

An Analysis of the Peer Effects in Charitable Giving: The Case of Taiwan

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ABSTRACT: The purpose of this study was to utilize the data from the Survey on Family Income and Expenditure in Taiwan to investigate the influence of peer effects on the behavior of charitable giving. Based on the definitions of the reference group in this study, the estimation results suggested that peer effects on households' decisions on both whether to make charitable giving and how much to contribute were quite modest. The study also found that the price elasticity and the income elasticity of charitable giving in Taiwan were larger than those in the U.S., which may partially explain the low ratio of charitable giving to GDP in Taiwan. The earthquake in 1999 substantially increased the amount of charitable giving though its effect diminished after sometime.

KEY WORDS: charitable giving; peer effects; price elasticity.

There has been an extensive analysis on the tax effects of charitable giving¹ (Clotfelter, 1985; Steinberg, 1990). In studies on the behavior of charitable giving, the issue of peer effects among individuals has also attracted extensive discussion.² Becker (1974) argued that an individual's charitable giving was dependent on others' giving, because charitable giving has the property of public goods and the amount of an individual's giving depends on others' total amount of giving. Andreoni (1989) and Duncan (1999) determined that

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The authors would like to thank the participants at the Fifth Biennial Conference of Asian Consumer and Family Economics Association and anonymous reviewers for their helpful comments. The authors also gratefully acknowledge financial support from NSC through Grant NSC91-2415-H-007-013.

individuals' charitable giving was interdependent if they give partly out of altruism; and Andreoni and Scholz (1998) noted that it was not clear a priori how peer effects would be expected to affect charitable giving. If charitable giving is a pure public good, an individual's giving is expected to decline with others' giving since he/she would shift more of his/her income towards private consumption to increase his/her utility over private goods and public goods. However, studies on interdependence preferences in the literature generally suggest that the expected effect is positive. Therefore, it is likely that peer effects result from other factors.

In a study of peer effects on saving decisions, Duflo and Saez (2002) suggested two reasons why peers play a role in saving decisions, which can be adopted to explain the peer effects in charitable giving. First, people may lack the information necessary to make decisions on charitable giving. The literature on informational cascades (Banerjee, 1992) provides reasons why information obtained from peers may be an important factor in deciding whether to give and how much to give—giving rise to peer effects. Second, giving decision may be influenced by social norms. Thus people learn about proper behavior of their social groups by observing people in the same reference group.

Social norms affect an individual's attitude toward charitable giving behaviors and thus people with similar social norms would have similar behaviors in charitable giving. Manski (1993) noted that people with similar preference for charitable giving were likely to belong to the same group. It thus generates a correlation between members' behaviors of charitable giving which was called a correlated effect, different from a peer effect. Culture is multi-dimensional and social norms are components of culture. Therefore, culture affects an individual's behavior of charitable giving, however, it is not through peer effects. The basic concept of peer effects is that the charitable giving of the reference group affects an individual's action. People may observe others in the same reference group in order to learn about proper behavior of their social group (Duflo & Saez, 2002). For example, new immigrants may just imitate other inhabitants' behaviors of charitable giving in order to follow proper behavior. However, it usually happens during the initial adjustment period into the new community and when immigrants lack the information about social norms.

If individuals' decisions on charitable giving are dependent on others' charitable giving, then a policy intended to promote charitable giving by the partial population would also encourage people,

who are not directly affected by the policy, to increase their charitable giving. In this regard, the estimates of peer effects are essential for policy implementation. Feldstein and Clotfelter (1976) estimated the effect of preference interdependence in charitable giving, but did not find any significant effect. As a result, a number of research studies were conducted in which equations for charitable giving have been estimated without accounting for interdependence (Andreoni & Scholz, 1998). Nevertheless, Andreoni and Scholz (1998) found that individuals made decisions on charitable giving partly based on the giving of the reference groups, though the overall effect was small. The difference in the above estimates of peer effects was likely due to the difference in the definition of reference groups in estimations. While Feldstein and Clotfelter (1976) defined the reference group as the persons of similar income, Andreoni and Scholz (1998) assumed an individual's giving depended on those who were similar in age, education, income and occupation. However, the literature does not have a definite conclusion although alternative approaches have been utilized to determine the reference group (Van Praag, Kapteyn, & Van Herwaarden, 1979).

This study was motivated by the fact that a substantial difference in the amount of charitable giving exists between Taiwan and the U.S. in terms of both per capita charitable giving (1.98% in the U.S. as compared to 0.46% in Taiwan) and the ratio of charitable giving to GDP (1.22% in the U.S. vs. 0.19% in Taiwan). The main purpose of this study was to explore if peer effects exist in households' charitable giving in Taiwan. The study also estimated the net-of-tax price elasticity and the income elasticity of charitable giving. Therefore, this study evaluated to what extent the peer effect, the net-of-tax price elasticity, and the income elasticity, respectively, explained the behaviors of charitable giving in Taiwan. Because the responsiveness of charitable giving to government policies has been a critical parameter in the ongoing debate about the desirability of allowing such a deduction, the investigation herein provided additional information on individuals' behaviors of charitable giving for policy evaluation in Taiwan. Taiwan experienced a devastating earthquake in 1999, after which the amount of average charitable contributions almost doubled the average amount of the previous year. In order to explore the effect of an exogenous event such as an earthquake on charitable giving in Taiwan, the study used data from 1998 to 2000.

Review of Literature

As surveyed by Clotfelter (1985), the estimated price elasticities of charitable giving in previous studies varied from as small as -0.04 to as large as -2.5 due to the variety of data sets, variables, and model specifications. However, the estimates in Clotfelter and Steuerle's (1981) study showed a price elasticity of -1.27 and an income elasticity of 0.78 , which were fairly representative. In empirical studies on the tax effect of charitable giving, the marginal tax rate was also determined by the amount of charitable giving. When taxpayers who itemized their deductions increased their charitable giving, they simultaneously decreased their taxable income and possibly their corresponding marginal tax rate, if they fell into lower tax brackets. Therefore, the marginal tax rate was a function of charitable giving, and thus the ordinary least-squares (OLS) estimates of the tax effect on charitable giving was biased. The most common procedure used in this context was the instrumental variable (IV) approach (Triest, 1998). Instead of using the "last-dollar" tax price, the standard solution was to use the "first-dollar" tax rate as the IV. Since the "first-dollar" tax rate was the tax price on the first dollar of charitable giving, the "first-dollar" tax rate was uncorrelated with charitable giving.

As noted above, economists have long been concerned with estimations of peer effects in charitable giving. However, econometric analyses face several problems in identifying the existence of peer effects and estimating the magnitude of the effects (Manski, 1993, 1995; Moffitt 1998). First, an inference on peer effects was not possible unless a priori information about the composition of the reference group was specified. The reference group was a group to which an individual belonged and thus the behaviors of the reference group influenced the behaviors of the individual. Second, the endogeneity problem led to difficulty in estimating peer effects. The basic conceptual relationship in the models of peer effects was that the actions of the reference group affected an individual's actions. Manski (1993) defined this effect as a peer effect or an endogenous effect.

The standard empirical approach in regression analysis relates the behavior of an individual to the behaviors of the reference group. An issue in the estimations of peer effects is thus whether such endogeneity can be circumvented by conventional techniques such as an instrumental variable approach, two-stage least squares, or other econometric methods.³ A critique of such an approach is that the group characteristics are correlated with an individual's behavior in

the estimation equation. There may also be an exogenous effect of the peer group members' characteristics on the individual behavior and thus it is typical to include the group characteristics in the regressions. However, because it is usually impossible to include all the characteristics of a group in the regressions, it is difficult to distinguish peer effects (endogenous effects) from exogenous effects attributed to the group characteristics. Moreover, people with similar preferences tend to belong to the same group. It thus generates a correlation between group behavior and individual behavior which does not indicate any causal relationship between the two. This is what Manski (1993) called a correlated effect. For example, people of similar attitudes toward charitable giving may choose to live in the same community, and the averages of charitable giving thus vary across communities due to this effect of Tiebout sorting in communities.

Econometric Specification and Data

Econometric Specification

If an individual's charitable giving behavior can be explained in a way consistent with utility maximization, then the effect of income taxation on giving can be analyzed using a microeconomic model, in which the optimal amount of giving is determined by the price of giving and total income. For example, Duncan (1999) indicated that if charitable giving has the property of private goods as well as that of public goods, then an individual's demand for charity could be estimated as a function of the net-of-tax price, disposable income, others' contributions, and personal characteristics.⁴ This study focused on the peer effects in individuals' charitable giving. Therefore, a proxy for peer effects was included to estimate its effect. The most common functional form in empirical studies of charitable giving was used, which was specified as follows (Andreoni & Scholz, 1998):

$$\ln(C_i) = \beta_0 + \beta_1 \ln(p_i) + \beta_2 \ln(y_i) + \varphi W_i C + X_i \beta + \varepsilon_i, \quad (1)$$

where C_i is the amount of household i 's charitable giving, P_i the net-of-tax price, y_i the disposable income, W_i an $I \times N$ weighting matrix used to adjust for peer effects varying across individuals of the reference group, C an $N \times I$ matrix representing each household's respective contribution, and X_i presented the personal characteristics,

which included educational attainment, marital status, age, and other; and ε_i was the unobservable error term. Because individuals in the same reference group were likely to have similar preferences, the error terms were not independent. District fixed effects were added in the estimation to reduce the potential bias resulting from this correlated effect.

Because charitable giving is deductible from taxable income, giving affects taxable income and the net-of-tax price of giving one dollar is equal to one minus the taxpayer's marginal tax rate. Specifically, the price of per dollar charitable giving is reduced by an amount of marginal tax rate. The actual last-dollar net-of-tax price is endogenous because it is affected by the amount of charitable giving. Therefore, the variable used in the estimation was the last-dollar net-of-tax price instrumented by the first-dollar net-of-tax price. Next, a logarithm of charitable giving was used, where β_1 was the price elasticity and β_2 was the income elasticity of charitable giving. Disposable income is affected by income tax that in turns affected by the amount of charitable giving. In order to avoid the possible endogeneity of disposable income, disposable income in the estimations was replaced with disposable income assuming the amount of charitable giving equaled zero. Peer effects exist because charitable giving of the reference group members affects an individual's giving through ϕ .

Data and Variables

This study utilized data from the Survey on Family Income and Expenditure in Taiwan conducted by the Directorate General of Budget Accounting and Statistics (DGBAS), Taiwan. Since its inception in 1978, there have been about 14,000 households surveyed each year, and the number of persons varies from approximately 50,000 to 75,000. New samples are drawn each year, making it impossible to track an individual household over time. The information collected from the survey includes family composition, housing conditions and facilities, family income and expenditure, fixed assets, and other miscellaneous items.

The surveys provide information of individuals' characteristics including educational achievement, occupation, age, gender, and location of residence, and thus making an estimation of peer effects possible.⁵ Even though information on individual characteristics is available for household members, the information about income and expenditure is based on household unit. Therefore, the total amount

of household members' charitable giving and disposable income were replaced for the corresponding variables in the regressions. However, the personal characteristics variables such as education, occupation, age, gender, and location of residence were replaced with the personal characteristics of household heads.

The estimations were based on pooled data from surveys over the period of 1998–2000. All dollar values in 1998 and 1999 were adjusted to a dollar value with the base year 2000 using the consumption price index. The CPI figures in 1998 and 1999 were, respectively, 1.002 and 1.013. The 1998–2000 surveys were selected because of the earthquake in 1999 that increased the variation in charitable giving among individuals and made it possible to evaluate how individuals' charitable giving might respond to others' giving.

The measurement of each variable in the regression is described below.

Charitable giving. The surveys contain a direct question on the amount of charitable giving which represent the variable of charitable giving in (1). In order to avoid taking a logarithm of zero, a logarithm of this reported amount plus 10 was used in the estimations.

Net-of-tax price. The net-of tax price was expected to exert a negative effect on charitable giving since the cost of giving increases with the price. Although the surveys do not contain any question on marginal tax rates, information on income tax was available and thus it was possible to calculate the corresponding marginal tax rates. Because filing status was necessary for the calculation of tax rates for married taxpayers, all married household heads were assumed to be joint tax return filers.⁶ With this assumption, taxpayers' applicable marginal tax rates were calculated by applying the amount of income tax to the tax schedule.

Taxable income was also inferred by applying an income tax to the tax schedule. The first-dollar marginal tax rates were calculated by adding the amount of charitable giving to taxable income so as to find the corresponding tax rates from the tax schedule. The first-dollar of charitable giving was independent of the amount of actual charitable giving and thus the corresponding tax rate was purged of endogeneity. The tax law in Taiwan allows taxpayers to deduct home mortgage interest, house rent, charitable contributions, medical and medical insurance expenses. Because the information of the above variables was available in the survey, the information was used to infer whether an individual chose a standard deduction or

an itemized deduction.⁷ Therefore, the last-dollar net-of-tax price of charitable giving was equal to one minus the marginal tax rate if an individual itemized his or her deductions, but was equal to one if he or she took the standard deduction.

The first-dollar net-of-tax price of charitable giving was equal to one minus the first-dollar marginal tax rate if an individual itemized his or her deduction,⁸ but was equal to one if he or she took the standard deduction.¹⁰ The last-dollar net-of-tax price was instrumented by the first-dollar net-of-tax price in (1). Because the exact information of an individual's deduction status was not available, caution was used in interpreting the estimate of the price effect. Generally, individuals with smaller contributions have smaller deductible expenses, making them more likely to take standard deductions.⁷ Therefore, treating them as taking itemized deductions would cause an upward bias of the estimate in absolute value.

Disposable income. Due to the income effect, it is expected that individuals' charitable giving increases as their incomes increase. The information on total income and transfers to the government was available in the surveys and hence disposable income was equal to the total income minus transfers to the government.

Peer effect. Peer effects are expected to be positive since members of the same reference group are affected by the giving of other members although the empirical literature finds insignificant or modest peer effects. In estimating households' decisions on whether to contribute or not, the ratio of households with charitable giving among the other households in the reference group as a proxy, was used to capture peer effects on participation. To estimate households' decisions on how much to contribute, the average giving of other households in the reference group was used to proxy peer effects on the amount of giving.

The definition of the reference group has been a problem in estimating peer effects. In a study on the definition and measurement of the reference group, Van Praag et al. (1979) made use of survey data from the Netherlands and found that a person's reference group generally included those with similar characteristics. In this study, the reference group was defined as comprising of households with similar income category and residing in the same municipality.⁹ The income categories included were < NT \$300,000, NT \$300,000 – NT \$1,000,000, NT \$1,000,000 – NT \$3,000,000, and > NT \$3,000,000 in 2,000 dollar value.¹⁰ Location proximity was also considered in the

reference group because some of the charities in Taiwan are local charities and thus local residents are more likely to benefit from the charitable contributions. A survey by Taiwan's Himalaya Foundation in 2002 indicated that over 40% of the non-for-profit foundations conducted charitable activities for local communities. As noted, the reason is partially attributed to the subsidies of local governments.¹¹ If residents are concerned more about the welfare of their own communities than others, then peer effects are more likely to exist among the residents in the same community, though no precise information about the appropriate measure of the community is available. Van Praag et al. (1979) also noted that people in rural areas refer more directly to other rural residents than people in urban areas (Andreoni & Scholz, 1998).

The process of urbanization has made the identity of communities in metropolitan areas difficult in Taiwan. This is especially true for municipalities in metropolitan areas defined by the governments that may not represent well the communities of ordinary lives. Therefore, the whole sample was divided into two subsamples, one including only households in the two metropolises in Taiwan and the other including households in other areas. The regressions based on subsamples can also provide indirect evidence for larger estimates of the price elasticity and the income elasticity.

Two models of households' behaviors in charitable giving were estimated. First, the Probit model of households' decisions on whether to contribute using the ratio of households with giving among the other households in the same reference group as the measure of peer effects was estimated. Second, the Tobit model of the amount of households' charitable giving using the average giving of other households in the same reference group as the measure of peer effects was estimated.¹²

The ratio of households that give is endogenous in the sense that a household's decision about whether to contribute or not affects others' decisions and thus affects the ratio of households that give in the reference group. Similarly, the average charitable giving is endogenous, because a household's decision about how much to contribute affects others' decisions and thus affects the average charitable giving of the reference group. In order to avoid the problem of endogeneity, the instrumental variable approach (IV) was adopted.¹³ Based on Duflo and Saez (2002), this study made use of two IVs: the proportion of households in the reference group who were in any given quintile of the age distribution of the sample, the proportion of households in each category of educational attainment, and both

together, as instruments for the average participation and average giving.¹⁴

It was assumed that there might be Tiebout sorting in districts, as people with similar tastes tend to live together. This makes giving by others in the same district correlated to both within and across time-periods. In order to alleviate the bias caused by the correlated effect, district dummies were included in the regressions to control for the district fixed effect in these estimations.

Other variables. The information on various demographic variables for the household heads was available in the surveys. Thus, demographic variables of household heads such as educational achievement, marital status, and age were included in the estimations to control for individual preference. The number of household members was used to account for the effect of household size. The estimates of demographic variables have been mixed in the review of literature. While education and family size increased giving in the U.S., apparently in Russia education had no effect and family size decreased charitable giving (Brooks, 2002). The amount of giving was generally found to increase with age. To compare households residing in a rural area, a dummy was included to control for the effect of residing in a town and a dummy for the effect of residing in a city. On the one hand, people in a rural area may make more contributions because of the community network. However, they may give less because of fewer solicitations from charity organizations. Dummies for years 1999 and 2000 were also included to account for year-specific effects. The year effect of 1999 compared to 1998 was expected to be positive as the amount of charitable giving increased substantially after the earthquake in 1999. The year effect of 2000 compared to 1998 was also expected to be positive since the influence of the fundraising drive for the earthquake victims could last until 2000. Fixed effects for municipalities were included to capture the district fixed effect due to similar preferences among members in the same municipalities..

Descriptive Statistics

As Clotfelter (1985) noted, the inclusion of the households who would have chosen the standard deduction had they not contributed results in the selection bias associated with the status of itemization. Thus, 837 of the borderline filers and 24 with no values for average giving of the reference group were excluded from the estimations.

Moreover, seven households that were outliers in charitable giving were deleted from the estimations¹⁵ for a final sample of 40,765 observations, 10,874 residing in two metropolises and 29,891 in non-metropolitan areas.

The descriptive statistics of the variables used in the estimations were listed in Tables 1 and 2. The statistics of the whole sample was presented in Table 1. The average charitable giving in 1999 was much higher than that in 1998 and 2000. A devastating earthquake struck Taiwan on September 21, 1999, motivating people to provide charity to those who needed help in the aftermath. Because of its profound impact on society, the average charitable giving in 2000 was also found to be higher than that in 1998. The first-dollar price of charitable giving was found to be similar to the last-dollar price of charitable giving. Deductible charitable giving might not change households' applicable marginal tax rates, because of a large tax bracket and a small average charitable giving. Hence, deductible charitable giving probably did not reduce taxable income enough to make the applicable marginal tax rate go down to a lower rate. Regarding the average amount of

TABLE 1
Descriptive Statistics—All Households

Variables	Mean	SD	Minimum	Maximum
Charitable giving	5285	14595	0	455850
1998 (<i>N</i> = 13,757)	3989	11537	0	426311
1999 (<i>N</i> = 13,458)	6845	16916	0	455850
2000 (<i>N</i> = 13,550)	5050	14744	0	450000
First-dollar price	0.9578	0.058	0.6	1
Last-dollar price	0.9581	0.057	0.6	1
Disposable income	1076452	690347	41435	1.78e+7
College graduate (dummy)	0.26	0.44	0	1
Marital status (dummy)	0.74	0.44	0	1
Household size	3.67	1.72	1	16
Age 65 or over (dummy)	0.13	0.33	0	1
Dummy for town	0.24	0.43	0	1
Dummy for city	0.63	0.48	0	1
Dummy for 1999	0.33	0.47	0	1
Dummy for 2000	0.33	0.47	0	1
Number of observations	40765			

Source: The Survey on Family Income and Expenditure 1998–2000, Taiwan.

Note: All 1998 and 1999 dollar values were adjusted to 2,000 dollar values using the consumption price index. S.D. stands for standard deviation.

TABLE 2
Descriptive Statistics—Based on the Subsample

Variables	Mean	SD	Minimum	Maximum
<i>Households in Metropolises (N = 10,874)</i>				
Charitable giving	7751	18778	0	426311
1998 (N = 3,628)	5521	16339	0	426310
1999 (N = 3,612)	9903	19159	0	315043
2000 (N = 3,634)	7838	20357	0	400000
First-dollar price	0.9338	0.069	0.6	1
Last-dollar price	0.9344	0.069	0.6	1
Disposable income	1340817	793195	57111	1.78e+7
College graduate (dummy)	0.41	0.49	0	1
Marital status (dummy)	0.74	0.44	0	1
Household size	3.63	1.53	1	12
Age 65 or over (dummy)	0.11	0.31	0	1
Dummy for 1999	0.33	0.47	0	1
Dummy for 2000	0.33	0.47	0	1
<i>Households in non-metropolitan areas (N = 29,891)</i>				
Charitable giving	4387	12619	0	455850
1998 (N = 10,129)	3441	9167	0	284207
1999 (N = 9,846)	5723	15869	0	455850
2000 (N = 9,916)	4027	11888	0	450000
First-dollar price	0.9666	0.050	0.6	1
Last-dollar price	0.9668	0.050	0.6	1
Disposable income	980279	621624	41434	1.28e+7
College graduate (dummy)	0.21	0.40	0	1
Marital status (dummy)	0.74	0.44	0	1
Household size	3.68	1.79	1	16
Age 65 or over (dummy)	0.13	0.34	0	1
Dummy for town	0.33	0.47	0	1
Dummy for city	0.48	0.50	0	1
Dummy for 1999	0.33	0.47	0	1
Dummy for 2000	0.33	0.47	0	1

Source: The Survey on Family Income and Expenditure 1998–2000, Taiwan.

Note: There are no dummies for town and city, because all households in the top panel reside in metropolitan areas. The households summarized in the bottom panel include those residing in cities, towns, and countries of Taiwan. All 1998 and 1999 dollar values were adjusted to 2,000 dollar values using the consumption price index.

SD stands for standard deviation.

charitable giving, the mean of NT \$5,285 and the average household size of 3.67 imply that the ratio of charitable giving to GNP was 0.33%.¹⁶

The descriptive statistics of the two subsamples based on their levels of urbanization were presented in Table 2, with the top and bottom panels listing statistics of households residing in the two metropolises and non-metropolitan municipalities of Taiwan, respectively. In general, households in metropolises contributed more to charities than households in non-metropolitan areas. This difference was possibly due to the income effect, because households in metropolises on average have a higher income than those in other areas.

Empirical Results and Discussion

Households' Participation in Charitable Giving

A household's decision on whether to provide charitable giving or not was investigated based on the Probit model. The estimation results of the subsamples of households residing in metropolitan and non-metropolitan areas were presented in Tables 3 and 4, respectively. The results in column (1) of Tables 3 and 4 were based on estimations with the variable for peer effects replaced by the participation ratios of households in the reference groups. In columns (2)–(4) of Tables 3 and 4, (1) was re-estimated using, respectively, the proportions of household heads in the reference group whose ages fall into any given quintile of the whole sample distribution, the proportions of household heads in the reference group whose educational achievement falls into each category, and both together, as instruments for participation ratios.

The estimates of the peer effects for both subsamples were found to be positive when the endogeneity of the participation ratios was not accounted for. However, when the participation ratios were instrumented, the coefficients of the peer effects for the non-metropolitan households dropped from 1.22 to around 0.35, while those for metropolitan households dropped from 1.93 to between 0.76 and 1.34. These declines in estimates indicated that the OLS estimates had upward bias, likely due to the endogeneity of the participation ratios. Two of the 2SLS estimates for metropolitan areas in Table 3 were still sizable and significant. In comparison, only one of the 2SLS estimates for non-metropolitan households in Table 4 was still significant with a smaller estimate of 0.39. Because F-statistics of the first-stage estimation were large, the insignificance of estimates in column (2) of Table 3 and columns (2) and (3) of Table 4 was less

TABLE 3

Probit Estimations of Charitable Giving—Households in Metropolises

Variable	Probit (1)	2SLS age (2) ^a	2SLS education (3) ^b	2SLS age education (4) ^c
Constant	-5.14* (-8.62)	-6.50* (-8.23)	-5.89* (-6.36)	-6.09* (-7.96)
Price (Log)	-3.02* (-4.34)	-3.14* (-4.54)	-3.18* (-4.62)	-3.10* (-4.49)
Disposable income (log)	0.70* (6.50)	1.04* (5.75)	0.87* (3.96)	0.93* (5.44)
College graduate	0.04 (0.99)	0.03 (0.91)	0.03 (0.91)	0.03 (0.91)
Married	0.13* (3.46)	0.13* (3.41)	0.13* (3.39)	0.13* (3.40)
Household size	-0.04* (-3.40)	-0.04* (-2.99)	-0.04* (-3.11)	-0.04* (-3.10)
Age 65 or over	-0.14* (-2.74)	-0.13** (-2.47)	-0.12** (-2.45)	-0.13** (-2.50)
Interdependence	1.93* (15.19)	0.76 (1.31)	1.34*** (1.86)	1.15** (2.22)
Dummy for 1999	0.43* (9.49)	0.66* (5.99)	0.56* (4.09)	0.59* (5.85)
Dummy for 2000	0.14* (3.89)	0.24* (4.12)	0.19* (2.79)	0.21* (3.78)
R Square	0.18	0.16	0.16	0.16
Number of observations	10874	10874	10874	10874

Note: ^aIn column (2), the instruments are the proportions of individuals in the peer groups whose ages fall into each category. In column (3), the instruments are the proportions of persons in the peer groups whose education achievement falls into each category. In column (4), both sets are used together.

^bThe district fixed effects were included in the estimations, but their estimates were not reported in the table.

^cThe values in parentheses are z-values. Symbols ***, **, and * indicate significance at the 1%, 5%, and 10% levels of the two-tailed test, respectively.

likely due to a weak correlation between the participation ratios and their instruments (Bound, Jaeger, & Baker, 1995).

The estimates of peer effects in columns (3) and (4) of Table 3 and column (4) of Table 4 were by contrast significant. Thus, the results suggested that a small peer effect existed among households in the reference group if the instruments are valid. An estimate of 1.15 for metropolitan households implied that a percentage point increase in the average participation ratio makes other members in the reference group more likely to contribute by 0.29 percentage points in probability.¹⁷ In comparison, an estimate of 0.39 for non-metro-

TABLE 4
Probit Estimations of Charitable Giving—Households
in Non-Metropolitan Areas

Variable	Probit (1)	2SLS age (2) ^a	2SLS education (3) ^b	2SLS age education (4) ^c
Constant	-5.68* (-17.71)	-6.86* (-13.26)	-6.83* (-15.41)	-6.77* (-16.14)
Price (log)	-1.40* (-2.89)	-1.42* (-2.91)	-1.39* (-2.86)	-1.41* (-2.90)
Disposable income (log)	0.87* (14.01)	1.16* (9.68)	1.15* (11.66)	1.14* (12.37)
College graduate	0.02 (0.99)	0.02 (0.99)	0.02 (0.99)	0.02 (0.99)
Married	0.15* (7.36)	0.16* (7.53)	0.16* (7.55)	0.16* (7.54)
Household Size	-0.03* (-4.03)	-0.02* (-4.26)	-0.03* (-4.26)	-0.03* (-4.24)
Age 65 or over	0.02 (0.60)	0.02 (0.58)	0.02 (0.56)	0.02 (0.57)
Interdependence	1.22* (11.62)	0.33 (0.97)	0.35 (1.31)	0.39*** (1.66)
Dummy for Town	-0.07* (-2.75)	-0.07* (-2.70)	-0.07* (-2.69)	-0.07* (-2.69)
Dummy for City	0.02 (0.59)	0.02 (0.75)	0.02 (0.75)	0.02 (0.75)
Dummy for 1999	0.29* (11.90)	0.40* (8.63)	0.40* (10.46)	0.39* (11.12)
Dummy for 2000	0.07* (3.37)	0.10* (4.35)	0.10* (4.56)	0.10* (4.57)
R square	0.11	0.11	0.11	0.11
Number of observations	29891	29891	29891	29891

Note: ^aIn column (2), the instruments are the proportions of individuals in the peer groups whose ages fall into each category. In column (3), the instruments are the proportions of persons in the peer groups whose education achievement falls into each category. In column (4), both sets are used together.
^bThe district fixed effects were included in the estimations, but their estimates were not reported in the table.
^cThe values in parentheses are z-values. Symbols ***, **, and * indicate significance at the 1%, 5%, and 10% levels of the two-tailed test, respectively.

politan households implied that member households in the reference group increased their likelihood to contribute by 0.1% with respect to a 1% point increase in the average participation ratio.

These 2SLS results alone do not constitute definite evidence, because the two conditions necessary for the validity of the age and education variables as instruments may fail. First, as discussed above, there may be direct exogenous effects of characteristics such as average income and educational achievement in the reference

group on a household's participation, even after conditioning for one's income and education. Second, unobserved characteristics correlated with the propensity to participate in giving may well be correlated with the income distribution, even conditioning for a household's income and controlling for district fixed effects. An ideal experiment to evaluate the correlation of charitable giving within the reference group would be to allocate households randomly to municipalities. In the absence of an experiment such as Sacerdote's (2001) example, the IV approach was used in this study. However, as the impacts on the estimate from the above sources cannot be excluded, the results in Tables 3 and 4 in general suggested that peer effects among households were at most small in both metropolitan areas and non-metropolitan areas.

Aside from the estimates of peer effects, the price effect and the income effect on households' decision, a higher price reduces the likelihood to make a charitable giving, but higher disposable income induces more people to give. However, a variation in the estimates of several explanatory variables warrants further exploration. The estimates of the price effect on participation for households in metropolises were in general larger than those for households in non-metropolitan areas, whereas the estimates of the income effect for households in metropolises were smaller than those for non-metropolitan households. The effects of dummies for 1999 and 2000 were significantly positive. Therefore, people are more likely to make a contribution in 1999 and 2000 than in 1998.

Households' Charitable Giving

In this section, households' decision on how much to give was investigated. The results in Tables 5 and 6 were, respectively, based on the households in metropolises and those in non-metropolitan areas. The estimates without accounting for endogeneity of the average amount of giving were presented in column (1) of Tables 5 and 6. Similar to the estimations of participation decisions, the proportions of household heads in the reference group whose ages fall into any given quintile of the whole sample distribution, the proportions of household heads in the reference group whose educational attainment falls into each category, and both together, as instruments for the amount of giving were used. The estimates using alternative IV's were reported in columns (2)–(4) of Tables 5 and 6.

Without accounting for the endogeneity of the average amount of giving of the reference group, it was found that the estimates of

TABLE 5

Tobit Estimation of Charitable Giving—Households in Metropolises

Variables	Tobit (1)	2SLS age (2) ^a	2SLS education (3) ^b	2SLS age education (4) ^c
Constant	-8.04* (-16.28)	-8.77* (-13.73)	-9.51* (-11.48)	-9.02* (-14.47)
Price (log)	-3.33* (-6.63)	-3.32* (-6.59)	-3.28* (-6.50)	-3.31* (-6.57)
Disposable income (log)	1.53* (15.53)	1.81* (10.23)	2.07* (8.02)	1.90* (11.28)
College graduate	0.05*** (1.79)	0.05*** (1.71)	0.05 (1.63)	0.05*** (1.68)
Married	0.10* (3.11)	0.10* (3.19)	0.10* (3.28)	0.10* (3.22)
Household size	-0.05* (-4.60)	-0.05* (-4.65)	-0.05* (-4.71)	-0.05* (-4.67)
Age 65 or over	-0.05 (-1.20)	-0.06 (-1.23)	-0.06 (-1.28)	-0.06 (-1.25)
Interdependence (log)	0.33* (6.50)	0.08 (0.56)	-0.16 (-0.73)	-0.00 (-0.02)
Dummy for 1999	0.66* (20.66)	0.72* (15.60)	0.78* (12.45)	0.74* (16.71)
Dummy for 2000	0.28* (9.29)	0.31* (8.96)	0.35* (8.27)	0.33* (9.47)
R square	0.09	0.09	0.09	0.09
Number of observations	10874	10874	10874	10874

Note: ^aIn column (2), the instruments are the proportions of individuals in the peer groups whose ages fall into each category. In column (3), the instruments are the proportions of persons in the peer groups whose education achievement falls into each category. In column (4), both sets are used together.

^bThe district fixed effects were included in the estimations, but their estimates were not reported in the table.

^cThe values in parentheses are z-values. Symbols ***, **, and * indicate significance at the 1%, 5%, and 10% levels of the two-tailed test, respectively.

peer effects were small but significant in both Tables 5 and 6 and thus biased the estimate upwards. The estimates of peer effects were 0.33 for metropolitan households and 0.23 for non-metropolitan households. As the instruments were significantly correlated with the average amount of giving, the insignificant estimates suggested that peer effects did not exist between households in the two metropolises. Because the interaction between people in a metropolis is not likely to depend on the proximity of the location, it is anticipated that decisions on charitable giving are not interdependent among individuals residing in the same district of metropolitan areas.

TABLE 6

Tobit Estimation of Charitable Giving—Households in Non-Metropolitan Areas

Variable	Tobit (1)	2SLS age (2) ^a	2SLS education (3) ^b	2SLS age education (4) ^c
Constant	-8.68* (-28.74)	-8.61* (-18.45)	-8.71* (-24.48)	8.69* (-24.67)
Price (log)	-2.15* (-4.96)	-2.30* (-5.28)	-2.27* (-5.20)	-2.27* (-5.20)
Disposable income (log)	1.68* (25.14)	1.66* (9.41)	1.71* (15.57)	1.70* (15.87)
College graduate	0.05** (2.03)	0.04*** (1.95)	0.04** (2.00)	0.04** (1.99)
Married	0.20* (9.24)	0.20* (9.25)	0.20* (9.25)	0.20* (9.25)
Household size	-0.04* (-6.77)	-0.04* (-6.69)	-0.04* (-6.73)	-0.04* (-6.72)
Age 65 or over	0.07** (2.40)	0.07** (2.39)	0.07** (2.43)	0.07** (2.43)
Interdependence (log)	0.23* (4.78)	0.25 (1.31)	0.20*** (1.84)	0.21** (2.02)
Dummy for town	-0.09* (-3.29)	-0.09* (-3.28)	-0.09* (-3.30)	-0.09* (-3.30)
Dummy for city	0.01 (0.26)	0.01 (0.27)	0.01 (0.26)	0.01 (0.26)
Dummy for 1999	0.46* (20.93)	0.46* (11.55)	0.47* (16.62)	0.46* (16.80)
Dummy for 2000	0.12* (5.74)	0.12* (5.48)	0.12 (5.76)	0.12* (5.74)
R square	0.06	0.06	0.06	0.06
Number of observations	29891	29891	29891	29891

Note: ^aIn column (2), the instruments are the proportions of individuals in the peer groups whose ages fall into each category. In column (3), the instruments are the proportions of persons in the peer groups whose education achievement falls into each category. In column (4), both sets are used together.

^bThe district fixed effects were included in the estimations, but their estimates were not reported in the table.

^cThe values in parentheses are z-values. Symbols ***, **, and * indicate significance at the 1%, 5%, and 10% levels of the two-tailed test, respectively.

As for non-metropolitan households, although the estimates of peer effects in columns (3) and (4) of Table 6 were significant, caution was used in interpreting the estimates. Because the estimates of peer effects among non-metropolitan households using alternative IVs were all around 0.2, the insignificance of the estimate in column (2) could be due to a weak correlation between the average giving of the reference group and its IV (Bound et al., 1995). As discussed

above in the subsection of participation decision, these 2SLS results alone do not constitute definite evidence, because the two conditions necessary for the validity of the age and education variables as instruments may fail. The significant estimates in columns (3) and (4) may have resulted from a direct exogenous effect of average educational achievement, especially with the instrument in column (3) being in the education achievement category. In addition, unobserved characteristics correlated with the amount of giving may well be correlated with the income distribution, even after conditioning for a household's income and controlling for district fixed effects.

If the peer effects among metropolitan households serve as a baseline case for evaluating peer effects among non-metropolitan households, it is expected that non-metropolitan households are more likely to be interdependent in charitable giving, because they generally have more interaction than their fellow residents in a metropolis. The estimates in Table 6 suggested that there were small peer effects, around 0.2 in charitable giving, which means that a 1% increase in average giving will induce a household to increase its giving by 0.2%. Therefore, if a policy intervention can promote the contributions of this subpopulation, then this increase in charitable giving further raises others' contributions in the same reference group.

The estimates of the price elasticity of charitable giving for metropolitan households in Table 5 were around -3.3 and around -2.2 for non-metropolitan households in Table 6. These estimates (in absolute value) were in general larger than estimates based on data in developed countries like the U.S. According to Clotfelter and Steuerle (1981), a price elasticity of -1.27 was fairly representative, though the estimate of price elasticities varied from -0.04 to -2.5 in the review of literature. They also suggested that an income elasticity of 0.78 was representative. Studies of charitable giving based on tax return data found that the price elasticity estimates ranged from -1.5 to -3.02 in Taiwan (Chang, 2001), and from -3 to -6 in Singapore (Chua & Wong, 1999), which were higher than in developed countries.

Households with household heads who were college graduates and married made more contributions and larger households made less contribution. Non-metropolitan individuals of age 65 or over contributed more to charities than those under 65, but age was not a determinant in metropolises. Households in towns made smaller contributions. Compared to 1998, households made larger contributions in 1999 and 2000.

Implications

The estimates of price elasticity and income elasticity were found to be larger than most of the estimates based on data from the U.S. As the income elasticity is larger than one, the ratio of charitable giving to GDP is expected to increase when per capita GDP increases over the next few decades. Price elasticity in the range of -2 to -3 indicates a very strong response from charitable contributions to the tax price of charitable giving. As the deductibility of charitable contributions is still limited in the tax code of Taiwan, any extension of deductibility to most charitable giving reduces the net-of-tax price of giving and induces more charitable giving.¹⁸ Therefore, the difference of price elasticity and income elasticity between Taiwan and the U.S. may explain partly why the ratio of charitable giving to GDP is relatively low for Taiwan. The Charitable Giving Act of 2003 in the U.S. provides an example of promoting charitable giving through tax deductions. The Act extends the deduction of charitable giving to nonitemizers and makes nonitemizers eligible for deducting their charitable contributions in tax returns. Nonitemizers in Taiwan are not allowed this benefit, however, a similar act which extends deduction of charitable giving to nonitemizers would reduce the price of giving by nonitemizers and increase their giving substantially given the price elasticity in Taiwan is quite large.

The Probit estimates in this study suggested that peer effects on participation in charitable giving were modest for both metropolitan and non-metropolitan households. In contrast, the Tobit estimates suggested that peer effects were small for non-metropolitan households, but most likely non-existent for metropolitan households. The elasticity estimate of 0.20 in this study meant that the peer effects for non-metropolitan households in Taiwan were about in the same range as that estimated in Andreoni and Scholz (1998). Because the peer effects for metropolitan households were almost non-existent, the peer effects could not be a crucial factor for the smaller ratio of charitable giving to GDP in Taiwan than in the U.S.

Because the definitions of the reference groups were different from those in Andreoni and Scholz (1998), it was difficult to compare the results in this study to other studies. Since there was no priori information to define the reference group, the definition of the reference group in this study was especially tentative. Therefore, although the estimates of peer effects suggested modest peer effects, larger peer effects may exist among households based on alternative definitions of the reference group.

In summary, peer effects can only explain part of the substantial difference in per capita charitable giving between Taiwan and the U.S. Brooks (2003) documented the dramatic differences in charity between secular and religious people. Religious people were 25% more likely to donate money than secularists. Since the percentage of religious people in the U.S. is believed to be higher than that in Taiwan, religious beliefs can explain part of the difference in per capita giving. It implies that charitable giving in Taiwan can be raised through learning or habit formation if charity is a learned behavior

Conclusion

As the ratio of charitable giving to GDP in Taiwan is essentially smaller than that in developed countries such as the U.S., an empirical study on peer effects as well as price elasticity and income elasticity of charitable giving provides valuable information for analyzing the difference. This study utilized survey data from Taiwan to investigate the behavior of charitable giving. It was found that the price and income elasticities were large relative to the estimates in the literature. If these larger estimates were not due to a potential bias in the estimations, then they imply that charitable giving is more responsive to changes in the tax rate and income. Therefore, if the government extends the deductibility to most charitable donors or if the per capita GDP increases, then it would substantially increase the ratio of charitable giving to GDP.

The issue of peer effects in human behavior has attracted increasing attention. Based on the definitions of the reference group in this study, the peer effects for charitable giving were most modest and could not be an important determinant of the small ratio of charitable giving to GDP in Taiwan. However, as the findings are subject to the choice of the reference group, further research is needed to better understand the peer effects in charitable giving in Taiwan.

Notes

1. For example, in Taiwan or the U.S., if an individual faces a marginal tax rate of 0.4 and charitable giving can be deducted from taxable income, then the net-of-tax price of charitable giving is in fact equal to 0.6.
2. Manski (1993) notes that, depending on the context, the effect of peer group influence may be called "neighborhood effects", "social interaction", "social norms", or "preference interdependence."

3. Moffitt (1998) noted that recent literature has clearer information about the conditions necessary for identifying the existence of peer effects and for estimating their magnitudes. For example, methods for inducing an exogenous variation in group members and methods for inducing partial-population price variation often permit the separate identification of exogenous and endogenous effects.
4. Specifically, Duncan assumes an individual's utility function as (A1) $U(x_i, l_i, Z(G), g_i)$, where x_i represents private consumption, l_i represents leisure, g_i represents i 's charitable giving, and $Z(G)$ is a function of total giving by society.
5. In contrast, tax return data provide limited information on personal characteristics though they have detailed information on the amount of deductible charitable giving and tax rates.
6. All married couples are required to file jointly in Taiwan. However, they can choose to use a joint calculation or separate calculation. In general, the income tax for separate calculation is less than that of a joint calculation if the couple has similar amounts of income.
7. If taxpayers make a standard deduction in filing tax returns, then the amount of charitable giving does not affect their taxable incomes and taxes and thus the price of charitable giving is equal to one.
8. Depending on the recipients of charitable giving, the total amount of deductible charitable giving may be restricted to be less than 20% of adjusted gross income.
9. There are 44 municipalities in the sample. Twenty-three of them are districts in the two metropolitan cities, Taipei and Kaohsiung. The others are municipality of Hsiens. The municipality of Hsien is similar to that of a county in the U.S. and hence a Hsien is called a county hereafter in this study.
10. Because the exchange rate between the NT dollar and U.S. dollar was 31 NT dollars per dollar, the three cut points are, \$9677, \$32258, and \$96770, respectively.
11. See the details at <http://www.npo.org.tw/>.
12. Including a household's own contribution on the right-hand side will result in a positive bias. Thus, the reference groups of a household are defined to include those residing in the same city or district, but not the household itself.
13. We can specify the behavior of charitable giving in a matrix form as (see Andreoni and Scholz, 1998):

$$(A2)C = X\beta + \phi WC + \varepsilon.$$

After transforming (A2) into (A3) $C = (I - \phi W)^{-1}X\beta + (I - \phi W)^{-1}\varepsilon$, we can estimate (A3) by the maximum likelihood estimation and alternatively derive the interdependence effect ϕ .

14. The educational attainments of individuals are categorized into five groups respectively, including illiterate, elementary or junior high, senior high, college, and graduate school.
15. The authors also run the regressions based on the sample, including households of extremely high amounts of charitable giving or income, but they found no significant difference in estimates.
16. Per capita GNP was NT\$418,675 in 1998, NT\$432,592 in 1999, and NT \$443,020 in 2000 (Directorate-General of Budget, Accounting, and Statistics, Taiwan). Therefore, the average per capita GNP over this period is 431,429 in 2000 dollar value after taking account for inflation rates.
17. The calculation of probability is based on the formula $\partial\Phi/\partial x = \phi(\bar{x}b)$, where b is the coefficient estimate of x .
18. For example, in a recent debate it was proposed that full deductibility should apply to charitable giving made to private colleges even though this might reduce tax revenue to the government.

References

- Andreoni, J. (1989). Giving with impure altruism. *Journal of Political Economy*, 97, 1447–1458.
- Andreoni, J., & Scholz, J. K. (1998). An econometric analysis of charitable giving with interdependent preferences. *Economic Inquiry*, 36, 410–428.
- Banerjee, A. V. (1992). A simple model of herd behavior. *Quarterly Journal of Economics*, 107, 797–817.
- Becker, G. (1974). A theory of social interaction. *Journal of Political Economy*, 82, 1063–1093.
- Bound, J., Jaeger, D. A., & Baker, R. M. (1995). Problems with instrumental variables estimation when the correlation between the instruments and the endogenous explanatory variable is weak. *Journal of American Statistical Association*, 9, 443–450.
- Brooks, A. (2002). Charitable giving in transition economies: Evidence from Russian. *National Tax Journal*, 55, 743–753.
- Brooks, A. (2003). Religious faith and charitable giving. *Policy Review*, 121, 39–50.
- Chang, L. H. (2001). *An empirical study of income tax in Taiwan*. Unpublished doctoral dissertation, National Taipei University, Taiwan (in Chinese).
- Chua, V. C. H., & Wong, C. M. (1999). Tax incentives, individual characteristics and charitable giving in Singapore. *International Journal of Social Economics*, 26, 1492–1504.
- Clotfelter, C. T. (1985). *Federal tax policy and charitable giving*. Chicago: University of Chicago Press.
- Clotfelter, C. T., & Steuerle, E. C. (1981). Charitable contributions. In H. J. Aaron, and J. A. Pechman (Eds.), *How taxes affect economic behavior* (pp. 403–446). Washington, DC: Brookings Institution.
- Duflo, E., & Saez, E. (2002). Participation and investment decisions in a retirement plan: The influence of colleagues' choices. *Journal of Public Economics*, 85, 121–148.
- Duncan, B. (1999). Modeling charitable contributions of time and money. *Journal of Public Economics*, 72, 213–242.
- Feldstein, M., & Clotfelter, C. T. (1976). Tax incentives and charitable contributions in the United States. *Journal of Public Economics*, 5(1–2), 1–26.
- Manski, C. (1993). Identification of endogenous social effects: The reflection problem. *Review of Economic Studies*, 60, 531–542.
- Manski, C. (1995). *Identification problems in the social sciences*. Cambridge, MA: Harvard University Press.
- Moffitt, R. A. (1998). Policy interventions, low-level equilibria and social interactions. Johns Hopkins University Working Paper.
- Sacerdote, B. (2001). Peer effects with random assignment: Result for Dartmouth roommates. *Quarterly Journal of Economics*, 116, 681–704.
- Steinberg, R. (1990). Taxes and giving: New findings. *Voluntas*, 1, 61–79.
- Triest, R. K. (1998). Econometric issues in estimating the behavioral response to taxation: A nontechnical introduction. *National Tax Journal*, 51, 761–772.
- Van Praag, B., Kapteyn, A., & Van Herwaarden, F. (1979). The definition and measurement of social reference spaces. *The Netherlands' Journal of Sociology*, 15, 13–25.