.9541	-0.1633
	(0.0530)	(0.0469)	(0.1760)	(0.1383)
Year 1987	-0.6482	0.1595	-1.9246	-0.2188
	(0.0529)	(0.0468)	(0.1756)	(0.1380)
Year 1988	-0.6481	0.1773	-1.9116	-0.1973
	(0.0528)	(0.0467)	(0.1751)	(0.1376)
Year 1989	-0.6481	0.1768	-1.9155	-0.1975
	(0.0528)	(0.0467)	(0.1752)	(0.1377)
Year 1990	-0.6090	0.1368	-1.8816	-0.2523
	(0.0526)	(0.0465)	(0.1745)	(0.1371)

Standard errors in parentheses.

Table 6. Elasticities of charitable giving, main specifications

	Permanent price elasticity	Transitory price elasticity	Permanent income elasticity	Transitory income elasticity
(1) Main specification				
Elasticity evaluated at aggregate share (.0226)	-0.291 (0.391)	-1.150 (0.598)	0.440 (0.158)	0.790 (0.402)
Aggregate elasticity evaluated over full sample	-0.287 (0.393)	-1.151 (0.602)	0.436 (0.159)	0.789 (0.405)
Aggregate elasticity, incomes over $100,000	-0.360 (0.353)	-1.136 (0.540)	0.493 (0.143)	0.810 (0.363)
Elasticity evaluated at Randolph's giving-weighted mean share (.085)	-0.812 (0.104)	-1.040 (0.159)	0.851 (0.042)	0.944 (0.107)
(2) Add square and interaction terms				
Aggregate elasticity evaluated over full sample	-0.915 (0.517)	-2.366 (1.209)	0.233 (0.165)	1.019 (0.435)
Aggregate elasticity, incomes over $100,000	-0.400 (0.394)	-1.964 (1.056)	0.311 (0.148)	1.017 (0.391)
(3) Add instruments based on difference between current and average income				
Aggregate elasticity evaluated over full sample	-0.390 (0.260)	-2.520 (0.195)	0.118 (0.139)	-0.445 (0.051)
Aggregate elasticity, incomes over $100,000	-0.453 (0.234)	-2.364 (0.175)	0.208 (0.125)	-0.297 (0.045)

Standard errors in parentheses.

Table 7. Replication of Randolph

	Permanent price elasticity	Transitory price elasticity	Permanent income elasticity	Transitory income elasticity
(4) Randolph's full model				
Elasticity evaluated at Randolph's giving-weighted mean share (.085) and price (.65)	-0.509 (0.060)	-1.548 (0.060)	1.141 (0.020)	0.576 (0.010)
Aggregate elasticity evaluated over my full sample	0.781	-3.116	1.534	-0.604
Aggregate elasticity, incomes over $100,000 in my sample	0.419	-2.990	1.480	-0.440
Elasticity evaluated at Randolph's unweighted sample mean share (.039) and price (.56)	-0.080 (0.100)	-2.270 (0.130)	1.300 (0.020)	0.090 (0.030)
(5) Exact replication of Randolph on my sample (including years '79-80, '83-85, and '88 only).				
Elasticity evaluated at Randolph's giving-weighted mean share (.085) and price (.65)	-0.559 (0.079)	-1.025 (0.124)	1.050 (0.019)	0.787 (0.031)
Aggregate elasticity evaluated over full sample	0.322 (0.275)	-1.202 (0.047)	1.188 (0.071)	0.195 (0.116)
Aggregate elasticity, incomes over $100,000	-0.155 (0.121)	-0.744 (0.218)	0.611 (0.033)	0.145 (0.054)

Standard errors in parentheses. Standard errors cannot be calculated for elasticities based on Randolph's estimates but evaluated at different points, given the information published in his paper.

Table 8. Alternative specifications (aggregate elasticities evaluated over whole sample)

	Permanent price elasticity	Transitory price elasticity	Permanent income elasticity	Transitory income elasticity
(6) Main specification, random effects,	-0.560	-0.740	0.988	1.090
(Chi-square statistic for Hausman test of fixed vs. random effects: 68.5)	(0.210)	(0.530)	(0.020)	(0.340)
(7) Main specification, fixed effects,	-0.203	-1.206	0.416	0.696
excluding 1980 and 1985	(0.448)	(0.644)	(0.178)	(0.444)
(8) Static model, fixed effects	-1.402		-0.159	
	(0.145)		(0.039)	
(9) Static model, pooled cross-section	-1.248		0.637	
	(0.159)		(0.039)	

Standard errors in parentheses.

Figure 1. Price of charitable giving, mean by income class, 1979-90

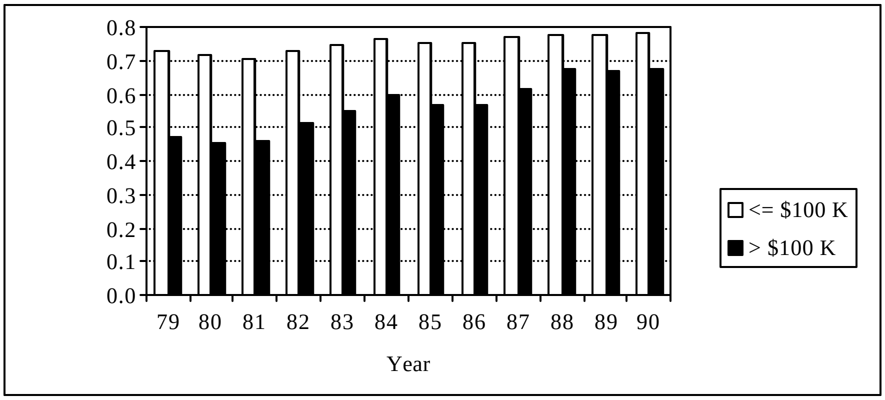


Figure 2. Average tax rate, mean by income class, 1979-90

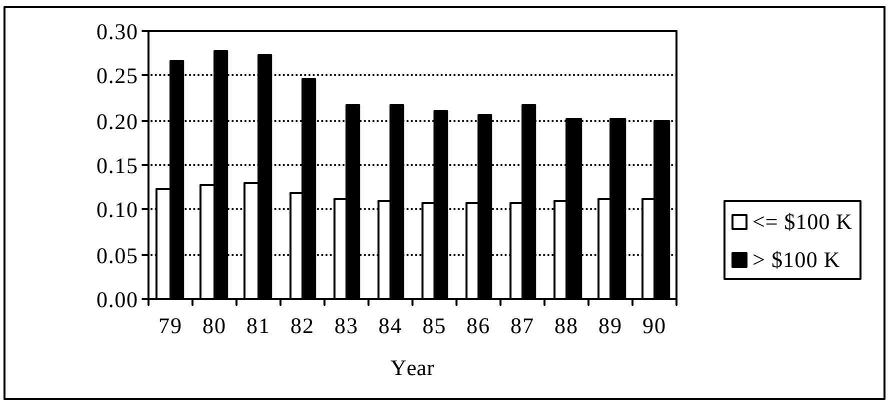
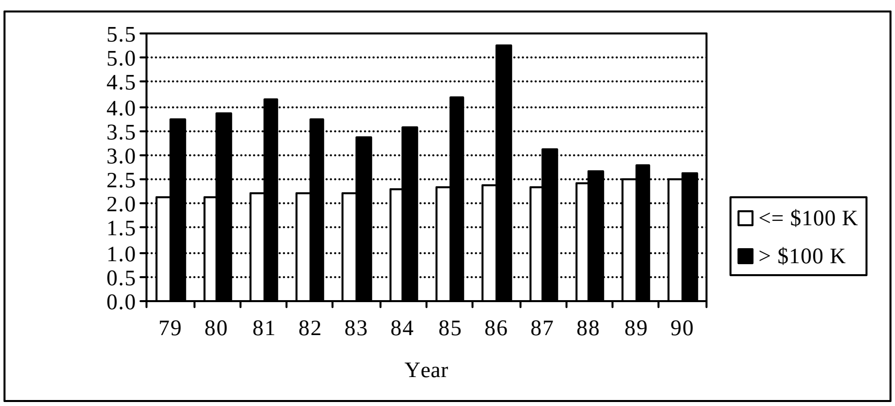


Figure 3. Charitable giving as a percentage of income, by income class, 1979-90



Source: population-weighted tabulations from the IRS Individual Model Files. Income is in constant 1990 dollars, defined consistently across years, and excludes capital gains. Only returns with itemized deductions, less charity and sales taxes, greater than the 1990 standard deduction (in constant dollars) are included

Endnotes

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[1] The price is also affected by such features of the tax code as limitations on itemized deductions for high-income taxpayers, the avoidance of capital gains taxes on gifts of appreciated property, and so forth. All of these factors will be addressed later in the paper, and are incorporated in the price used in the empirical work.

[2] As suggested by Thurow (1971), redistribution to the poor may be viewed as a public goods problem, if people who do not voluntarily contribute to the reduction of poverty nonetheless enjoy the benefits of living in a society with less poverty. Also, this is not meant to suggest that all, or even most, charitable deductions necessarily represent contributions to public goods or redistribution to the needy, but simply that these are two possible justifications for the deduction.

[3] Another perspective sometimes expressed in the literature is that the revenue loss from the charitable deduction will lead to reduced government spending and a reduced supply of public goods. Of course, there is no reason why this should have to happen. Marginal tax rates can always be adjusted to keep the supply of public goods at the optimal level. Still, if marginal tax rates were fixed and the only concern were the total supply of public goods, then an elasticity smaller than the critical value of negative one would suggest rejecting the deduction. To the extent that government spending crowds out private contributions, the critical elasticity would be somewhat smaller in magnitude. Kingma (1989) discusses government crowding-out of private contributions, and presents some estimates based public radio budget data. His results imply that an additional dollar of government spending on public radio reduces private contributions by 13.5 cents, which would imply a critical value for the price elasticity of 0.865. As discussed in the text, however, there are many other considerations to take into account regarding the desirability of the charitable deduction, so it might be a good policy even if the price elasticity is below the critical value.

[4] Some (e.g., Lindsey, 1990) have argued that horizontal equity requires that charitable contributions must be subtracted from income in order to properly compare "ability to pay." This would imply that even if the deduction had no influence on giving whatsoever (i.e., the price elasticity were zero), it might still be desirable for equity reasons. This argument is suspect, however, because contributions are voluntary and presumably provide some utility to the donor.

[5] If the charitable deduction raises marginal rates on less-charitable people and lowers them for more-charitable people, total deadweight loss may increase because, at least in a linear approximation, excess burden is proportional to the square of the rate.

[6] Another argument against the charitable deduction is put forth by some advocates of fundamental tax reform, such as Hall and Rabushka (1995). They suggest that allowing even one deduction or exception, no matter how meritorious, can create a "slippery slope," allowing many other, less worthy deductions to creep into the tax code.

[7] See Moffitt and Wilhelm (2000) for a discussion of the issues involved in obtaining separate consistent estimates of income and tax effects in panel data.

[8] Examples of early panel studies of charitable giving that dealt with some subset of the issues addressed here include Clotfelter (1980), Broman (1989), and Barrett (1991).

[9] The 23 percent reduction worked as follows. Rates were reduced to 95 percent of the previous year's level in 1982, 90 percent in 1983, and 90 percent in 1984, which adds up to 1-(.95 x .90 x .90) = .2305.

[10] Beginning in 1991, if 80 percent of the total of certain itemized deductions (including charity) was less than 3 percent of the difference between AGI and $100,000, then an additional dollar of charitable giving would only reduce taxes by .2 times the marginal tax rate.

[11] Details of the calculation of marginal and average tax rates and income are discussed later in the data section. There is one important difference between the calculations done later for the empirical work (described in the data section) and those done here for descriptive purposes. The calculations for Table 1 and Figures 1 through 3 are all done setting capital gain realizations to zero. So, for example, pre-tax income (which serves as the denominator of the average tax rate) excludes capital gains, and the tax liability (which is the numerator of the average tax rate) is attained by running the tax calculator using actual amounts for all income and deduction items but setting capital gains to zero. The rationale is to remove the most obvious source of transitory fluctuations in income, making the descriptive illustrations easier to interpret. For example, there was a large transitory spike in capital gains realizations in 1986, which would obscure the concurrent spike in charitable giving in a graph of contributions as a share of income. Removing capital gains is unnecessary in the later empirical work, as the estimation methodology explicitly deals with such transitory fluctuations.

[12] Further detail could in principle be incorporated into the empirical model by formally modeling jumps between different segments of the nonlinear after-tax budget constraint, as in Hausman's (1981) study of taxation and labor supply. Studies of charitable giving have generally ignored these considerations, arguing that charitable deductions are usually too small to move many people onto a different segment of the budget constraint. Moreover, the maximum-likelihood approach necessary to fully model piecewise-linear budget constraints imposes some very restrictive assumptions, so that it is not necessarily any better than the more common instrumental variables approach used here. See Triest (1987, 1990) and Blomquist (1995) for discussion of these issues. Most importantly, timing effects and fixed effects, the main issues in this paper, cannot be tractably incorporated into Hausman's approach. Reece and Zieschang (1985) do estimate a charitable giving model using Hausman's approach, but in a very simple cross-sectional context which does not address timing, most forms of endogeneity, or unobserved individual-specific effects.

13 Replacing expenditure with income is problematic, because it may introduce measurement error in the dependent variable that is correlated with some of the right-hand-side variables, particularly income. In that case, the requirement for consistency of the price coefficients, the main parameters of interest, is that price be uncorrelated with this measurement error after controlling for income. Given the available data, it would be difficult to improve upon this.

14 The Treasury dataset used by Randolph also includes a continuous age variable, but this is not publicly available.

15 When $\delta_5[\ln(P_{it}/P_{it}*)]^2 + \delta_6[(\ln P_{it})(\ln P_{it}*)]$ is added to the specification, the price elasticities change to:

Permanent price elasticity:

$$\varepsilon_{g,P*} = \frac{P*}{g}\frac{\partial g}{\partial P*}\bigg|_{d(P/P*=0)} \quad = \quad \frac{\delta_2 + 2\delta_6 \ln P}{\omega} \quad - 1$$

Transitory price elasticity:

$$\varepsilon_{g,P} = \frac{P}{g}\frac{\partial g}{\partial P}\bigg|_{dP*=0} \quad = \quad \frac{\delta_1 + \delta_6 \ln P}{\omega} \quad - 1$$

Note that δ_5 drops out of the transitory price elasticity because it is evaluated at an incremental change around ln(P/P*)=0.

16 In all cases in this paper, the elasticities are linear combinations of parameters multiplied by constants, and thus their standard errors can be calculated in a straightforward manner by application of the formula: Var(aX+bY) = a^2Var(X) + b^2Var(Y) + abCov(X,Y), where X and Y in this case are the parameters, and a and b are constants.

17 Consider a case where there are just two individuals, who face the same price. The aggregate elasticity calculated according to equation (11) is:

$$\frac{e_1 g_1 + e_2 g_2}{g_1 + g_2}$$

Substituting the formula for the individual price elasticities and replacing ω_i with (Pg_i/Y_i) yields:

$$\frac{\left(\frac{dY_1}{Pg_1}-1\right)g_1+\left(\frac{dY_2}{Pg_2}-1\right)g_2}{g_1+g_2}$$

This reduces to:

$$\frac{d}{\left(\frac{Pg_1+Pg_2}{Y_1+Y_2}\right)}-1=\frac{d}{w_a}-1$$

This demonstrates that calculating the elasticity for each individual and constructing the appropriate weighted sum (the aggregate elasticity) is the same as evaluating the elasticity at a single share, the aggregate expenditure share from equation (12).

[18] About half the sample is randomly omitted from the public-use panel in 1982, 1984, and 1986 -- see the data section for further discussion. In these cases, 12-year averages are based on 9 years of data, with heavier weights on the years adjacent to the missing years (amounting to a linear extrapolation across the missing years).

[19] In accordance with the instrumental variables interpretation, it is not necessary for 12-year average income to be known to each individual in each year. Consistency involves the weaker requirement that the instrument constructed based on this information, $\ln P_s(\overline{M}_{is})$, be strongly correlated with the permanent variation in log price, and uncorrelated with the error terms. We could reasonably expect 12-year averages of income to be highly correlated with factors such as ability and education that determine expectations about future income, and to smooth out to approximately mean zero all timing behavior and random fluctuations in income over the sample period. It is not perfect, however, as an averaged measure of income which includes data from future years may be correlated with forecast error for expected income. My approach is also somewhat restrictive in that it requires the fixed 12-year average of income to have the same relationship with expected future income in each year, conditional on the other explanatory variables, despite the fact that it involves a different mix of past and future years' incomes in each year.

An alternative approach would be to use a lagged measure of averaged income from several past years to predict average income over several future years. This approach was rejected largely for data reasons. Such measures would need to include a reasonably large number of years in order to smooth out the effects of timing behavior, which is probably serially correlated over time. This would require eliminating from estimation several years from the beginning and the end of the sample. Because the panel only spans the years 1979 through 1990, this would effectively eliminate most of the time-series variation in tax law from the estimation period, which is crucial for identification. As discussed in the literature review, Auten, Sieg, and Clotfelter (2000) pursue another, less restrictive approach to identifying transitory versus permanent variation in income, but it comes at the cost of ignoring the potentially very important effects of pre-announced changes in tax law.

[20] I also tried estimating without these last two instruments and found that they made little difference to the estimates.

[21] The model is estimated using the fixed-effects two-stage-least-squares estimator in LIMDEP (Greene, 1998).

[22] When the model is extended to include the square and interaction terms in (6) above, the procedure is adjusted as follows. The endogenous / measured-with-error variables $[\ln(P_{it}/P_{is})]^2$ and $[\ln P_{it} \ln P_{is}]$ are added to the right-hand-side of equation (18), and $[\ln P_t(\overline{M}_{it}) - \ln P_s(\overline{M}_{is})]^2$ and $[\ln P_t(\overline{M}_{is}) \ln P_s(\overline{M}_{is})]$ are added to the set of excluded instruments.

[23] See Bound, Jaeger, and Baker (1995) for a discussion of this issue.

[24] 1983 is presumably kept in Randolph's sample because the systematic difference between current and future prices due to the gradual phase-in of ERTA81 was fairly small by 1983.

[25] Another problem with Randolph's estimation procedure involves the way the predicted values were constructed for the square of the transitory price deviation and the interaction between the current and permanent prices. These endogenous variables were not linearly regressed on the instrument set and other right-hand-side variables to construct their predicted variables, as is required by instrumental variables. Instead, he simply substituted into the square and interaction functions the predicted values for temporary and permanent prices obtained from linear regressions. As these are nonlinear functions, consistency is no longer guaranteed. This was presumably done because the instrument set provides no identification for the square and interaction terms.

[26] Christian and Frischmann (1989) provide a detailed discussion of attrition in this data set.

[27] For 1990, since actual 1991 P_{is} and Y_{is} are not available, I impute them by assuming 1990 income and deductions grow at the rate of inflation.

[28] This was estimated by Feldstein (1975) and Feldstein and Clotfelter (1976). The procedure used to account for gifts of appreciated assets in my paper follows Randolph (1995).

[29] Feenberg (1987) uses state income tax information in a study based on public-use cross-sectional tax return data, and simply omits the upper-income households for whom

state information is not available. He finds results similar to those estimated using federal tax law alone.

[30] Even among people who live in a single state with unchanging state tax law over the entire sample period, there may still be some tax-rate variation induced by state of residence that is independent of the fixed effects. This could occur due to the combination of changes in federal tax law and cross-deductibility rules.

[31] Other adjustments to pre-tax income include adding untaxed unemployment compensation before 1987, the health insurance deduction for the self-employed, untaxed pension distributions, excluded foreign earned income, and accelerated depreciation preferences. Disallowed passive losses are allowed after 1986, moving expenses and employee business expenses are subtracted in years when they are counted as itemized deductions rather exclusions. Taxable Social Security income is also removed in 1984 and later years.

[32] The exact definition of "averaged" taxable income is:

$$\overline{M}_{it} = \bar{y}_i - (d_1 + d_2)(.6)\overline{CG_i} - \overline{D}_i - (d_1 + d_2)\overline{S}_i - E_{it} - d_2\overline{W}_i - d_1\bar{I}_{1i} - d_2\bar{I}_{2i} - d_3\bar{I}_{3i} + d_3\overline{L}_i$$

where $\bar{y}_i$ is the individual's average-pretax income over twelve years, and d_1, d_2, and d_3 represent dummies for each of the three tax regimes: pre-ERTA81, the period between ERTA81 and TRA86, and post-TRA86. Average long-term capital gains realizations are represented by $\overline{CG}_i$, and 60 percent of this average is subtracted in 1986 and earlier years, consistent with the law during that period. $\overline{D}_i$ is average itemized deductions other than charity and state and local sales taxes over the whole sample period. $\overline{S}_i$ is average state and local sales tax deductions over the years they are observed (through 1986). E_{it} is the value of personal exemptions under the law in year t. $\overline{W}_i$ represents the average of the deduction for a two-worker couple over the years it was available. $\bar{I}_{ji}$ represents the average of IRA and Keogh deductions over each of the tax regimes j=1,2,3, reflecting changes in the allowable deduction amounts and eligibility requirements across the periods. $\overline{L}_i$ is the average of disallowed passive losses (expressed as a positive amount) over the post TRA86 period (these had been subtracted from y_{it} to obtain a consistent definition across years).

[33] Note that a one percent increase in price for everyone is not the same as a one percentage point decrease in the tax rate for everyone.

[34] This similarity also holds true for all of the other specifications, although the correspondence is not quite as exact for the specification with the square and interaction terms added, as it deviates from the almost ideal demand system form and its aggregability.

[35] The transitory instrument set for specification (3) includes [$\ln P_t(M_{it})$- $\ln P(\overline{M}_{it})$] and [$\ln(1\text{-}ATR(M_{it})$- $\ln(1\text{-}ATR(\overline{M}_{it}))$], where M_{it} is calculated in same way as $\overline{M}_{it}$, except it includes current pre-tax income and capital gains realizations rather than averaged levels.

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