Web Appendix to:
How Does Charitable Giving Respond to Incentives and Income? New Estimates from Panel Data

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CONTENTS

I. TECHNICAL DETAILS ON OUR ECONOMETRIC SPECIFICATION

In this section, we clarify the conditions under which our econometric specification is a consistent estimator of the elasticity of charitable giving with respect to permanent and transitory shocks to price and income. In the discussion that follows, we abstract from the use of "first dollar" price variables as instruments for current price and lagged changes in price, and we focus on the specification where we use one-period future changes in price and income. To simplify the notation, we define g_{it}, $p_{it,}$ and y_{it} as the residual variation in log charitable giving, log price, and log first-dollar after-tax income, respectively, after regressing them on the fixed effects, time dummies, and exogenous covariates. In that case, the equation we would like to estimate is:

$$(A.1)\quad g_{it} = \beta_1 \Delta p_{it-1} + \beta_2 \Delta p_{it} + \beta_3 (p_{it}) + \beta_4 E_{it}(\Delta p_{it+1}) + \beta_5 \Delta y_{it-1} + \beta_6 \Delta y_{it} + \beta_7 (y_{it}) + \beta_8 E_{it}(\Delta y_{it+1}) + \mu_{it.}$$

Here, $E_{it}(.)$ signifies individual *i*'s expectation at time *t* of the variable inside the parentheses, and μ_{it} represents a random error term. In reality, we as econometricians cannot observe an individual's expectation at time *t* of a future change in price or income, but rather observe the actual change in future price and income that is realized; we will address this with an instrumental variables strategy that will be explained later, and everything we say below depends on having valid instruments for expected future changes in price and income. We wish to allow for stochastic processes for the evolution of prices and incomes that involve three types of shocks: (1) transitory shocks that dissipate after one period; (2) persistent shocks that are a surprise at the time they begin to affect price or income; and (3) persistent shocks to price or income that are anticipated one period in advance. To do this, let us assume that the residual variation in the log price of charity evolves according to the following relationship:

$$(A.2)\quad p_{it} = p_{it-1} + u_{it} + v_{it} + e_{it} - e_{it-1,}$$

where u_{it} is a permanent shock occurring at time t that individual i does not anticipate at time t-1; v_{it} is a permanent shock occurring at time t that individual i does anticipate at time t-1; and e_{it} is a transitory shock that lasts one period and then disappears at time t+1. Let us also allow for an analogous stochastic process for the residual variation in income, where shocks to income are distinguished from their analogous shocks to price by a y superscript.

$$(A.3)\quad y_{it} = y_{it-1} + u^y_{it} + v^y_{it} + e^y_{it} - e^y_{it-1}$$

These stochastic processes are similar to those specified in Auten, Sieg, and Clotfelter (2002) except that we allow for future persistent shocks that are anticipated one period before they occur (the v's).

If *A.2* and *A.3* characterize the stochastic processes for residual log price and residual log income, then by substitution we can re-express equation *A.1* in terms of the various transitory and permanent shocks in equation *A.4* below:

$$\begin{aligned}(A.4)\quad g_{it} = {} & \beta_1(u_{it-1} + v_{it-1} + e_{it-1} - e_{it-2}) + \beta_2(u_{it} + v_{it} + e_{it} - e_{it-1}) \\ & + \beta_3\,[p_{i0} + e_{it} + \textstyle\sum_{s=0}^{t} (u_{is} + v_{is})] + \beta_4(v_{it+1} - e_{it}) \\ & + \beta_5(u^y_{it-1} + v^y_{it-1} + e^y_{it-1} - e^y_{it-2}) + \beta_6(u^y_{it} + v^y_{it} + e^y_{it} - e^y_{it-1}) \\ & + \beta_7[y_{i0} + e^y_{it} + \textstyle\sum_{s=0}^{t} (u^y_{is} + v^y_{is})] + \beta_8(v^y_{it+1} - e^y_{it}) \\ & + \mu_{it,}\end{aligned}$$

where p_{i0} and y_{i0} represent the initial conditions for residual log price and residual log income, respectively, for individual i. To demonstrate our claim in the paper that β_3 is an estimator of the effect of a change in price that has persisted for at least three periods (t-2, t-1, and t) and is not expected to reverse itself in the future, take the partial derivative of equation A.4 with respect to u_{it-2}, which is precisely a shock to price that has already persisted for three periods and is not expected to reverse itself in the future:

$$(A.5)\quad \partial g_{it} / \partial u_{it-2} = \beta_3$$

More generally, β_3 estimates the elasticity of charitable giving at time *t* with respect any permanent shock to log price (*u* and *v*) from any prior period up to and including period *t-2*. Moreover, if equations A.1 and A.2 together accurately characterize the demand function for current charitable giving and the stochastic process for price, then the persistent shocks from t-2 and earlier are the *only* kinds of shocks to price that contribute the identification of β_3. The fact that we have included the lagged and future price changes in the specification controls for *all* of the other shocks (whether transitory or permanent) that affect current charitable giving. The only remaining independent variation in current price once we control for the lagged and lead changes in price comes from persistent shocks that occurred before t-2.

The inclusion of lagged changes in price and income in our specification allows the short-run effect on charitable giving of a permanent shock to price or income to differ from its long-run effect. The short-run and long-run effects may differ, for example, because of gradual learning. Such an effect is intuitively plausible, especially considering that some of the variation in price during our sample period arose from complicated tax reforms, involving rather non-transparent changes in the alternative minimum tax, limitations on itemized deductions involving byzantine calculations, and complicated interactions between federal and state income taxes. Presumably it may have taken taxpayers some time to begin to understand the implications of these changes for their incentives to give to charity. To see how this is addressed in our specification, consider for example the effect on current charitable giving of a new permanent shock to price, u_{it}. The partial derivative of equation A.4 with respect to u_{it} is:

$$(A.6) \qquad \partial g_{it} / \partial u_{it} = \beta_2 + \beta_3$$

Empirically, we find that β_3 is negative, as we should expect since it is a price elasticity. In most specifications we find that our estimate of β_2 is positive and statistically different from zero. This suggests that the absolute value of the price elasticity of a new permanent shock to charitable giving is smaller than the elasticity of charitable giving to older permanent shocks, which is consistent with the hypothesis that there is gradual learning about changes to the tax law.

The effect of a one period transitory shock to price can be found by taking the partial derivative of equation *A.4* with respect to e_{it}, which yields:

(A.7) $\partial g_{it} / \partial e_{it} = \beta_2 + \beta_3 - \beta_4$

This corresponds to what Auten, Sieg, and Clotfelter call the "transitory price elasticity."

The effect of a future shock to price that is anticipated in advance can be found by taking the partial derivative of equation A.4 with respect to v_{it+1}, which yields:

(A.8) $\partial g_{it} / \partial v_{it+1} = \beta_4$

Analogous procedures can be used to show that β_7 estimates the effect on current charitable giving of a permanent shock to income (u^y or v^y) occurring in any prior period up to and including *t-2*. The short-run effect on current charitable giving of a new permanent shock to price is estimated by $\beta_6 + \beta_7$. The transitory income elasticity is estimated by $\beta_6 + \beta_7 - \beta_8$, and the elasticity of current giving with respect to an anticipated future increase in income is given by β_8.

In this framework, it is easy to see the potential sources of bias in the previous literature. In the traditional cross-sectional literature, only the current price was included the specification. The coefficient on current price in such a specification would be a biased estimator of β_3, because the expected future price change is an omitted variable that affects current charitable giving and is correlated with current price. In our framework, the expected future price change is definitely correlated with current price because current price contains e_{it} and expected future price change contains $-e_{it}$. In addition, the other component of the expected future price change, v_{it+1}, is likely to be correlated with current price as well. Figure 1 in the text, which illustrates the time path of the price of charitable giving in different income classes, demonstrates why. Tax reforms over the past few decades have tended to change prices a lot more for people with low prices (that is, high-income people) than for people with high prices (low- and middle-income people). This creates a systematic relationship between the size of anticipated future price changes caused by tax reform and current price. In such a case, a specification that fails to account for predictable future persistent changes in price that are induced by tax reform can be expected to yield inconsistent estimates of the persistent price elasticity, whereas our specification would produce consistent estimates.

An important challenge is that we do not observe the individual's expectation at time *t* of the future changes in price and income. We treat the change in future price and income that is actually realized after-the-fact as a measurement, with error, of the individual's time *t* expectation of those changes. If the resulting measurement error around the expectation is classical measurement error (mean zero white noise), and if we can find a valid instrument, then we can apply the standard instrumental variables remedy for errors-in-variables bias.

If price and income evolve according to the stochastic process we specified in equations *A.2* and *A.3,* then we can express the realized change in future residual variation in log price Δp_{it+1} and realized change in future residual variation in log income Δy_{it+1} as:

$$(A.9)\quad \Delta p_{it+1} = (v_{it+1} - e_{it}) + (u_{it+1} + e_{it+1})$$

$$(A.10)\quad \Delta y_{it+1} = (v^y_{it+1} - e^y_{it}) + (u^y_{it+1} + e^y_{it+1})$$

Since $(v_{it+1} - e_{it}) = \mathrm{E}_{\mathrm{it}}\Delta p_{it+1}$ and $(v^y_{it+1} - e^y_{it}) = \mathrm{E}_{\mathrm{it}}\Delta y_{it+1}$ are the "true" variables that we would like to include in our regression, $(u_{it+1} + e_{it+1})$ and $(u^y_{it+1} + e^y_{it+1})$ represent the measurement error in the realized future price change and income change variables that we include in our regression. So consistent estimation requires instruments that are correlated with $(v_{it+1} - e_{it})$ and $(v^y_{it+1} - e^y_{it})$, uncorrelated with $(u_{it+1} + e_{it+1})$ and $(u^y_{it+1} + e^y_{it+1})$, and that meet the other standard criteria for good instruments. For this to fit the classical measurement error model, the future unanticipated shocks $u_{it+1},\ e_{it+1},\ u^y_{it+1},\ e^y_{it+1}$ must be mean zero random errors that are uncorrelated with the exogenous instruments in our system, which is essentially the same assumption made in Auten, Sieg, and Clotfelter.

We argue that there is some portion of the expected future change in price that is predictable and knowable by the econometrician, and we construct an instrument meant to capture that predictable portion. One source of predictable future change in price is a tax reform that can be anticipated in advance of its implementation, for example because it was enacted before the year when it began to take effect, because it is gradually phased-in over time, or because it was part of the campaign platform of a politician who was elected before the end of the year. Another source of predictable changes in future prices is predictable demographic changes that have tax consequences – for instance, turning age 65 can be predicted in advance, and provides the taxpayer with various federal and state tax benefits that could push the taxpayer into a different marginal rate bracket; having a child can be predicted about 9 months in advance, and also yields numerous tax benefits. A third source of predictable price changes arises from that fact that price is a complicated non-linear function $P_{it}(Y'_{it})$, where $P_{it}(.)$ is the individual- and time-specific function that transforms pre-tax income into price, and Y'_{it} is pre-tax income. Since price is a function of marginal tax rates that depend on taxable income rather than pre-tax income, we are treating the characteristics that affect the relationship between pre-tax and taxable income, such as marital status, number of children, various and deductions as a share of pre-tax income, as part of the $P_{it}(.)$ function. Some portion of the future change in income is predictable based on the set of exogenous variables in our system, for example due to life-cycle factors and mean reversion in income over time. To the extent these affect price in a linear fashion, we cannot distinguish their effects through from the independent direct effects. Because $P_{it}(.)$ is a known non-linear function that varies greatly across time and across individuals due to tax reforms and individual characteristics such as state of residence, marital status, personal deductions, and so forth, predictable changes in future income due to these exogenous variables create predictable changes in price that are both independent of the linear effects of the exogenous variables and separately identifiable. Our primary instrument for future change in log price is:

$$(A.11)\quad lnP^*_{it+1}(Y'_{it} + e^{\hat{\gamma}\, z_{it}}) - lnP_{it}(Y'_{it})$$

$lnP^*_{it+1}(.)$ is the log price function constructed at time t+1 using actual tax law applying at time t+1, which is assumed to be known as of time t due to lags between the time when the law is enacted and implemented, gradual phase-ins, predictability due to election in year t, etc. Demographic factors involved in the P^*_{it+1} function that affect the transformation of pre-tax income into taxable income are assumed to be known in advance as well, for example because age, and number of children in the future, are generally predictable in advance.[1] We also assume in constructing P^*_{it+1} that individual deductions and components of income are equal to predicted pre-tax income times the average share of individual deductions and income

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[1] Changes in marital status do not come into play because when marital status changes, the taxpayer is treated as a different taxpaying unit.

components in overall pre-tax income over the previous three years. Y'_{it} is pre-tax income at time t, and $e^{\hat{\gamma} Z_{it}}$ is the predicted change in pre-tax income from a regression where the dependent variable is change in log pre-tax income between t and t+1, and the vector of explanatory variables $\mathbf{Z}_{it}$ includes the full set of exogenous variables in the system that would be known to the individual and the econometrician at time *t* -- that is, the exogenous variables in equation (1), not including year dummies and time dummies, and the full set of excluded instruments.[2] As a sensitivity analysis, we also try using a simpler instrument constructed by calculating $\Delta \ln P_{it+1}$ holding real income and all inputs into the tax calculator constant in real terms at their year *t* values, so that the variation in the instrument is driven entirely by tax reforms.

There is some portion of $(v_{it+1} - e_{it})$ that cannot be explained by our full set of instruments $\mathbf{Z_{it}}$ in a linear first stage regression; we'll call that unexplainable part w_{it+1}. The w_{it+1} could include, for example, the effects of private information about future shocks such as a raise that an individual anticipates in advance, or it could reflect some degree of imperfect foresight about next year's tax law. Based on the standard properties of instrumental variables estimators, consistent estimation does not require that our instrument explains all of the predictable change in price, only that it is correlated with that predictable change in price, is uncorrelated with the measurement error $(u_{it+1} + e_{it+1})$, and is uncorrelated with ε_{it}, the error term in equation (1).

Our primary instrument for change in future first-dollar after-tax log income is the predictable change in average tax rate, where average tax rate is defined as the individual's total income tax liability divided by pre-tax income. This is motivated by the fact that:

$$(A.12)\quad \ln Y_{it} = \ln Y'_{it} + \ln[1 - ATR_{it}(Y'_{it})],$$

where $\ln Y_{it}$ is log after-tax income, $\ln Y'_{it}$ is log pre-tax income, and $ATR_{it}(.)$ is the average tax rate as a function of pre-tax income. So basically, this uses the predictable future change in tax

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[2] We omit the individual fixed effects and year dummies because including them would presume perfect foresight about mean income for an individual over years included in the sample, and average change in income over the next year for the sample. Although we are controlling for these separately in a linear fashion, feeding them through the P_{it} function would introduce non-linear functions of them into the instrument set, and so would independently contribute to identification, which would violate our requirement that the instruments be uncorrelated with the forecast error. In the income prediction equation, we replace these with year *t* values of age and a dummy variable for marital status, which are normally omitted because the combination of fixed effects and year effects control for them.

liability as an instrument for the future change in after-tax income. We construct our future change in average tax rate instrument in a manner analogous to the future change in price instrument, so the instrument is:

$$(A.13)\quad \ln[1\text{-}ATR^*_{it+1}(Y'_{it} + e^{\hat{\gamma}\mathbf{Z}_{it}})] - \ln[1\text{-}ATR_{it}(Y'_{it})]$$

Here, $ATR^*_{it+1}(.)$ is the predicted function that transforms pre-tax income into an average tax rate for time t+1, constructed in a manner analogous to $P^*_{it+1}(.)$. The identifying assumptions are that our instrument shown in *A.13* is correlated with the anticipated future change in income ($v^y_{it+1} - e^y_{it}$), is uncorrelated with the measurement error $(u^y_{it+1} + e^y_{it+1})$, and is uncorrelated with ε_{it}, the error term in equation (1).

As noted in the text, we also use the time *t* marginal tax rate on capital gains and the predictable future change in marginal tax rate on capital gains as excluded instruments, since these should be another arguably exogenous source of persistent and transitory shocks to income and price, and should only influence charitable giving through their influence on income and price. We construct the instrument for future change in marginal tax rate on capital gains in a manner analogous to what we do for price and average tax rate in *A.11* and *A.12*.

Note that in the regressions used to construct the predictable future change in future log pre-tax income, $\hat{\gamma}\mathbf{Z}_{it}$, the set of explanatory variables $\mathbf{Z}_{it}$ includes the full set of exogenous instruments, including instruments for the future change in price, future change in average tax rate, and future change in *mtrcg* themselves. The rationale for including the future tax change variables is that they are meant to capture the effects of anticipated tax reforms on income dynamics – for instance, exogenous predictable changes in future tax rates due to tax reform are another source of predictable changes in future income if people retime income in response to the incentives to do so. For these initial income prediction regressions, we construct those future tax change instruments by holding an individual's real pre-tax income and all other inputs into the tax calculator constant in real terms at year t values.

In sum, the above analysis suggests that as long as we have valid instruments for future price and income changes, our econometric specification provides a consistent estimator of the elasticity of charitable giving with respect to permanent and transitory shocks to price and income under reasonable assumptions about the stochastic processes for price and income.

To check on this, we constructed simulated data where log price follows the stochastic process specified in equation A.2, and where we know the true values of the various shocks involved and the true relationship between charitable giving and these shocks, and then run a regression analogous to our econometric specification to see if it recovers the parameters of interest. The simulated data was constructed from 21,303 observations on log price of giving from the 1979-90 IRS / University of Michigan public use individual tax panel (which are simply used to provide initial conditions for price). We then use a random number generator to create simulated random shocks to price and charitable giving for each individual for a sufficient number of years to produce an estimation sample with ten years of data for each individual, according to the following equations:

(A.14) $g_{it} = 0.05\Delta p_{it-1} + 0.1\Delta p_{it} - 0.5 p_{it} + 1.1\mathrm{E}_{it}(\Delta p_{it+1}) + \mu_{it}$

(A.15) $\mathrm{E}_{it}(\Delta p_{it+1}) = v_{it+1} - e_{it}$

(A.16) $p_{it} = p_{it-1} + u_{it} + v_{it} + e_{it} + e_{it-1}$

(A.17) $v_{it+1} = 0.5 z_{it} + w_{it}$

(A.18) $w_{it} = -0.05 p_{it} + \eta_{it}$

Following our earlier notation, g is residual log giving, p is residual log price, μ_{it} is random error in the giving equation, v is a persistent shock to log price that is anticipated one period in advance, u is a persistent shock to price that is not anticipated in advance, and $\underline{e}$ is a transitory one-period shock to log price that is expected to disappear next period. The z_{it} is our instrument for the predictable future persistent shock to price v_{it+1}, which is imperfectly correlated with the true v_{it+1}; w_{it} is the error in the instrument's prediction of v_{it+1}. Equation A.18 allows the anticipated future persistent shock to price to be negatively and imperfectly correlated with current price, which as discussed above seems likely given the nature of tax reforms in the U.S. during our sample period. In the simulation, the μ_{it}, v_{it+1}, e_{it}, z_{it} are all random draws from a normal distribution with mean zero and standard deviation of 0.1, and the shock η_{it} is a random draw from a normal distribution with mean zero and standard deviation of 0.05. We chose the parameters in equation A.14 to allow for a situation where the transitory price elasticity is much larger than the persistent price elasticity, which is the case where the bias from failing to account for anticipated future price changes would be the greatest. In this simulation, the true persistent price elasticity is -0.5 and the true transitory price elasticity is -1.5, which correspond to Randolph's characterization of his preferred estimates.

In column (1) of Table A.1, we show estimates from a version of equation *A.14* where $E_{it}(\Delta p_{it+1})$ is replaced with Δp_{it+1}, and where we use z_{it} as the excluded instrument for Δp_{it+1}, which matches the specification we use in the text (after partialing out the effects of other covariates), provided we have a valid instrument. The 2SLS estimates in column (1) confirm that when we have a valid instrument such as z_{it} for the expected future price change, we recover the parameters of the true relationship shown in equation A.14, with some very small deviations due to the random noise in the simulation. In column (2), we use the same data to estimate the same equation but without the future price change. The estimated persistent price elasticity in that specification, at -0.589, is larger than the true value of -0.5, which demonstrates that if there are anticipated future persistent shocks to price that are correlated with current price, and people are highly responsive to those anticipated future shocks, then failing to account for those anticipated future shocks biases the absolute value of the estimated persistent price elasticity upwards. In an exercise not shown in Table A.1, we also tried a simulation that was similar in all respects except that the anticipated future persistent price shock (v_{it+1}) is *not* correlated with current price. In other words, the simulation was the same in all respects except that $-0.05p_{it}$ was removed from equation A.17. In that simulation, when we estimated a regression equivalent to column (2) in Table A.1, the coefficients on the lagged price changes were biased, but the coefficient on current price was not. This makes sense, because in that simulation, the omitted variable (future price change) is only correlated with current price because the future price change contains $-e_{it}$, the negative of the time t transitory shock, and a specification that includes Δp_t already controls for e_{it}, removing the bias. But, in the more realistic case where the anticipated future persistent price shocks are correlated with current price, column (2) of Table A.1 demonstrates that simply controlling for Δp_t is not adequate to eliminate the bias.

Table A.1 -- Estimates of equation A.14 using simulated data

	(1)	(2)	(3)
	Full specification, 2SLS	Current price and lagged changes in price	Current price only
Δp_{t-1}	0.049	-0.036	
	(0.002)***	(0.002)***	
Δp_t	0.098	-0.207	
	(0.003)***	(0.002)***	
p_t	-0.502	-0.589	-0.638
	(0.002)***	(0.001)***	(0.001)***
Δp_{t+1}	1.095		
	(0.008)***		
Constant	-0.001	-0.004	-0.020
	(0.001)	(0.000)***	(0.000)***
Observations	213,030	213,030	213,030

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Finally, column (3) of Table A.1 displays an estimate using the simulated data corresponding to equations (A.14) – (A.18) above (with anticipated persistent future price shocks that are correlated with current price), but where the regression that we estimate only includes current price. Now the coefficient on current price is -0.638, suggesting that it is an even more biased estimator of the persistent price elasticity. This makes sense, since the once lagged price change was reducing the bias by controlling for the transitory shock.

The simulation confirms that failing to allow for anticipated future price shocks that are correlated with current price biases estimates of the persistent price elasticity. It also confirms that our estimation procedure will produce consistent estimates if our characterization of the stochastic processes and relationships between various shocks and charitable giving are correct, and if we have valid instruments for the anticipated future price shock. Another interesting lesson from the simulation is that even when the transitory price elasticity is much larger than the persistent price elasticity and the magnitude of shocks that create differences between current and expected future prices is large, the degree of bias in a specification that just includes the current price is not that large. We have not carefully calibrated our simulation to ensure that the magnitudes of the various shocks are empirically realistic, so one should not draw strong conclusions about the magnitude of the bias from this.

II. FURTHER DETAILS ON HOW WE CONSTRUCTED PRICE VARIABLES

As explained in the text, we specify the price of charitable giving as:

$$(A.19) \quad P_{it} = 1 - mtr_{it} - n_{it} * s_{it} * a * (d * mtrcg_{it+1} - mtrcharcg_{it})$$

Recall that n_{it} is non-cash donations as a share of total donations, s_{it} is donations of stock and real estate as a share of total non-cash donations, a is unrealized appreciation as a share of non-cash donations, and d is a discount factor applied to the capital gains tax rate to reflect the fact that the alternative to donating an appreciated asset today may be to realize the capital gain on the asset at some distant future date or not at all.

Constructing n_{it} is complicated by the fact that various types of charitable contributions are subject to percentage of AGI limits, and donations in excess of those limits may be carried forward to later years. In our tax return data, the only charity variables that we have on a consistent basis are total charitable deductions after limitations, reported non-cash donations (taxpayers sometimes report amounts in excess of the limits for these), and carryovers from prior years that are deducted in the current year. The data do not indicate whether carried over amounts were originally cash or non-cash. Given this, we define n_{it} to be the minimum of non-cash donations currently reported by the taxpayer or 30 percent of AGI (the limit applicable for most types of non-cash donations), divided by the current charitable deduction after limitations less carryovers from prior years. As noted in the text, because n_{it} is likely endogenously related to charitable donations, we replace it with its mean value in the sample, 0.17, when constructing instruments for price.

We constructed an income-specific value for s_{it}, donations of stocks and real estate as a share of non-cash donations, from Table 3 in the July 2008 version of Ackerman and Auten. Taxpayers with incomes below \$75,000 (in constant year 2004 dollars) are assigned a value of 0.028 for s_{it}, and those with incomes above \$1 million are assigned a value of 0.956. Ackerman and Auten report mean values of s_{it} of 0.215 for incomes between \$75,000 and \$100,000, 0.52 for incomes between \$100,000 and \$250,000, 0.666 for incomes between \$250,000 and \$500,000, and 0.891 for incomes between \$500,000 and \$1 million. For these intermediate income ranges, we assign the mean value of s to the midpoint income in each range, and linearly interpolate values of s_{it} for others. The mean imputed value of s_{it} is 0.56.

We computed an average value of 0.59 for *a* from a sample of taxpayers who were subject to the alternative minimum tax (AMT) in the years 1987 through 2002, and therefore had to report capital gains on donations of appreciated assets. We limit the sample to those who would have been on the AMT even if they did not make any non-cash charitable donations. For these returns, we computed the aggregate amount of capital gains on donations of appreciated assets, and divided it by the aggregate value among the returns of the product of non-cash contributions and s_{it} (where s_{it} is imputed for each return explained in the previous paragraph).

There is relatively little evidence available to determine a reasonable value for the discount factor *d* applied to the capital gains rate. The previous literature has generally ignored *mtrcharcg* and has assumed that the product $a*s*d = 0.5$. The 0.5 comes from papers by Feldstein (1975) and Feldstein and Clotfelter (1976) that estimated it as a parameter in a cross-sectional charitable giving equation using maximum likelihood methods. We attempt to improve on this by inferring a reasonable value for *d* based on recent research by Ivkovic, Poterba, and Weisbenner (2005). Based on five years of individual-level data on asset trades from a brokerage house, they estimate the probability of selling an asset at each point over the five year period, conditional on the accumulated capital gains. Using this in conjunction with an assumed statutory tax rate on realized capital gains of 28% and an assumed 1% monthly nominal rate of appreciation (which is roughly consistent with the experience of the S&P500 1979-2005), they estimate an effective present-value- equivalent marginal tax rate on gains of 24% if assets not sold in the first 5 years are sold in year 5, 13% if assets not sold in the first 5 years are sold in year 20, and 0.6% if assets not sold in the first 5 years are held until death 20 years in the future. We compute an effective rate on assets sold at any time over 20 years by linearly interpolating between the 24% and 13% rates, assuming probabilities of sale in 5-year periods from year 5 to year 20 are proportional to sales of assets with that holding period as a share of total sales of assets with holding periods between 5 and 20 years, reported in Auten and Wilson (1999). We then compute the weighted average of that and the 0.6% rate on gains held until death in 20 years, where the weight on 0.6% is the estimated revenues that would be raised form taxing unrealized gains at death in 1998 (estimated by Poterba and Weisbenner, 2003) divided by actual revenues raised from taxing capital gains, from <http://www.treas.gov/offices/tax-policy/library/capgain2-2008.pdf>. The resulting effective rate is 19.5%, implying a discount factor of 19.5/28 or approximately 0.7.

III. DETAILS ON THE CONSTRUCTION OF THE DEPENDENT VARIABLE, CURRENT CHARITABLE CONTRIBUTIONS

In our data, we have the amount of prior year contribution that is carried over and claimed in the current year for all observations in all years from 1980 on. The year in which the carryover was originally donated is not reported in the data. Moreover, taxpayers do not report directly whether their contributions were limited in a particular year, and the percent of AGI limits differ depending on the type of organization to which the taxpayer is contributing and the type of gift.

In a situation where a taxpayer deducts a carried-over contribution from a prior year, we attempt to pinpoint the prior year in which the carried-over contribution originated, and reallocate it to that year. To do this, we rely on the following assumptions: (1) donations leading to carryovers must have originated in years when the taxpayer was at or above at least one of the percentage of AGI limits on charitable deductions; (2) if a taxpayer deducting a carried-over prior year donation in year *t* is also deducting a carried-over prior-year donation in year *t-1* then the donation likely originated in a year earlier than *t-1*; and (3) if a taxpayer deducting a carried-over prior year donation in year *t* is also is also deducting carried-over prior-year donations in both year *t-1* and year *t-2* then the donation likely originated in a year earlier than *t-2.* Drawing on these assumptions, we use the following algorithm to attempt to identify the year in which carryover contributions originated. For any taxpayer that reports carried over contributions from prior years in year *t*, we look back to year *t-1*. If no carryovers were claimed in year *t-1*, then year *t-1* is considered a possible source of the carryover. We then check year *t-2*. If year *t-1* was not a possible source, and no carryovers were claimed in year *t-2*, then year *t-2* is considered a possible source of the carryover. If year *t-1* was a possible source, then we include *t-2* as also a possible source only if no carryover was claimed in year *t-2* and the taxpayer was likely to be limited under the rules that pertain to “not-50% organizations” (for which the percent of AGI limits are lower). If more than one year is identified as a possible source, we then attempt to refine the set of possible source years by including as possible sources only the years that would have been limited under limits that apply to “50% organizations” (for which the percent of AGI limits are higher). The vast majority of charitable contributions are to 50% organizations. Finally, we allocate the carryover amounts equally among the year or years that are identified as possible sources of the carryover. The re-allocated carryovers are then added to the charitable deduction for the year or years when we deem the original donation to have occurred, and we subtract from that total the carryovers that were claimed in that year but came from prior year donations.

Our tax return data include the amounts that taxpayers originally reported on the individual line items from Schedule A for non-cash donations (except for a subset of returns in 1979 and 1980), and in some years and for some samples we also have the individual line item from Schedule A for cash donations. Taxpayers sometimes report amounts on these line items that are clearly in excess of the applicable percentage of AGI limits, and then apply the limits only on the line item for the final charitable deduction. Joulfaian (2001) used information from the individual line items for cash and non-cash donations to infer total current year contributions. We do not take this approach because we are missing at least one of these individual line items for a large number of observations in our data set, and because our review of the relevant IRS forms, instructions, and publications suggest to us that the meaning of these line items may be inconsistent across years and taxpayers. The instructions for how to apply the percentage of AGI limits on charitable giving are contained in IRS Publication 526 (versions of this publication dating back to 1992 are available at www.irs.gov). In many years since 1992, the relevant worksheet in that publication specifically instructed taxpayers to report the *after-limitation* amounts of non-cash donations and cash donations on the individual line items for those types of donations on Schedule A. In other years, the worksheet was ambiguous in this regard. An examination of the data suggests that some taxpayers do report amounts above the percentage of AGI limits on the individual line items for cash- and non-cash giving, regardless of what the instructions say. But because the instructions often clearly indicated not to do so, it is unclear what fraction of people with giving above the limits actually reported it there, and whether this varied systematically across years depending on how the instructions were phrased. Moreover, the IRS Statistics of Income division edited the cash, non-cash, and carryover line item variables in 1987-1990 to make them sum to the allowable charitable deduction (Joulfaian, 2001, p. 356). In any event, using this alternative approach would dramatically shrink our sample size and remove many years with tax reforms that are useful for identification, because the amount reported on the individual line item for cash donations on Schedule A is only available in our data for a limited number of years.

IV. ADDITIONAL ESTIMATES AND SENSITIVITY ANALYSES

In the balance of this appendix, we present the additional results from regressions reported in the paper, as well as results from a wide range of sensitivity analyses.

A. Pooled cross-section estimates and sensitivity to methods for addressing censoring

In Table A.2, we report estimates from specifications that omit both fixed effects and lag and lead changes in price and income, in order to verify that our data yield estimates roughly similar to the old cross-sectional literature when we use similar sources of identification. Columns (1) and (2) estimate such a model that also omits the state-level control variables, while column (3) adds back the state characteristics. In column (1), the dependent variable is the current charitable deduction (excluding current donations over the limits and including carryovers from prior years), while in columns (2) and (3) the dependent variable is the current charitable deduction in year *t*, less carryovers from prior years, plus any carryovers claimed in the next two future years that various indicators suggest probably came from year *t*. To examine whether explicitly accounting for censoring of the dependent variable affects the estimated price and income elasticities, column (4) presents marginal effects from a Tobit specification that includes the state-level control variables and uses donation instead of deduction in constructing the dependent variable. In all of these specifications, the price of giving is instrumented using the first dollar price.[3]

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[3] In all of the pooled cross-section specifications in Table A.2, we include two variables that are omitted from the fixed effects specifications reported in the text due to their collinearity with the combination of fixed effects and year effects: age and marital status. In addition, in the specifications that include state covariates we include a state-specific measure of church attendance in 2006. The church variable is the share of state residents who say they "attend church or synagogue once a week or almost every week," from a Gallup poll cited in San Diego Union-Tribune (2006).

Table A.2 -- Explaining log charitable giving: pooled cross section estimates

	(1)	(2)	(3)	(4)
	Charitable deduction, no state covariates	Charitable donation, no state covariates	Charitable donation, add state covariates	Tobit marginal effects
lnP_{it}	-0.992	-0.960	-0.957	-1.026
	(0.152)***	(0.143)***	(0.122)***	(0.030)***
lnY_{it}	0.918	0.893	0.896	0.899
	(0.017)***	(0.017)***	(0.015)***	(0.003)***
age	0.026	0.044	0.044	0.047
	(0.003)***	(0.004)***	(0.004)***	(0.002)***
(age/100) squared	0.783	-1.130	-1.159	-1.395
	(0.309)**	(0.361)***	(0.370)***	(0.157)***
married	0.281	0.331	0.324	0.351
	(0.034)***	(0.035)***	(0.034)***	(0.010)***
children	0.137	0.126	0.124	0.128
	(0.009)***	(0.009)***	(0.009)***	(0.005)***
other dependents	0.114	0.111	0.111	0.114
	(0.007)***	(0.007)***	(0.007)***	(0.004)***
lnP_salestax			-1.111	-1.170
			(1.037)	(0.265)***
ln(state house price)			-0.057	-0.057
			(0.076)	(0.014)***
state unemployment			-1.334	-1.403
			(0.991)	(0.295)***
church			0.802	0.797
			(0.284)***	(0.068)***
state gov't spending			1.942	1.950
			(0.877)**	(0.144)***

All columns control for year dummies, and use first-dollar price as an instrument for price. Standard errors are in parentheses; in the first three columns they are robust and clustered by state and income class; standard errors for the tobit are not robust nor clustered and they are not adjusted for the use of instrumental variables. Asterisks denote significance at the 1% (***), 5% (**), and 10% (***) levels.

In the most basic specifications in column (1), the price elasticity of the charitable *deduction* is estimated to be -0.992 with a standard error of 0.152, and the income elasticity for the charitable deduction is estimated to be 0.918, with a standard error of 0.017. When we switch to using our measure of charitable *donation* in column (2), the estimates are very similar; the price elasticity is -0.960 with a standard error of 0.143, while the income elasticity is 0.893 with a standard error of 0.017. These price elasticities are somewhat below the standard estimate of from single year cross-sectional studies around -1.2 noted in Clotfelter (1985) for estimates of this type, and the income elasticities are a bit higher than the standard estimate of around 0.7. One possible explanation for the modest differences in estimates compared to traditional single-year cross section studies is that we are here using a pooled set of cross sections from a large number of years that span widely varying federal and state tax laws, which provides greater independent identification for price and income variation and should reduce any biases arising from misspecification of functional form and difficulty disentangling price effects from income effects. In Column (3), controlling for state level characteristics has no appreciable effect on these estimates.

Table A.2 also depicts estimates of the effects of the various control variables. In the cross section, many of these factors have statistically significant and sensible effects. Age, marriage, children, and dependents are each estimated to have a positive partial association with charitable giving. Church attendance in one's state is estimated to have a particularly large positive impact on giving. Higher state government spending has a positive partial association with charitable donations, which is the opposite of "crowd out," although the estimates are imprecise. Log real state housing price and state unemployment rate have negative point estimates, but the standard errors are too large to say anything conclusive about them when we use robust clustered standard errors.

The degree of censoring in our estimation sample is small; only 3.7 percent of returns in the sample have zero charitable donations. In Column (4) of Table A.2, we report marginal effects, calculated at the means of the data in our estimation sample, of a Tobit model estimated on the pooled cross-sectional data, which includes the same explanatory variables as in column (3).[4] The dependent variable is the same as in columns (2) and (3), ln(*charity* + 10), and the Tobit accounts for censoring at a lower limit of ln(10).[5] The marginal effects estimated from the Tobit regression are quite similar to those in the other specifications, suggesting that explicitly accounting for the censoring of charitable giving does not have an appreciable effect on estimated price and income elasticities, at least in the pooled cross-section.

Estimating a censored regression model with over 60,000 fixed effects and instrumental variables is extremely challenging because the fixed effects cannot be differenced out of a non-

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[4] To address the endogeneity of price in the Tobit specification, we estimate a first stage linear regression where price is the dependent variable, and first-dollar price and the exogenous covariates are the explanatory variables. We then include the residual from the linear first stage equation for price as a control variable in the Tobit specification. Smith and Blundell (1986) show the conditions under which this will produce a consistent estimator of the Tobit coefficients. The reported standard errors in the Tobit have not been corrected for the use of instrumental variables.

[5] As long as the dependent variable is measured in log form, using a Tobit model does not obviate the need to add a constant to charity, since the log of charity is still undefined when charity equals zero. We explore the sensitivity to the size of the constant added to charity further below.

linear model, and including them directly in the specification was not feasible given the technology we had to work with at the Treasury Department. Fack and Landais (2009) estimate a censored quantile regression using pooled cross-sectional data to investigate the effects of tax incentives on charitable giving in France, which has the advantage of dealing with censoring in a way that requires fewer restrictive parametric assumptions than a Tobit does, of allowing the marginal effects of tax incentives on charitable donations to vary across quantiles of the distribution of donations in a flexible fashion, and avoiding distortion due to outliers. But implementing that approach was much easier in their context because they did not attempt to control for individual-specific fixed effects nor use instrumental variables. Chernozhukov, Fernandez-Val, and Kowalski, Amanda (2008) recently developed a censored quantile instrumental variables estimator, but implementing this with over 60,000 fixed effects was not feasible given our technology. Honore (1992) has developed a censored least absolute devaiations regression model that controls for fixed effects through a differencing-like method, but this does not allow for instrumental variables. Application of these methods to estimate the price elasticity of charitable giving would be a promising extension, but given the centrality of fixed effects and instrumental variables to our identification strategy, the technological limitations of the computers and software we have to work with at Treasury, and the very small degree of censoring in our data, we leave this for future research.

B. Fixed effects estimates omitting future price and income changes

In Table A.3, we demonstrate the impact of adding individual-specific fixed effects to the specification, while omitting lagged and / or future changes in price and income. In column (1) of Table A.3, we estimate a regression to the pooled cross section specification in column (3) of Table A.2, but adding individual specific fixed effects; it is also similar to the specification shown in column (5) of Table 2 in the text, but without lagged or future changes in price and income. Compared to the cross-sectional specification from column (3) of Table A.2, the price elasticity is now smaller in absolute value, dropping from -0.96 to -0.63, and the income elasticity is much smaller, dropping from 0.90 to 0.38. . The low income elasticity is what we would expect if people respond more to persistent variation in income than to transitory fluctuations in income, as the income elasticity in this specification is measuring responses to a mix of transitory and persistent changes in income. The price elasticity is actually very similar to persistent price elasticity of -0.61 we estimate in column (5) in Table 2 in the text, but column (2) of Table A.3 demonstrates that this similarity results from two biases working in opposite directions, which will not necessarily always offset each other so closely. In column (2) we add two lagged changes in price and income but still omit future changes. Here the coefficients on lnP_t and lnY_t represent "persistent" price and income elasticities in the sense that they estimate the change in giving in response to a change in price or income that has persisted for three years, but they ignore the possibility of anticipated future changes in price and income. In this specification, the persistent price elasticity increases somewhat to -0.768, and the persistent income elasticity decreases to 0.506, suggesting that failing to incorporate the possibility of anticipated future price and income changes tends to bias the persistent price elasticity upwards in absolute value, and tends to bias the persistent income elasticity downwards, but by modest amounts in this particular specification.

In column (3) of Table A.3, we show the effects of omitting lagged and lead changes in price and income from the specification shown in column (5) of Table 3 in the text, where coefficients on all variables except price are allowed to differ across income classes. In this specification, bias to the persistent price elasticity from omitting lagged and lead changes is more apparent, as omitting them reduces the persistent price elasticity estimate from -1.10 to -0.76. The difference here may be due to the fact that including separate year dummies by income class absorbs most of the effects of large and obvious predictable future tax price (as evidenced by the small coefficient on future price change in column (5) of Table 3), but not the effects of lagged changes in price (which as we will show below in Table A.5 still have a large and statistically significant effect on current giving even when we control for different time effects by income class). Income elasticity estimates in column (3) of Table A.3 are once again substantially smaller than the persistent income elasticity estimates we find when we add lagged and lead changes in income and price in column (5) of Table 3.

Table A.3 -- Fixed effects estimates omitting future changes in price and income from the specification

		(1)	(2)	(3)
		Assuming all coefficients are constant across income classes		Allowing coefficients on all variables except price to differ across income classes
		No lags or leads	Two lags, no leads	No lags or leads
ΔlnP_{it-1}			0.031 (0.040)	
ΔlnP_{it}			0.202 (0.064)***	
lnP_{it} *[persistent price elasticity]*		-0.629 (0.058)***	-0.768 (0.087)***	-0.756 (0.092)**
ΔlnY_{it-1}			-0.061 (0.008)***	
ΔlnY_{it}			-0.158 (0.008)***	
	< $100K			0.337 (0.035)**
	$100K - $200K			0.340 (0.034)**
lnY_{it} *[persistent income elasticity]*	$200K - $500K	0.381 (0.011)***	0.506 (0.016)***	0.255 (0.033)**
	$500K - $1M			0.284 (0.031)**
	≥ $1M			0.445 (0.016)**

All columns control for individual fixed effects, year dummies, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, and *state gov't spending*. In column (3) all variables except price and individual fixed effects are interacted with income class dummies. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (***) levels.

C. More detail on coefficient estimates for specifications reported in the paper, and tests of equality of coefficients across income classes

In Table A.4, we report the full results from the specifications reported in Table 2 in the text, including coefficients on demographic and state level variables. Briefly, number of children and number of other dependents are both estimated to have positive and significant effects on giving, and age squared has significant negative effects in all specifications. Estimates for state-year-specific variables generally have confidence intervals too wide to say anything conclusive.

We tried omitting these variables from the specification as well and found that the coefficients on the price and income variables were virtually unchanged.

Table A.4 -- Coefficients on All Variables from Specifications in Table 2, Explaining Log Charitable Giving: Estimates Assuming Coefficients are Uniform across Income Classes

	(1)	(2)	(3)	(4)	(5)	(6)
	Separate federal and state prices					
	Predictable tax change instruments		Perfect foresight		Combined federal-state price	
	Federal	State	Federal	State	Predictable tax change instruments	Perfect foresight
ΔlnP_{it-1}	0.027	0.170	0.022	0.163	0.012	0.021
	(0.046)	(0.075)**	(0.042)	(0.074)**	(0.047)	(0.040)
ΔlnP_{it}	0.181	0.567	0.171	0.564	0.189	0.198
	(0.067)***	(0.120)***	(0.063)***	(0.125)***	(0.066)***	(0.064)***
lnP_{it} [persistent price elasticity]	-0.346	-1.164	-0.389	-1.131	-0.607	-0.651
	(0.164)**	(0.278)***	(0.140)***	(0.202)***	(0.179)***	(0.097)***
$\Delta lnP_{i,t+1}$	0.442	0.250	0.371	0.292	0.180	0.145
	(0.185)**	(0.377)	(0.158)**	(0.302)	(0.198)	(0.046)***
ΔlnY_{it-1}	-0.054		-0.054		-0.061	-0.061
	(0.008)***		(0.008)***		(0.008)***	(0.008)***
ΔlnY_{it}	-0.141		-0.141		-0.153	-0.156
	(0.010)***		(0.009)***		(0.008)***	(0.007)***
lnY_{it} [persistent income elasticity]	0.510		0.528		0.602	0.541
	(0.107)***		(0.020)***		(0.120)***	(0.018)***
$\Delta lnY_{i,t+1}$	0.034		0.057		0.132	0.049
	(0.141)		(0.013)***		(0.158)	(0.008)***
lnP_salestax	-0.456		-0.453		-0.413	-0.392
	(0.509)		(0.509)		(0.501)	(0.523)
(age/100) squared	-4.834		-4.706		-3.847	-4.174
	(0.968)***		(0.557)***		(1.041)***	(0.547)***
children	0.037		0.037		0.034	0.035
	(0.007)***		(0.007)***		(0.007)***	(0.007)***
other dependents	0.040		0.040		0.038	0.039
	(0.007)***		(0.007)***		(0.007)***	(0.007)***
ln(state house price)	0.028		0.026		0.022	0.029
	(0.041)		(0.036)		(0.042)	(0.037)
state unemployment	0.106		0.115		0.064	-0.005
	(0.424)		(0.398)		(0.427)	(0.409)
state gov't spending	-0.102		-0.083		0.229	0.185
	(0.507)		(0.502)		(0.530)	(0.517)

All columns control for individual fixed effects and year dummies, (not shown). Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (***) levels.

In Table A.5, we report coefficients on all price and income variables in the specifications reported in the paper. Relative to what was already discussed in the paper, one notable point is that the coefficient on ΔlnP_{it} is consistently large and statistically significant. While the coefficient on lagged changes in state price remain larger than those on lagged changes in federal price, compared to Table 2 the coefficient on lagged federal price changes gets larger and moves close to the coefficient on lagged state price change, which makes sense given that controlling for separate time dummies by income class is removing most of the large, obvious time-series variation in federal price from the variation used to identify federal price effects, leaving more subtle identifying variation that may take longer to learn about and understand. Table A.5 also demonstrates that coefficients on ΔlnY_{it} are large, negative, and statistically significant for most income classes. As noted in the text, this is consistent with mean-reversion in income, along with stronger responsiveness of charitable giving to persistent than to transitory variation income. Coefficients on ΔlnY_{it} tend to grow larger in absolute value at higher income levels, suggesting that mean reversion in income may be stronger at higher income levels.

Table A.5 -- Coefficients on All Price Variables from Specifications in Table 3, Allowing Coefficients on Non-Price Variables to Differ Across Income Classes

	(1)	(2)	(3)	(4)	(5)	(6)
	Separate federal and state prices					
	Predictable tax change instruments		Perfect foresight		Combined federal-state price	
	Federal	State	Federal	State	Predictable tax change instruments	Perfect foresight
ΔlnP_{it-1}	0.120	0.121	0.119	0.122	0.116	0.113
	(0.052)**	(0.074)	(0.047)**	(0.076)	(0.050)**	(0.046)**
ΔlnP_{it}	0.316	0.473	0.315	0.490	0.336	0.337
	(0.075)***	(0.118)***	(0.071)***	(0.130)***	(0.074)***	(0.072)***
lnP_{it} *[persistent price elasticity]*	-0.919	-1.530	-0.857	-1.396	-1.103	-0.958
	(0.435)*	(0.582)***	(0.132)***	(0.198)***	(0.453)**	(0.139)***
$\Delta lnP_{i,t+1}$	0.120	-0.273	0.141	-0.104	-0.044	0.086
	(0.445)	(0.664)	(0.058)*	(0.066)	(0.464)	(0.054)

All columns control for *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price*), *state unemployment rate*, *state gov't spending*, and year dummies, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (***) levels.

Table A.5, Continued -- Coefficients on Income Variables from Specifications in Table 3, Estimates Allowing Coefficients on Non-Price Variables to Differ Across Income Classes

		(1) and (2)	(3) and (4)	(5)	(6)
		Separate federal and state prices		Combined federal and state price	
		Predictable tax change instruments	Perfect foresight	Predictable tax change instruments	Perfect foresight
ΔlnY_{it-1}	< $100K	-0.008	-0.034	-0.011	-0.037
		(0.032)	(0.022)	(0.031)	(0.021)
	$100K - $200K	-0.025	-0.025	-0.027	-0.028
		(0.029)	(0.020)	(0.029)	(0.020)
	$200K - $500K	-0.071	-0.062	-0.075	-0.064
		(0.022)***	(0.013)***	(0.022)***	(0.013)***
	$500K - $1M	-0.092	-0.059	-0.093	-0.061
		(0.022)***	(0.014)***	(0.022)***	(0.013)***
	≥ $1M	-0.059	-0.063	-0.061	-0.064
		(0.011)***	(0.010)***	(0.010)***	(0.010)***
ΔlnY_{it}	< $100K	-0.071	-0.096	-0.074	-0.098
		(0.045)	(0.030)***	(0.044)*	(0.030)***
	$100K - $200K	-0.059	-0.057	-0.062	-0.061
		(0.042)	(0.024)**	(0.042)	(0.024)***
	$200K - $500K	-0.157	-0.141	-0.163	-0.146
		(0.029)***	(0.019)***	(0.029)***	(0.018)***
	$500K - $1M	-0.200	-0.153	-0.206	-0.160
		(0.032)***	(0.018)***	(0.033)***	(0.017)***
	≥ $1M	-0.164	-0.166	-0.170	-0.172
		(0.011)***	(0.010)***	(0.010)***	(0.009)***
lnY_{it}	< $100K	0.601	0.438	0.612	0.437
		(0.211)***	(0.044)***	(0.211)***	(0.044)***
	$100K - $200K	0.458	0.416	0.467	0.417
		(0.150)***	(0.040)***	(0.150)***	(0.039)***
	$200K - $500K	0.315	0.376	0.330	0.386
		(0.109)***	(0.040)***	(0.109)***	(0.039)***
	$500K - $1M	0.298	0.420	0.323	0.438
		(0.107)***	(0.037)***	(0.109)***	(0.036)***
	≥ $1M	0.557	0.621	0.580	0.641
		(0.140)***	(0.026)***	(0.144)***	(0.024)***
$\Delta lnY_{i,t+1}$	< $100K	0.314	0.024	0.330	0.023
		(0.337)	(0.023)	(0.337)	(0.022)
	$100K - $200K	0.112	0.051	0.133	0.053
		(0.304)	(0.018)***	(0.302)	(0.018)***
	$200K - $500K	-0.085	0.045	-0.076	0.050
		(0.209)	(0.015)***	(0.212)	(0.015)***
	$500K - $1M	-0.354	0.007	-0.339	0.015
		(0.208)*	(0.013)	(0.207)	(0.013)
	≥ $1M	-0.014	0.055	-0.001	0.064
		(0.172)	(0.016)***	(0.178)	(0.016)***

All columns control for *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, *state gov't spending*, and year dummies, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (***) levels.

Table A.6 shows a full set of estimated coefficients on all variables, including year dummies, for the specification shown in columns (1) and (2) of Table 3 in the text (the specification using predictable tax change instruments that allows all coefficients on all variables except for price to differ by income class, and which includes separate federal and state prices). Notably, life cycle factors – represented here by (Age / 100) squared -- and year dummies tend to have statistically significant effects that appear to differ substantially across income classes. Children and other dependents both have positive and statistically significant effects across all income classes, and state housing prices are positively and statistically significantly associated with charitable giving for the below $100,000 income group, with smaller and less conclusive effects for higher-income groups, consistent with the fact that housing represents a larger share of wealth for the lower income groups (recalling that this is a sample of people who are in the midst of a span of itemizing deductions for at least six consecutive years, and so even those with incomes below $100,000 are likely to be homeowners). Aside from that, effects of other control variables are inconclusive due to large standard errors.

In Table A.7, for each specification reported in Table 3 in the text, we report p-values from chi-square tests against the null hypothesis that coefficients on each explanatory variable are equal across income classes. Across all specifications, we are able to reject the hypothesis of equality of coefficients across income classes at the 1 percent significance level for the persistent income elasticity, (age/100) squared, and all of the year dummies (with the exception of 1983 in the predictable tax change instrument specifications, where p-values are just slightly above 0.01). Equality across income classes for the coefficient on ΔlnY_{it} can be rejected at the 1 percent significance level in perfect foresight specifications, and at the 5 percent significance level in the predictable tax change specifications. We can also reject equality of coefficients across incomes at the 5 percent significance level for *ln(state house price)* in the perfect foresight specifications. In the perfect foresight specifications we can reject equality across income levels for the coefficients on future income change at the 10 percent significance level. We are not able to reject equality of coefficients across income classes at conventional significance levels for the other control variables.

Table A.6 – Estimated Coefficients on Control Variables, Specification in First Two Columns of Table 3, with Predictable Tax Change Instruments, Separate Federal and State Prices, and Allowing Coefficients on Non-Price Variables to Differ Across Income Classes

	< \$100K	\$100K - \$200K	\$200K - \$500K	\$500K – \$1 million	> \$1 million
lnP_salestax	-0.023	-0.155	0.270	-0.444	-0.862
	(0.596)	(0.792)	(0.674)	(0.771)	(0.540)
(age/100) squared	-5.525	-5.947	-6.134	-6.250	-5.910
	(1.143)***	(1.088)***	(1.067)***	(1.047)***	(1.000)***
children	0.017	0.030	0.039	0.040	0.056
	(0.012)	(0.011)***	(0.011)***	(0.011)***	(0.013)***
other dependents	0.027	0.031	0.038	0.043	0.057
	(0.012)**	(0.011)***	(0.010)***	(0.011)***	(0.011)***
ln(state house price)	0.101	0.062	0.020	0.019	-0.036
	(0.048)**	(0.052)	(0.045)	(0.053)	(0.047)
state unemployment	0.982	0.139	0.116	0.670	-1.324
	(0.717)	(0.614)	(0.666)	(0.766)	(1.063)
state gov't spending	-0.539	-0.379	-0.791	-0.233	0.531
	(0.514)	(0.466)	(0.536)	(0.608)	(0.743)
1981 dummy	-3.560	-1.463	0.876	0.985	-2.169
	(1.094)***	(0.184)***	(1.142)	(1.918)	(2.653)
1982 dummy	-3.556	-1.499	0.676	0.617	-2.277
	(1.102)***	(0.172)***	(1.147)	(1.927)	(2.664)
1983 dummy	-3.389	-1.375	0.627	0.728	-2.073
	(1.099)***	(0.163)***	(1.151)	(1.919)	(2.660)
1984 dummy	-3.307	-1.139	1.108	1.228	-1.885
	(1.105)***	(0.153)***	(1.151)	(1.925)	(2.680)
1985 dummy	-3.238	-1.067	1.223	1.430	-1.749
	(1.119)***	(0.135)***	(1.140)	(1.902)	(2.690)
1986 dummy	-3.099	-0.941	1.324	1.440	-1.491
	(1.113)***	(0.138)***	(1.144)	(1.902)	(2.645)
1987 dummy	-2.981	-0.937	1.371	1.502	-1.649
	(1.115)***	(0.121)***	(1.140)	(1.911)	(2.698)
1988 dummy	-2.942	-0.766	1.556	1.699	-1.434
	(1.116)***	(0.122)***	(1.141)	(1.906)	(2.678)
1989 dummy	-2.864	-0.675	1.678	1.865	-1.225
	(1.112)**	(0.108)***	(1.141)	(1.899)	(2.669)
1990 dummy	-2.790	-0.596	1.778	1.909	-1192
	(1.112)**	(0.106)***	(1.148)	(1.900)	(2.659)
1991 dummy	-2.700	-0.497	1.881	2.002	-1.021
	(1.120)**	(0.093)***	(1.143)*	(1.904)	(2.667)
1992 dummy	-2.582	-0.393	1.925	2.007	-1.041
	(1.123)**	(0.083)***	(1.145)*	(1.908)	(2.656)
1993 dummy	-2.529	-0.300	2.015	2.091	-0.797
	(1.123)**	(0.046)***	(1.142)*	(1.901)	(2.643)
1994 dummy	-2.506	-0.284	2.071	2.157	-0.689
	(1.131)**	(0.057)***	(1.140)*	(1.903)	(2.651)

All columns control for individual fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (***) levels.

Table A.6, Continued – Estimated Coefficients on Control Variables, Specification in First Two Columns of Table 3, with Predictable Tax Change Instruments, Separate Federal and State Prices, and Allowing Coefficients on Non-Price Variables to Differ Across Income Classes

	< $100K	$100K - $200K	$200K - $500K	$500K – $1 million	> $1 million
1995 dummy	-2.402	-0.230	2.138	2.463	-0.850
	(1.130)**	(0.046)***	(1.133)*	(1.891)	(2.650)
1996 dummy	-2.336	-0.122	2.301	2.550	-0.500
	(1.134)**	(0.032)***	(1.130)**	(1.894)	(2.642)
1997 dummy	-2.195	omitted	2.425	2.665	-0.340
	(1.143)*	category	(1.123)**	(1.878)	(2.690)
1998 dummy	-2.074	0.101	2.397	2.443	-0.339
	(1.145)*	(0.036)***	(1.130)**	(1.887)	(2.620)
1999 dummy	-1.995	0.214	2.637	2.663	-0.075
	(1.149)*	(0.039)***	(1.121)**	(1.873)	(2.650)
2000 dummy	-1.873	0.312	2.664	2.734	-0.134
	(1.151)	(0.044)***	(1.127)**	(1.867)	(2.617)
2001 dummy	-1.747	0.435	2.795	2.908	-0.080
	(1.154)	(0.047)***	(1.125)**	(1.878)	(2.654)
2002 dummy	-1.653	0.523	2.929	3.042	0.033
	(1.162)	(0.059)***	(1.126)***	(1.898)	(2.678)
2003 dummy	-1.563	0.608	3.022	3.231	0.255
	(1.170)	(0.074)***	(1.128)***	(1.917)*	(2.705)
2004 dummy	-1.465	0.756	3.158	3.406	0.439
	(1.176)	(0.080)***	(1.128)***	(1.917)*	(2.716)

All columns control for individual fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (***) levels.

Table A.7 -- P-values on Tests against Null Hypothesis that Coefficients are Equal across Income Classes, for Specifications in Table 3, Allowing Coefficients on Non-Price Variables to Differ Across Income Classes

	(1) and (2)	(3) and (4)	(5)	(6)
	Separate federal and state prices		Combined federal-state price	
	Predictable tax change instruments	Perfect foresight	Predictable tax change instruments	Perfect foresight
ΔlnY_{it-1}	0.1606	0.3788	0.1527	0.4074
ΔlnY_{it}	0.0498	0.0001	0.0386	0.0001
lnY_{it} *[persistent income elasticity]*	0.0059	0.0000	0.0047	0.0000
$\Delta lnY_{i,t+1}$	0.2435	0.0892	0.2219	0.0967
lnP_salestax	0.6770	0.5393	0.6585	0.5240
(age/100) squared	0.0000	0.0000	0.0000	0.0000
children	0.2306	0.3167	0.2522	0.3411
other dependents	0.4644	0.4063	0.5288	0.4759
ln(state house price)	0.0912	0.0225	0.1207	0.0349
state unemployment	0.3285	0.3208	0.3177	0.3261
state gov't spending	0.3585	0.3010	0.3424	0.2778
1981 dummy	0.0029	0.0000	0.0037	0.0000
1982 dummy	0.0073	0.0001	0.0090	0.0001
1983 dummy	0.0144	0.0007	0.0173	0.0004
1984 dummy	0.0041	0.0000	0.0050	0.0000
1985 dummy	0.0038	0.0001	0.0048	0.0000
1986 dummy	0.0050	0.0001	0.0060	0.0001
1987 dummy	0.0049	0.0001	0.0058	0.0001
1988 dummy	0.0034	0.0000	0.0041	0.0000
1989 dummy	0.0030	0.0000	0.0036	0.0000

All columns control for individual fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (***) levels.

Table A.7, Continued -- P-values on Tests against Null Hypothesis that Coefficients are Equal across Income Classes, for Specifications in Table 3, Allowing Coefficients on All Variables Including Price to Differ Across Income Classes

	(1) and (2)	(3) and (4)	(5)	(6)
	Separate federal and state prices		Combined federal-state price	
	Predictable tax change instruments	Perfect foresight	Predictable tax change instruments	Perfect foresight
1990 dummy	0.0024	0.0000	0.0029	0.0000
1991 dummy	0.0033	0.0000	0.0039	0.0000
1992 dummy	0.0033	0.0000	0.0040	0.0000
1993 dummy	0.0048	0.0001	0.0058	0.0001
1994 dummy	0.0051	0.0001	0.0062	0.0001
1995 dummy	0.0011	0.0000	0.0014	0.0000
1996 dummy	0.0020	0.0000	0.0027	0.0000
1997 dummy	0.0023	0.0001	0.0029	0.0001
1998 dummy	0.0068	0.0006	0.0079	0.0006
1999 dummy	0.0080	0.0005	0.0092	0.0005
2000 dummy	0.0046	0.0001	0.0055	0.0001
2001 dummy	0.0036	0.0001	0.0044	0.0001
2002 dummy	0.0040	0.0001	0.0047	0.0001
2003 dummy	0.0045	0.0001	0.0053	0.0001
2004 dummy	0.0044	0.0002	0.0053	0.0002

All columns control for individual fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (***) levels.

Tables A.8 and A.9 depict coefficients on all price and income variables for the specifications reported in Table 4 in the text, which allow coefficients on all variables including price to differ by income class. Coefficients on lagged price changes again provide evidence of gradual adjustment to price changes, perhaps due to learning. Persistent income elasticities exhibit similar patterns across income classes to those in corresponding specifications that constrain price elasticities to be constant across income classes. There is once again evidence of a modest positive response to future increases in income in the perfect foresight specifications, but evidence on this is inconclusive in the predictable tax change instrument specifications.

In Table A.10, for each specification reported in Table 4 in the text, we report p-values from chi-square tests against the null hypothesis that coefficients on each explanatory variable are equal across income classes. As noted in the text, we generally cannot reject the hypothesis of equality of persistent price elasticities across income classes, except that the difference across incomes of the persistent state price elasticity is marginally significant in the predictable tax change instrument specification, with a p-value of 0.067. Neither can we reject equality of coefficients across income classes for the other price variables at conventional significance levels, with on small exception being the coefficient on future state price change in the perfect foresight specification. We can once again consistently reject equality of coefficients across income classes for the persistent income elasticity, year dummies, and (age / 100) squared. Equality of coefficients across incomes can be rejected at the 5 percent significance level for ΔlnY_{it} and *ln(state house price)* in the perfect foresight specifications, and for ΔlnY_{it+1} in the perfect foresight specification which includes separate state and federal prices. Otherwise, we generally cannot reject equality of coefficients across income levels for other explanatory variables.

Table A.8 – Estimated Coefficients on Price Variables from Specifications in Table 4, Allowing Coefficients on All Variables Including Price to Differ Across Income Classes

		(1)	(2)	(3)	(4)	(5)	(6)
		Separate federal and state prices				Combined federal and state price	
		Predictable tax change instruments		Perfect foresight		Predictable tax change instruments	Perfect foresight
		Federal	State	Federal	State		
ΔlnP_{it-1}	< \$100K	0.181	-0.019	0.062	-0.181	0.167	0.025
		(0.177)	(0.184)	(0.077)	(0.135)	(0.156)	(0.075)
	\$100K - \$200K	0.277	0.193	0.133	0.101	0.256	0.122
		(0.153)*	(0.172)	(0.076)*	(0.136)	(0.132)*	(0.075)
	\$200K - \$500K	0.057	0.220	0.139	0.292	0.080	0.154
		(0.099)	(0.155)	(0.084)*	(0.139)**	(0.093)	(0.084)*
	\$500K - \$1M	0.129	0.149	0.155	0.145	0.134	0.154
		(0.099)	(0.151)	(0.094)*	(0.140)	(0.094)	(0.090)*
	≥ \$1M	0.081	0.109	0.109	0.144	0.068	0.098
		(0.069)	(0.102)	(0.064)*	(0.100)	(0.065)	(0.060)*
ΔlnP_{it}	< \$100K	0.510	0.392	0.260	-0.030	0.512	0.217
		(0.325)	(0.338)	(0.145)*	(0.194)	(0.285)*	(0.136)
	\$100K - \$200K	0.538	0.544	0.293	0.454	0.514	0.301
		(0.227)**	(0.307)*	(0.141)**	(0.233)*	(0.205)**	(0.146)**
	\$200K - \$500K	0.239	0.307	0.416	0.486	0.257	0.425
		(0.129)*	(0.175)*	(0.105)***	(0.129)***	(0.116)**	(0.100)***
	\$500K - \$1M	0.193	0.268	0.267	0.320	0.207	0.280
		(0.141)	(0.212)	(0.117)**	(0.160)**	(0.142)	(0.116)*
	≥ \$1M	0.255	0.589	0.291	0.659	0.296	0.347
		(0.115)**	(0.163)***	(0.097)***	(0.167)***	(0.104)***	(0.096)***
lnP_{it}	< \$100K	-0.227	0.356	-0.911	-0.858	0.024	-0.869
		(0.773)	(0.766)	(0.182)***	(0.231)***	(0.667)	(0.168)***
	\$100K - \$200K	0.302	-0.362	-0.779	-1.044	0.002	-0.819
		(0.673)	(0.662)	(0.150)***	(0.232)***	(0.594)	(0.149)***
	\$200K - \$500K	-0.797	-1.185	-0.833	-1.247	-0.913	-0.902
		(0.530)	(0.488)**	(0.127)***	(0.180)***	(0.454)**	(0.129)***
	\$500K - \$1M	-0.705	-1.036	-0.792	-1.208	-0.833	-0.859
		(0.648)	(0.690)	(0.163)***	(0.182)***	(0.626)	(0.161)***
	≥ \$1M	-1.091	-1.711	-0.831	-1.583	-1.403	-1.032
		(0.441)**	(0.626)***	(0.248)***	(0.264)***	(0.432)***	(0.240)***
$\Delta lnP_{i,t+1}$	< \$100K	1.463	2.377	0.065	-0.016	1.790	0.070
		(1.257)	(1.346)*	(0.092)	(0.151)	(1.067)*	(0.085)
	\$100K - \$200K	2.021	0.656	0.046	-0.121	1.586	0.015
		(1.213)*	(1.443)	(0.099)	(0.156)	(1.052)	(0.098)
	\$200K - \$500K	-0.133	-0.630	0.022	-0.308	-0.249	-0.034
		(0.764)	(0.751)	(0.092)	(0.118)***	(0.619)	(0.089)
	\$500K - \$1M	0.255	-0.164	0.067	-0.402	0.109	-0.005
		(0.847)	(1.029)	(0.114)	(0.139)***	(0.811)	(0.111)
	≥ \$1M	-0.029	-0.007	0.321	0.130	-0.248	0.241
		(0.504)	(0.733)	(0.135)**	(0.124)	(0.434)	(0.125)*

See notes to Table 4. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (***) levels.

Table A.9 – Estimated Coefficients on All Income Variables from Specifications in Table 4, Allowing Coefficients on All Variables Including Price to Differ Across Income Classes

		(1) and (2)	(3) and (4)	(5)	(6)
		Separate federal and state prices		Combined federal and state price	
		Predictable tax change instruments	Perfect foresight	Predictable tax change instruments	Perfect foresight
ΔlnY_{it-1}	< \$100K	0.017	-0.052	0.015	-0.053
		(0.064)	(0.024)	(0.058)	(0.024)**
	\$100K - \$200K	-0.017	-0.023	-0.016	-0.027
		(0.060)	(0.021)	(0.052)	(0.021)
	\$200K - \$500K	-0.075	-0.056	-0.079	-0.062
		(0.025)	(0.013)	(0.023)***	(0.013)***
	\$500K - \$1M	-0.099	-0.057	-0.091	-0.060
		(0.023)	(0.014)	(0.023)***	(0.013)***
	≥ \$1M	-0.058	-0.063	-0.060	-0.064
		(0.012)	(0.010)	(0.011)***	(0.010)***
ΔlnY_{it}	< \$100K	-0.022	-0.122	-0.020	-0.122
		(0.103)	(0.036)***	(0.093)	(0.036)***
	\$100K - \$200K	-0.043	-0.061	-0.046	-0.068
		(0.086)	(0.031)**	(0.074)	(0.030)**
	\$200K - \$500K	-0.172	-0.136	-0.173	-0.141
		(0.031)***	(0.019)***	(0.030)***	(0.019)***
	\$500K - \$1M	-0.207	-0.155	-0.212	-0.160
		(0.036)***	(0.017)***	(0.035)***	(0.017)***
	≥ \$1M	-0.159	-0.162	-0.171	-0.172
		(0.016)***	(0.011)***	(0.012)***	(0.009)***
lnY_{it}	< \$100K	0.791	0.446	0.823	0.455
		(0.425)*	(0.048)***	(0.350)**	(0.048)***
	\$100K - \$200K	0.563	0.423	0.577	0.430
		(0.304)*	(0.046)***	(0.243)**	(0.045)***
	\$200K - \$500K	0.284	0.374	0.311	0.387
		(0.172)*	(0.041)***	(0.141)**	(0.039)***
	\$500K - \$1M	0.216	0.402	0.253	0.428
		(0.097)**	(0.034)***	(0.094)***	(0.033)***
	≥ \$1M	0.465	0.620	0.487	0.644
		(0.144)***	(0.026)***	(0.138)***	(0.025)***
$\Delta lnY_{i,t+1}$	< \$100K	0.678	0.016	0.704	0.019
		(0.701)	(0.025)	(0.590)	(0.025)
	\$100K - \$200K	0.191	0.038	0.229	0.041
		(0.648)	(0.023)*	(0.524)	(0.022)*
	\$200K - \$500K	-0.218	0.035	-0.170	0.042
		(0.288)	(0.017)*	(0.241)	(0.016)**
	\$500K - \$1M	-0.443	-0.004	-0.407	0.012
		(0.224)**	(0.013)	(0.219)*	(0.013)
	≥ \$1M	-0.128	0.057	-0.128	0.063
		(0.186)	(0.016)***	(0.175)	(0.016)***

See notes to Table 4. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (***) levels.

Table A.10 -- P-values on Tests against Null Hypothesis that Coefficients are Equal across Income Classes, for Specifications in Table 4, Allowing Coefficients on All Variables Including Price to Differ Across Income Classes

	(1) and (2)		(3) and (4)		(5)	(6)
	Separate federal and state prices				Combined federal-state price	
	Predictable tax change instruments		Perfect foresight		Predictable tax change instruments	Perfect foresight
	Federal	State	Federal	State		
ΔlnP_{it-1}	0.6964	0.8295	0.9293	0.1523	0.7018	0.7543
ΔlnP_{it}	0.7136	0.6305	0.7642	0.0838	0.7112	0.7096
lnP_{it} *[persistent price elasticity]*	0.1486	0.0668	0.9457	0.2685	0.1430	0.9196
$\Delta lnP_{i,t+1}$	0.3327	0.3286	0.4245	0.0116	0.3190	0.4212
ΔlnY_{it-1}	0.4039		0.5452		0.3137	0.6068
ΔlnY_{it}	0.2377		0.0217		0.2245	0.0132
lnY_{it} *[persistent income elasticity]*	0.0016		0.0000		0.0021	0.0000
$\Delta lnY_{i,t+1}$	0.1684		0.0362		0.1871	0.1381
lnP_salestax	0.5462		0.4402		0.6063	0.4827
(age/100) squared	0.0000		0.0000		0.0000	0.0000
children	0.1207		0.3088		0.1027	0.3138
other dependents	0.2981		0.3379		0.2634	0.4276
ln(state house price)	0.1390		0.0167		0.0993	0.0371
state unemployment	0.2749		0.4160		0.1557	0.3506
state gov't spending	0.3729		0.4732		0.4150	0.3189
1981 dummy	0.0106		0.0002		0.0083	0.0000
1982 dummy	0.0172		0.0010		0.0139	0.0001
1983 dummy	0.0318		0.0043		0.0282	0.0007
1984 dummy	0.0127		0.0005		0.0107	0.0001

Table A.10, Continued -- P-values on Tests against Null Hypothesis that Coefficients are Equal across Income Classes, for Specifications in Table 4, Allowing Coefficients on All Variables Including Price to Differ Across Income Classes

	(1) and (2)	(3) and (4)	(5)	(6)
	Separate federal and state prices		Combined federal-state price	
	Predictable tax change instruments	Perfect foresight	Predictable tax change instruments	Perfect foresight
1985 dummy	0.0127	0.0005	0.0109	0.0001
1986 dummy	0.0157	0.0007	0.0123	0.0001
1987 dummy	0.0159	0.0006	0.0130	0.0001
1988 dummy	0.0133	0.0003	0.0113	0.0001
1989 dummy	0.0118	0.0003	0.0102	0.0001
1990 dummy	0.0108	0.0002	0.0083	0.0001
1991 dummy	0.0126	0.0003	0.0104	0.0001
1992 dummy	0.0111	0.0003	0.0096	0.0001
1993 dummy	0.0136	0.0006	0.0120	0.0002
1994 dummy	0.0142	0.0005	0.0125	0.0002
1995 dummy	0.0057	0.0001	0.0050	0.0000
1996 dummy	0.0078	0.0001	0.0069	0.0001
1997 dummy	0.0073	0.0003	0.0109	0.0001
1998 dummy	0.0198	0.0015	0.0171	0.0009
1999 dummy	0.0155	0.0013	0.0138	0.0007
2000 dummy	0.0130	0.0005	0.0118	0.0007
2001 dummy	0.0108	0.0004	0.0094	0.0001
2002 dummy	0.0111	0.0004	0.0096	0.0001
2003 dummy	0.0131	0.0005	0.0116	0.0002
2004 dummy	0.0146	0.0006	0.0130	0.0003

D. Sensitivity of estimates to constraining coefficients on certain variables to be constant across income classes

Given that there are some variables for which we cannot reject equality of coefficients across income classes, in Table A.11 we report estimates from more parsimonious versions of selected specifications that were reported in the text. Column (1) of Table A.11 shows the price and income elasticity estimates that were reported in column (5) of Table 3, the specification that allowed coefficients on all non-price variables to differ across income classes, used combined federal-state price, and followed the predictable tax change instrument approach. In column (2) of Table A.11, we show estimates from a similar specification which constrains the coefficients on *lnP_salestax*, *children*, *other dependents*, *ln(state house price)*, *state unemployment*, and *state gov't spending* to be constant across income classes, since we were unable to reject equality of coefficients across income classes at the 5 percent significance level for any of these variables in this particular specification. Estimates of the main parameters and standard errors of interest are almost identical when we do this – for instance, the estimated persistent price elasticity is -1.11 with a standard error of 0.44 in the more parsimonious specification, and -1.10 with a standard error of 0.45 in the less parsimonious specification, and persistent income elasticity estimates and standard errors are also very close across the two specifications. Columns (3) and (4) of Table A.11 repeat this exercise for the specification shown in column (5) of Table 4 in the text, which allowed coefficients on all variables including price to differ by income class, used the predictable tax change instrument approach, and used combined federal-state prices. Once again the estimates of the key parameters and standard errors of interest are very similar in the more and less parsimonious specifications.

Table A.11 – Sensitivity of persistent price and income elasticity estimates to constraining coefficients on *lnP_salestax*, *children*, *other dependents*, *ln(state house price)*, *state unemployment*, and *state gov't spending* to be constant across income classes, predictable tax change instrument specifications using combined federal-state price

		(1)	(2)	(3)	(4)
		Uniform price elasticities		Heterogeneous price elasticities	
Elasticity	Income class	Unconstrained	Constrained	Unconstrained	Constrained
Persistent price	< $100K	-1.10 (0.45)**	-1.11 (0.44)**	0.02 (0.67)	-0.16 (0.67)
	$100K - $200K			0.00 (0.60)	-0.15 (0.59)
	$200K - $500K			-0.91 (0.45)**	-0.87 (0.46)
	$500K - $1M			-0.83 (0.63)	-0.99 (0.63)
	≥ $1M			-1.40 (0.43)***	-1.34 (0.42)***
Persistent income	< $100K	0.61 (0.21)***	0.55 (0.21)***	0.82 (0.35)**	0.67 (0.39)*
	$100K - $200K	0.47 (0.15)***	0.43 (0.15)***	0.58 (0.24)**	0.46 (0.27)*
	$200K - $500K	0.33 (0.11)***	0.31 (0.11)***	0.31 (0.14)**	0.26 (0.16)
	$500K - $1M	0.32 (0.11)***	0.32 (0.11)***	0.25 (0.09)***	0.25 (0.09)***
	≥ $1M	0.58 (0.14)***	0.59 (0.14)**	0.49 (0.14)***	0.51 (0.13)***

All columns control for *(age/100) squared* and year dummies, each interacted with dummies for each income class, along with fixed effects. Columns labeled "constrained" control for *lnP_salestax*, , *children*, *other dependents*, *ln(state house price*), *state unemployment rate*, *state gov't spending*, with coefficients on those variables constrained to be constant across income classes. Columns labeled "unconstrained" interact *lnP_salestax*, , *children*, *other dependents*, *ln(state house price*), *state unemployment rate*, and *state gov't spending* with dummies for each income class. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

E. Income prediction regressions

In Tables A.12 and A.13, we report estimates from the regressions that we run to construct the predicted values of future income that are in turn run through the tax calculator to help us construct the predictable tax change instruments for future changes in price and income. Table A.12 presents results for the specifications in which parameters are constrained to be constant across income groups, and Table A.13 presents the results when we allow for heterogeneity by income group. Predicted values of income from the regression in Table A.12 are used to construct the instruments used in the predictable tax change instrument specifications in Table 2 in the text. Predicted values of income from the regression in Table A.13 are used to construct the instruments used in the predictable tax change specifications in Tables 3 and 4 in the text. The most striking pattern evident from these tables is the strong empirical confirmation of mean-reversion in income. That is, positive lagged changes in income and high current levels of income both strongly predict a future decline in income. The estimates also suggest that the characteristics of the tax system and demographic factors have strong partial associations with future income growth.

Table A.12 – Regression explaining change in pre-tax income between t and t+1, used to construct predictable tax change instruments in uniform parameters specifications

ΔlnY_{it-1}	-0.092 (0.002)***
ΔlnY_{it}	-0.292 (0.002)***
lnY_{it}	-0.046 (0.001)***
ΔlnP_{it-1}, 1^{st}*-dollar*	0.066 (0.008)***
ΔlnP_{it}, 1^{st}*-dollar*	0.081 (0.009)***
lnP_{it}, *1st-dollar*	-0.143 (0.008)***
$lnP_{it+1}(Y'_{it})$ - $lnP_{it}(Y'_{it})$	-0.367 (0.019)***
$ln[1-ATR_{it+1}(Y'_{it})]$ – $ln[1-ATR_{it}(Y'_{it})]$	0.696 (0.039)***
$mtrcg_{it}$, *first dollar*	-0.436 (0.013)***
$mtrcg_{it+1}(Y'_{it})$ – $mtrcg_{it}$, *first dollar*	-0.141 (0.038)***
age	-0.003 (0.000)***
(age/100) squared	0.269 (0.044)***
children	0.020 (0.001)***
other dependents	0.005 (0.001)***
lnP_salestax	-0.564 (0.072)***
ln(state house price)	-0.007 (0.003)***
state unemployment	0.339 (0.061)***
state gov't spending	0.531 (0.035)***
married	0.032 (0.003)***
constant	0.601 (0.033)***

Standard errors are in parentheses. R-squared is 0.12. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Table A.13 – Regression explaining change in pre-tax income between t and t+1, used to construct predictable tax change instruments in heterogeneous specifications

	(1)	(2)	(3)	(4)	(5)
	Income < \$100K	Income \$100K - \$200K	Income \$200K - \$500K	Income \$500K – \$1M	Income ≥ \$1M
ΔlnY_{it-1}	-0.159	-0.179	-0.177	-0.142	-0.054
	(0.008)***	(0.008)***	(0.005)***	(0.005)***	(0.002)***
ΔlnY_{it}	-0.385	-0.447	-0.430	-0.397	-0.227
	(0.009)***	(0.008)***	(0.005)***	(0.005)***	(0.002)***
lnY_{it}	-0.033	-0.011	-0.015	-0.021	-0.096
	(0.006)***	(0.006)*	(0.006)***	(0.007)***	(0.002)***
ΔlnP_{it-1}, 1^{st}-dollar	-0.183	-0.087	-0.010	0.003	0.026
	(0.027)***	(0.028)***	(0.021)	(0.021)	(0.012)**
ΔlnP_{it}, 1st-dollar	-0.349	-0.264	-0.118	0.067	0.065
	(0.029)***	(0.029)***	(0.022)***	(0.023)***	(0.014)***
lnP_{it}, 1st-dollar	0.202	0.099	-0.036	-0.039	-0.047
	(0.030)***	(0.028)***	(0.021)*	(0.022)*	(0.013)***
$lnP_{it+1}(Y'_{it})$ -	-0.009	-0.117	0.096	-0.133	-0.418
$lnP_{it}(Y'_{it})$	(0.084)	(0.087)	(0.052)*	(0.052)**	(0.027)***
$ln[1\text{-}ATR_{it+1}(Y'_{it})]$ –	-0.517	-0.282	-0.127	0.685	0.800
$ln[1\text{-}ATR_{it}(Y'_{it})]$	(0.257)**	(0.227)	(0.137)	(0.113)***	(0.049)***
$mtrcg_{it}$, *first dollar*	-0.239	-0.313	-0.520	-0.759	-0.983
	(0.033)***	(0.032)***	(0.035)***	(0.045)***	(0.032)***
$mtrcg_{it+1}(Y'_{it})$ –	-0.024	-0.025	-0.108	0.021	-0.418
$mtrcg_{it}$, *first dollar*	(0.078)	(0.082)	(0.095)	(0.134)	(0.093)***
age	-0.002	-0.005	-0.009	-0.006	0.004
	(0.001)**	(0.001)***	(0.001)***	(0.002)***	(0.001)***
(age/100) squared	0.025	0.300	0.637	0.407	-0.179
	(0.093)	(0.108)***	(0.115)***	(0.135)***	(0.087)**
children	0.006	0.016	0.020	0.016	0.033
	(0.003)**	(0.003)***	(0.003)***	(0.003)***	(0.002)***
other dependents	-0.002	0.004	0.005	-0.002	0.008
	(0.002)	(0.002)*	(0.002)**	(0.003)	(0.002)***
lnP_salestax	0.274	-0.032	-0.709	-0.076	-0.757
	(0.146)	(0.153)	(0.173)***	(0.215)	(0.140)***
ln(state house price)	-0.001	-0.017	-0.012	-0.005	0.040
	(0.005)	(0.005)***	(0.005)**	(0.007)	(0.004)***
state unemployment	0.078	-0.124	0.110	0.356	1.114
	(0.127)	(0.134)	(0.147)	(0.173)**	(0.121)***
state gov't spending	0.186	0.230	0.556	0.545	1.288
	(0.077)**	(0.075)***	(0.084)***	(0.098)***	(0.067)***
married	0.015	0.015	0.041	0.015	0.017
	(0.005)***	(0.007)**	(0.007)***	(0.009)	(0.006)***

Different columns show coefficients from a single regression where all explanatory variables are interacted with dummies for each income class. Constant is 0.565 with a standard error of 0.048. R-squared is 0.13. Standard errors are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

F. First stage regression example

Table A.14 displays the coefficients on the excluded instruments for one example specification, the "predictable tax change instrument" approach using t+1 leads and that was shown in column (5) of Table 2 in the text. The excluded instrument most closely associated with each endogenous (or measured-with-error) explanatory variable is highlighted in gray. Not surprisingly, the instruments for lagged changes in log price and the current level of log price have high partial correlations with their endogenous counterparts from the second stage equation, as they are just first-dollar versions of those variables. The more difficult identification challenge arises with the future changes in price and income. In the first stage regression for ΔlnP_{t+1} in column (4) of Table A.14, the coefficient on the exogenous instrument for ΔlnP_{t+1} is 0.204 with a standard error of 0.016; i.e., a one percent increase in the predictable component of future log price is associated with a 0.20 percent increase in actual future log price. In column (5), the coefficient on the instrument for ΔlnY_{t+1} is 0.137 with a standard error of 0.015. That is, a one percent increase in (1 – *average tax rate*) between year t and year t+1 is associated with an 0.137 percent increase in after-tax income over that same time period. That the instruments are highly statistically significant is reassuring. Not surprisingly, given the existence of large unpredictable fluctuations in pre-tax income over time, the instruments seem to explain a relatively small portion of future changes in price and income. The capital gains tax rate instruments help somewhat in this regard. For instance, in column (5), where the dependent variable if future change in log income, a one percentage point increase in the future capital gains tax rate, holding the current rate constant, is estimated to lead to a future decline in income of 0.305 percent, with a standard error of 0.064. This makes sense; if next year's capital gains rate is predicted to be higher than this year's rate, then people would tend to realize more income this year and less income next year, hence the decline in future income. The coefficient on current capital gains marginal tax rate in column (5) is also a statistically significant -0.497, suggesting that holding future changes in capital gains tax rates constant, income tends to grow more slowly over time during periods when the capital gains marginal tax rate is high. In column (4), where the dependent variable is future change in log price, the coefficient on predicted future change in capital gains marginal tax rate of positive 0.132 also makes sense; if next year's marginal tax rate on capital gains is higher than today's, more income gets realized today relative to next year, which pushes taxpayers into a higher tax bracket today and a lower tax bracket next year (hence, the increase in price next year).

Table A.14 -- Coefficients on excluded instruments in first stage regressions for specification in Table 2, column (5)

	(1)	(2)	(3)	(4)	(5)
	ΔlnP_{it-1}	ΔlnP_{it}	lnP_{it}	ΔlnP_{it+1}	ΔlnY_{it+1}
ΔlnP_{it-1}, *1st-dollar*	0.799	0.030	0.001	0.051	0.122
	(0.016)***	(0.004)***	(0.003)	(0.005)***	(0.012)***
ΔlnP_{it}, *1^{st}-dollar*	0.048	0.807	-0.033	0.093	0.169
	(0.003)***	(0.017)***	(0.004)***	(0.005)***	(0.020)***
$lnP_{it,}$ *1st-dollar*	-0.005	-0.047	0.855	-0.517	-0.394
	(0.007)	(0.009)***	(0.028)***	(0.014)***	(0.039)***
$lnP_{it+1}(Y'_{it} + e^{\hat{\gamma} z_{it}})$ -	0.007	0.056	0.047	0.204	-0.061
$lnP_{it}(Y'_{it})$	(0.006)	(0.006)***	(0.008)***	(0.016)***	(0.039)
$ln[1-ATR_{it+1}(Y'_{it} + e^{\hat{\gamma} z_{it}})]$ –	0.001	-0.009	0.012	0.048	0.137
$ln[1-ATR_{it}(Y'_{it})]$	(0.002)	(0.002)***	(0.002)***	(0.005)***	(0.015)***
$mtrcg_{it}$, *first dollar*	-0.025	-0.061	-0.086	0.297	-0.497
	(0.012)**	(0.024)**	(0.038)**	(0.023)***	(0.076)***
$mtrcg_{it+1}(Y'_{it} + e^{\hat{\gamma} z_{it}})$ –	0.019	0.039	0.021	0.132	-0.305
$mtrcg_{it}$, *first dollar*	(0.010)	(0.011)***	(0.013)	(0.022)***	(0.064)***
Partial R-squared of excluded instruments	0.499	0.483	0.582	0.222	0.004
Shea partial R-squared	0.502	0.538	0.148	0.032	0.003
P-value of F-test on excluded instruments	0.000	0.000	0.000	0.000	0.000

All columns also control for individual fixed effects, year dummies, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, and *state gov't spending*. Robust standard errors, clustered by state and income class, are reported in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

The bottom line is that although our instruments for the future price and income changes do not explain a huge portion of the rather noisy actual future changes in price and income, they have sensible signs and are highly statistically significant, and the identification is strong enough to avoid weak instruments bias. In this specification, and all specifications reported in the paper and the appendix, the p-value on the Anderson canonical correlation test is 0.0000, meaning that it rejects the null hypothesis of weak identification. The fact that our instruments explain a relatively small portion of the variation in future price and income changes is borne out by the low values of the Shea partial R-squared's for the future price and income changes. But here we are helped greatly by the fact that weak instruments bias is a small-sample bias problem -- i.e., it is a function of both the partial R-squared of the excluded instruments and the size of the sample, and we are using an enormous sample.

G. Sensitivity to constant added to charitable giving

In Tables A.15 through A.19, we examine the sensitivity of results reported in the text to the constant that was added to charitable giving when creating the dependent variable, supplying more detail relative to what we already showed in Table 5 in the text. As noted in the text, the dependent variable used in the results reported in the paper is ln(charity+10). We chose this approach to maintain comparability with the previous literature. For instance, Auten, Sieg, and Clotfelter (2002) indicate that they also use ln(charity+10) as the dependent variable (this is specified in the appendix to their paper; see Auten, Sieg, and Clotfelter 2000). Adding a constant to charity is necessary because 3.7 percent of returns in our estimation sample report zero charitable donations, and ln(0) is undefined. Adding a larger constant has the potential advantage of reducing noise in the data caused by large changes in very small donations, but choosing too large of a constant would risk distorting the percentage changes in donations for a large share of the sample. Only one percent of returns in our sample report charitable donations greater than \$0 and less than \$100. But 15 percent of our estimation sample reports charitable giving greater than \$100 and less than \$1,000.

Table A.15 shows the sensitivity to the size of the constant added to charity for the specification reported in column (1) and (2) of Table 2, which uses the predictable tax change instrument approach, constrains parameters to be constant across income classes, and uses separate federal and state prices. As noted in the test, the federal persistent price elasticity is quite sensitive to adding a very large constant to charity, changing from -0.391 with a constant of \$1 to -0.009 with a constant of \$1,000. The elasticity of giving with respect to a future federal price change is also somewhat sensitive, falling from 0.526 to 0.306 when the constant added to charity is changed from \$1 to \$1,000. The coefficient on federal ΔlnP_{it} drops from 0.197 to 0.049 when the constant added to charity changes from \$1 to \$1,000. By contrast, estimates based on variation in the time path of taxes across states are more robust to the size of the constant added to charity. The state persistent price elasticity ranges from -1.163 when a constant of \$1 is used to -0.990 when a constant of \$1,000 is used. The coefficient on state ΔlnP_{it} is almost completely unaffected by the size of constant added to charity. Elasticities of giving with respect to persistent and future changes in income are quite sensitive to the size of constant added to charity in this specification, with both increasing substantially when a larger constant is used.

Table A.15 -- Sensitivity to the constant added to charitable giving, specification in columns 1 and 2 of Table 2 (predictable tax change instruments, parameters constrained to be constant across income classes, separate federal and state prices).

	(1)	(2)	(3)
Dependent variable ->	ln(charity+1)	ln(charity+100)	ln(charity+1000)
Federal ΔlnP_{it-1}	0.025 (0.055)	0.020 (0.039)	-0.023 (0.035)
Federal ΔlnP_{it}	0.197 (0.080)**	0.146 (0.056)***	0.049 (0.050)
Federal lnP_{it} *[persistent price elasticity]*	-0.391 (0.191)**	-0.255 (0.141)*	-0.009 (0.121)
Federal ΔlnP_{it+1}	0.526 (0.222)**	0.362 (0.154)*	0.306 (0.126)*
State ΔlnP_{it-1}	0.146 (0.090)	0.195 (0.062)***	0.211 (0.052)***
State ΔlnP_{it}	0.567 (0.138)***	0.570 (0.104)***	0.571 (0.091)***
State lnP_{it} *[persistent price elasticity]*	-1.163 (0.299)***	-1.146 (0.271)***	-0.990 (0.279)***
State ΔlnP_{it+1}	0.364 (0.416)	0.130 (0.356)	0.083 (0.353)
ΔlnY_{it-1}	-0.056 (0.009)***	-0.051 (0.007)***	-0.043 (0.007)***
ΔlnY_{it}	-0.157 (0.012)***	-0.122 (0.009)***	-0.090 (0.008)***
lnY_{it} *[persistent income elasticity]*	0.432 (0.116)***	0.606 (0.104)***	0.718 (0.109)***
ΔlnY_{it+1}	-0.109 (0.154)	0.210 (0.138)	0.448 (0.147)***

All columns control for individual fixed effects, year dummies, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, and *state gov't spending*. Robust standard errors, clustered by state and income class, are in parentheses.
* significant at 5%; ** significant at 1%

In Table A.16, we formally test whether coefficients are statistically different depending on the size of the constant added to charity for the specification reported in columns (1) and (2) of Table 2. To do this, we created two replicates of our estimation data set, and specified a single regression where the dependent variable was ln(charity+10) for all observations in one replicate, and ln(charity + some other constant) for the other replicate. The regression included the full set of explanatory variables twice, once interacted with a dummy for being in the first replicate, and once interacted with a dummy for being in the second replicate. We also treated given taxpaying units in each replicate as different individuals for purposes of fixed effects analysis, and interacted the income / state categories used to compute clustered standard errors with dummies for which replicate the taxpaying unit was from as well. This enabled us to estimate coefficients on the same variables for different values of constants added to the dependent variable in a single regression, which facilitated testing of the equality of coefficients depending on the size of the constant added to charity. We verified that indeed, the coefficient estimates and standard errors for a given constant added to charity were identical to those reported in Table A.15.

Table A.16 – P-values on tests where null hypothesis is equivalence of coefficients between selected specification and specification where $10 is added to charity, regression reported in Table 2, columns 1 and 2 (predictable tax change instruments, parameters constrained to be constant across income classes, separate federal and state prices).

	(1)	(2)	(3)
Dependent variable ->	ln(charity+1)	ln(charity+100)	ln(charity+1000)
Federal ΔlnP_{it-1}	0.9791	0.9018	0.3865
Federal ΔlnP_{it}	0.8766	0.6887	0.1128
Federal lnP_{it} *[persistent price elasticity]*	0.8597	0.6734	0.0984
Federal ΔlnP_{it+1}	0.7714	0.7398	0.5419
State ΔlnP_{it-1}	0.8389	0.8028	0.6570
State ΔlnP_{it}	0.9970	0.9845	0.9823
State lnP_{it} *[persistent price elasticity]*	0.9992	0.9642	0.6595
State ΔlnP_{it+1}	0.8391	0.8166	0.7467
ΔlnY_{it-1}	0.8743	0.7651	0.2838
ΔlnY_{it}	0.3144	0.1447	0.0001
lnY_{it} *[persistent income elasticity]*	0.6192	0.5219	0.1745
ΔlnY_{it+1}	0.4937	0.3708	0.0423

As Table A.16 shows, in almost all cases we cannot reject the null hypothesis of equality of coefficients across specifications that add different constants to charity at conventional levels of statistical significance. The only exceptions are ΔlnY_{it}, ΔlnY_{it+1}, and the federal persistent price elasticity, where the null hypothesis of equality of coefficients between the specification where \$10 is added to charity and the specification where \$1,000 is added to charity can be rejected at the 1 percent, 5 percent, and 10 percent levels of statistical significance, respectively.

Table A.17 shows sensitivity to the size of the constant added to charity for the specification from column (5) of Table 2, which constrained all coefficients to be constant across income classes, used predictable tax change instruments, and used combined federal-state prices. The basic pattern is similar to that shown in Table A.15. The combined federal-state persistent price elasticity drops from -0.63 to -0.35 when the size of the constant added to charity increases from \$1 to \$1,000, although as Table A.15 demonstrated above, this is mostly due to the sensitivity of the federal price elasticity to the size of the constant added to charity.

Table A.17 -- Sensitivity to the constant added to charitable giving, specification in column 5 of Table 2 (predictable tax change instruments, parameters constrained to be constant across income classes, combined federal-state price).

	(1)	(2)	(3)
Dependent variable ->	ln(charity+1)	ln(charity+100)	ln(charity+1000)
ΔlnP_{it-1}	0.011	0.005	-0.035
	(0.056)	(0.041)	(0.038)
ΔlnP_{it}	0.208	0.153	0.062
	(0.079)***	(0.056)***	(0.051)
lnP_{it} *[persistent price elasticity]*	-0.630	-0.548	-0.351
	(0.200)***	(0.165)***	(0.160)**
ΔlnP_{it+1}	0.296	0.055	-0.058
	(0.228)	(0.179)	(0.175)
ΔlnY_{it-1}	-0.062	-0.058	-0.052
	(0.009)***	(0.007)***	(0.007)***
ΔlnY_{it}	-0.168	-0.134	-0.103
	(0.010)***	(0.007)***	(0.007)***
lnY_{it} *[persistent income elasticity]*	0.504	0.721	0.865
	(0.128)***	(0.119)***	(0.129)***
ΔlnY_{it+1}	-0.036	0.339	0.618
	(0.170)	(0.157)**	(0.173)***

All columns control for individual fixed effects, year dummies, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, and *state gov't spending*. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

In Table A.18 we test the equality of coefficients across constants added to charity for the specifications shown in Table A.17, using the same procedure as in Table A.18. In this case, we are only able to reject equality of coefficients between the specification adding $10 to charity and the one adding $1,000 to charity in the case of ΔlnY_{it} and ΔlnY_{it+1}.

Table A.18 – P-values on tests where null hypothesis is equivalence of coefficients between selected specification and specification where $10 is added to charity, regression reported in Table 2, column 5 (predictable tax change instruments, parameters constrained to be constant across income classes, combined federal-state price).

	(1)	(2)	(3)
Dependent variable ->	ln(charity+1)	ln(charity+100)	ln(charity+1000)
ΔlnP_{it-1}	0.9835	0.9014	0.4325
ΔlnP_{it}	0.8555	0.6763	0.1263
lnP_{it} *[persistent price elasticity]*	0.9311	0.8079	0.2875
ΔlnP_{it+1}	0.6995	0.6407	0.3671
ΔlnY_{it-1}	0.9159	0.8345	0.4114
ΔlnY_{it}	0.2198	0.0799	0.0000
lnY_{it} *[persistent income elasticity]*	0.5781	0.4786	0.1336
ΔlnY_{it+1}	0.4682	0.3508	0.0377

In Table A19 we show the sensitivity to the size of the constant added to charity of the persistent price elasticity for specifications reported in Table 3 in the text. Evidence that the persistent price elasticity is large when identified by variation in the time paths of price across states is robust to adding different constants to charity; in the predictable tax change instrument specifications, the state persistent price elasticity ranges from -1.603 when $1 is added to charity, to -1.301 when $1,000 is added to charity. In the perfect foresight specifications, the state persistent price elasticity ranges from -1.522 when $1 is added to charity, to -1.039 when $1,000 is added to charity. The federal persistent price elasticity, while still sensitive to the size of constant added to charity, remains relatively large across different constants added to charity. In the predictable tax change specification, the federal persistent price elasticity ranges from -1.010 when $1 is added to charity to -0.717 when $1,000 is added to charity. In the perfect foresight specification, the federal persistent price elasticity changes from -1.056 to -0.683 when the size of the constant added to charity is changed from $1 to $1,000.

Table A.19 -- Sensitivity to the constant added to charitable giving of persistent price elasticity estimates reported in Table 3 (specifications allowing coefficients on all variables except price to differ by income class).

	(1)	(2)	(3)	(4)	(5)	(6)
	Predictable tax change instruments			Perfect foresight		
	Constant added to charity			Constant added to charity		
	$1	$100	$1,000	$1	$100	$1,000
Separate federal and state prices						
State persistent price elasticity	-1.603 (0.637)**	-1.446 (0.533)***	-1.301 (0.484)***	-1.522 (0.222)***	-1.252 (0.177)***	-1.039 (0.154)***
Federal persistent price elasticity	-1.010 (0.485)**	-0.822 (0.389)**	-0.717 (0.337)**	-0.949 (0.149)***	-0.752 (0.117)***	-0.600 (0.101)***
Combined federal and state prices						
Persistent price elasticity	-1.190 (0.502)**	-1.010 (0.410)**	-0.896 (0.364)**	-1.056 (0.155)***	-0.846 (0.124)***	-0.683 (0.108)***

All columns control for *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, *state gov't spending*, and year dummies, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

In Table A20 we show the sensitivity to the size of the constant added to charity of the persistent income elasticity for specifications reported in Table 3 in the text. In the predictable tax change instrument specifications, persistent income elasticity estimates are not especially sensitive to the size of the constant added to charity in the top and bottom income classes, but there is still some sensitivity in between. In the perfect foresight specifications, the sensitivity is the largest in the lowest income classes, and largely disappears in the higher income classes.[6]

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[6] In the specifications where we allow coefficients to differ across income classes, we were unable to formally test the equality of coefficients across specifications that add different constants to charity using the procedures that we used to construct Tables A.16 and A.18, due to memory limitations on the computers we had to work with at the Treasury department.

Table A.20 – Sensitivity to the constant added to charitable giving of persistent income elasticity estimates reported in Table 3 (specifications allowing coefficients on all variables except price to differ by income class).

	(1)	(2)	(3)	(4)	(5)	(6)
	Predictable tax change instruments			Perfect foresight		
	Constant added to charity			Constant added to charity		
	$1	$100	$1,000	$1	$100	$1,000
Separate federal and state prices						
< $100K	0.511	0.664	0.620	0.525	0.326	0.149
	(0.260)**	(0.173)***	(0.154)***	(0.054)***	(0.035)***	(0.027)***
$100K - $200K	0.343	0.557	0.561	0.425	0.385	0.266
	(0.178)*	(0.129)***	(0.117)***	(0.047)***	(0.035)***	(0.027)***
$200K - $500K	0.256	0.375	0.411	0.388	0.355	0.288
	(0.124)**	(0.098)***	(0.087)***	(0.046)***	(0.034)***	(0.027)***
$500K - $1M	0.285	0.318	0.350	0.446	0.389	0.333
	(0.121)**	(0.096)***	(0.088)***	(0.044)***	(0.031)***	(0.025)***
≥ $1M	0.568	0.556	0.577	0.644	0.593	0.549
	(0.156)***	(0.130)***	(0.125)***	(0.029)***	(0.023)***	(0.022)***
Combined federal and state prices						
< $100K	0.519	0.677	0.633	0.524	0.325	0.148
	(0.259)**	(0.173)***	(0.154)***	(0.054)***	(0.036)***	(0.027)***
$100K - $200K	0.349	0.569	0.573	0.426	0.386	0.267
	(0.179)*	(0.129)***	(0.117)***	(0.047)***	(0.034)***	(0.027)***
$200K - $500K	0.267	0.394	0.432	0.399	0.364	0.295
	(0.126)**	(0.096)***	(0.085)***	(0.045)***	(0.033)***	(0.026)***
$500K - $1M	0.305	0.349	0.382	0.465	0.406	0.347
	(0.123)**	(0.097)***	(0.089)***	(0.042)***	(0.030)***	(0.024)***
≥ $1M	0.585	0.584	0.608	0.665	0.611	0.564
	(0.159)***	(0.135)***	(0.130)***	(0.027)***	(0.022)***	(0.022)***

All columns control for *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, *state gov't spending*, and year dummies, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Adding a constant to charity is inescapable in the log-log specification. While our estimates do exhibit sensitivity to adding a very large constant to charity, our main finding that the elasticity of giving with respect to a persistent change in price is fairly large when identified by differences in the time path of price across states is robust to this arbitrary change. Nonetheless, given the apparent sensitivity of estimates to the size of the constant used, alternative methods for dealing with this issue may be a fruitful area for future research. We experimented with other functional forms, such as one that used the charity expenditure share (that is, price of charity times charitable donation divided by Y_0) as the dependent variable. Unfortunately, we found that this approach created a large number of enormous outliers. For example, while the mean value of expenditure share in the sample was about 0.04, about 0.2 percent of the sample had expenditure shares greater than 1. Estimates were very sensitive to how these outliers were addressed. This is partly driven by the fact that our data set heavily oversamples high-income people, some of whom make enormous donations, and because we are using a measure of charity that more closely reflects actual donations made in each year, instead of following the approach in the previous literature of using charitable deduction, which truncates very large donations that exceed the percentage of AGI limitations. The log-log approach has the advantage of limiting the influence of large outlier donations on our estimates. A good systematic approach to addressing outlier problems would be to estimate censored quantile instrumental variable regressions, for example using the approach outlined in Chernozhukov, Fernandez-Val, and Kowalski (2008), but this approach was beyond the technical capabilities of our Treasury computer, especially in the presence of over 60,000 individual fixed effects, so for now we suggest this as a potential avenue for future research.

H. Sensitivity to treatment of donations that are not deductible in the year they are made

In Table A.21, we investigate the effects of using alternative measures of charitable giving as the dependent variable. In the specifications presented in the text, our dependent variable was defined as the current charitable deduction in year *t*, less carryovers from prior years, plus any carryovers claimed in the next two future years that various indicators suggest probably came from year *t*. To facilitate comparisons, column (1) of Table A.21 repeats the estimates from the specification from Table 2, column (5). In column (2), we show estimates of the same specification estimated on the same sample, except now the dependent variable is the current charitable deduction (excluding current donations over the limits and including carryovers from prior years). The persistent price elasticity is quite similar at about -0.61 under either specification, though the persistent income elasticity is slightly higher when current deduction is used as the dependent variable, 0.653 versus 0.602. The direction of the effect is consistent with the bias we would expect from the mechanical relationship where people with higher incomes have larger charitable deductions because more of their charity fits under the percentage of AGI limitations. One other notable difference is that when charitable deduction is used as the dependent variable, there is now a larger and marginally statistically significant elasticity of charitable giving with respect to a future price change, estimated at 0.359 with a standard error of 0.18. Aside from that, Table A.20 suggests that using current charitable donation instead of current charitable deduction does not make a huge difference for the sample as a whole.

In columns (3) and (4) of Table A.21, we investigate the effect of limiting our search for carryovers that may have been donated in year *t* to a two year window of future years instead of a five year window. The drawback to using a longer window is that we must remove from the estimation sample observations from all of those future years. The five year window leaves a much smaller sample and forces us to omit many whole years of data spanning tax reforms that provide some of the best sources of identification. In both columns (3) and (4) of Table A.20, we estimate the specification from Table 2, column (1) (which is reported again in column 1 of Table A.20, but limit the sample to those observations that have data for at least five consecutive future years. Column (3) uses donations computed with a two year carryover window, and column (4) uses donations computed with a five year carryover window. In column (3), limiting the sample to returns with five future years but using the two-year carryover window to compute donations affects the estimates slightly, with the most notable change being an increase in the persistent price elasticity from -0.607 to -0.700. Comparing columns (3) and (4) of Table A.21 demonstrates that switching from the two-year carryover window to the five-year carryover window, holding the estimation sample constant, has no significant effect on the estimates.

Table A.21 -- Sensitivity to using different measures of charity: specification in Table 2, column 5 (predictable tax change instruments, parameters constrained to be constant across income classes, combined federal-state price)

	(1)	(2)	(3)	(4)
	Current donation using carryovers from next 2 years (same as Table 2 column 1)	Current charitable deduction	Donations using carryovers from next 2 years, sample limited to returns with 5 future years of data	Current donation using carryovers from next 5 years, sample limited to returns with 5 future years of data
ΔlnP_{it-1}	0.012	-0.041	-0.008	-0.002
	(0.047)	(0.034)	(0.059)	(0.058)
ΔlnP_{it}	0.189	0.066	0.213	0.208
	(0.066)***	(0.049)	(0.096)**	(0.094)**
lnP_{it} *[persistent price elasticity]*	-0.607	-0.610	-0.700	-0.725
	(0.179)***	(0.135)***	(0.159)***	(0.162)***
$\Delta lnP_{i, future}$	0.180	0.359	0.226	0.188
	(0.198)	(0.180)**	(0.205)	(0.205)
ΔlnY_{it-1}	-0.061	-0.053	-0.056	-0.056
	(0.008)***	(0.005)***	(0.009)***	(0.009)***
ΔlnY_{it}	-0.153	-0.093	-0.133	-0.137
	(0.008)***	(0.009)***	(0.015)***	(0.015)***
lnY_{it} *[persistent income elasticity]*	0.602	0.653	0.649	0.628
	(0.120)***	(0.128)***	(0.182)***	(0.181)***
$\Delta lnY_{i, future}$	0.132	0.288	0.261	0.236
	(0.158)	(0.170)*	(0.232)	(0.230)
Number of observations	330,396	330,396	133,199	133,199
Number of unique taxpaying units	60,657	60,657	33,683	33,683

All columns control for individual fixed effects, year dummies, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, and *state gov't spending*. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

In Table A.22, we show how the construction of our charitable giving variable matters in a specification that allows coefficients on non-price variables to differ across income classes. Column (1) of Table A.22 again shows estimates from the specification in column (5) of Table 3, which allowed coefficients on non-price variables to differ across income classes, used predictable tax change instruments, and used combined federal-state prices. Column (2) of Table A.22 shows estimates from the same specification but using charitable deduction in place of charitable donation as the dependent variable. The persistent price elasticity is little affected, falling from -1.10 to -1.04 when we change from donation to deduction. The standard error of this estimate does drop substantially however, from 0.45 to 0.27, when we switch from donation to deduction, which is not surprising since using deductions reduces the variance of the dependent variable considerably by truncating very large donations that exceed the percentage of AGI limits. By contrast, we find in this specification that estimates of the persistent income elasticity are quite sensitive to the use of deduction in place of donation. For the bottom three income classes, persistent income elasticities are substantially larger when deduction is used in place of donation, whereas for the top two income groups persistent income elasticities are substantially smaller when deduction is used. The direction of bias for the lower income classes is consistent with the mechanical relationship between income and deduction introduced by the percentage of AGI limitations – a larger income (AGI) allows one mechanically to deduct a larger share of one's donations. On the other hand, the fact that deductions are a truncated measure of donations in the case of very large donations could bias the estimated persistent income elasticity downwards to the extent that much of the positive association between income and donations incomes from very large lumpy donations. This latter effect seems to dominate for the two highest income classes (above $500,000).

Table A.22 – Sensitivity to using different measures of charity: specification in Table 3, column 5 (predictable tax change instruments, allowing coefficients on all variables except price to differ by income class, combined federal-state price)

		(1)	(2)
Elasticity	Income class	Current donation using carryovers from next 2 years (same as Table 3 column 5)	Current charitable deduction
Persistent price	All	-1.10 (0.45)**	-1.04 (0.27)***
Future price	All	-0.04 (0.47)	0.33 (0.31)
Persistent income	< $100K	0.61 (0.21)***	1.20 (0.24)***
	$100K - $200K	0.47 (0.15)***	0.86 (0.17)***
	$200K - $500K	0.33 (0.11)***	0.48 (0.10)***
	$500K - $1M	0.32 (0.11)***	0.19 (0.11)*
	≥ $1M	0.58 (0.14)***	0.24 (0.15)

All columns control for *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, *state gov't spending*, and year dummies, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

In Table A.23, we show the effect of using charitable deduction in place of donation for the specification from column (5) of Table 4, which allowed coefficients on all variables to differ by income class, and used predictable tax change instruments and combined federal-state price. Persistent price elasticities are not much affected, and persistent income elasticities are affected in a similar manner to that discussed in relation to Table A.22.

Table A.23 – Sensitivity to using different measures of charity: specification in Table 4, column 5 (predictable tax change instruments, allowing coefficients on all variables to differ by income class, combined federal-state price)

		(1)	(2)
Elasticity	Income class	Current donation using carryovers from next 2 years (same as Table 4 column 5)	Current charitable deduction
Persistent price	< $100K	0.02 (0.67)	0.04 (0.61)
	$100K - $200K	0.00 (0.60)	-0.02 (0.46)
	$200K - $500K	-0.91 (0.45)**	-0.78 (0.29)***
	$500K - $1M	-0.83 (0.63)	-1.08 (0.35)***
	≥ $1M	-1.40 (0.43)***	-1.22 (0.32)***
Future price	< $100K	1.79 (1.07)*	1.94 (1.03)*
	$100K - $200K	1.59 (1.05)	1.60 (0.83)*
	$200K - $500K	-0.25 (0.62)	0.16 (0.40)
	$500K - $1M	0.11 (0.81)	0.08 (0.51)
	≥ $1M	-0.25 (0.43)	0.25 (0.37)
Persistent income	< $100K	0.82 (0.35)**	1.02 (0.30)***
	$100K - $200K	0.58 (0.24)**	0.70 (0.21)***
	$200K - $500K	0.31 (0.14)**	0.33 (0.10)**
	$500K - $1M	0.25 (0.09)***	0.11 (0.09)
	≥ $1M	0.49 (0.14)***	0.19 (0.14)

All columns control for full set of price and income variables, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, *state gov't spending*, and year dummies, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

I. Sensitivity of standard error estimates to clustering scheme

In Table A.24, we investigate whether the clustering scheme used in our preferred specification, in which observations were clustered by state and by five income classes, appreciably affects estimated standard errors. Bertrand, Duflo, and Mullainathan (2004) suggest that the clustering scheme should match the source of identifying variation for the key explanatory variable, and in our study the identifying variation comes from differing time paths across income levels and states (and to some extent across marital status) in federal and state tax rates. Our estimation procedure, which makes use of Stata's **xtivreg2**, (Schaffer 2007) requires that there be at least as many clusters as there are exogenous instruments in the system; Baum, Schaffer, and Stillman (2003) explain why this is an econometric requirement. Column (1) of Table A.24 presents the coefficient estimates on the price and income variables from the specification in column (5) of Table 2, and for ease of comparison, column (2) presents the standard errors using the clustering scheme noted above. To examine whether the standard errors are sensitive to the clustering scheme, in column (3) standard errors are computed with clustering by 50 equal income quantiles of the unweighted sample distribution of average income over time (that is, average income for the taxpaying unit falls in the top 2 percent, average income falls in the next 2 percent, etc), but not by state. In column (4), observations are clustered by into 21 income classes (less than \$50,000, \$50,000 to \$100,000, etc. up to \$950,000 to \$1 million, and greater than \$1 million, again based on average income of the taxpayer) interacted with marital status. In column (5), observations are clustered according to the modal state of residence of the taxpayer, with no clustering by income. Finally, in column (6) non-robust standard errors with no clustering are presented. Looking across these columns, the specification presented in the text results in the most conservative standard errors for most coefficients, and this is especially true for our most important parameter estimate, the persistent price elasticity. For two coefficients (the twice lagged price difference and the once lagged income difference), at least one alternative clustering scheme yields a slightly higher standard error, but the difference is too small to affect the significance of these estimates.

Table A.24 -- Explaining log charitable giving: sensitivity to clustering scheme of standard errors in Table 2, Column 5 (predictable tax change instruments, parameters constrained to be constant across income classes, combined federal-state price)

	(1) Coefficient estimates (same as Table 2 column 1)	(2) Robust standard errors clustered by state and 5 income classes (same as Table 2 column 1)	(3) Robust standard errors clustered by 50 income quantiles	(4) Robust standard errors clustered by 21 income classes and marital status	(5) Robust standard errors clustered by state	(6) Non-robust standard errors with no clustering
ΔlnP_{it-1}	0.012	0.047	0.049	0.041	0.042	0.041
ΔlnP_{it}	0.189	0.066	0.057	0.051	0.054	0.051
lnP_{it} *[persistent price elasticity]*	-0.607	0.179	0.118	0.122	0.146	0.122
$\Delta lnP_{i,future}$	0.180	0.198	0.130	0.167	0.166	0.167
ΔlnY_{it-1}	-0.061	0.008	0.007	0.006	0.008	0.006
ΔlnY_{it}	-0.153	0.008	0.010	0.009	0.010	0.009
lnY_{it} *[persistent income elasticity]*	0.602	0.120	0.112	0.091	0.118	0.091
$\Delta lnY_{i,\ future}$	0.132	0.158	0.144	0.125	0.156	0.125

All columns control for individual fixed effects, year dummies, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, and *state gov't spending*. Income classes are defined based on the taxpaying unit's mean real income over the time period the taxpaying unit is included in the sample. The income classes in column (2) are: less than \$100,000; \$100,000 - \$200,000; \$200,000 - \$500,000; \$500,000 - \$1 million; and greater than \$1 million. The income quantiles in column (3) are computed based on the un-weighted distribution of individual mean incomes, and each of the 50 quantiles contains 2 percent of the distribution. The income classes in column (4) are \$50,000 increments up to \$1 million, plus income over \$1 million.

J. Sensitivity to using two-year-ahead changes in price and income

In Table A.25, we show estimates for specifications identical to those shown in Table 2 in the text, except that we use changes in price and income between *t* and *t*+2 instead of between *t* and *t*+1. In the perfect foresight specifications, this simply entails including the actual value of (lnY_{0it+2} - lnY_{0it}) directly in the specification, and using the actual change in first-dollar log price between t and t+2 as an instrument for the actual change in last-dollar price over that period. In the predictable tax change instrument specifications, we assume that taxpayers know about any federal tax reform that has already been enacted in year t, and also know about any reform that will take effect starting in year t+1. So for example, we assume that taxpayers in 1986 know about TRA86 because it was enacted before the end of the year, and they knew what effect it will have in 1987 and 1988. However, we assume that people did not anticipate TRA86 in 1985. This rule also means that we assume that people in 1992 already know about the federal tax changes enacted in 1993, including their implications for taxes in 1994, and in 2002 already know about the federal tax changes that would be enacted in 2003, including their implications for taxes in 2004. For state tax reforms, we assume that people know about any changes in state tax parameters that will begin to apply next year, but do not know about changes that begin to apply two years or more in the future.

Table A.25 demonstrates that when coefficients are constrained to be constant across income classes, estimates of the persistent price elasticity are broadly similar but somewhat smaller than those reported in Table 2, while point estimates of the response to a future price change are somewhat larger than in Table 2. Standard errors are considerably larger than in Table 2, especially in the predictable tax change instrument specifications.

Table A.25 – Sensitivity to using two-year-ahead changes in price and income: specifications from Table 2 (specifications assuming all coefficients are uniform across income classes)

	(1)	(2)	(3)	(4)	(5)	(6)
	Separate federal and state prices					
	Predictable tax change instruments		Perfect foresight		Combined federal-state price	
	Federal	State	Federal	State	Predictable tax change instruments	Perfect foresight
ΔlnP_{it-1}	0.015	0.151	0.007	0.136	0.001	0.017
	(0.046)	(0.076)**	(0.042)	(0.075)*	(0.047)	(0.040)
ΔlnP_{it}	0.159	0.537	0.146	0.513	0.170	0.189
	(0.065)**	(0.118)**	(0.064)**	(0.116)***	(0.064)***	(0.064)***
lnP_{it} [persistent price elasticity]	-0.157	-0.993	-0.217	-0.730	-0.558	-0.580
	(0.276)	(0.596)*	(0.207)	(0.327)**	(0.308)*	(0.088)***
$\Delta lnP_{i,t+1}$	0.544	0.408	0.457	0.682	0.181	0.190
	(0.288)*	(0.639)	(0.195)**	(0.384)*	(0.316)	(0.042)***
ΔlnY_{it-1}	-0.054		-0.055		-0.061	-0.060
	(0.008)***		(.008)		(0.008)***	(0.008)***
ΔlnY_{it}	-0.141		-0.143		-0.154	-0.156
	(0.010)***		(0.009)***		(0.008)***	(0.007)***
lnY_{it} [persistent income elasticity]	0.539		0.554		0.660	0.554
	(0.152)***		(0.023)***		(0.168)***	(0.019)***
$\Delta lnY_{i,t+1}$	0.066		0.080		0.179	0.057
	(0.172)		(0.017)***		(0.186)	(0.008)***

All columns control for individual fixed effects, year dummies, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, and *state gov't spending*. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Table A.26 shows estimated price and income elasticities from specifications similar to those in Table 3 in the text, but using two-year-ahead changes in price and income. In the perfect foresight specifications elasticity estimates and degree of statistical significance are broadly similar to what we found in Table 3. The point estimate for the state persistent price elasticity is somewhat smaller when we use two-year-ahead changes, at -1.22 compared to -1.40, but actually has a smaller standard error at 0.16 compared to 0.2. In the predictable tax change instrument specifications, by contrast, the use of two-year-ahead changes in price and income dramatically increases standard errors. Nonetheless, the state persistent price elasticity remains large (-1.888) and statistically significant at the 5 percent level (with a standard error of 0.917).

Table A.27 depicts estimated price elasticities from specifications similar to those in Table 4 in the text, but using two-year-ahead changes in price and income. Once again in the perfect foresight specifications the persistent price elasticity estimates and standard errors are largely similar whether we use one-year-ahead or two-year-ahead changes in price and income. In the predictable tax change instrument specifications, the point estimates for persistent price elasticities are broadly similar between Table A.27 and Table 4, but the standard errors are much larger in Table A.27, reflecting the rather demanding nature of this particular econometric approach.

Table A.26 -- Sensitivity to using two-year-ahead changes in price and income: specifications in Table 3 (estimates allowing coefficients on all non-price variables to differ across income classes)

		(1)	(2)	(3)	(4)	(5)	(6)
		Separate federal and state prices					
		Predictable tax change instruments		Perfect foresight		Combined federal-state price	
Elasticity	Income class	Federal	State	Federal	State	Predictable tax change instruments	Perfect foresight
Persistent price	All	-0.671	-1.888	-0.813	-1.216	-0.970	-0.892
		(0.654)	(0.917)**	(0.114)***	(0.155)***	(0.678)	(0.117)***
Future price	All	0.359	-0.610	0.150	0.139	0.088	0.138
		(0.593)	(0.892)	(0.048)***	(0.087)	(0.613)	(0.051)***
Persistent income	< $100K	0.589		0.464		0.627	0.460
		(0.216)***		(0.041)***		(0.217)***	(0.042)***
	$100K - $200K	0.461		0.432		0.495	0.430
		(0.180)**		(0.038)***		(0.181)***	(0.038)***
	$200K - $500K	0.307		0.390		0.349	0.395
		(0.154)**		(0.040)***		(0.156)**	(0.039)***
	$500K - $1M	0.290		0.442		0.343	0.452
		(0.180)		(0.037)***		(0.181)*	(0.037)***
	≥ $1M	0.545		0.642		0.596	0.654
		(0.223)**		(0.026)***		(0.222)***	(0.025)***
Future income	< $100K	0.240		0.049		0.274	0.048
		(0.275)		(0.021)**		(0.278)	(0.021)**
	$100K - $200K	0.102		0.047		0.135	0.046
		(0.253)		(0.017)***		(0.253)	(0.016)***
	$200K - $500K	-0.062		0.036		-0.026	0.035
		(0.227)		(0.014)***		(0.230)	(0.013)***
	$500K - $1M	-0.284		0.035		-0.231	0.035
		(0.241)		(0.014)**		(0.242)	(0.015)**
	≥ $1M	-0.026		0.072		0.015	0.071
		(0.239)		(0.013)***		(0.239)	(0.014)***

All columns control for *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, *state gov't spending*, and year dummies, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Table A.27 -- Sensitivity to using two-year-ahead changes in price and income: specifications in Table 4: (estimates allowing coefficients on all variables including price to differ across income classes)

		(1)	(2)	(3)	(4)	(5)	(6)
		Separate federal and state prices					
		Predictable tax change instruments		Perfect foresight		Combined federal-state price	
Elasticity	Income class	Federal	State	Federal	State	Predictable tax change instruments	Perfect foresight
Persistent price	< $100K	-0.191	-0.013	-0.783	-0.915	0.041	-0.799
		(0.889)	(0.879)	(0.187)***	(0.219)***	(0.751)	(0.172)***
	$100K - $200K	0.642	-0.225	-0.761	-1.012	0.353	-0.802
		(0.968)	(0.936)	(0.155)***	(0.238)***	(0.811)	(0.156)***
	$200K - $500K	-0.552	-1.222	-0.758	-1.090	-0.799	-0.823
		(0.754)	(0.809)	(0.126)***	(0.172)***	(0.671)	(0.125)***
	$500K - $1M	-0.351	-1.127	-0.772	-1.029	-0.731	-0.820
		(0.865)	(0.952)	(0.164)***	(0.171)***	(0.808)	(0.159)***
	≥ $1M	-0.563	-1.681	-0.817	-1.229	-1.182	-0.934
		(0.673)	(0.985)*	(0.179)***	(0.198)***	(0.630)*	(0.172)***
Future price	< $100K	0.865	1.130	0.209	-0.188	1.206	0.161
		(0.994)	(1.165)	(0.096)**	(0.152)	(0.838)	(0.091)
	$100K - $200K	2.069	1.022	-0.003	-0.128	1.836	-0.025
		(1.394)	(1.400)	(0.088)	(0.151)	(1.146)	(0.088)
	$200K - $500K	0.135	-0.475	0.105	-0.067	-0.075	0.071
		(0.851)	(0.958)	(0.073)	(0.112)	(0.740)	(0.072)
	$500K - $1M	0.563	-0.374	0.043	-0.197	0.135	0.005
		(0.996)	(1.132)	(0.112)	(0.137)	(0.904)	(0.113)
	≥ $1M	0.545	0.074	0.254	0.554	0.022	0.304
		(0.662)	(0.987)	(0.087)***	(0.134)***	(0.580)	(0.089)***

All columns also control for ΔlnY_{it-1}, ΔlnY_{it}, lnY_{it}, ΔlnY_{it+1}, ΔlnP_{it-1}, $\Delta lnP_{it,}$ *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price*), *state unemployment rate*, *state gov't spending*, and year dummies, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

K. Sensitivity to possibility that marginal charitable donations may never be deducted

Joulfaian (2001) emphasizes that among very wealthy elderly taxpayers, the aggregate value of charitable contributions exceeds the aggregate amount deducted by a large amount, due to limits on charitable deductions as a percentage of AGI. This raises the possibility that a marginal contribution may never be deductible, which has implications for the price of giving. Among the subset of our sample for which five future years of data are available, 0.17 percent of returns are up against the 50 percent of AGI limit in the current year and each of the next five years, and so will never be able to deduct a marginal contribution. This is a small fraction of our sample, but these taxpayers give unusually large amounts to charity, and so account for a large share of charitable donations in the sample. When we use a measure of charitable contributions that reallocates carryovers from a five year window back to their likely origin year, taxpayers who are unlikely to ever deduct the marginal contribution account for 12.6 percent of contributions.

In all specifications reported in the text, if the taxpayer is up against the 50% of AGI limit for total charitable contributions in a given year, then that year's price is replaced with the following year's price. So for example, if the taxpayer is up against the 50% of AGI limit both this year and next year, then in constructing the price, the ordinary marginal tax rate at which the contribution is deducted (but not the capital gains or AMT marginal rate) will be set to zero, because the marginal contribution is not deductible in either year. The *instruments* for price, however, are calculated on a "first-dollar basis" (that is, they are based on the marginal tax rates on the first dollar of charitable giving), which is unaffected by whether the marginal contribution is above the 50% of AGI limit. Directly using information on whether a taxpayer gave such a large contribution as to exceed the 50% of AGI limit to help construct the instruments for price would introduce substantial endogeneity.

Table A.28 -- Explaining log charitable giving: sensitivity of estimates in Table 2, column 5, to possibility that marginal charitable donation may never be deducted; fixed effects estimates with predictable tax change instruments, t+1 changes in price and income, and uniform parameters and time effects

	(1)	(2)	(3)
	Table 2, column 1	If charity > 49% of AGI this year and next 2 years, price is calculated assuming marginal donation will never be deducted; price instruments multiply benefit of deduction by (1 - predicted probability of never being able to deduct)	If charity > 49% of AGI this year and next 2 years, or sum of carryovers and non-cash giving > 29% of AGI this year and next two years, price is calculated assuming marginal donation will never be deducted; price instruments multiply benefit of deduction by (1 - predicted probability of never being able to deduct)
ΔlnP_{it-1}	0.012	0.014	0.014
	(0.047)	(0.046)	(0.046)
ΔlnP_{it}	0.189	0.191	0.193
	(0.066)***	(0.065)***	(0.066)***
lnP_{it} *[persistent price elasticity]*	-0.607	-0.595	-0.594
	(0.179)***	(0.180)***	(0.181)***
$\Delta lnP_{i,future}$	0.180	0.190	0.197
	(0.198)	(0.199)	(0.200)
ΔlnY_{it-1}	-0.061	-0.060	-0.061
	(0.008)***	(0.008)***	(0.008)***
ΔlnY_{it}	-0.153	-0.153	-0.152
	(0.008)***	(0.008)***	(0.008)***
lnY_{it} *[persistent income elasticity]*	0.602	0.595	0.597
	(0.120)***	(0.120)***	(0.119)***
$\Delta lnY_{i,future}$	0.132	0.125	0.128
	(0.158)	(0.158)	(0.157)

All columns control for individual fixed effects, year dummies, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, and *state gov't spending*. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

To examine the robustness of our estimates to how the price of giving is calculated for these taxpayers, we run two specification checks, which are presented in Table A.28. First, using the sample of taxpayers for whom five full years of future data are available, we estimated a probit model where the dependent variable is equal to one if a taxpayer's charitable contributions in each of the next five years are above 49 percent of AGI, in which case a current marginal contribution will never be deductible, and zero otherwise. The explanatory variables included the full set of exogenous instruments except replacing the year dummies and fixed effects with age and marital status. Then, when constructing the instruments for price, we multiplied the marginal tax rate at which donations are deducted by one minus the predicted probability from the probit model of never getting to deduct the contribution. Thus, our price instruments in this specification take into account the fact that there is some probability that donations will never be deducted, and this probability is higher, for example, for higher-income people. We estimate a model similar to that in Table 2, column (5) on the full estimation sample, and the (endogenous) price variables are all constructed assuming the marginal contribution is never deducted if charity is greater than 49 percent of AGI this year and each of the next two years. The estimates from this specification are shown in Table A.28 column (2); column (1) shows the estimates from Table 2 column (5) for comparison.

Our method of accounting for the possibility of never deducting contributions has very little effect on the estimates. In column (3), we perform an exercise similar to that in column (2), but use a more conservative indicator of whether a marginal contribution will ever be deducted. Here, in the probit to construct the predicted probability of never deducting the marginal contribution that is used to construct the instruments for price, and in the construction of the endogenous price variables, we assume a marginal contribution is not deductible if charitable contributions exceed 49 percent of AGI and the sum of non-cash carryovers and non-cash giving (which are generally limited to 30 percent of AGI) exceed 29 percent of AGI. Again, the estimates are very similar. This is not surprising given the very small percentage of taxpayers who never get to deduct their marginal contributions in the sample. Nonetheless, as noted above, although the share of taxpayers who never deduct their marginal contribution is small, they do account for a disproportionate share contributions (an unweighted value of 12.6 percent in our disproportionately high-income sample), which is important. For instance, if one were to perform simulations of the effect of repealing the deduction for charitable contributions on aggregate contributions, this should be taken into account. A more satisfying response to this issue would involve explicitly modeling the nonlinear budget constraint in a dynamic setting, which is very challenging but may be a good avenue for future research.

L. Sensitivity of estimates in heterogeneous parameters specifications to method of controlling for unobservable time-varying factors that differ across income classes

In Tables A.29 through A.33, we show the sensitivity of our estimates to different methods of controlling for time-varying unobservable influences on charity that differ across income classes. In Tables 3 and 4, we did this by including separate year dummies for each income class. In A.29, we adapt the predictable tax change instrument specifications from Table 3 using two alternative approaches, both of which allow coefficients on all variables other than the prices and year dummies to differ by income class. In columns (1), (2), and (5), we constrain the coefficients on year dummies to be constant across income classes (we call this the "common time effect" approach). While this still removes the average time-series variation in federal tax rates from identification, it preserves identification arising from the fact that federal tax rates changed in different ways over time for different income groups. On the other hand, it has the drawback that it does nothing to control for omitted influences on charity that may have been changing in different ways over time for people at different income levels. In columns (3), (4) and (6), we omit year dummies altogether and replace them with an income class-specific quadratic time trend and an income-class specific effect of the log real S&P500. This approach restores identification for price variation coming from the fact that federal tax rates changed over time within an income class in ways that did not conform to a smooth quadratic time trend. Thus, for example, most of the identification arising from the relatively sharp discrete changes in federal tax rates arising from TRA86 and the 1993 federal tax increase are preserved in this specification.

Under either approach, the state persistent price elasticity estimates remain large and statistically significant, but are now closer to those reported in Table 2, at -1.119 with common time effects or -1.015 with income-class-specific quadratic time trends. The federal persistent price elasticity estimates are part way between those in Table 2 and those in Table 3. In the common time effect approach, the federal persistent price elasticity estimate is -0.605. This suggests that the inclusion of separate year dummies for each income class accounts for roughly half of the increase in federal persistent price elasticity from -0.35 in Table 2 to -0.92 in Table 3, with the rest due to allowing coefficients on other variables (particularly income and age/100 squared, as evidenced by Table A.11) to differ across income classes. In the income-class-specific quadratic time trend approach, the persistent federal price elasticity estimate is -0.553; so allowing for unobservable influences on charity that follow different time paths at different income levels, but which follow a restrictive smooth quadratic path over time, leads to smaller estimates of both the federal and state persistent price elasticity than the more flexible approach of allowing different year dummies for each income class. Nonetheless, our basic conclusion that persistent price elasticities identified by differences in time paths of price across state are large remains robust.

Interestingly, evidence of responsiveness to future changes in federal price is restored when we use these more restrictive methods of controlling for omitted time-varying influences on charity, since these methods preserve most of the really large obvious discrete changes in federal tax rates in the identifying variation for this parameter. With common time effects, the elasticity of charity with respect to a future federal price increase is 0.39 with a standard error of 0.24, which is marginally significant with a P-value of 0.11. With income-class-specific quadratic time trends, the elasticity of charity with respect to a future federal price increase is 0.44 with a standard error of 0.12. When we use combined federal-state prices and income-class-specific quadratic time trends, in column (6), the elasticity of giving with respect to a future price increase is 0.42 with a standard error of 0.12.

Across all specifications reported in Table A.29, persistent income elasticities tend to be smaller than those in the corresponding specifications in Table 3 in the text. A possible explanation could be that the specifications in Table A.29 do less to control for factors associated with predictable differences between current and future income (for example, Table A.29 controls for life-cycle variation in a less flexible fashion than Table 3), so our persistent income elasticity estimates in Table A.29 may be mixing in small responses to transitory variation in income with larger responses to persistent variation to a greater degree than those in Table 3.

Table A.29 – Sensitivity to alternative methods of controlling for unobservable time-varying influences: predictable tax change instrument specifications from Table 3 (estimates allowing coefficients on all non-price variables to differ across income classes)

		(1)	(2)	(3)	(4)	(5)	(6)
		Separate federal and state prices					
		Common time effects		Separate quadratic time trends & log real S&P500 for each income class		Combined federal-state price	
Elasticity	Income class	Federal	State	Federal	State	Common time effects	Separate quadratic time trends & log real S&P500 for each income class
Persistent price	All	-0.605	-1.119	-0.553	-1.015	-0.803	-0.631
		(0.262)**	(0.422)***	(0.127)***	(0.289)***	(0.262)***	(0.119)***
Future price	All	0.392	0.403	0.443	0.272	0.297	0.425
		(0.244)	(0.512)	(0.123)***	(0.361)	(0.246)	(0.120)***
Persistent income	< $100K	0.400		0.369		0.474	0.342
		(0.171)**		(0.123)***		(0.169)***	(0.119)***
	$100K - $200K	0.376		0.316		0.422	0.281
		(0.138)***		(0.107)***		(0.134)***	(0.104)***
	$200K - $500K	0.342		0.249		0.365	0.205
		(0.109)***		(0.102)**		(0.106)***	(0.100)**
	$500K - $1M	0.359		0.231		0.369	0.178
		(0.095)***		(0.104)**		(0.091)***	(0.101)*
	≥ $1M	0.496		0.401		0.487	0.333
		(0.095)***		(0.111)***		(0.085)***	(0.101)***
Future income	< $100K	0.059		0.069		0.225	0.049
		(0.352)		(0.223)		(0.351)	(0.219)
	$100K - $200K	-0.187		-0.103		-0.041	-0.136
		(0.344)		(0.235)		(0.341)	(0.234)
	$200K - $500K	-0.319		-0.292		-0.297	-0.371
		(0.210)		(0.202)		(0.207)	(0.205)*
	$500K - $1M	-0.409		-0.569		-0.438	-0.669
		(0.155)***		(0.205)***		(0.148)***	(0.203)***
	≥ $1M	-0.044		-0.194		-0.085	-0.295
		(0.113)		(0.143)		(0.101)	(0.131)**

All columns also control for ΔlnY_{it-1}, ΔlnY_{it}, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, *state gov't spending*, each interacted with dummies for each income class, along with fixed effects, ΔlnP_{it-1}, and ΔlnP_{it},. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

In Table A.30, we report estimates from specifications similar to those reported in Table 4 of the text, allowing coefficients on all variables except price to differ by income class, except that we constrain coefficients on all year dummies to be constant across income classes (the “common time effect” approach). The perfect foresight state persistent price elasticity estimates tend to be broadly similar to those reported in Table 4, with estimates ranging from -0.884 with a standard error of -1.636 with a standard error of 0.160 in the highest income class. The perfect foresight federal persistent price elasticity estimates are also broadly similar but somewhat smaller in the upper income classes and larger in the lower income classes compared to Table 4. In the predictable tax change instrument specifications, persistent price elasticities in the bottom two income classes are much larger in absolute value compared to what we found in Table 4, with point estimates closer to those for upper income people, but standard errors remain very large. The persistent federal and state price elasticities for the top three income classes in the predictable tax change instrument specification are somewhat smaller than in the corresponding specification in Table 4. Nonetheless the state persistent price elasticity for millionaires remains large at -1.22 with a standard error of 0.47.

Table A.31 shows estimates similar to those in Table 4 but this time using income-class specific quadratic time trends and ln real S&P500 effects in place of year dummies.
In Table A.31, where we substitute income-class-specific quadratic time trends for year dummies, state persistent price elasticities in the perfect foresight specification remain large for all income classes, ranging from -0.748 with a standard error of 0.218 in the lowest income class to -1.391 with a standard error of 0.141 in the highest income class. Perfect foresight fedreal persistent price elasticity estimates are a bit smaller than they were in Table 4. In the predictable tax change instrument specifications, the persistent price elasticity estimates are rather sensitive to this alternative method of controlling for time-varying omitted influences on charity, but state and overall persistent price elasticity estimates for millionaires remain large, at -1.108 and -0.917, repsectively.

Table A.31 suggests stronger evidence of responsiveness of current giving to future price changes among upper-income people compared to Table 4, especially in the predictable tax change instrument specifications. For example, in column (5) of Table A.31 the elasticity of current giving with respect to an increase in next year's price is 0.561 with a standard error of 0.206 in the $500,000 to $1 million income range, and 0.427 with a standard error of 0.147 for millionaires.

Table A.30 – Price elasticity estimates when coefficients on all variables except year dummies are allowed to differ across income classes (common time effects)

		(1)	(2)	(3)	(4)	(5)	(6)
		Separate federal and state prices					
		Predictable tax change instruments		Perfect foresight		Combined federal-state price	
Elasticity	Income class	Federal	State	Federal	State	Predictable tax change instruments	Perfect foresight
Persistent price	< \$100K	-0.889	-0.264	-1.035	-0.884	-1.082	-0.973
		(0.680)	(0.805)	(0.176)***	(0.213)***	(0.679)	(0.160)***
	\$100K - \$200K	-0.299	-0.631	-0.835	-1.034	-0.660	-0.885
		(0.433)	(0.608)	(0.151)***	(0.220)***	(0.477)	(0.151)***
	\$200K - \$500K	-0.631	-0.804	-0.701	-1.139	-0.802	-0.781
		(0.310)**	(0.410)**	(0.122)***	(0.170)***	(0.311)***	(0.124)***
	\$500K - \$1M	-0.532	-0.648	-0.617	-1.074	-0.698	-0.700
		(0.267)**	(0.377)*	(0.114)***	(0.153)***	(0.266)***	(0.117)***
	≥ \$1M	-0.647	-1.223	-0.645	-1.636	-0.973	-0.851
		(0.217)***	(0.465)***	(0.132)***	(0.160)***	(0.216)***	(0.132)***
Future price	< \$100K	0.687	1.436	0.068	-0.012	0.668	0.082
		(0.907)	(1.337)	(0.089)	(0.149)	(0.883)	(0.082)
	\$100K - \$200K	1.123	0.281	0.055	-0.086	0.743	0.030
		(0.715)	(1.346)	(0.092)	(0.155)	(0.783)	(0.091)
	\$200K - \$500K	0.146	0.083	0.065	-0.265	0.028	0.015
		(0.420)	(0.741)	(0.083)	(0.115)**	(0.404)	(0.081)
	\$500K - \$1M	0.387	0.433	0.121	-0.340	0.284	0.055
		(0.302)	(0.596)	(0.092)	(0.124)***	(0.292)	(0.089)
	≥ \$1M	0.382	0.741	0.353	0.163	0.190	0.228
		(0.214)*	(0.578)	(0.103)***	(0.103)	(0.197)	(0.099)**

All columns also control for ΔlnY_{it-1}, ΔlnY_{it}, lnY_{it}, ΔlnY_{it+1}, ΔlnP_{it-1}, ΔlnP_{it}, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, *state gov't spending*, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Table A.31 – Price elasticity estimates controlling for separate quadratic time trends and log real S&P500 effects for each income class in place of year dummies, and allowing coefficients on all other variables to differ across income classes

		(1)	(2)	(3)	(4)	(5)	(6)
		Separate federal and state prices					
		Predictable tax change instruments		Perfect foresight		Combined federal-state price	
Elasticity	Income class	Federal	State	Federal	State	Predictable tax change instruments	Perfect foresight
Persistent price	< $100K	-0.713	0.050	-0.800	-0.748	-0.379	-0.741
		(0.496)	(0.578)	(0.169)***	(0.218)***	(0.425)	(0.153)***
	$100K - $200K	-0.028	-0.362	-0.571	-0.840	-0.102	-0.607
		(0.290)	(0.471)	(0.138)***	(0.218)***	(0.287)	(0.136)***
	$200K - $500K	-0.474	-0.495	-0.558	-0.943	-0.456	-0.619
		(0.186)**	(0.328)	(0.098)***	(0.162)***	(0.161)***	(0.099)***
	$500K - $1M	-0.275	-0.344	-0.453	-0.805	-0.295	-0.524
		(0.167)*	(0.282)	(0.104)***	(0.148)***	(0.146)**	(0.104)***
	≥ $1M	-0.614	-1.108	-0.694	-1.391	-0.827	-0.917
		(0.138)***	(0.348)***	(0.127)***	(0.141)***	(0.113)***	(0.114)***
Future price	< $100K	0.457	1.750	0.109	-0.014	0.949	0.115
		(0.755)	(1.137)	(0.090)	(0.152)	(0.699)	(0.082)
	$100K - $200K	0.845	0.053	0.076	-0.098	0.833	0.045
		(0.570)	(1.185)	(0.093)	(0.154)	(0.569)	(0.092)
	$200K - $500K	0.112	0.365	0.109	-0.179	0.198	0.060
		(0.312)	(0.754)	(0.081)	(0.114)	(0.286)	(0.080)
	$500K - $1M	0.554	0.548	0.190	-0.249	0.561	0.115
		(0.227)**	(0.513)	(0.091)**	(0.121)**	(0.206)***	(0.087)
	≥ $1M	0.534	0.602	0.387	0.231	0.427	0.288
		(0.161)***	(0.432)	(0.097)***	(0.096)**	(0.147)***	(0.089)***

All columns also control for ΔlnY_{it-1}, ΔlnY_{it}, lnY_{it}, ΔlnY_{it+1}, ΔlnP_{it-1}, ΔlnP_{it}, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, *state gov't spending*, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

A drawback of the specifications shown in Table A.31 is that they do not control for unobservable time varying influences on charitable giving in a very flexible fashion, so that we might worry that, for example, our estimates of the effects of persistent price and income changes could be confounded with the effects of other factors that were changing over time in a fairly non-linear way. At the same time, because we are not controlling for time effects in a completely flexible way, this identification strategy does a good job of pinpointing the times when there was a really large incentive to re-time giving. The estimate of a large response among very high income people to obvious timing incentives around TRA86 and the 1993 tax change seems reasonable -- for instance, there is no other apparent reason for there to be a spike in charitable giving in 1986.

In Table A.32, we explore the sensitivity of the estimates in the predictable tax change specifications from Table A.31 to the degree of flexibility allowed in the income-class-specific time trend. In columns (1), (2), and (5) of Table A.32 we use income-class-specific linear time trends, and in columns (3), (4), and (6) we use income-class-specific cubic time trends. We also allow for income-class-specific log real S&P 500 effects, as in Table A.31.

Looking across columns in Table A.33, switching from the quadratic trends specification to either linear trends or cubic trends results in higher persistent price elasticities for all income groups. For the highest income group, the persistent elasticity increases from -0.827 in the quadratic trends specification to -0.913 in the linear trends specification and -1.176 in the cubic trends specification. Future price elasticities, however, tend to be larger with the quadratic trends included. For the highest income group, the future price elasticity is 0.427 and statistically significant with quadratic trends, compared to 0.329 and statistically significant with linear trends and 0.282 and statistically insignificant with cubic trends.

Similar results are found when log federal and log state prices are allowed to have different effects. The persistent price elasticities with respect to both federal and state prices are generally smallest for the quadratic trends specification. In addition, though there are some exceptions, future price elasticities with respect to both federal and state prices tend to be larger in the quadratic trends specification.

Table A.32– Price elasticity estimates controlling for separate linear or cubic time trends and log real S&P500 effects for each income class in place of year dummies, and allowing coefficients on all other variables to differ across income classes, using predictable tax change instruments

Elasticity	Income class	(1)	(2)	(3)	(4)	(5)	(6)
		Separate federal and state prices				Combined federal-state price	
		Linear trends		Cubic trends		Linear trends	Cubic trends
		Federal	State	Federal	State		
Persistent price elasticity	< $100K	-1.553	-1.118	-1.023	-0.386	-1.215	-0.698
		(0.551)***	(0.624)*	(0.548)*	(0.611)	(0.469)***	(0.474)
	$100K - $200K	-0.530	-1.181	-0.345	-0.763	-0.575	-0.444
		(0.321)*	(0.516)**	(0.354)	(0.501)	(0.314)*	(0.344)
	$200K - $500K	-0.691	-0.873	-0.836	-0.924	-0.637	-0.824
		(0.197)***	(0.341)**	(0.225)***	(0.331)***	(0.173)***	(0.200)***
	$500K - $1M	-0.459	-0.438	-0.702	-0.836	-0.436	-0.748
		(0.182)**	(0.282)	(0.237)***	(0.328)**	(0.161)***	(0.222)***
	≥ $1M	-0.779	-1.082	-0.891	-1.439	-0.913	-1.176
		(0.122)***	(0.348)***	(0.162)***	(0.350)***	(0.105)***	(0.159)***
Future price elasticity	< $100K	-0.245	0.133	0.357	1.359	0.161	0.787
		(0.827)	(1.178)	(0.791)	(1.157)	(0.759)	(0.734)
	$100K - $200K	0.420	-1.366	0.690	-0.161	0.365	0.623
		(0.629)	(1.296)	(0.614)	(1.192)	(0.622)	(0.608)
	$200K - $500K	-0.031	-0.224	-0.225	0.148	0.065	-0.115
		(0.319)	(0.783)	(0.343)	(0.723)	(0.298)	(0.318)
	$500K - $1M	0.449	0.601	0.254	0.303	0.504	0.255
		(0.237)*	(0.517)	(0.255)	(0.520)	(0.219)**	(0.239)
	≥ $1M	0.380	0.639	0.414	0.650	0.329	0.282
		(0.159)**	(0.433)	(0.161)**	(0.409)	(0.144)**	(0.149)*

All columns also control for ΔlnY_{it-1}, ΔlnY_{it}, lnY_{it}, ΔlnY_{it+1}, ΔlnP_{it-1}, ΔlnP_{it}, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price*), *state unemployment rate*, *state gov't spending*, and log real S&P500 index, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

M. Sensitivity to method of constructing predictable tax change instruments

In the text, we used instruments for future change in price and income based on applying the “predictable” future marginal and average tax rate functions to a predictions of future income that came from a regression of the future change in log income on the exogenous variables in our system that were knowable at time *t*. In Tables A.33 through A.35, as sensitivity analyses, we try using a simpler instrumental variables strategy in which the instruments for future changes in price and income were constructed holding real income and all inputs into the tax calculator constant in real terms at their year *t* values, so that the variation in the instruments is driven entirely by the "predictable" difference between this year's and next year's tax functions.

Table A.33, column (1) repeats the results reported in the main paper in Table 2 columns (1), (2) and (5), but with this simpler approach to constructing instruments for future price and income changes. In column (2), the state persistent price elasticity estimate is almost identical, at -1.16 in both Table 2 and Table A.33. The federal persistent price elasticity is a bit smaller, falling from -0.35 to -0.23 when the simpler instrument is used. In column (3), using combined federal-state price, the persistent price elasticity is -0.52, a bit smaller than the -0.61 estimate in the corresponding specification in column (5) of Table 2.The persistent income elasticity, on the other hand, changes more significantly, increasing from 0.51 to 0.88 in the specification including separate federal and state prices, and from 0.60 to 0.95 in the specification with combined federal-state price. Elasticities with respect to future income changes are also notably larger with the simpler approach to constructing instruments.

Table A.33 – Alternative method of constructing predictable tax change instruments: specifications from Table 2 (estimates assuming coefficients are uniform across income classes)

	(1)	(2)	(3)
	Separate federal and state prices		Combined federal and state prices
	Federal	State	
ΔlnP_{it-1}	-0.029	0.142	-0.040
	(0.047)	(0.080)	(0.046)
ΔlnP_{it}	0.098	0.615	0.128
	(0.070)	(0.123)***	(0.067)*
lnP_{it} *[persistent price elasticity]*	-0.233	-1.156	-0.515
	(0.210)	(0.283)***	(0.223)**
$\Delta lnP_{i,t+1}$	0.414	0.226	0.159
	(0.224)*	(0.317)	(0.235)
ΔlnY_{it-1}	-0.053		-0.061
	(0.008)***		(0.008)***
ΔlnY_{it}	-0.122		-0.138
	(0.010)***		(0.008)***
lnY_{it} *[persistent income elasticity]*	0.879		0.948
	(0.125)***		(0.117)***
$\Delta lnY_{i,t+1}$	0.544		0.607
	(0.169)***		(0.156)***

All columns also control for individual fixed effects, year dummies, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, and *state gov't spending*. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Table A.34 reports estimates from modifying the specification from column (5) of Table 3 in the paper (which allowed coefficients on all non-price variables to differ by income class and which used combined federal-state price) to use the simpler approach to constructing instruments. The persistent price elasticity is now estimated to be -1.41 with standard error of 0.37 with the simpler instruments, compared to -1.10 with a standard error of 0.45 with the instruments used in the paper. In contrast to Table A.35, persistent and future income elasticity estimates are not so different from those reported in Table 3 when we use the simpler method to constructing instruments but allow heterogeneity across income classes.

Table A.34 -- Alternative method of constructing predictable tax change instruments: combined federal-state price specification from Table 3 (estimates allowing all coefficients on all non-price variables to differ across income classes)

Persistent price elasticity		-1.410 (0.366)***
Future price elasticity		-0.442 (0.356)
Persistent income elasticity	< $100K	0.563 (0.181)***
	$100K - $200K	0.468 (0.137)***
	$200K - $500K	0.348 (0.145)**
	$500K - $1M	0.348 (0.144)**
	≥ $1M	0.719 (0.168)***
Future income elasticity	< $100K	0.241 (0.285)
	$100K - $200K	0.212 (0.253)
	$200K - $500K	-0.010 (0.352)
	$500K - $1M	-0.501 (0.306)
	≥ $1M	0.189 (0.212)

All columns also control for ΔlnY_{it-1}, ΔlnY_{it}, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, *state gov't spending*, and year dummies, each interacted with dummies for each income class, along with fixed effects, ΔlnP_{it-1}, and ΔlnP_{it},. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Table A.35 presents estimated price elasticities from specifications that allow heterogeneity in all parameters, including price elasticities, by income class (similar to that in column (5) of Table 4), but for which the alternative instruments are used. Comparing Table A.35 to column (5) of Table 4, the persistent price elasticities tend to be slightly larger when the alterative instruments are used, but are broadly similar. However, future price elasticities for the top 3 income classes are now wrong-signed, with the elasticity for millionaires estimated at a marginally significant and large -0.78. This counterintuitive estimate might have arisen because the simpler approach to constructing instruments for future price changes does not do as good a job of providing an unbiased estimate of the predictable portion of a future price change.

Table A.35 -- Alternative method of constructing predictable tax change instruments: combined federal-state price specification from Table 4 (estimates allowing coefficients on all variables including price to differ across income classes)

Persistent price elasticity	< \$100K	-0.466 (0.543)
	\$100K - \$200K	-0.425 (0.409)
	\$200K - \$500K	-1.214 (0.355)***
	\$500K - \$1M	-1.085 (0.403)***
	≥ \$1M	-1.721 (0.429)***
Future price elasticity	< \$100K	1.359 (0.749)*
	\$100K - \$200K	0.933 (0.683)
	\$200K - \$500K	-0.641 (0.546)
	\$500K - \$1M	-0.086 (0.652)
	≥ \$1M	-0.783 (0.433)*

All columns also control for ΔlnY_{it-1}, ΔlnY_{it}, lnY_{it}, ΔlnY_{it+1}, ΔlnP_{it-1}, ΔlnP_{it}, *lnP_salestax*, *(age/100) squared*, *children*, *other dependents*, *ln(state house price)*, *state unemployment rate*, *state gov't spending*, and year dummies, each interacted with dummies for each income class, along with fixed effects. Robust standard errors, clustered by state and income class, are in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

V. GRAPHICAL DEPICTION OF VARIATION IN TIME PATHS OF STATE PRICES BY STATE AND INCOME CLASS

Figures A.1 and A.2 illustrate variation in the time path of state prices in all states for people with incomes above and below $200,000, respectively, using a procedure identical to that used to construct Figure 2 in the text. The graph for each state depicts the average effect of the state's income tax on the price of giving for people in that income group for each year between 1979 and 2006, computed as the difference between combined federal-state price, and what the price would be if there were no state income tax. The time paths in most states with income taxes are similar to those depicted in Figure 2, with the commonalities arising largely due to the federal-state interactions discussed in the text in association with Figure 2. States with unusual patterns include Louisiana and West Virginia, both of which eliminated itemized deductions during the sample period. For states without an income tax (Alaska, Florida, South Dakota, Texas, Washington, and Wyoming), the state price is always zero.

Figure A.2 depicts the average effect of state income taxes on the price of giving for each state among people with incomes below $200,000. Here, the variation is less dramatic, but time-series changes in price on the order of 5 cents on the dollar are not uncommon. Again, commonalities in the time paths across states arise from federal-state interactions. For the below $200,000 group, one important federal-state interaction arises because of reductions in federal marginal tax rates over time, which increased the incremental effect of state income taxes on the price of charity (making the lines in Figure A.2 lower later in the period). Another important factor was the federal deduction for non-itemizers that applied from 1982 through 1986. In 1982 and 1983, non-itemizers could deduct 25 percent of up to $100 of charity; in 1984 they could deduct 25 percent of up to $300 of charity; in 1985 they could deduct 50 percent of an unlimited amount of charity, and in 1986 they could deduct 100% of charitable donations (in all cases subject to the standard percentage of AGI limits). One important way that a state income tax reduces the price of charity is that people who pay state income taxes are more likely to itemize deductions on their federal returns, which reduces the price of giving relative to comparable people in other states who do not itemize because they don't pay state income taxes. As the non-itemizer deduction became more generous between 1982 and 1986, this factor became less important, which explains why state income taxes had a diminishing impact on the price of giving during this period in Table A.2.

Figure A.1 -- Effect of state income tax on price of charity, income > $200,000, 1979-2006

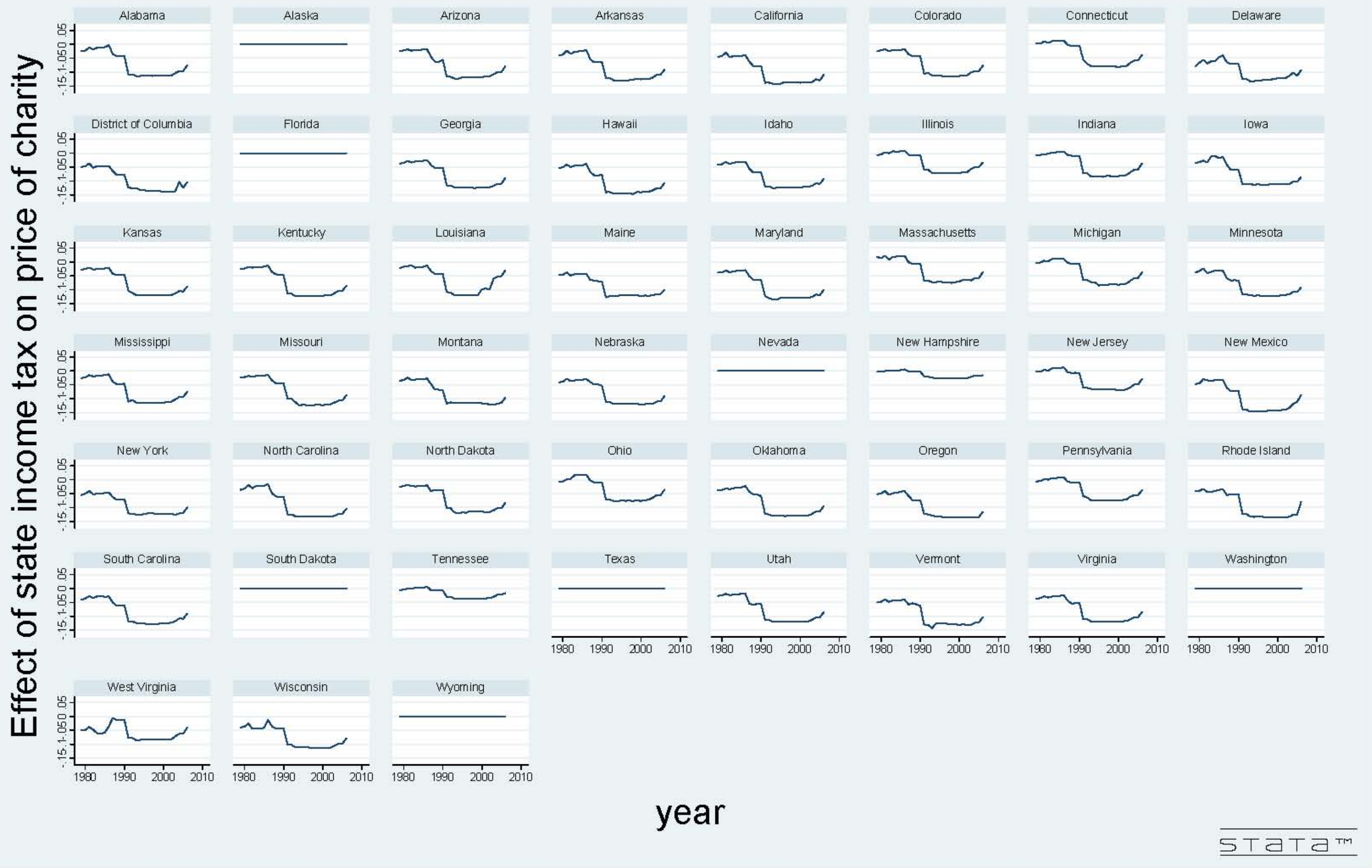
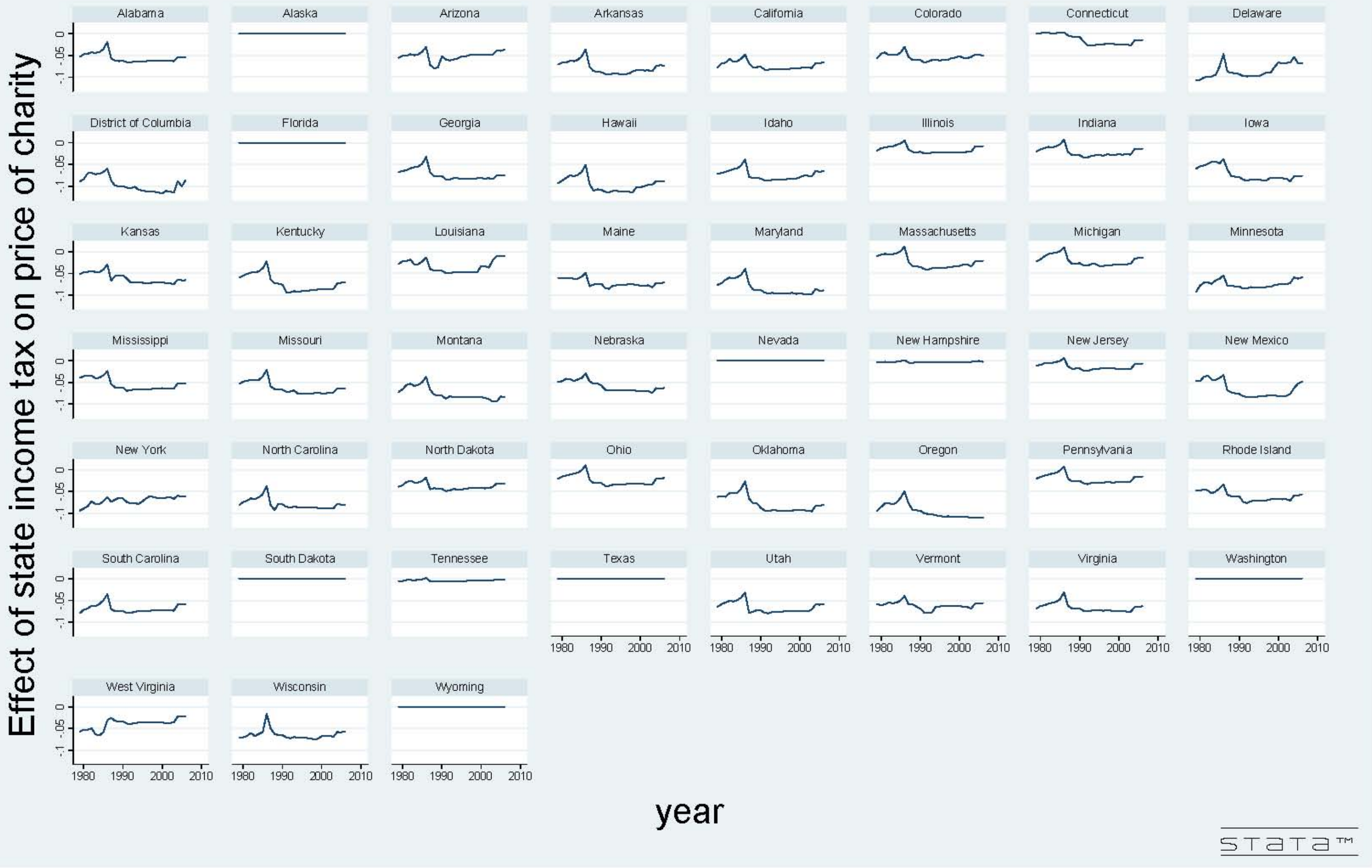


Figure A.2 -- Effect of state income tax on price of charity, income < $200,000, 1979-2006



VI. COMPOSITION OF ESTIMATION SAMPLE BY YEAR AND INCOME

Table A.38 shows the number of observations and mean income in the estimation sample by year. Recall that we select a sample that is in the midst of a spell of at least six consecutive years of meeting all of our sample selection criteria (discussed in the main body of the paper), and then we omit the first two and last two years of data for each taxpaying unit so that we can have two lagged changes in price and income, future change in price and income over one or two future years, and so we can re-allocate carryovers from at least two future years; as a result, our estimation sample includes returns from the years 1981 through 2004. In the years 1981 through 1988, there are roughly 5,000 returns per year; all of these returns are from the 1979-1995 panel. That panel heavily oversampled returns that had high incomes in 1981, and hence mean income during those years is well over $1 million. From 1989 through 1993, we have returns from both the 1979-1995 panel, and the 1987-1996 family panel (1989-1993 are the only years where two past and two future years of data are available for both of those panels at the same time). In those years, our sample size increases dramatically to over 31,000 per year, due to the large cross-sectional dimension of the family panel. In 1994, most returns from the 1979-1995 panel drop out (due to lack of two future years of data), and this is also the last year for which we have two future years of data for the vast majority of returns in the family panel. Throughout 1989-1994 mean income in the sample continually exceeds $1 million. For the years 1995 through 1999, the estimation sample only includes returns that appeared in one of the other panels, and continued to be sampled in the IRS Statistics of Income annual cross-sections in 1997 and 1998 because they were part of the random subsample that was selected based on two 4-digit social security number endings. In each of those years, we only have roughly 3,000 observations, and the mean income in each of those years ranges from 152,002 to 188,647; despite the randomness of the original sample of returns from which this set of returns was drawn, was the mean income is still relatively high because we are limiting our sample to people who would have itemized deductions without any charitable giving for at least six consecutive years, which selects a disproportionately high-income group. In 2000, the sample size increases to 7,800 because starting in 1998 the IRS Statistics of Income division increased the number of 4-digit social security number endings that it sampled in its annual cross-sections to five, and these returns were followed in the 1999-2006 edited panel. From 2001-2004, we have two lagged years and two future years of data for the vast majority of returns in the 1999 – 2006 edited panel, so we have a much larger sample in the vicinity of 20,000 returns in each of those years, and the mean income is around $3 million to $4 million. Table A.39 shows the number of returns in our estimation sample that are in each class of current year pre-tax income, measured in constant year 2007 dollars. The pattern of returns by income class is slightly U-shaped, and the largest group is millionaires, with 90,520 observations.

Table A.37 – Number of observations in estimation sample and mean income by year

Year	Number of observations	Mean pre-tax income in constant year 2007 dollars
1981	4,952	1,492,892
1982	5,344	1,371,511
1983	5,391	1,568,265
1984	5,390	1,326,286
1985	5,114	1,399,425
1986	5,131	1,793,121
1987	5,081	1,282,290
1988	4,951	1,784,664
1989	31,282	1,830,055
1990	32,799	1,708,508
1991	32,374	1,427,476
1992	31,932	1,562,818
1993	31,730	1,442,516
1994	27,714	1,360,443
1995	2,636	152,002
1996	2,705	156,646
1997	2,802	161,960
1998	2,900	188,647
1999	3,130	180,094
2000	7,800	182,418
2001	19,136	4,011,925
2002	20,318	3,146,831
2003	20,680	3,331,808
2004	19,104	4,144,224

Table A.38 – Composition of estimation sample by income

Current pre-tax income, in constant year 2007 dollars	Number of observations
$0 - $100,000	71,713
$100,000 - $200,000	68,743
$200,000 - $500,000	56,934
$500,000 - $1 million	42,486
Over $1 million	90,520
All incomes	330,396

Appendix References

Ackerman, Deena, and Gerald Auten. 2008. “Tax Expenditures from Noncash Charitable Contributions.” Paper presented at the NBER Conference on Incentive and Distributional Consequences of Tax Expenditures, March 27-29. <http://www.nber.org/~confer/2008/tep08/auten.pdf>.

Auten, Gerald, and Janette Wilson. 1999. "Sales of Capital Assets Reported on Individual Tax Returns, 1985." *Statistics of Income Bulletin* 18 (Spring), pp. 355-88.

Auten, Gerald, Holger Sieg, and Charles Clotfelter. 2002. “The Distribution of Charitable Giving, Income and Taxes: An Analysis of Panel Data.” *American Economic Review*, Vol. 92, No. 1 (March), 371-382.

Auten, Gerald E., Holger Sieg, and Charles T. Clotfelter. 2000. “Apppendix of the Paper: The Distribution of Charitable Giving, Income and Taxes: An Analysis of Panel Data.” February 16.

Baum, Christopher F., Mark E. Schaffer, and Steven Stillman. 2003. “Instrumental Variables and GMM: Estimation and Testing.” *The Stata Journal*. Vol. 3, No. 1, pp. 1-31.

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan. 2004. "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, Vol. 119, No. 1 (February), pp. 249-75

Chernozhukov, Victor; Fernandez-Val, Ivan; and Kowalski, Amanda. 2008. “Censored Quantile Instrumental Variable Estimation via Control Functions.” Working Paper, MIT Department of Economics. <http://econ-www.mit.edu/files/3466>.

Fack, Gabrielle, and Camille Landais. 2009. “Are Tax Incentives for Charitable Giving Efficient? Evidence from France.” Working paper, March.

Feldstein, Martin S. and Clotfelter, Charles T. “Tax Incentives and Charitable Contributions in the United States: A Microeconometric Analysis.” *Journal of Public Economics*, January–February 1976, 5(1–2), pp. 1–26.

Feldstein, Martin. "The Income Tax and Charitable Contributions: Part I -- Aggregate and Distributional Effects." *National Tax Journal* 28 (March 1975): 81-100
Friedman, Milton. 1957. *A Theory of the Consumption Function*. Princeton, N.J.: Princeton University Press.

Honore, Bo E. 1992. "Trimmed LAD and Least Squares Estimation of Truncated and Censored Regression Models with Fixed Effects." *Econometrica.* Vol. 60, no. 3: 533-565.

Ikovic, Zoran, James Poterba, and Scott Weisbenner. 2005. "Tax-Motivated Trading by Individual Investors." *American Economic Review*. Vol. 95 (Dec.) pp. 1605-1630.

Joulfaian, David. 2001. “Charitable Giving in Life and at Death.” in William Gale, James Hines, and Joel Slemrod, eds., *Rethinking Estate and Gift Taxation*, 2001, pp. 350-69, Washington, D.C.: Brookings Institution Press.

Poterba, James M., and Scott Weisbenner. 2001. “The Distributional Burden of Taxing Estates and Unrealized Capital Gains at Death.” In *Rethinking Estate and Gift Taxation*, edited by William G. Gale, James R. Hines Jr., and Joel Slemrod (pp. 422–449). Washington, DC: Brookings Institution Press.

Randolph, William C. 1995. "Dynamic Income, Progressive Taxes, and the Timing of Charitable Contributions." *Journal of Political Economy*. 103 (4), 709-738.

San Diego Union-Tribune. 2006. “Church or Synagogue Attendance by State.” May 6. <http://www.signonsandiego.com/uniontrib/20060502/news_lz1n2thelist.html>.

Schaffer, M.E., 2007. "xtivreg2: Stata module to perform extended IV/2SLS, GMM and AC/HAC, LIML and k-class regression for panel data models." <http://ideas.repec.org/c/boc/bocode/s456501.html>.