

## *Taxes and Voluntary Contributions: Evidence from State Tax Form Check-off Programs*

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**National Tax Journal**  
Vol. LIV, No. 4

**Abstract** - *This paper analyzes taxpayer contributions to state check-off funds using four years of Kentucky household income tax data. An ordered probit shows that a taxpayer tends to give to more check-off funds as income increases and tax price of contribution decreases. A Heckman selection model shows that the Nature Fund and Child Fund are normal goods, with income elasticities of contribution of 0.20 and 0.14. With values of -0.58 and -0.29, the tax price elasticities of contribution are even greater. If refund amount is included, elasticities become smaller; the refund elasticities of contribution are 0.08 and 0.06, respectively.*

### INTRODUCTION

Several states now use tax form check-offs as one source of revenue for state funded programs.<sup>1</sup> These tax form check-offs are a type of charitable contribution from the taxpayer to state programs. The check-off amounts reveal willingness to pay for programs in addition to the amounts given indirectly through mandatory taxes and charitable contributions to private programs addressing similar concerns. Each taxpayer due a refund is given the opportunity to contribute all or a portion of the refund to one or more programs selected by the state. The taxpayer makes the decision of whether or not to contribute to the check-off fund based, in part, on his or her income, the tax price of contribution, and possibly the amount of refund due. By analyzing contributions to state income tax form check-offs, information concerning the factors affecting preferences for selected state funded programs can be elicited. Levmore (1998), for example, has argued that the tax system, through check-offs, can be used to improve upon the traditional ballot box method of gauging citizen preferences.

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<sup>1</sup> See Noragon (1981) for an in-depth history of federal and state check-off programs. See Revier and Harpman (1992) for a discussion of the history of check-offs used for non-game wildlife programs in various states.

contribution.<sup>2</sup> A taxpayer thinking about contributing through a check-off considers the opportunity cost, in terms of lost income, and the expected benefit, in terms of increase in the provision of services from the given state-funded program.

Eubanks and Wyckoff (1989) looked at 1982 data from Minnesota's tax form check-off for a wildlife program. Taking advantage of differences in federal personal marginal tax rates that existed at that time, they concentrated on the tax price of check-off fund giving. Eubanks and Wyckoff found the price elasticity of contribution to be  $-2.26$ . They noted that over time, 85 percent of the changes in contributions could be explained by increases in the number of taxpayers who give, not by increases in contributions for those already giving.

Revier and Harpman (1992) examined the tax check-off as the use of voluntary contributions to finance public goods. They conducted two analyses: a regression on individual contributions using a random sample of 5,281 Idaho state income tax forms filed for 1982, and a regression on total state contributions using aggregated data for 18 states. They found the income elasticity of contribution amount to be between 0.33 and 0.43. They found conflicting results in the two regressions concerning the effect of multiple check-offs on the contribution to any one check-off.

The purpose of the current paper is to analyze contributions to two tax form

check-offs for Kentucky, the Nature Fund and the Child Fund. An Ordered Probit is used to determine the factors important in the decision concerning the number of check-off funds to which a taxpayer will contribute. For this analysis two smaller funds are included: the Olympic Fund and the Veteran Fund. Contributing to any one fund can be thought of as being composed of two parts: the decision to contribute, and the decision of how much to contribute. In this paper, a Heckman selection model is used to analyze these decisions. The implied income, refund, and tax price elasticities of contribution are calculated. An effort is made to answer several questions: What factors affect contributions to multiple check-off funds? Do the check-off funds represent normal goods? What is the relative importance of income, tax price, and possibly refund amount on the contribution decision?<sup>3</sup>

#### THE DATA

Kentucky Revenue Cabinet data from Kentucky Individual Income Tax Forms was obtained for each of the four years 1990-3, inclusive. During that time there were an average of 1.85 million taxpayers each year. Each year, about 53.3 percent of the taxpayers received refunds. Of those taxpayers receiving refunds, about 2.5 percent gave to a check-off fund.<sup>4</sup>

<sup>2</sup> Several studies examine the trade-offs an individual considers when contributing to charity. Auten and Joulfaian (1996) have shown that the charitable contribution of an individual is affected by the income of the individual's children and rate of bequest taxes. Roberts (1984) has shown that the level of private charity has declined in the U.S. as public transfers have increased, indicating individuals are aware of the affect of public projects on the level of expected benefits of a contribution.

<sup>3</sup> There are tax-funded government programs and charity-funded private programs that provide services similar to those funded through the check-offs studied in this paper. Due to data limitations, the authors could not control for potential crowd out effects from these other programs. See Kingma (1989) for a description of how contributions to a nonprofit organization can crowd out private charitable contributions for a public good. See Steinberg (1987) for a theoretical treatment of crowd out, and Steinberg (1991) for a more empirical treatment.

<sup>4</sup> The actual number of taxpayers each year was: 1990 (1,816,442); 1991 (1,858,918); 1992 (1,853,772); and 1993 (1,880,002). The percent of all taxpayers who received refunds each year was: 1990 (50.5); 1991 (53.5); 1992 (54.4); and 1993 (54.9). The percent of taxpayers receiving refunds who contributed to a check-off fund each year was: 1990 (2.4); 1991 (2.6); 1992 (2.5); and 1993 (2.5).

*Four Check-off Funds*

During the years 1990-3, the Individual Tax Form had four different tax form check-off funds. In 1990, three of these appeared on the form: the Nongame Wildlife/Natural Areas Fund (the Nature Fund), the Child Victim's Trust Fund (the Child Fund), and the Bluegrass State Games and U.S. Olympic Committee Fund (the Olympic Fund). There were no changes to the Individual Tax Forms in 1991. In 1992 another fund, the Veterans' Program Trust Fund (the Veteran Fund), was added. In 1993 the Nature Fund's name was changed from "Nongame Wildlife/Natural Areas Fund" to the "Nature and Wildlife Fund."

Check-offs for all four funds are found immediately after the line on the Individual Income Tax Form that reads "Amount Overpaid." Kentucky's check-off program has more options than the federal tax form, which only has one fund, the Presidential Election Campaign Fund. Kentucky's check-off program also differs from the federal program in that the Kentucky program reduces the individual taxpayer's refund.

The instruction booklet that accompanies each Individual Tax Form mentions each of the check-off funds in two different places. Separate paragraphs describing each fund are found in a glossary of Special Terms near the front of each year's instructions. The paragraphs change only slightly each year. In 1990, the description of the Nature Fund read:

You may contribute all or a portion of your overpayment to this fund which is managed by the Department of Fish and Wildlife Resources and the Nature Preserves Commission. The fund was established for the purposes of acquiring natural areas and managing nongame wildlife. These efforts are funded solely by the tax-deductible contributions to this fund. The amount of contribution entered on Line 28 will reduce your refund

accordingly. Contributions may also be made directly to the . . .

In 1990, the description of the Child Fund read:

You may contribute all or a portion of your overpayment to this fund which is administered through the Attorney General's Office. This fund finances local programs designed to prevent the sexual abuse and exploitation of children. This undertaking relies solely on the tax deductible contributions made by interested citizens. The amount of contribution entered on Line 29 will reduce your refund accordingly. Contribution may also be made directly to the . . .

The Olympic and Veteran Funds had similar, appropriate descriptions. Data collection was focused on taxpayers contributing to any of the four funds on the Individual Tax Form.

*Variables Used in Analysis*

Three different types of observations were captured. The first observation type includes all taxpayers who gave any amount to any of the four funds. The second observation type includes taxpayers who received refunds, but who did not give to any of the funds. The third observation type includes taxpayers who received no refund. 1.6 percent of the observations were dropped because they included individuals with negative refunds who mistakenly contributed to a check-off fund. Because only taxpayers who had positive refunds could use the check off, it would be inappropriate to include such observations.

Data were captured for every taxpayer who contributed to any of the four funds. Table 1 summarizes the information for those receiving refunds, including the number of observations for each type and year, as well as average values for refund amounts and contributions to the each of

TABLE 1  
OBSERVATIONS OF TAXPAYERS RECEIVING REFUNDS<sup>a</sup>

Observations of Taxpayers:	1990	1991	1992	1993	Total
<b>Receiving Refunds</b>					
Sample Size	31,103	34,986	34,334	35,376	135,799
Average Refund	251.25	271.67	255.60	248.36	249.40
<b>Contributing to the Nature Fund<sup>b</sup></b>					
Sample Size	14,012	16,387	16,221	17,751	64,371
Average Refund	266.13	277.38	276.54	259.83	269.88
Average Fund Contribution <sup>c</sup>	5.31	5.38	5.51	5.21	5.35
<b>Contributing to the Child Fund<sup>b</sup></b>					
Sample Size	16,851	20,146	18,212	18,318	73,527
Average Refund	285.40	308.80	286.43	274.78	289.42
Average Fund Contribution <sup>c</sup>	5.20	5.35	5.22	4.84	5.16
<b>Contributing to the Olympic Fund<sup>b</sup></b>					
Sample Size	553	725	549	531	2,358
Average Refund	521.59	477.75	536.14	505.06	507.78
Average Fund Contribution <sup>c</sup>	1.41	1.42	1.35	1.33	1.38
<b>Contributing to the Veteran Fund<sup>b</sup></b>					
Sample Size	—	—	4,296	4,664	8,960
Average Refund	—	—	79.72	272.33	275.87
Average Fund Contribution <sup>c</sup>	—	—	4.44	4.66	4.56
<b>Not Contributing to Any Fund</b>					
Sample Size	9,404	9,382	9,325	9,381	37,492
Average Refund	212.26	221.15	217.38	221.65	218.11

<sup>a</sup>This table includes observations for those taxpayers receiving refunds, 1990-3. The data set includes observations for every taxpayer contributing to any fund. The data set also includes a randomly drawn sample of approximately 9,000 taxpayers who received refunds each year but did not contribute to any fund. All refunds and contributions are in 1993 dollars.

<sup>b</sup>Taxpayers may have contributed to more than one fund.

<sup>c</sup>All contributions were positive amounts—no zeroes.

the funds. The yearly average number of observations for contributions to the Nature Fund is 16,093 and the yearly average for the Child Fund is 18,382 observations.

Table 2 shows variables used in analysis. Some information is captured directly from completed Individual Tax Forms. Most of the dollar amounts entered on each form are used to create variables such as Kentucky gross income (INCOME) and refund due from taxes (REFUND).<sup>5</sup>

The effects of tax price on non-check-off fund charitable contributions have been studied by several authors. Auten, Cilke, and Randolph (1992) and Clotfelter (1985) have found federal tax price changes to be an important factor in individual decisions to contribute to charity. Our variable TAXPRICE is equal to one less the federal marginal tax rate. The marginal tax rate for each taxpayer was determined by considering the taxpayer's federal taxable income and filing status.

<sup>5</sup> These include federal adjusted gross income, additions and subtractions to federal adjusted gross income, Kentucky adjusted gross income, total deductions, Kentucky use tax, taxes withheld, tax declared, credit forwarded, amount refunded, amount owed, check-off fund contributions, and tax due. All the dollar figures were adjusted for inflation using the Department of Labor's CPI-U (base from 1982-4) and putting all values in 1993 dollars. The income tax return allows contributions to check-off funds if there is an amount overpaid. The variable REFUND measures this. REFUND is positive if the taxpayer has a refund due, and therefore may contribute to check-off funds. This measure may include any errors the taxpayer originally placed on the return. Because the taxpayer was giving under the assumption that REFUND was the maximum amount, this is the pertinent variable.

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TABLE 2  
DESCRIPTION OF VARIABLE NAMES USED IN REGRESSION EQUATIONS<sup>a</sup>

Variable <sup>b</sup>	Brief Explanation
INCOME	KY gross income in \$1,000's.
TAXPRICE	The price of a charitable contribution in cents/\$.100 if not itemizing and (1-marginal tax rate) if itemizing.
REFUND	Refund due from taxes in \$10's.
YEAR91, YEAR92, YEAR93	Year of observation. Dummy variables. Base year of 1990 = 0.
EAST, EMBAYMENT, PLATEAU, WEST <sup>c</sup>	Physiographic Region of Kentucky. Dummy variables. Base Region of Bluegrass, which is the North Central Region of Kentucky, = 0.
MARRIED	Married. 1 = Yes 0 = No.
CHILDCARE	Deduction for Child Care. 1 = Yes 0 = No.
DEPENDENTS	Number of dependents.
SEPARFILE	Married, Filing Separately. 1 = Yes 0 = No.
MEDIANAGE <sup>d</sup>	County median age in years.
POPDEN <sup>d</sup>	County Population density in 100's per square mile.
PARKS <sup>e</sup>	Number of State parks with hiking trails in county or adjoining county.
CREDIT	Credits refund forward to next year. 1 = Yes 0 = No.
MISTAKE	Error on tax form. 1 = Yes 0 = No.

<sup>a</sup>All dollar values are adjusted to base year 1993.

<sup>b</sup>Source is Kentucky Individual Income Tax Form files unless indicated otherwise.

<sup>c</sup>Source is Kentucky Geological Survey.

<sup>d</sup>Source is 1990 Kentucky county census.

<sup>e</sup>Source is Kentucky Geological Survey topological maps.

Federal taxable income was determined using information about federal adjusted gross income from the Kentucky tax return. For each taxpayer, federal exemptions were taken based on the number of dependents. Because of the inaccessibility of federal return information for each taxpayer, it was assumed that each individual who itemized on the state return in a given year itemized on the federal return in the following year. If a taxpayer itemized on the Kentucky return, the deductions and the Kentucky tax withheld were also deducted from federal adjusted gross income to get federal taxable in-

come. If a taxpayer did not itemize on the Kentucky return, the taxpayer was considered to have a full 100-cent per dollar tax price of contribution.

Some variables are added by matching 1990 Kentucky county census data with each observation. These variables include MEDIANAGE and POPDEN. PARKS is created to proxy for the taxpayer's access to nature. The location of each county within one of the five physiographic regions of the state is included in a set of four dummy variables: EAST, EMBAYMENT, PLATEAU, and WEST.<sup>6</sup>

<sup>6</sup> To create dummy variables for region, county information was used to place each respondent in one of five physiographic regions in Kentucky. These regions represent differences in the physical characteristics of the landscape. These regions also roughly separate the state by social, cultural, and industrial differences. If a county is not covered completely by one region, it is associated with the region that covers the majority of the county area.

### Summary Statistics of Participation and Contribution Amounts

Observations of taxpayers who had positive REFUND's are captured because the taxpayers either: 1) contributed to one of the four funds (Nature, Child, Olympic, or Veteran) or 2) received a refund but did not give to any fund. These observations are useful in examining the influences affecting the number of funds to which a taxpayer contributes and the choice of whether or not to contribute to any check-off fund, given the taxpayer has a refund.

Although only data for taxpayers receiving refunds are used in analyzing participation and contribution amount, data were collected for a sample of taxpayers not receiving refunds. There are approximately 9,000 such observations for each year. Comparing the characteristics of taxpayers who did not receive refunds against those who did is one way to consider the representativeness of the sample observations. Table 3 shows such a comparison. Taxpayers due refunds have a bit lower income and are more likely to: be single, take a childcare tax credit, live in a more urban area, and do their returns correctly. In the analysis that follows the focus is on the behavior of taxpayers who receive refunds. The characteristics that are included in the analysis will control for effects of observable factors that are different between taxpayers who get returns and those who do not. Nonetheless, because of unobserved characteristics, the results of the analysis still may not be generalized to the entire population of taxpayers.

TABLE 3  
COMPARING TAXPAYERS WITH POSITIVE REFUNDS TO TAXPAYERS WITH NO REFUNDS<sup>a</sup>

Variable	Means for Observations with:	
	Positive Refunds	No Refund <sup>b</sup>
INCOME (\$1000) <sup>c</sup>	30.316	33.467
TAXPRICE (cents/\$) <sup>d</sup>	86.3	—
REFUND (\$10) <sup>e</sup>	25.7	-22.8
MARRIED (%)	46.7	61.8
CHILDCARE (%)	6.8	2.6
DEPENDENTS	0.9	2.9
MEDIANAGE (Years)	33.1	33.4
POPDEN (x100)	7.02	4.89
PARKS	1.38	1.42
MISTAKE (%)	0.5	2.3
N	135,799	36,723

<sup>a</sup>For all variables listed the differences between the means for the two groups were found to be significant at the .05 level.

<sup>b</sup>No Refund observations are for taxpayers either having no refund or having some tax due.

<sup>c</sup>All dollar values are adjusted for inflation using the base year 1993.

<sup>d</sup>The Refund variable used in the regressions is in tens of dollars.

<sup>e</sup>Taxpayers who do not itemize have a TAXPRICE of 100 cents per dollar. The other possible values are 85, 72, and 69. The TAXPRICE of taxpayers without refund is not relevant.

As shown in Table 1, there are 135,799 observations with positive REFUNDS. Of taxpayers who were due refunds and who gave to a check-off fund, 65.5 percent contributed to the Nature Fund, 74.8 percent to the Child Fund, 9.1 percent to the Veteran Fund, and 2.4 percent to the Olympic Fund.<sup>7</sup> Taxpayers contributing to the Nature Fund gave an average of \$5.35. Child Fund contributors gave an average contribution of \$5.16. The Olympic Fund received average contributions of \$1.38 from its contributors. Veteran Fund contributors gave an average \$4.56 to the fund, which was introduced in 1992. Taxpayers who gave to at least one of the

<sup>7</sup> Another 2,304 had observations for REFUND which were below or equal to zero. This occurs because some taxpayers contributing to check-off funds believe they are due a REFUND, but after correcting for mistakes it turns out they actually owe taxes. The average Nature Fund contribution for taxpayers with negative or zero REFUNDS is \$4.25. The mean contribution to the Nature Fund is \$5.35 for the observations with positive REFUNDS. Negative REFUNDS are observed only for taxpayers that did not receive refunds, but mistakenly contributed to some fund thinking that they had a refund. Having a negative or zero REFUND is perfectly correlated with having given to some fund. Additionally, observations with negative or zero REFUNDS are more likely to contain a taxpayer error. We think it is inappropriate to keep the observations with negative or zero REFUNDS in the data set. We have deleted the observations with these errors.

## Taxes and Voluntary Contributions

funds have larger average refunds than those who do not give to any fund.

Taxpayers contributing to the Nature Fund gave to one of the other funds on the form in 64.5 percent of the cases. Contributions to all the funds are highly positively correlated.<sup>8</sup> Table 4 shows the number of taxpayers contributing to each of the various possible combinations of the four check-off funds. The most commonly chosen combinations of the 98,307 contributions were the Nature Fund/Child Fund combination (33.9 percent), the Child Fund alone (32.0 percent), and the Nature Fund alone (23.1 percent).

The most frequent contribution to the Nature Fund is \$1 (40.7 percent). The second most frequent contribution to the

fund is \$5 (27.5 percent). The next most frequent contributions in order are \$10, \$2, \$3, and \$4. The high frequencies of \$1, \$5, and \$10 contributions are expected due to the availability of closed-ended check-off boxes on the Kentucky Individual Tax Form for these amounts. There are also peaks in the frequency distribution around all the other integer dollar amounts, until \$15.

The most frequent contribution to the Child Fund is \$2 (40.8 percent). The second most frequent contribution to the fund is \$4 (27.3 percent). There is also a sizable frequency (8.3 percent) of \$10 contributions. Closed-ended check-off boxes for \$2 and \$4 contributions to the Child Fund are available on the Individual Tax Form.

TABLE 4  
FREQUENCY OF CONTRIBUTION TO DIFFERENT COMBINATIONS OF FUNDS

Fund Combination				Number of Taxpayers
Nature Fund	Child Fund			33,280
	Child Fund			31,445
Nature Fund				22,734
Nature Fund	Child Fund		Veteran Fund	6,008
Nature Fund	Child Fund	Olympic Fund		1,163
	Child Fund		Veteran Fund	978
			Veteran Fund	967
Nature Fund			Veteran Fund	537
Nature Fund	Child Fund	Olympic Fund	Veteran Fund	433
		Olympic Fund		320
Nature Fund		Olympic Fund		203
	Child Fund	Olympic Fund		202
	Child Fund	Olympic Fund	Veteran Fund	18
Nature Fund		Olympic Fund	Veteran Fund	13
		Olympic Fund	Veteran Fund	6

<sup>8</sup> The pairwise correlations for contributions to funds, given that the taxpayers contributed to both funds in each pair are: Nature Fund and Child Fund (0.5154); Nature Fund and Veteran Fund (0.6386); Nature Fund and Olympic Fund (0.2993); Child Fund and Veteran Fund (0.5410); Child Fund and Olympic Fund (0.2137); and Veteran Fund and Olympic Fund (0.8941). All the correlations are significantly positive at the 0.01 level.

## MODELING PARTICIPATION AND CONTRIBUTION

Each taxpayer receiving a refund must decide on the number of tax form check-off funds he or she wishes to contribute. For each fund, the taxpayer also has to decide whether or not to contribute (a participation decision) and how much to contribute (a level of contribution decision). In this paper, different models are used to examine each decision: an Ordered Probit model run on the number of funds to which a taxpayer contributes, and a Heckman selection model run on participation in and contribution to each check-off fund.

Choe and Jeong (1993) used a simultaneous equations Tobit to avoid the statistical bias of the non-negativity constraint in their study of tax deduction incentives on charitable contributions. Eubanks and Wyckoff (1989) also made use of such a model in their analysis of contributions to state wildlife check-off programs. Contributions to the Nature Fund and Child Fund, however, are not truly a case of censored variables because each taxpayer first decides whether or not to contribute to a fund, and negative contributions are impossible. Maddala (1992) argues that, in such a case, it is more appropriate to model the causation of the zero values. This is what is done with the Heckman selection model in this paper. The Heckman model uses data drawn from all taxpayers who receive refunds, including those who do not contribute to any check-off fund (Heckman, 1979).

The participation and level of contribution decisions are analyzed for contributions to the Nature Fund and Child Fund, the two more established check-off funds on the Individual Tax Form during the period of study. Decisions for the Olympic Fund and Veteran Fund are not analyzed because they are small. Only 1.7 percent of the observations includes contributions to the Olympic Fund and the

average contribution to the Olympic Fund, of \$1.38, is relatively small. Of taxpayers contributing to the Olympic Fund, 83 percent contributed \$1. This does not provide enough variation in contributions to allow for an OLS analysis. The Veteran Fund was introduced in 1992, halfway through the period of study.

### *The Hypotheses*

The tax form check-offs provide two useful types of information. First, they provide information concerning whether or not a particular taxpayer participated in any check-off fund. Second, they provide information concerning the amount of contribution to any fund. The actual contribution level for any check-off fund indicates the strength of an individual's preference for the fund.

Several variables can be used to explain the decision to contribute to multiple funds, the decision to participate in a particular fund, and the decision of how much to contribute to a fund. Some variables are used to control for certain socio-demographic characteristics. For other variables, there are specific hypotheses regarding the sign of the effect.

As a taxpayer's income (and refund amount) increases, the likelihood of contributing to multiple check-off funds and participating in any given check-off fund is expected to increase. A decrease in the tax price of contribution is expected to have a positive effect on each of these decisions. As in the research of Auten, Cilke, and Randolph (1992), a natural log specification for income and tax price (and refund) is assumed in the regression specification in the Heckman model.

For the Nature Fund, a taxpayer's opportunity to participate in nature based activities is expected to have a positive effect on the decision to contribute. Previous studies have shown that Kentucky citizens are willing to pay higher taxes for improved natural amenities (Ready,

Berger, and Blomquist, 1997). To capture this effect the following analysis uses the proxy variable PARKS.

For the Child Fund, taxpayers who have dependent children and taxpayers who have a deduction for child care are expected to be more likely to contribute and to contribute more. These people are more likely to be sensitive to sexual abuse of children.

*Ordered Probit Analysis*

In the multiple check-off fund participation model, it is assumed that the individual has received a refund and is deciding in how many funds to participate. The analysis attempts to determine the factors that explain the number of check-off funds to which a taxpayer contributes. The dependent variable is an integer equal to the number of funds to which a taxpayer contributes. In the case of the Kentucky Individual Income Tax Form there are four such funds. The probability of contributing to any number of check-off funds is estimated as a linear function of the independent variables and a set of cut-off points.<sup>9</sup> For example, the probability (*P*) of contributing to a given number of funds can be written:

$$[1] P(\text{Contributing to a Given Number of Check-Off Funds}) = F[ B_0 + B_1 \text{ INCOME} + B_2 \text{ TAXPRICE} + B_3 \text{ REFUND} + B_4 \text{ YEAR91} + B_5 \text{ YEAR92} + B_6 \text{ YEAR93} + B_7 \text{ EAST} + B_8 \text{ EMBAYMENT} + B_9 \text{ PLATEAU} + B_{10} \text{ WEST} + B_{11} \text{ MARRIED} + B_{12} \text{ CHILDCARE} + B_{13} \text{ DEPENDENTS} + B_{14} \text{ SEPARFILE} + B_{15} \text{ MEDIANAGE} + B_{16} \text{ POPDEN} + B_{17} \text{ CREDIT} + B_{18} \text{ MISTAKE}]$$

where *B<sub>i</sub>* is the probit coefficient, *i* = [0,18].

*Heckman Probit: Participation*

The Heckman selection model consists of a participation specification that

corrects the contribution level regression results for selection. In the participation model, it is assumed that the individual has received a refund and is deciding whether or not to participate in a check-off fund. The analysis attempts to determine the factors that explain the decision of whether or not to contribute. This Probit model requires observations for those taxpayers who have the opportunity to participate, whether or not they actually do participate.

There are two probit participation models, one each for the Nature Fund and the Child Fund. In each case, the dependent variable is a dummy equal to one if the individual observation includes contributions to the particular fund, and zero otherwise. The probability of any particular taxpayer with a refund due contributing to any check-off fund can be modeled as a cumulative distribution function, with an error term distributed normally. For example, the probability of contributing to the Nature Fund may be written:

$$[2] P(\text{Contributing to Nature Fund}) = F[ B_0 + B_1 \text{ INCOME} + B_2 \text{ TAXPRICE} + B_3 \text{ REFUND} + B_4 \text{ YEAR91} + B_5 \text{ YEAR92} + B_6 \text{ YEAR93} + B_7 \text{ EAST} + B_8 \text{ EMBAYMENT} + B_9 \text{ PLATEAU} + B_{10} \text{ WEST} + B_{11} \text{ MARRIED} + B_{12} \text{ CHILDCARE} + B_{13} \text{ DEPENDENTS} + B_{14} \text{ SEPARFILE} + B_{15} \text{ MEDIANAGE} + B_{16} \text{ POPDEN} + B_{17} \text{ PARKS} + B_{18} \text{ CREDIT} + B_{19} \text{ MISTAKE}]$$

where *B<sub>i</sub>* is the probit coefficient, *i* = [0,19].

The same variables available for inclusion in the probit model of participation in the Nature Fund are available for use in the probit model of participation in the Child Fund. However, there is no reason to suspect the variable PARKS affects participation in the Child Fund. All other variables are the same for both probit models.

<sup>9</sup> See Peterson and Harrell (1990) for a more technical explanation of the Ordered Probit model.

*Heckman Regression: Contribution Level*

In the model for the level of contribution, it is assumed that the individual has decided to contribute to a check-off fund. The analysis attempts to determine the factors that explain the amount of contributions. There are regression models for the Nature Fund and the Child Fund. In the Heckman, each regression is corrected for selection bias using the results of the Probits.

The dependent variable in both of the regressions is the natural log of the contribution amount for the particular fund being modeled. The independent variables are the natural logs ( $\ln$ ) of INCOME, TAXPRICE, and REFUND. The theoretical motivation for including income and price is clear. The rationale for the refund variable is more speculative. Two different specifications for the contribution amount regressions are used in this paper. While the main specification includes only income and tax price variables, the expanded version includes the refund variable as well.

For example, the expanded specification for the Nature Fund can be written:

$$[3] \ln(\text{Nature Fund Contribution}) = B_0 + B_1 \ln(\text{INCOME}) + B_2 \ln(\text{TAXPRICE}) + B_3 \ln(\text{REFUND}) + \varepsilon.$$

Notice that few of the control variables found in the participation specification are included. The assumption is that after a taxpayer decides to contribute to a particular fund, it is just income, tax price of the contribution, and refund amount that affect contribution level. The same three independent variables available for inclusion in the regression model for Nature Fund contribution level are available for use in the model for Child Fund contribution level.

**RESULTS**

The results of the Ordered Probit for the number of funds to which taxpayers contribute are reported in Table 5. If a given

independent variable has a positive coefficient, then an increase in that independent variable increases the likelihood that a taxpayer will give to a larger number of check-off funds. For example, the Ordered Probit results for INCOME and REFUND are positive and significant, indicating that a taxpayer with higher income and a larger refund will be more likely to contribute to a larger number of funds. For example, a \$1,000 increase in the income of a typical taxpayer living in the Bluegrass Region of Kentucky in 1990 would cause the probability of contributing to one, two, three, and four check-off funds to change from 59.02 percent, 34.44 percent, 6.24 percent, and 0.30 percent, respectively, to 58.99 percent, 34.47 percent, 6.24 percent, and 0.30 percent. This is a slight but significant increase in the likelihood taxpayers will contribute to two check-off funds instead of one check-off fund. A \$10 increase in the refund of the same taxpayer causes a similar effect. Note that the coefficients for YEAR92 and YEAR93 are also positive and significant. This is expected because the Veterans fund was added in 1992.

A negative coefficient in the Ordered Probit indicates that an increase in the dependent variable decreases the likelihood that a taxpayer will contribute to a larger number of funds. For example, the TAXPRICE result is negative and significant, indicating that a taxpayer with a higher tax price of contribution will be less likely to contribute to a larger number of funds. A one cent per dollar increase in the tax price for a typical taxpayer would cause the probability of contributing to one, two, three, and four check-off funds to change from 59.02 percent, 34.44 percent, 6.24 percent, and 0.30 percent, respectively, to 59.10 percent, 34.40 percent, 6.22 percent, and 0.28 percent. There is a slight but significant increase in the likelihood taxpayers will contribute to only one check-off fund instead of two or more. Taxpayers who take a child care credit,

## Taxes and Voluntary Contributions

**TABLE 5**  
 ORDERED PROBIT FOR NUMBER OF FUNDS TO WHICH A TAXPAYER CONTRIBUTES  
 (INDEPENDENT VARIABLE IS THE NUMBER OF FUNDS)

Dependent Variable	Coefficient <sup>a</sup> (Standard Error)
INCOME	0.0003* (0.0001)
TAXPRICE	-0.0069* (0.0004)
REFUND	0.0006* (0.0001)
YEAR91	0.0128 (0.0110)
YEAR92	0.1950* (0.0110)
YEAR93	0.2331* (0.0109)
EAST	-0.0123 (0.0148)
EMBAYMENT	-0.0056 (0.0217)
PLATEAU	-0.0274 (0.0146)
WEST	-0.0642* (0.0187)
MARRIED	0.0108 (0.0106)
CHILDCARE	-0.0622* (0.0150)
DEPENDENTS	0.0168* (0.0039)
SEPARFILE	-0.0770* (0.0301)
MEDIANAGE	-0.0112* (0.0022)
POPDEN	-0.0005 (0.0007)
CREDIT	0.1773* (0.0211)
MISTAKE	-0.6978* (0.0314)

N = 98307 Log Likelihood = -87965.89  
 Cutoff 1 = -0.702  
 Cutoff 2 = 0.581  
 Cutoff 3 = 1.820

<sup>a</sup>Values followed by an "\*" are significant at the 0.05 level.

who are married but file separately, and who make mistakes on their tax forms are all less likely to contribute to a larger number of check-off funds.

Results of the Heckman Probit model for participation in the Nature Fund and Child Fund are reported in Table 6. The Probit regressions determine how a one-unit change in each independent variable affects the likelihood that a given taxpayer with a refund will contribute to each fund. The significantly negative Mills Ratios indicates that a taxpayer who decides to contribute to a fund through a tax check-off will contribute less to the fund than otherwise indicated by his or her characteristics. This result may be because large contributors are more likely to use other contribution vehicles, such as the Nature Conservancy, to make direct contributions. Large contributors tend to want more control over the use of their contributions and get more recognition. If these other more socially visible contribution vehicles were not available, the larger contributors would likely have contributed through the tax check-off.

While both INCOME and REFUND are positive in the probit regression for Nature Fund, only INCOME is significant. This indicates that although an increase in refund amount does not increase the likelihood that a taxpayer will contribute to the Nature Fund, an increase in income has a significant and positive effect. INCOME and REFUND are both significantly positive in the probit regression for Child Fund. This indicates that a taxpayer's income and refund amount have a positive effect on the likelihood of participation in this fund. TAXPRICE proves significantly negative in the probit regressions for both funds. This indicates that a taxpayer who faces a higher tax price of contribution will be less likely to participate in either fund.

MARRIED has a significantly negative effect on participation in both funds. While CHILDCARE and DEPENDENTS

both have negative effects on participation in the Nature Fund, these two variables have positive effects on participation in the Child Fund. This indicates that taxpayers with more dependents and younger children are less likely to give to the Nature Fund and more likely to give to the Child Fund. PARKS was created to proxy for access to nature. PARKS has a significantly positive affect on participation in Nature Fund. Taxpayers are more likely to contribute to a charity that improves resources they are more likely to use. In other words, the contributions reflect at least some on-site use value.

The Heckman selection model regression determines the effect of each independent variable on the contribution level to each fund. Due to the natural log specification, the regression coefficients found at the bottom of Table 6 may be interpreted as elasticities. The income elasticity of contribution to the Nature Fund is 0.20. A 1 percent increase in income will lead to a 0.20 percent increase in contribution to the Nature Fund. The income elasticity of contribution to the Child Fund is 0.13.

The tax price elasticity of contribution is the percentage change in contribution amount due to a 1 percent change in tax price. As expected, the elasticities are negative; a higher tax price is associated with a lower contribution level. The tax price elasticity of contribution to the Nature fund is  $-0.58$ , and the tax price elasticity of contribution to the Child Fund is  $-0.27$ . Contributions to both funds are more sensitive to tax price than to income. Contributions to the Nature Fund appear to be particularly sensitive to changes in tax price.

When the Nature Fund regression specification is expanded to included the refund variable, the income elasticity changes from 0.20 to 0.18 and the tax price elasticity changes from  $-0.58$  to  $-0.41$ . Including the refund variable causes the income elasticity and tax price elasticity to decrease. These changes are indepen-

## Taxes and Voluntary Contributions

**TABLE 6**  
RESULTS OF HECKMAN SELECTION REGRESSIONS

	Nature Fund Coefficient* (Standard Error)	Child Fund Coefficient (Standard Error)
Probit Specification:		
INCOME	0.0008* (0.0001)	0.0032* (0.0002)
TAXPRICE	-0.0072* (0.0004)	-0.0032* (0.0004)
REFUND	0.0002 (0.0001)	0.0008* (0.0001)
YEAR91	0.0429* (0.0099)	0.0865* (0.0099)
YEAR92	0.0482* (0.0099)	-0.0317* (0.0099)
YEAR93	0.1262* (0.0099)	-0.0546* (0.0099)
EAST	-0.3306* (0.0129)	-0.0697* (0.0127)
EMBAYMENT	-0.1214* (0.0192)	0.1423* (0.0191)
PLATEAU	-0.2918* (0.0127)	-0.0858* (0.0126)
WEST	-0.2774* (0.0163)	-0.1213* (0.0157)
MARRIED	-0.0793* (0.0095)	-0.1515* (0.0096)
CHILDCARE	-0.0603* (0.0142)	0.1851* (0.0146)
DEPENDENTS	-0.0813* (0.0036)	0.0877* (0.0036)
SEPARFILE	-0.2106* (0.0266)	0.1034* (0.0266)
MEDIANAGE	-0.0360* (0.0019)	-0.0233* (0.0019)
POPDEN	0.0042* (0.0006)	0.0151* (0.0007)
PARKS	0.0282* (0.0060)	—
CREDIT	0.3792* (0.0219)	0.2280* (0.0226)
MISTAKE	0.1465* (0.0281)	0.2627* (0.0285)

TABLE 6 (continued)  
RESULTS OF HECKMAN SELECTION REGRESSIONS

Regression Specification:	Nature Fund Coefficient* (Standard Error)		Child Fund Coefficient (Standard Error)	
ln (INCOME)	0.2042* (0.0085)	0.1764* (0.0086)	0.1331* (0.0058)	0.1141* (0.0059)
ln (TAXPRICE)	-0.5849* (0.0626)	-0.4127* (0.0641)	-0.2721* (0.0392)	-0.1667* (0.0391)
ln (REFUND)	—	0.0845* (0.0059)	—	0.0640* (0.0035)
	N = 135767 Mills: -0.519* (0.049)		N = 135799 <sup>b</sup> Mills: -0.233* (0.032)	

\*Values followed by an “\*” are significant at the .05 level.

<sup>b</sup>The difference in observations is due to the fact that some observations had an income of zero, but a positive refund, and a positive contribution to a particular fund. There are a different number of such observations for each Heckman.

dently and jointly significant at the 0.01 level. The larger effect is on tax price elasticity. When the Child Fund regression specification is expanded to included the refund variable, the income elasticity changes from 0.13 to 0.11 and the tax price elasticity changes from -0.27 to -0.17. Including the refund variable again causes the income elasticity and tax price elasticity to decrease. These changes are independently and jointly significant at the 0.01 level. And, again, the larger effect is on tax price elasticity.<sup>10</sup>

The refund elasticity of contribution to the Nature Fund is 0.08. This means that a 1 percent increase in refund will lead to a 0.08 percent increase in contribution to the Nature Fund. The refund elasticity of contribution to the Child Fund is 0.06. In the case of both funds, income elasticities are larger than refund elasticities; contribution amounts are more sensitive to income than to refund. The results also indicate that contributions to the Child Fund are much less sensitive to changes in household income and refunds than are

contributions to the Nature Fund. Because the income elasticities are positive and less than one, the programs associated with the funds can be considered normal goods.

CONCLUSIONS

This paper presents the results of an analysis of taxpayer contributions to state check-off funds in Kentucky, the Nature Fund, Child Fund, Olympic Fund, and Veteran’s Fund. Ordered Probit is used to analyze the factors affecting contributions to multiple funds. Next, the decisions of whether or not, and how much, a taxpayer contributes to a particular fund are analyzed. Unlike previous research on check-off fund contributions, this paper models the taxpayer’s decision to contribute to a particular fund as a two-step process using a Heckman selection model on Individual Tax Form data. This paper also controls for income and tax price of contribution (and refund amount) simultaneously.

<sup>10</sup> When all variables are used in the regression portion of the Heckman procedure we find the expected signs, as before, for Income and Tax Price. However, the coefficients are smaller and less statistically significant for both the Nature Fund and the Child Fund. The income elasticities for the Nature Fund and Child Fund are (were) 0.19 (0.20) and 0.11 (0.14), respectively. The tax price elasticities for the two funds are (were) -0.03 (-0.58) and -.19 (0.29). The Tax Price coefficient in the Nature Fund regression becomes insignificant. Because we are uncomfortable with depending solely on the functional form to identify the model, and because of the improved significance of the two variables we have the most confidence in, we use the specification shown in Table 6.

Analysis of more than 135,000 taxpayer contribution decisions from 1990–3 shows that taxpayers with higher income levels (and refunds) are more likely to contribute to a larger number of funds. Taxpayers facing a higher tax price of contribution are less likely to contribute to a larger number of funds. Based on analysis of contribution amounts to the two major funds, the check-off fund programs are both found to be normal goods. For the Nature Fund, the point estimate of the income elasticity of contribution is 0.20 and the point estimate of the tax price elasticity of contribution is  $-0.58$ . Controlling for the refund amount reduces the point estimates to 0.18 for income and  $-0.41$  for price and the differences are statistically significant. The point estimate for the refund elasticity is 0.08. Similarly for the Child Fund, the income elasticity is 0.13 and the tax price elasticity is  $-0.27$ . Controlling for the refund amount reduces the point estimates to 0.11 for income and  $-0.17$  for price and the differences are statistically significant. The point estimate for the refund elasticity is 0.06.

Revenue from specific tax check-off programs is influenced by various factors considered in the analysis. Economic growth increases income and can be expected to increase contributions by both increasing the probability of contribution and by increasing the amount given by each contributor. If federal marginal tax rates are reduced, the tax price of contributions will increase. The price increase can be expected to reduce both the probability of contributing and the average amount given by contributors. In contrast, state tax reform that changes obligations to allow deductions for charitable contributions without itemizing, as President Bush has suggested at the federal level, would reduce the tax price of contributions for non-itemizers and increase the total amount of contributions. The analysis in this paper allows some estimates of the impacts on contributions that changes in such

economic and policy factors might have on state tax form check-off programs.

### Acknowledgments

We thank Sally Thalheimer and Clay Snedegar of the Kentucky Revenue Cabinet for their help in obtaining data, and Teresa Prather of the Kentucky State Nature Preserves Commission for her support. This paper benefited from the comments of Mark Berger, Elena Beseding, William Hoyt, Editor Douglas Holtz-Eakin, and an anonymous referee. The research was supported in part under Memorandum of Agreement No. 13814 between the Kentucky Water Resources Research Institute and the Kentucky Natural Resources and Environmental Protection Cabinet. The views expressed in this report are the authors' only.

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