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Abstract We exploit the time-series properties of charitable giving to provide additional insights into the relationship between charitable contributions and government spending. Cointegration tests reveal a significant long-run relationship between several categories of charitable giving and government spending. Granger causality tests provide evidence on the short-run giving and spending relationship. Evidence suggests that charitable contributions to education respond quite differently to state and local government education expenditures versus federal government expenditures. We argue that the government spending and charitable giving relationship depends on the source of government revenue, how this revenue is used, and the rational ignorance of private donors.

Keywords Government Spending, Charity, Growth, Crowding Out

JEL classification D12, D64, H3

1 Introduction

Real charitable giving in the United States has nearly tripled over the past 40 years, growing from $91.2 billion in 1965 to over $260 billion in 2005.[1] The growth in giving is paralleled by growth in federal, state, and local government expenditures. Real federal government expenditures per capita were $3,326 in 1965 and totaled $7,116 in 2004, reflecting an average annual increase of 2%. Real state and local government expenditures increased at an annual rate of 2.1%, totaling $1,966 per capita in 1965 and $4,300 per capita in 2004. Over time, a growing component of government spending has been for health, education, and social services (32% of federal spending in 1965 and 66% in 2004), the same services to which some of the largest shares of private charitable contributions have been made.

The steady growth in both charitable contributions and government spending, especially government spending on education, health, and other social services, has sparked much economic research on the question of whether individuals who contribute to charities reduce or increase their contributions in response to more generous government spending on charities. The research question has been whether government spending crowds out or crowds in private contributions to charities.[2] Studies differ in terms of the type of data used and the sector in question; most studies used cross-sectional or panel methods to analyze either survey data or more aggregated data on charitable giving.[3] A summary of the previous empirical studies suggests that government spending is most commonly associated with partial crowding in or partial crowding out of charitable giving.

Analyses of the relationship between government spending and charitable giving that use time-series data are few. Jones (1983) explored the relationship between charitable giving and government spending in the United Kingdom from 1961 to 1979 and found evidence of partial crowding out. Brooks (2000a) examined the relationship between several components of government spending (welfare, health, and education) and charitable giving in the United States from 1955 to 1995. He found evidence of crowding out, but the degree of crowding out was relatively small. This limited time-series research suggests that additional study of the temporal relationship between charitable contributions and government spending is warranted.

This paper provides a more extensive time-series treatment of the charitable giving and government spending relationship than previous studies (Jones 1983; Brooks 2000a). Specifically, we explore both the short-run (year-to-year) and long-run (entire sample period) government spending and charitable giving relationship using U.S. time-series data on various categories of charitable giving and government spending.

The complexity of the donor/charity relationship and the heterogeneity in the size, type of good/service provided, and management structure of charities often requires use of disaggregated data to effectively assess crowding in or crowding out. Our goal here is not to (nor does our aggregated data allow us to) directly test specific theories on crowding in or crowding out per se, although our empirical results can be used as support for various theories of charitable giving. Rather, we wish to provide insights into the intertemporal short-run and long-run relationship between charitable giving and government spending in the United States given the dramatic increase in federal and state government spending during the last half of the twentieth century (Higgs 1987). The

results not only shed light on the past intertemporal relationships between charitable giving and government spending, but they also serve as predictions for future charitable giving in the face of continued government growth (Holcombe 2005).

The paper is organized as follows: The following section briefly reviews several theories of charitable giving and the implications of each for crowding in or crowding out. The empirical section of the paper explores the long-run and short-run relationships between government spending and charitable contributions using various time-series techniques that have not been used in past studies. Specifically, cointegration tests are used to explore long-run relationships, if any, between several categories of both charitable giving and government spending (Steinberg 1987). Granger (1969) causality tests are conducted to capture the short-run relationship between government spending and charitable giving. The final section of the paper is reserved for discussion.

2 Motives for giving

Because the relationship between government spending and charitable contributions is a function of donors' potential motives for giving, differences in empirical results may reflect different motives for giving. Also, the predictions of each theory regarding the relationship between government spending and charitable contributions are dependent on donors' awareness of the taxing and spending activities of government. If politicians and government officials can create a fiscal illusion with respect to the size of individuals' tax bills and the targets of public expenditures, then the predicted effect of government spending on donations can be quite different than it would

be if individuals had perfect information regarding the taxing and spending activities of government (Buchanan 1967; Oates 1988; Eckel et al. 2005).

Economists have developed several theories as to why individuals make charitable donations (see Eckel et al. 2005 and Andreoni 1989, 1990, 2006). The theory of perfect altruism assumes that donors are concerned with the total amount of funds that a charity receives. If the charity receives funding from other sources, including governments, the donor will reduce his or her contribution by that amount. The implication is that government spending completely crowds out charitable giving if, in the eyes of the donor, the appropriate funding level is met. Perfect altruism is hypothesized to result in full crowding out regardless of whether fiscal illusion is present (Eckel et al. 2005).[4]

Under the warm glow theory of giving, donors receive utility from the act of giving itself (Andreoni 1990). Donors prefer gifts to be made by themselves rather than others, and they consequently view their own $1 contribution as different from a $1 increase in government spending on the charity. The implication of the warm glow theory under the assumptions of fiscal illusion and no wealth effects on donors (Andreoni 1989) is that government spending results in partial or no crowding out.

A final reason for charitable giving is prestige (Glazer and Konrad 1996). This theory of giving suggests that publishing names and contributions signals donors' wealth. Thus, charities can increase donations by reporting such information. The prestige theory of giving implies no effect of government spending on contributions absent any wealth effects (Andreoni 1989).

Although most of the hypothesized reasons for charitable giving suggest crowding out, several potential reasons government spending may crowd in private contributions (see Brooks 2000a). The first reason is that some government grants are in the form of matching funds, so that every dollar of voluntary donations is matched by a government contribution of one dollar. This effectively lowers the price of charitable giving. Second, some donors may interpret a government grant to a charity as proof of the charity's quality or reputability; donors may perceive a charity as high quality because it receives government funding and is thus worthy of private donations.

3 Data and analyses

Our charitable giving data are from the Giving USA Foundation (2006) and cover the period 1965 to 2003. We obtained annual data on total charitable giving nationwide as well as charitable giving to educational organizations (e.g., universities, private schools, public libraries), health organizations (e.g., health services and disease research), and human services (e.g., social services, disaster relief, job training).[5] We also obtained aggregate levels of federal government and state and local government expenditures on categories that most closely align with our charitable giving categories.[6] Specifically, we use annual federal expenditures from 1965 to 2003 on the primary functions of education, health, international affairs, income maintenance, and natural resources; and annual state and local government expenditures on health, hospitals, natural resources, and welfare.[7] All data in the analyses are per capita and have been converted to 2003 dollars using the consumer price index. Descriptive statistics for all variables used in our analysis are shown in Table 1.

Some of our later empirical models include other explanatory variables. The percentage of the U.S. population over the age of 45 is included because Brooks (2003) argues that this age group is the most likely to provide charitable contributions. The marginal personal income tax rate is also included to test the effect of tax changes on charitable giving.[8] We also include real per capita gross domestic product (GDP) to capture the potential effect of the national business cycle on charitable giving. The average annual return on the Standard and Poor's 500 (S&P 500) is included to determine whether changes in wealth may explain charitable giving because standard theories of consumption (e.g., the permanent income hypothesis and the life cycle hypothesis) support wealth as an argument in the consumption function.[9] Finally, we include a dummy variable that has a value of one for the years during which the US economy was in recession, zero otherwise, to determine whether average charitable contributions differ significantly during recession years.[10]

3.1 The long-run giving and spending relationship

Previous studies (Jones 1983; Brooks 2000a) using time series data have regressed charitable giving on government spending, with the resulting coefficient on government spending providing information on crowding out ($\beta<0$) or crowding in ($\beta>0$).[11] A potential problem with this method arises if the mean, the variance, or both properties of either series are not constant over time, that is, they are non-stationary. We apply the augmented Dickey-Fuller (ADF) test to all variables to reach a conclusion regarding stationarity.[12,13] We test (i) whether the variables are stationary in levels, (ii)

whether the variables are trend stationary, and (iii) whether the variables are difference stationary.[14] The stationarity test results for each variable are shown in Table 2.

The ADF test statistics presented in Table 2 indicate that none of the government spending or charitable giving variables are level stationary or trend stationary. We do find evidence, however, that the government spending and charitable giving variables are difference stationary. The results in Table 2 suggest that the percentage of the population over age 45 and the annual return on the S&P 500 are both stationary in levels. This is not surprising, because both the percentage of the population over age 45 and the average return on the S&P 500 have remained fairly constant over time. Per capita GDP and marginal tax rates are both difference stationary.

Although the results in Table 2 indicate that the government spending and charitable giving variables are nonstationary, it is possible that a linear combination of two nonstationary variables may indeed be stationary - the variables may be cointegrated (Engle and Granger 1987; Engle 1991). The stationary linear combination can then be interpreted as a long-run equilibrium relationship among the variables and estimates of this long-run relationship can then be obtained. Johansen's (1991, 1995) cointegration test results are shown in Table 3.

The statistics in Table 3 show a cointegrating relationship for only a few variable pairs. We find that total charitable giving is cointegrated with federal government spending and total government spending. Both test statistics support this conclusion. We also find evidence of a cointegration between education giving and total government spending, and among welfare giving and state and local government spending. The

evidence also shows that education giving is cointegrated with state and local government spending, but only one of the two test statistics supports this conclusion.

The cointegrating coefficients from each significant cointegration pair provide an estimate of the long-run relationship between them.[15] Table 4 shows the cointegrating coefficients. Importantly, these coefficients should not be interpreted in the same way as coefficients in a structural equation, for example, a one-unit change in *x* causes a two-unit change in *y*, but rather as a single relationship over the entire sample period. Four of the five cointegrating coefficients in Table 4 show that a higher level of government spending is associated with a lower level of charitable giving. This relationship is the strongest between total charitable giving and federal government spending and total government spending (-0.218 and -0.119, respectively). Coefficients for charitable giving to education and total education spending and state and local education spending are also smaller in magnitude (-0.058 and -0.063, respectively).

3.2 The short-run relationship: granger causality tests

In this section we use Granger (1969) causality tests on the four categories of charitable giving and the three categories of government spending. Our Granger causality tests are motivated in part by the work of Andreoni and Payne (2003). The authors argue that increased government spending on a charitable organization may result in reduced private giving not only by private donors giving less, but also by a reduction in fundraising efforts by the recipient charitable organization. There is no reason to believe, however, that this reduction in fundraising will be targeted only toward private donors and has no implications for future revenues to the charitable organization.

Certainly, if fundraisers can influence charitable contributions, as suggested by Andreoni and Payne (2003), then there is no reason to believe that fundraisers could not adjust their efforts to obtain additional funds from other government sources. This idea was raised by Brooks (1997) in his study of private contributions to symphony orchestras. Thus, in addition to the traditional spending-giving relationship, our Granger causality tests allow us to explore whether changes in charitable giving influence government spending.

The Granger causality test requires all variables to be stationary. Thus, all variables are transformed to annual percentage changes, as suggested by the ADF test results in Table 2. Because the variables are all denoted as percentage changes, the causality tests provide evidence on the short-run relationship between government spending and charitable giving.[16]

We test for a causal relationship between each category of charitable giving (Table 1) and the three measures of government spending -- state and local government spending, federal government spending, and total government spending. In addition, we run each causality test with and without other exogenous variables to ensure that any detected causality between the charitable giving and government spending variables reflects causality and not correlations between each variable with an omitted third variable. Our exogenous variables include the recession dummy variable described earlier and the four variables listed at the bottom of Table 1. We run a total of 12 causality tests for each of the four categories of charitable giving. The results from the causality tests are shown in Tables 5 through 8.[17]

We first consider the tests on whether government spending causes charitable giving. Table 5 shows that federal government spending causes total charitable giving.

The direction of causality is negative - the sum of the lagged coefficients (not shown) is -0.12. This result, however, is not robust in the model that includes exogenous variables. We also find that total government spending on education causes education giving (Table 6) and that the direction of causality is negative (sum of lagged coefficients is -0.73), but this result also is not robust to the inclusion of exogenous variables.

The finding that state and local government education spending causes education giving (Table 6) and state and local government welfare spending causes welfare giving (Table 8) is robust to the inclusion of exogenous variables.[18] The direction of causality is negative for both, and the lagged coefficients (from the models that include exogenous variables) sum to -0.26 and -0.50, respectively.

The results thus far have shown evidence that changes in government spending do influence changes in charitable giving for several variable pairs, and that the relationship is consistently negative and less than unity, thus suggesting partial crowding out. An interesting point is that those government spending and charitable giving variable pairs that were found to have a long-run relationship were also found to have a statistically significant short-run relationship.

3.3 The short-run relationship: granger causality with error correction

For the variable pairs in which a cointegrating relationship was found (Table 3), we can improve on the earlier Granger causality models by adding an error correction term in the respective short-run equations. The error correction term, which is the one-period lagged error from each cointegrating equation (Table 4), provides evidence of the adjustment of the dependent variable toward long-run equilibrium. For our models

specifically, the error correction term reveals what fraction of the discrepancy between the actual and long-run (equilibrium) value of the dependent variable in each Granger causality model is eliminated in the first year. The larger (smaller) the absolute value of the error correction coefficient, the greater (slower) is the speed at which equilibrium is restored.

The Granger causality models with error correction for the five cointegrated variable pairs are presented in Table 9. All models include the full set of exogenous variables defined earlier. The final column of Table 9 shows the error correction coefficients. We also include the lag order (which remains the same as earlier results) and the sum of the lagged coefficients. *F*-tests are conducted on the null hypothesis that the lagged coefficients are jointly equal to zero.

The joint significance of the coefficient estimates on the lagged variables again provides evidence that state and local government spending causes charitable giving to education and welfare. Consistent with the results presented earlier, none of the lagged coefficients from the remaining causality models presented in Table 9 reveals a significant relationship between the different categories of charitable giving and government spending.

The error correction coefficient estimates reveal that government spending adjusts to the long-run equilibrium more quickly than charitable giving. Based on the range of coefficient estimates from the government spending models, between 12% and 28% of the discrepancy between the actual and long-run value of the government spending is eliminated in the first year. In fact, the error correction coefficients are not statistically significant for any of the charitable giving models, thus suggesting that the various

categories of charitable giving do not adjust in response to deviations from each of their long-run values.

The more rapid adjustment of government spending may be explained by the fact that it is determined through a budgeting process and is more immune to changes in economic conditions. The level of government spending is determined by the legislative and executive branches, both of which respond to voters' demands for government services and to those of special interests. Although demand from both sources have strengthened over time, it is unlikely that either varies significantly from year to year. It also seems reasonable that charitable giving, which occurs at the individual level, is much more sensitive to economic dynamics than spending by either is federal or state and local governments.. Certainly consumers are more liquidity constrained than governments, and this suggests that consumer expenditures experience larger variations and slower adjustments to equilibrium as a result of changes in economic conditions than do government expenditures.

3.4 A closer look at education

Of particular interest are the causality tests that examined whether charitable giving influences government spending, especially with regard to education spending and charitable giving. Recall that the impetus to investigate this direction of causality is to test the hypothesis that private charities pursue government funding in response to a reduction in private contributions. The results shown in Table 6 provide evidence that education giving does influence federal spending on education (the sum of coefficients is -0.56), but not vice versa. State and local government spending on education, however,

does influence charitable giving (sum of coefficients is -0.26), but not vice versa. Thus, charitable giving to education appears to influence federal education spending but not state and local government spending, and federal education spending does not influence education giving but state and local education spending does influence education giving.

This relationship between education giving and federal government spending and state and local government spending is shown in Figure 1.[19] A reduction in state and local government expenditures on education at time t-1 causes an increase in charitable giving at time t that then leads to a reduction in federal government spending on education at time t+1.

Why do changes in federal government education expenditures not cause a change in charitable giving to education (of which roughly 90% is given to colleges and universities)?[20] One explanation for the opposing directions of causality between education giving and federal government and state and local government education spending may be the different revenue sources for federal monies for education versus state monies for education and the size of each relative to overall government spending.

Traditionally, roughly 80% to 85% of federal funds was allocated to higher education (not including student loans) in the form of earmarked research grants and contracts, whereas between 90% and 95% of state government funds to higher education was spent on general appropriations.[21] Also, federal funds to primary and secondary schools, libraries, etc. are in the form of grants. Applying for grant monies requires much time and effort on the part of the potential recipient, whereas legislatively appropriated funds are allocated to the institution. State and local government revenue is a much greater percentage of total (primary, secondary, and post secondary) education revenues

than is revenue from the federal government, and state and local governments spend larger percentages of their budgets on all levels of education than does the federal government.[22] Thus, educational institutions are much more sensitive to changes in state and local education expenditures (changes in appropriations) than they are to federal education expenditures (changes in grants). As more private contributions flow to the institution from increased fundraising efforts, institutions reduce their efforts to obtain federal grants and future federal funds to the institution then decrease.[23]

4 Discussion and summary

This paper examined the short-run and long-run relationships between various categories of government spending and charitable contributions over the period 1965 to 2003, a period marked by rapid growth in federal and state government spending. Cointegration tests showed that a long-run negative relationship does exist between charitable giving and government spending, most notably total giving and education giving. The relationship is less than one-for-one, thus suggesting partial crowding out. Granger causality tests showed that increases in state and local government welfare and education spending do reduce charitable giving to these respective categories. To summarize the results, we find limited evidence of crowding out in the long run and the short run, and conclusions regarding crowding in or crowding dependent on the specific categories of government spending and charitable giving studied.

We obtained the interesting result that a decrease in state and local government spending on education increases private giving to education, and that increased education giving then leads to a reduction in federal government spending on education. We

argued that this one-way relationship is a result of changing fundraising efforts and the nature of state and local government versus federal government education expenditures (general appropriations versus grants, respectively) and the relative size of each toward total education expenditures.

In addition to a reduction in private charitable contributions resulting from government spending on charitable organizations, government growth itself, ignoring the destination of government spending, may reduce private charitable contributions. Private contributions may decrease because of reduced disposable income that results from higher taxes used to fuel future government growth. The response of charitable giving to a decrease in disposable income is uncertain, as Auten et al. (2002) find that the income elasticity of charitable donations ranges from 0.29 to 0.87.

Rational ignorance (Downs 1957) may explain the relatively few significant giving and spending relationships. Fiscal illusion (Buchanan 1967; Oates 1988; Eckel et al. 2005) assumes that officials can mislead citizens regarding the taxation and spending activities of government. One way citizens can be mislead is if they do not take the time to learn about the taxing and spending activities of government because the time cost of doing so is greater than the benefit, that is, citizens are rationally ignorant (Congleton 2001). Thus, if people are rationally ignorant about the size and activities of government, regardless of whether officials attempt to hide their activities, then one would expect there to be no statistical relationship between government spending and charitable contributions. Our results suggest much less fiscal illusion and rational ignorance about education funding than other social spending functions, however, a result that is likely due to the fact that education directly affects more people than any other social program.

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Endnotes

[1] Charitable giving data are from Giving USA Foundation (2006).

[2] Brooks (2006) provides an excellent review of the literature.

[3] Abrams and Schmitz (1984), Day and Devlin (1996), Hughes and Luksetich (1999), Kingma (1989), and Schiff (1985) all use cross-sectional data. Survey data were used in several of these studies; however, all of the surveys differed and were conducted during different years. Schiff (1985) used 1974 data from the National Survey of Philanthropy, and Day and Devlin (1996) used a Canadian survey from 1986 and 1987. Non-survey, cross-sectional studies include those by Abrams and Schmitz (1984), who used tax return data, Hughes and Luksetich (1999) who used data from contributions to museums, and Kingma (1989) who used data from contributions to public radio stations. Several studies have used panel data methods to analyze the effect of government spending on charitable contributions. Brooks (2000b) used American symphony orchestra data from 1984 through 1991. Brooks (2003) used social welfare, education, health, arts and culture, the environment, and international relief data for 1986 through 1995. Khanna et al. (1995) used charity data from the United Kingdom for 1983 through 1990. Tax return data were used by Lindsey and Steinberg (1990) for 1979 through 1981 and Abrams and Schmitz (1978) for 1948 through 1972. Payne (1998) used data on nonprofit shelters and other similar human resource organizations from 1982 through 1992.

[4] Andreoni (1988) argues that the theory of perfect altruism is not valid in the case of a large number of donors.

[5] Giving USA Foundation (2006) describes the types of organizations comprising each category of charitable giving. According to contacts at the Giving USA Foundation, roughly 90% of charitable giving to education is for colleges and universities.

[6] We have not included other categories of giving (religion and the arts) in the separate analyses because there is not a comparable measure of federal or state and local government expenditures on these categories. Giving to religion and the arts is included in total charitable giving.

[7] Federal expenditures on the primary government functions were obtained from the *U.S. Office of Management and Budget.* State and local government expenditures were obtained from the U.S. Census,

State and Local Government Finances. A listing of all federal subfunctions within each function (e.g., all spending items that qualify as "health") can be found at the *U.S. Office of Management and Budget.* Federal expenditures on health do not include Medicare, and federal expenditures on income maintenance do not include Social Security.

[8] Brooks (2003) uses the average effective federal tax rate (for a couple earning $50,000). The marginal tax rates we use for each year are based on taxable income (average earnings minus the exemption for married filing jointly). Average earnings for each year were obtained from the Social Security Administration. The exemption for married filing jointly and the marginal tax rate on taxable income were both obtained from the Internal Revenue Service.

[9] S&P 500 data are from the *Wall Street Journal*. We consider financial wealth rather than household wealth. The different effects of changes in household wealth versus financial wealth on consumption are discussed in Benjamin et al. (2004).

[10] See http://www.nber.org/cycles.html for a list of recession dates from the National Bureau of Economic Research. A year is considered a recession year if a recession occurred any time in the respective year.

[11] Brooks (2000a) used welfare, health, and education data from 1945 through 1995, and Jones (1983) used data on average household donations from 1961 through 1979 for the United Kingdom.

[12] See Dickey and Fuller (1979). See notes to Table 2 for more details.

[13] We confirmed the results of the ADF tests using the unit root tests of Elliot et al. (1996) and Ng and Perron (2001). The only contradiction was for federal health spending and total government health spending. The ADF test revealed that these series are second-difference stationary (first-difference stationary at $\alpha \approx 0.20$) whereas the tests of Elliot et al. (1996) and Ng and Perron (2001) suggested that the two series are first-difference stationary. Because two of the three tests (and arguably the two more powerful tests) suggested that the two series are first-difference stationary, we defer to this result when conducting later empirical analyses.

[14] For each variable, denoted as Y_t, the respective test equations are 1) $\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + u_t$, 2) $\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 T + u_t$, 3) $\Delta Y_t = \alpha_0 + \alpha_1 \Delta Y_{t-1} + u_t$. The null hypothesis in each case is $\alpha_1=0$. The equations

considered various lags for u_t (not shown) to reduce serial correlation. The lag order for u_t was based on the Akaike Information Criterion (AIC).

[15] See Johansen (1991, 1995) for information on how the cointegrating coefficients are obtained.

[16] The Granger causality test involves regressing a variable *y* on lagged values of itself and lagged values of another variable, *x*, and regressing *x* on lagged values of itself and lagged values of *y*. The number of lags for *x* and *y* can be determined using the AIC. Rejecting the null hypothesis that the coefficients on the *x* (*y*) variables are not jointly different than zero suggests that *x* (*y*) causes *y* (*x*). It should be noted that the finding of causality between variables does not imply that one variable is necessarily the effect of another variable, but rather the test determines how much of one variable can be explained by lags of the other variable.

[17] The complete results from each Granger causality test will be provided on request; however, it is worthwhile to provide an overview of the importance of the exogenous variables to the empirical models in Table 5 through Table 8. Of the five exogenous variables, the S&P500 was statistically significant in the majority of charitable giving and government spending regressions. On average, the coefficient estimate for the S&P500 was 0.20. The coefficients on each of the other four exogenous variables were insignificant in the majority of regression equations. However, *F*-tests on the joint significance of the coefficients on the exogenous variables in randomly selected equations resulted in a rejection of the null hypothesis that the coefficients are jointly equal to zero. Thus, we find that wealth is the predominant factor in explaining changes in charitable giving and government spending, but taxes, changes in GDP, recessionary periods, and population growth together provide additional explanatory power.

[18] Our finding that charitable contributions to education do not influence state and local government spending on education is opposite that of Becker and Lindsay (1994), who find, using panel data techniques, a near dollar-for-dollar crowding out of public education funding by private donations to education.

[19] The relationship shown in Figure 1 represents the short-run relationship between state and local government education spending, federal spending on education, and charitable giving to education. We explored whether a long-run relationship exists among the three variables by conducting a joint

cointegration test on the three variables. The results from the cointegration test reveal only one cointegrating relationship (rather than two). Decomposing the results revealed that the single cointegrating relationship exists between state and local government spending and charitable giving to education (as per Table 3). We repeated the test using total government spending on education and again obtained the result that a long-run relationship exists only between state and local government spending on education and charitable giving to education. The cointegration test results will be provided on request.

[20] The estimate of 90% was given by Sharon Bond, a senior Public Relations manager at the Giving USA Foundation.

[21] Data are from the National Center for Education Statistics, *Digest of Education Statistics,* 2006, Table 336. Averages listed in the text are based on annual data from 1980 to 2005.

[22] Historically, state and local government revenue to higher education has accounted for roughly 30% of higher education revenues whereas federal government revenue to higher education has accounted for about 14% (see *Digest of Education Statistics* 2006, Table 335). For elementary and secondary schools, state and local government revenue has accounted for nearly 90% of all elementary and secondary school revenue (see *Digest of Education Statistics* 2006, Table 158).

[23] The inverse relationship between charitable giving to education and federal education spending could also be explained by the degree to which education giving is targeted. Targeted federal education spending would substitute for targeted education giving. Giving USA Foundation (2006) lists the major benefactors of education giving, such as public libraries, tutoring programs, public schools, educational service organizations, etc. However, Giving USA Foundation (2006) and contacts at the organization could provide no specific information on the amount of education giving that is targeted rather than used for general appropriations.

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Table 1 – Descriptive statistics

Variable	*Variables in Levels*		*Variables as Percent Change*	
	Mean	Standard Deviation	Mean	Standard Deviation
Total Giving	566.64	117.93	0.0171	0.0478
Giving to Education	69.87	21.02	0.0176	0.0590
Giving to Health	57.95	6.24	0.0116	0.0486
Giving to Human Services	59.57	7.54	0.0036	0.0730
Total Federal Spending	1,526.23	418.68	0.0373	0.0721
Total State and Local Spending	1,000.22	340.85	0.0298	0.0325
Total Spending	2,526.44	745.09	0.0321	0.0410
Federal Education Spending	224.42	51.32	0.0530	0.1916
State and Local Education Spending	1,494.53	304.33	0.0247	0.0339
Total Education Spending	1,718.96	320.25	0.0265	0.0447
Federal Health Spending	318.27	183.90	0.0751	0.0882
State and Local Health Spending	109.17	57.44	0.0585	0.0442
Total Health Spending	427.45	240.27	0.0702	0.0701
Federal Welfare Spending	790.73	251.08	0.0419	0.1027
State and Local Welfare Spending	576.41	232.99	0.0476	0.0583
Total Welfare Spending	1,367.14	464.87	0.0435	0.0724
Per capita GDP	25,334	5,714.7	0.0205	0.0207
S&P 500 annual return	0.074	0.135	-------	-------
Percentage of Population over 45	0.536	0.024	-------	-------
Marginal Tax Rate	0.189	0.037	-0.0035	0.0693
Observations	39	39	38	38

Note: Percentage change in the S&P 500 and the population over aged 45 are not included in the final models. Full sample period is 1965 to 2003. See text for data sources.

Table 2 –Stationarity test results

	(1)	(2)	(3)
Variable (Y_t)	H_0: Not Stationary in Levels $\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + u_t$	H_0: Not Trend Stationary $\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 T + u_t$	H_0: Not Difference Stationary $\Delta Y_t = \alpha_0 + \alpha_1 \Delta Y_{t-1} + u_t$
Total Giving	-0.176	-1.614	-3.378**
Giving to Education	-0.201	-1.655	-3.073**
Giving to Health	-1.185	-1.734	-3.365**
Giving to Human Services	-2.234	-2.337	-3.353**
Total Federal Spending	-0.879	-2.308	-3.918***
Total State and Local Spending	-0.120	-2.673	-2.916*
Total Spending	-0.469	-2.535	-3.610**
Federal Education Spending	-2.575	-2.563	-3.859***
State and Local Education Spending	-0.065	-1.872	-3.020**
Total Education Spending	-0.301	-1.795	-3.586**
Federal Health Spending	1.249	-0.874	-2.300[a]
State and Local Health Spending	1.367	-1.317	-3.716***
Total Health Spending	1.276	-0.894	-2.160[a]
Federal Welfare Spending	-1.725	-2.321	-4.314***
State and Local Welfare Spending	-0.034	-2.108	-2.682*
Total Welfare Spending	-1.029	-2.891	-3.800***
Per capita GDP	0.503	-2.814	-4.506***
S&P 500 annual return	-3.629***	-3.612**	-6.844***
Percentage of Population over 45	-2.721*	-1.738	-0.692
Marginal Tax Rate	-0.819	-2.229	-4.685***

Note: Augmented Dickey-Fuller test (ADF) statistics are shown and test the null hypothesis that $\alpha_1 = 0$. * denotes significance at 10%, ** at 5%, and *** at 1%. Lag order for u_t (not shown) is based on Akaike Information Criterion. All money variables are per capita and converted to 2003 dollars. Sample period is 1965 to 2003. [a] See note 13.

Table 3: Johansen cointegration tests

Variable	Hypotheses		Trace Statistic	Max λ Statistic
Cointegrating Relationship with Total Charitable Giving Per Capita				
Federal Spending	H_0: r=0	H_1: r=1	13.680*	13.275*
State and Local Spending	H_0: r=0	H_1: r=1	13.074	11.989
Total Spending	H_0: r=0	H_1: r=1	15.723**	15.024**
Per Capita GDP	H_0: r=0	H_1: r=1	8.694	7.137
Marginal Tax Rate	H_0: r=0	H_1: r=1	4.125	3.906
Cointegrating Relationship with Education Giving Per Capita				
Federal Education Spending	H_0: r=0	H_1: r=1	11.870	11.269
State and Local Education Spending	H_0: r=0	H_1: r=1	13.244	13.182*
Total Education Spending	H_0: r=0	H_1: r=1	15.956**	15.911**
Per Capita GDP	H_0: r=0	H_1: r=1	7.350	4.794
Marginal Tax Rate	H_0: r=0	H_1: r=1	6.029	5.160
Cointegrating Relationship with Health Giving Per Capita				
Federal Health Spending [a]	-----	-----	-----	-----
State and Local Health Spending	H_0: r=0	H_1: r=1	6.362	4.106
Total Health Spending [a]	-----	-----	-----	-----
Per Capita GDP	H_0: r=0	H_1: r=1	11.304	7.428
Marginal Tax Rate	H_0: r=0	H_1: r=1	4.026	3.511
Cointegrating Relationship with Welfare Giving Per Capita				
Federal Welfare Spending	H_0: r=0	H_1: r=1	8.588	6.769
State and Local Welfare Spending	H_0: r=0	H_1: r=1	15.603**	15.563**
Total Welfare Spending	H_0: r=0	H_1: r=1	11.456	10.925
Per Capita GDP	H_0: r=0	H_1: r=1	11.627	6.811
Marginal Tax Rate	H_0: r=0	H_1: r=1	8.013	7.273

Note: * denotes significance at 10%, ** at 5%, and *** at 1%. 'r' is the number of cointegrating relationships. The test VAR uses one lag of each variable. See Johansen (1991, 1995) for more details on the cointegration test procedure. Sample period is 1965 to 2003.

[a] Cointegration tests require both series in pair to be integrated of the same order. See Table 2.

Table 4: Cointegrating coefficients – evidence of long-run relationships

Variable Pair	Normalized Cointegrating Coefficient
Total Charitable Giving / Federal Spending	-0.218*** (3.72)
Total Charitable Giving / Total Spending	-0.119*** (4.56)
Giving to Education / State and Local Education Spending	-0.063*** (7.06)
Giving to Education / Total Education Spending	-0.058*** (6.27)
Giving to Welfare / State and Local Welfare Spending	-0.004 (0.006)

Note: Variable pairs shown above are those in which the cointegration tests in Table 3 revealed evidence of cointegration. * denotes significance at 10%, ** at 5%, and *** at 1%. Absolute *t*-statistics shown in parentheses. See Johansen (1991, 1995) for more details on the cointegration coefficients.

Table 5: Granger causality – total giving and government spending

Null Hypothesis (*x* does not cause *y*):	F-Statistic	Exogenous Variables Included?	Lags (*x*,*y*)
Total Government Spending			
Total Government Spending does not cause Total Giving	0.24	No	1,1
Total Giving does not cause Total Government Spending	1.94	No	1,1
Total Government Spending does not cause Total Giving	0.01	Yes	1,1
Total Giving does not cause Total Government Spending	1.13	Yes	2,1
Federal Government Spending			
Federal Government Spending does not cause Total Giving	3.54**	No	2,1
Total Giving does not cause Federal Government Spending	2.10	No	1,4
Federal Government Spending does not cause Total Giving	0.03	Yes	1,1
Total Giving does not cause Federal Government Spending	2.52	Yes	1,4
State and Local Government Spending			
State and Local Government Spending does not cause Total Giving	0.01	No	1,1
Total Giving does not cause State and Local Government Spending	0.23	No	1,1
State and Local Government Spending does not cause Total Giving	0.10	Yes	1,1
Total Giving does not cause State and Local Government Spending	0.02	Yes	1,1

Note: * denotes significance at 10%, ** at 5%.
All charitable giving and government spending variables are in percentage changes. Exogenous variables are the percentage change in real per capita GDP, the S&P 500, the percentage of the population over age 45, the percentage change in marginal tax rates, and a recession dummy variable. Lag order was determined by the Akaike Information Criterion (AIC). Complete empirical results are available upon request.

Table 6: Granger causality – education giving and government spending

Null Hypothesis (x does not cause y):	F-Statistic	Exogenous Variables Included?	Lags (x,y)
Total Government Education Spending			
Total Government Spending does not cause Education Giving	4.53**	No	6,1
Education Giving does not cause Total Government Spending	1.51	No	1,1
Total Government Spending does not cause Education Giving	1.92	Yes	4,1
Education Giving does not cause Total Government Spending	0.33	Yes	1,1
Federal Government Education Spending			
Federal Government Spending does not cause Education Giving	0.02	No	1,1
Education Giving does not cause Federal Government Spending	4.22**	No	1,1
Federal Government Spending does not cause Education Giving	0.11	Yes	1,1
Education Giving does not cause Federal Government Spending	3.43**	Yes	1,1
State and Local Government Education Spending			
State and Local Government Spending does not cause Education Giving	5.78**	No	4,1
Education Giving does not cause State and Local Government Spending	0.31	No	1,1
State and Local Government Spending does not cause Education Giving	3.69**	Yes	4,1
Education Giving does not cause State and Local Government Spending	0.11	Yes	1,1

Note: * denotes significance at 10%, ** at 5%.
All charitable giving and government spending variables are in percentage changes. Exogenous variables are the percentage change in real per capita GDP, the S&P 500, the percentage of the population over age 45, the percentage change in marginal tax rates, and a recession dummy variable. Lag order was determined by the Akaike Information Criterion (AIC). Complete empirical results are available upon request.

Table 7: Granger causality – health giving and government spending

Null Hypothesis (*x* does not cause *y*):	F-Statistic	Exogenous Variables Included?	Lags (*x*,*y*)
Total Government Health Spending			
Total Government Spending does not cause Health Giving	0.28	No	1,2
Health Giving does not cause Total Government Spending	0.99	No	1,1
Total Government Spending does not cause Health Giving	0.001	Yes	1,1
Health Giving does not cause Total Government Spending	1.52	Yes	1,1
Federal Government Health Spending			
Federal Government Spending does not cause Health Giving	1.42	No	1,1
Health Giving does not cause Federal Government Spending	1.49	No	1,1
Federal Government Spending does not cause Health Giving	0.02	Yes	1,1
Health Giving does not cause Federal Government Spending	2.35	Yes	1,1
State and Local Government Health Spending			
State and Local Government Spending does not cause Health Giving	0.18	No	1,1
Health Giving does not cause State and Local Government Spending	0.04	No	1,2
State and Local Government Spending does not cause Health Giving	0.77	Yes	1,1
Health Giving does not cause State and Local Government Spending	0.14	Yes	1,1

Note: * denotes significance at 10%, ** at 5%.
All charitable giving and government spending variables are in percentage changes. Exogenous variables are the percentage change in real per capita GDP, the S&P 500, the percentage of the population over age 45, the percentage change in marginal tax rates, and a recession dummy variable. Lag order was determined by the Akaike Information Criterion (AIC). Complete empirical results are available upon request.

Table 8: Granger causality – welfare giving and government spending

Null Hypothesis (x does not cause y):	F-Statistic	Exogenous Variables Included?	Lags (x,y)
Total Government Welfare Spending			
Total Government Spending does not cause Welfare Giving	0.98	No	2,1
Welfare Giving does not cause Total Government Spending	0.94	No	1,1
Total Government Spending does not cause Welfare Giving	0.01	Yes	1,1
Welfare Giving does not cause Total Government Spending	0.001	Yes	1,1
Federal Government Welfare Spending			
Federal Government Spending does not cause Welfare Giving	0.03	No	1,1
Welfare Giving does not cause Federal Government Spending	1.49	No	1,2
Federal Government Spending does not cause Welfare Giving	0.15	Yes	1,1
Welfare Giving does not cause Federal Government Spending	0.18	Yes	1,2
State and Local Government Welfare Spending			
State and Local Government Spending does not cause Welfare Giving	3.93**	No	4,1
Welfare Giving does not cause State and Local Government Spending	0.73	No	2,4
State and Local Government Spending does not cause Welfare Giving	4.00**	Yes	6,1
Welfare Giving does not cause State and Local Government Spending	0.59	Yes	2,2

Note: * denotes significance at 10%, ** at 5%.
All charitable giving and government spending variables are in percentage changes. Exogenous variables are the percentage change in real per capita GDP, the S&P 500, the percentage of the population over age 45, the percentage change in marginal tax rates, and a recession dummy variable. Lag order was determined by the Akaike Information Criterion (AIC). Complete empirical results are available upon request.

Table 9: Granger causality error correction estimates
(For cointegrated variable pairs from Table 3)

Null Hypothesis (x does not cause y):	Sum of lagged x coefficients (F-test all $x = 0$)	Lags (x,y)	Error Correction Coefficient (t-stat.)
Total Government Spending does not cause Total Giving	0.0034 (0.002)	1,1	-0.0036 (0.05)
Total Giving does not cause Total Government Spending	-0.2611 (1.49)	2,1	0.2365** (3.60)
Federal Government Spending does not cause Total Giving	0.0013 (0.001)	1,1	-0.0049 (0.08)
Total Giving does not cause Federal Government Spending	-0.3168 (1.10)	1,4	0.2771* (1.97)
Total Government Spending does not cause Education Giving	-0.1630 (1.91)	4,1	0.0371 (0.60)
Education Giving does not cause Total Government Spending	-0.0581 (0.58)	1,1	0.1205** (3.26)
State and Local Government Spending does not cause Education Giving	-0.3385** (3.93)	4,1	0.1137 (1.01)
Education Giving does not cause State and Local Government Spending	0.0352 (0.33)	1,1	-0.1658** (3.03)
State and Local Government Spending does not cause Welfare Giving	-0.3942** (3.27)	6,1	-0.1216 (1.06)
Welfare Giving does not cause State and Local Government Spending	0.0820 (0.67)	2,2	0.2026** (2.72)

Note: * denotes significance at 10%, ** at 5%.
Exogenous variables are included in the error correction models. These include the percentage change in real per capita GDP, the S&P 500, the percentage of the population over age 45, the percentage change in marginal tax rates, and a recession dummy variable. Lag order was determined by the Akaike Information Criterion (AIC). Complete empirical results are available upon request.

Figure 1: Education giving and government education spending