I INTRODUCTION

Recently, there have been calls for private charitable organizations, especially faith based organizations, to assume a greater role in providing relief to the poor. The belief is that as the government reduces expenditures to the poor, the private sector will compensate for these reductions.\(^1\) This paper examines the effect that public expenditures to social welfare programs have on private charitable contributions to the poor.\(^2\) For example, whether government expenditures on social welfare programs increase, decrease or leave unchanged the level of private charitable contributions to the poor. The public policy ramifications of this research are clear. If public expenditures on social welfare programs “crowd-out” or reduce private charitable contributions to the poor, then reductions in public spending on the poor will be compensated for by an increase in private charitable contributions. Thus, reductions in social welfare spending

\(^1\) The Bush administration has been a proponent of this view. Olasky (1992) makes this argument and provides a historical analysis of private charity.

\(^2\) A draft of this paper was presented to the Regional Science Association International North American Meetings. Houston Texas, November 12, 1993.
will not be detrimental to the poor and will allow for a reduction in taxes.

Using a public goods model, this paper analyzes the determinants of private charitable contributions by utility maximizing consumers. The paper begins with a review of the theoretic models of voluntary contributions. The comparative statics are examined, including the conditions under which crowd-out occurs. A model of “joint” crowd-out, which examines the interaction among private giving and public expenditures to social welfare at the federal, state & local level is also examined.

II THE PUBLIC GOOD MODEL

The model generally used in the theoretical and empirical literature to analyze the interaction between private and public contributions toward social welfare is a public goods model. If we assume that people, to varying degrees, are concerned about the well being of the poor, then increases in the well being of the poor satisfy the conditions of a public good. Specifically, increases in the well being of the poor are non-rivalrous and non-excludable.

To analyze voluntary contributions to the poor, consider the following Samuelsonian or pure public goods model with n consumers and only two goods, one private good and one public good. Let \( x_i \) represent the consumption of private good by consumer \( i \) and \( G \) represent the total level of the public good. The public good in this case is consumption by the poor. That is, the non-poor view increased consumption by the poor as a public good. Consumption of the poor entering the utility of the non-poor creates an inter-dependent utility function of the form \( U_i (x_i, G) \) for each consumer \( i \). The utility function has the usual conditions of being monotonic, continuous, twice
differentiable and strictly quasi-concave. Assume that each consumer is exogenously endowed with an income of $\omega_i$ which is allocated between the private good $x_i$ at price $p_x$ and a voluntary contribution toward the public good $g_i \geq 0$ at a price $p_g$. Contributions to the public good by all consumers other than $i$ are denoted $G_{-i}$. The total level of the public good is then $G = G_{-i} + g_i$. Assumed that private contributions can be costlessly transferred to the poor. If the price of the private consumption good is normalized to one, then both prices, $p_g$ and $p_x$, can be set equal to one. Assuming Nash-Cournot behavior, we can then set up the individual optimization problem as follows:

\[
\begin{align*}
(1a) & \quad \underset{x_i, g_i}{\text{Max}} \quad U_i(x_i, g_i + G_{-i}) \quad \text{s.t.} \quad \omega_i = x_i + G_{-i} \\
& \quad \text{alternatively} \\
(1b) & \quad \underset{x_i, G}{\text{Max}} \quad U_i(x_i, ,G) \quad \text{s.t.} \quad \omega_i = x_i + G - G_{-i} \\
(2) & \quad \frac{\partial U / \partial x_i}{\partial U / \partial G} = 1 \quad \Rightarrow \text{MRS}_i = 1 \quad \forall i
\end{align*}
\]

Note that with the Nash behavioral assumption, each individual consumer $i$ takes the contributions of others $G_{-i}$ as given. The first order conditions for a maximum produce the usual marginal conditions. That is, each consumer chooses $x_i$ and $g_i$ so that the marginal rate of substitution between own consumption and consumption of the poor are equal to the relative price between the two goods or the slope of her budget constraint, which equals one. The relative price tells us the rate at which we can exchange one good for another or the marginal rate of transformation (MRT) between the two goods. Thus we have usual utility maximizing condition where $\text{MRS}_i = 1 = \text{MRT}$.

Recall, however, that because of the non-excludability property of the public
good the Samuelson condition for a Pareto optimal allocation of a public good requires
that $\Sigma \text{MRS}_i = \text{MRT}$. The non-cooperative Nash-Cournot solution however produces the
condition that $\Sigma \text{MRS}_i = N$, where $N$ is the number of consumers. Thus, for $N > 1$ the
non-cooperative solutions results in $\Sigma \text{MRS}_i = N > \text{MRT} = 1$, producing an inefficient
allocation of the public good. That is, there is an under allocation of the public good.

This can be shown graphically. Suppose that individual $i$ is alone in her altruistic
concern for the poor. An interior Nash-Cournot solution for consumer $i$ is shown
graphically in Figure 1. In this simple economy an efficient equilibrium solution is
reached at $E^*$. The equilibrium level of the public good is $G^*$. From the budget
constraint in equation (1b), it can be seen that with only one person contributing to the
public good $g_i = \omega_i - x_i$ where $g_i = G^*$ and $G_i = 0$.

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3 This ignores the possibility of a corner solution.
The first order conditions show that consumer i optimizes by allocating her income such that her \( MRS_i = 1 \), the slope of the budget constraint. The Samuelson condition (i.e., \( \sum MRS_i = MRT \)) is satisfied so the Nash-Cournot solution is Pareto efficient. Individual i selects the optimal amount of the consumption good \( x_i^* \) and contributes \( g_i^* \) towards the public good.

Assume now that others are also concerned about the well being of the poor. Figure 2 again shows an interior Nash-Cournot solution for the same individual when she is not alone in her altruism. Individual i again chooses her optimal contribution to the poor \( g_i^* \) and optimal level of the consumption good \( x_i^* \). In this case however consumer i’s budget constraint shows a horizontal shift to the right by an amount equal...
to the contributions by those other than i, $G_i$.\(^4\) Nash behavior assumes that she treats the contributions of others as a lump sum transfer to herself. Specifically, because the benefits from increasing the consumption of the poor cannot be excluded from those who do not contribute, individual i benefits equally from the contributions of others. This is shown in Figure 2 as a horizontal shift of $G_i$ in i’s budget constraint. The equilibrium level of the public good G is shown as $G^*$, where $G^* = g_i + G_i$ and $g_i = \omega_i - x_i$. Note that the slope of the budget constraint does not change and consumer i’s optimal allocation is again set where $MRS^i = 1$. The relative price (or MRT) faced by the individual consumers are not reflective of the external benefits flowing to others as a result of an increase in their individual contributions. Thus, the Nash-Cournot equilibrium solution results in a situation in which the $\Sigma MRS^i = N$ which is greater than the $MRT = 1$, or the marginal social benefit is greater than the marginal social cost. The non-excludability property of the pure public good induces individuals to under-contribute toward the public good in the belief that they can rely or free ride on the contributions of others.\(^5\) The Samuelson condition is therefore not satisfied and the Nash-Cournot solution is sub-optimal in the Pareto sense.

Note, from the first order conditions, that as the number of altruistic consumers in economy increases, the Nash equilibrium moves further away from Pareto efficiency. Thus, only in the initial case in which one consumer is concerned with the welfare of the

\[^4\] A corner solution is shown in which consumer i’s voluntary contribution $g_i = 0$. The equilibrium level of the public good in this case is then $G = G_i$.

\[^5\] Cornes and Sandler pg. 17 (1991).
poor, is the Nash solution Pareto optimal. As the number of people concerned with the well being of the poor increases, the Nash-Cournot equilibrium provision of the public moves further from Pareto optimality.

Andreoni (1988) shows that as the economy grows, the number of consumers contributing to the public good diminishes to a small fraction of the population at the high end of the wealth distribution with the average voluntary contribution of contributors becoming smaller. There are thus two opposing influences affecting the provision of the public good as an economy grows. First, although there is a decreasing percentage of consumers contributing to the public good, the absolute number of contributors will increase. Secondly, each contributor will be making a smaller average contribution. The total effect on the public good provision consequently depends on which effect dominates.

III COMPARATIVE STATICS

How will the voluntary contribution of consumer i and the Nash equilibrium level of the public good react to changes in the contributions of others? Consider first the case in which contributions of others, G_i, are initially equal to zero. Figure 3 shows the consumer initially maximizing utility at E* along the budget constraint AB consuming x_i* of the private good and G* of the public good. In this case, since consumer i is the lone contributor, her own contribution is equal to the equilibrium level of the public good, g_i* = G*.

Now, suppose there is an exogenous increase in the contributions of others to some positive level G_i > 0. This will shift consumer i’s budget constraint over and to the
Note that in this instance the term “substitution effect” takes on a different meaning than what is normally understood in economic theory. The substitution effect normally refers to a consumer’s response to a change in relative price. In this instance, the “substitution effect” refers to a change in the level of consumption due to changes in the contributions of others.

Figure 3

Changes in $G_i$ When $G_i$ and $g_i$ Are Perfect Substitutes

right by the amount of the contributions of others. The new budget constraint is now $ACD$ with the consumer maximizing utility at $E^{**}$ occurring along the CD portion of the new budget constraint. Note first, that at the new equilibrium, consumption of both goods increase with consumer $i$ consuming $x_i^{**} > x_i^*$ of the private good and $G^{**} > G^*$ of the public good. Note also, however, that although the equilibrium level of the public good increases, consumer $i$’s voluntary contribution to the public decreases from $g_i^* = G^*$ to $g_i^{**} = G^{**} - G_i^*$, where $g_i^* > g_i^{**}$.

To more closely examine the total effect of the exogenous increase in the contributions of others, it is useful to distinguish between the income effect and the substitution effect. Isolating each effect of a change in the contributions of others
however, the substitution effect refers to a consumers substitution of her own contribution to the public good for that of others.

7 See Cornes and Sandler (1991) for a detailed explanation of the income and substitution effect of change in contributions by others.
Figure 4
Changes in $G_i$ When $G_i$ and $g_i$ Are Perfect Substitutes

contributions of others results in an increase in the equilibrium level of public good provision.

In the above example, an increase in the contributions of others to the public good increased the equilibrium level of public good provision. This result is not general however. Figure 4 shows the same initial equilibrium situation as Figure 3 with consumer i as the sole contributor optimizing at $E^*$ with consumption levels $x_i^*$ of the private good and $G^*$ of the public good. As in the previous case, assume that there is an increase in the contributions of others which results in a new equilibrium at $E^{**}$. Note again, that the equilibrium consumption of the private good increases to $x_i^{**} > x_i^*$. The utility constant Hicksian substitution effect is again shown along the original indifference curve $I_0$. As the contributions of others increase, consumer i substitutes
dollar for dollar the contributions of others for her own contribution. Thus, the substitution effect again results in consumer i reducing her own contribution by exactly the amount of the increase in the contributions of others.

Consider now the income effect of the increase in the contributions of others. In this instance, the parallel shift in the budget constraint from AB to ACD does not result in an increase the equilibrium level of the public good. That is, there is no income effect resulting from the increase in the contributions of others. In this case, because there is no income effect, the total effect of an increase in the contributions of others consists of only a substitution effect and thus results in the equilibrium level of public good remaining unchanged.

Clearly whether the income or substitution effect dominates determines whether own contributions to the public good increase or decrease. Schiff (1985) argues that in general, the substitution effect will dominate the income effect so that the net result of a change in contributions by others on individual i’s contribution will be negative.

However, although individual contributions to the public good may fall with an

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8 These types of preferences produce what are known as vertically parallel indifference curves. In the example above, the slope of all indifference curve are the same at G*. For a brief discussion of these types of preferences see Silberberg (1990).

9 Roberts (1984) assumes a zero income effect when he arrives at his dollar for dollar crowd-out. Note that to arrive at dollar for dollar crowd-out, you must assume perfect substitututability among the various sources of expenditures and a zero income effect.

10 Note that if the income effect of increased contributions by others dominates the substitution effect, then individual i will increase her voluntary contribution. Thus as Cornes and Sandler state, “micro-level [free] riding depends upon the absence of a strong income effect.”
exogenous increase in the contributions of others, the net effect on the total level of contributions toward the public good will be to increase the equilibrium provision of the public good.\textsuperscript{11}

Another effect that may act to reduce individual own contributions as the contributions by others increase, is a reduction in the marginal valuation of the public good by its recipients. Recall that the inter-dependent utility model assumes that the well being of the poor enters the utility function of the non-poor. As contributions to the poor increase, the well being of the poor increases. As a result, the marginal utility that the poor receive from contributions decreases which, due to the inter-dependent utility between the poor and contributors, will reduce the marginal utility that contributors receive from making contributions. The effect of decreasing marginal valuation of contributions is shown in Figure 5. For example, Figure 5 shows consumer i in an initial equilibrium at $E^*$ with others contributing $G_{i^*}$ to the public good and individual i consuming $x_{i^*}$ of the private consumption good and contributing $g_{i^*}=G^*-G_{i^*}$ to the public good. The equilibrium allocation of the public good is $G^*=g_{i^*}+G_{i^*}$. Note that the budget constraint $ABD$ has a horizontal shift to the right of the amount $G_{i^*}$, the contributions of others.

Assume now that there is an exogenous increase in the contributions of others toward the public good. Contributions of others increase from $G_{i^*}$ to $G_{i^{**}}$ which shifts the budget constraint from $ABD$ to $ACF$. The new optimal choice of $x_i$, $g_i$, and $G$ will be

\textsuperscript{11} See Bergstrom et al. (1986) Theorem 4 part (ii) for elaboration on this point.
There is the possibility that the relationship between $g_i$ and $G_i$ is positive. If for example individual $i$ is motivated to contribute to the public good because others are giving, then this “demonstration effect” will produce a positive relationship.

Along the segment CF of the new budget constraint. Recall that in the pure public good model, each consumer is concerned only with the total level of the public good and that each consumer takes the contributions of others as given. Thus, if the contributions of others increase, with a positive income effect, there will be an increase in the level of public good provision. Suppose however, that the increase the level of the public good leads to a decrease in the marginal valuation of the public good by consumer $i$.

Consequently, as the marginal valuation of the public good decreases, consumer $i$ decreases her contribution to the public good. This is shown in Figure 5 as a counter clockwise rotation in consumer $i$’s indifference curve from $I_2$ to $I_3$.

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There is the possibility that the relationship between $g_i$ and $G_i$ is positive. If for example individual $i$ is motivated to contribute to the public good because others are giving, then this “demonstration effect” will produce a positive relationship.
Figure 6
Consumer Equilibrium Resulting From a Pure Redistribution of Wealth

The above analysis examined how an exogenous change in the contributions of others effects own contributions of utility maximizing consumers. We can also examine how the Nash equilibrium allocation is affected by a pure redistribution of wealth among contributors in which the change in the contributions of others is exactly offset by a change in the wealth of the individual contributor. Warr (1983) and Bergstrom, Blume, and Varian (1986) show that the equilibrium provision of the public good is unaffected by pure redistributions in wealth among contributors to the public good. To see this, consider the first order conditions derived above. From the first order conditions, Warr derives aggregate demand functions for the public and private goods that are dependent on prices and aggregate income but are independent of the distribution of income. These results are shown graphically in Figure 6, in which a representative consumer is in

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\textsuperscript{13} See Warr (1983) or Cornes and Sandler (1991) for an elaboration on this point.
an initial equilibrium at $E^*$. The contributions of others is given as $G_{i^*}$. Thus the individual consumer is restricted to the segment BD of the budget line. At the initial equilibrium, the consumer consumes $x_{i^*}$ of the private good while contributing $g_{i^*} = G^* - G_{i^*}$ toward the public good. The level of the public good provided is $G^*$.

Consider now a redistribution in which consumer i’s wealth is decreased by an amount $\Delta \omega_i$ which is less than her original contribution (i.e., $\Delta \omega_i < g_i$) and redistributed in a lump sum fashion to the other contributors in the economy. If consumers other than i increase their voluntary contributions by exactly the amount of their lump sum transfer, then the redistribution increases the level of contributions by consumers other than i to $G_{i^**} = G^* - \Delta \omega_i$, which is shown in Figure 6. The effect of the redistribution is to restrict consumers i’s budget constrain, shown From Figure 6, to the segment CD.

Note that after consumer i’s negative wealth transfer, consumer i’s equilibrium level of consumption of the private good remains the same. Consumer i does however reduce her contribution to the public good to $g_{i^**} = G^* - G_{i^**}$. From Figure 6 it is clear that the post redistribution voluntary contribution is less than the contribution before the wealth transfer (i.e., $g_{i^**} < g_{i^*}$) and that she reduces her contribution by exactly the amount of her loss in wealth (i.e., $g_{i^*} - g_{i^**} = \Delta \omega_i$). That is, “consumer i changes her contribution toward the public good by the same amount as the change in her wealth as long as all other contributors do so.” 14 Thus we can conclude that the Nash equilibrium provision of a public good is invariant to a pure redistributions of wealth among contributing consumers.

14 Bergstrom et al. (1986).
The comparative static results derived above can be summarized as follows.

Assuming homothetic preferences and a positive income effect, increases in the contributions of others will increase the Nash-Cournot equilibrium provision of the public good. The Nash-Cournot equilibrium provision of a public good is invariant to a pure redistribution in wealth.

Suppose now we introduce government into the model. The government imposes a policy of lump sum taxes and transfers, in which the government taxes the endowments of individual consumer at the rate “t” to provide a transfer to the poor of \( T_G = \sum \omega_i t \).

Assume initially that the government only taxes current contributors to the public good and that the government does not tax any individual contributor more than the amount of their initial voluntary contribution (i.e., \( \omega_i t \leq g_i \)). The individual optimization problem facing the contributing consumers now becomes:

\[
\begin{align*}
\text{Max} & \quad U_i(X_i,G) \\
\text{s.t.} & \quad G = p_g \left[ \omega_i (1-t) - x_i \right] + \sum_{j \neq i} \left[ \omega_j (1-t) - x_j \right] + p_t \sum_{i=1}^n \omega_i t
\end{align*}
\]

The budget constraint can be rewritten as \( G = p_g g_i + G_{-i} + p_t T_G \). If we assume that both private and public contributions are costlessly transferred to the public good, then we can set \( p_g \) and \( p_t \) equal to one. Thus we have \( G = g_i + G_{-i} + T_G \). Nash behavior will produce the usual first order conditions and provide us with a conditional demand for the public good of the form:

\[
(4) \quad g_i = g_i(\omega_i, \bar{G}_{-i}, \bar{T}_G)
\]

Where \( \bar{G}_{-i} \) and \( \bar{T}_G \) are exogenously determined levels of contributions by others and the government respectively.
Consider now the effect of an exogenous change in government taxes and transfers on consumer i’s voluntary contribution and the equilibrium level of the public good. Equation (5) shows the result of partially differentiating the above demand function, holding contributions by others constant, and allows us to examine the income and substitution effects of a change in government expenditures as follows:\textsuperscript{15}

\begin{equation}
\frac{\partial g_i}{\partial T_G} = \frac{\partial g_i}{\partial T_G} - \frac{\partial g_i}{\partial T_G} \left[ \frac{\partial x_i}{\partial T_G} + \frac{\partial g_i}{\partial T_G} + 1 \right]
\end{equation}

The sign of the derivative \(\frac{\partial g_i}{\partial T_G}\) in equation (5) can take on a positive or negative value depending on the relative sign and magnitude of the substitution and income effects.

**The Substitution Effect**

\begin{equation}
(5a) \quad \frac{\partial g_i}{\partial T_G} < 0
\end{equation}

The first term in equation (5) is replicated here as equation (5a) and represents the Hicksian or compensated substitution effect (i.e., the change in the demand for charitable contributions holding utility constant). The sign and magnitude of (5a) depends on how the individual consumer views government transfers to the poor in relation to their own private contributions. In the pure public goods model \(g_i\) and \(T_G\) are seen as perfect substitutes so that equation 5a will be equal to negative one, (i.e., \(\frac{\partial g_i}{\partial T_G} = -1\)). In the absence of an income effect, a one dollar increase in government expenditures will lead to a one dollar decrease in private contributions, leaving the Nash

\textsuperscript{15} Allowing giving by others (\(G_i\)) to change does not affect the general results. See Schiff (1985) for more a more complete examination.
equilibrium level of the public good unchanged.

If alternatively, $g_i$ and $T_G$ are seen as imperfect substitutes, then the substitution effect will be between minus one and zero (i.e., $-1 < \frac{\partial g_i}{\partial T_G} < 0$). In this case a one dollar increases in government expenditures will reduce private contributions by less than a dollar, thereby increasing the equilibrium level of the public good.

The substitution effect will be positive (i.e., $\frac{\partial g_i}{\partial T_G} > 0$) if $g_i$ and $T_G$ are complements. That is if individual $i$ views private and public contributions as complements, then increases in government taxes and transfers may lead to increases in private contributions. The substitution effect will be zero if $g_i$ and $T_G$ are seen as unrelated.

**The Income Effect**

(5b) \[
\frac{\partial g_i}{\partial \omega_i} \left[ \frac{\partial x_i}{\partial T_G} + \frac{\partial g_i}{\partial T_G} + 1 \right]
\]

The second part of equation (5) is replicated here as equation (5b) and represents the income effect. Consider first the term outside the brackets in equation 5b, ($\frac{\partial g_i}{\partial \omega_i} > 0$). If individual $i$ views charitable contributions as a normal good, then increases in income will result in an increase the voluntary contribution and the term outside the brackets will be positive ($\frac{\partial g_i}{\partial \omega_i} > 0$).

Consider next the term inside the brackets. Recall from the budget constraint that government taxes and transfers are assumed to be costless, thus the “1” in the bracketed term is the constant marginal cost of a unit of government transfers. The remaining term $\frac{\partial x_i}{\partial T_G} + \frac{\partial g_i}{\partial T_G}$ can then be interpreted as the marginal benefit of an additional unit of
government transfers (i.e., how consumption of the both goods, g_i and x_i , change due to
changes in government taxes and transfers). The sign of the income effect is then
dependent on the difference between the marginal benefit and the marginal cost of
government taxes and transfers. Schiff (1985) categorizes the three most likely
outcomes of the income effect as follows:

If \( \left( \frac{\partial x_i}{\partial T_G} + \frac{\partial g_i}{\partial T_G} + 1 \right) > 0 \), then the marginal cost of an additional unit of
government transfers is greater than the marginal benefit and the consumer is “over-
satisfied” with the level of government provisions toward the public good. Increasing
taxes and transfers to the public good will lead to a reduction in consumer i’s charitable
collection. In this case, the income and substitution effects of increased government
expenditures work in the same direction. Both act to unambiguously reduce or crowd-
out individual contributions toward the public good.

If \( \left( \frac{\partial x_i}{\partial T_G} + \frac{\partial g_i}{\partial T_G} + 1 \right) < 0 \), then the marginal cost of an additional unit of
government transfers is less than the marginal benefit and the consumer is “under-
satisfied.” In this case the income and substitution effects of an increase in government
transfers work in opposite directions. The total effect on individual contributions cannot
be unambiguously determined.

If \( \left( \frac{\partial x_i}{\partial T_G} + \frac{\partial g_i}{\partial T_G} + 1 \right) = 0 \) then the marginal cost of an additional unit of
government transfers is equal to the marginal benefit and the consumer is “just satisfied.”
In this case, the income effect is zero and the substitution effect will dominate. Increased
government transfers will unambiguously decrease or crowd-out individual contributions
toward the public good. Note that in this last case where the income effect is zero, if we
assume that $T_g$ and $g_i$ are perfect substitutes (i.e., that $\frac{\partial g_i}{\partial T_g} = -1$) as in the pure public goods model, we get the special case in which there will be dollar for dollar crowding out. A one dollar increase in government transfers will lead to exactly a one dollar decrease in individual i’s voluntary contribution, leaving the equilibrium level of the public good unchanged.\textsuperscript{16} This is the situation of perfect crowding out examined for example by Warr (1982, 1983) and Roberts (1984).\textsuperscript{17}

The comparative static results, thus far, have been made under some very restrictive assumptions. Specifically that only current contributors are involved in the government tax and transfer program and that no contributor is taxed more than their original voluntary contribution. Relaxing these assumptions will allow for a more general analysis.

Consider first the case in which the government taxes some non-contributors and transfers the funds towards provision of the public good. This can be treated similarly to the case in which we have an exogenous increase in the contributions of others examined above. That is, taxing non-contributors and transferring the funds toward the provision of the public good is identical to the case in which there is an exogenous increase in the

\textsuperscript{16} The case of perfect crowding out between private and public contributions can also be seen in terms of the original neutrality theorem resulting from a pure redistribution of wealth. Since only current contributors are taxed, a government tax and transfer program to the public good is identical to a pure redistribution of wealth among contributing consumers. From the above neutrality theorem we know that a pure redistribution of wealth among contributing consumers will not affect the Nash equilibrium level of the public good.

\textsuperscript{17} The same results can be attained under the same assumptions with a government policy that includes taxes and subsidies. See Andreoni (1988) for an elaboration on this point.
contributions of others. Recall from above that if preferences are homothetic and there is a positive income effect, then an increase in the contributions of others will increase the Nash-Cournot equilibrium provision of the public good. Under these conditions, we arrive at the result that, “if the government collects some of the taxes that pay for its contribution from non-contributors, then although private contributions may decrease, the equilibrium total supply of the public good must increase.”\textsuperscript{18}

Consider next the case in which the government taxes a current contributor more than their initial voluntary contribution (i.e., $\omega_i t \geq g_i$). This can be examined by referring to both the neutrality of a pure redistribution and the preceding case of taxing non-contributors. Suppose first that the consumer is taxed an amount exactly equal to her voluntary contribution. Her voluntary contribution then goes to zero. By the neutrality theorem we know that the equilibrium level of the public good is unaffected. Suppose next that the consumer is taxed again by some positive amount. We now have the case in which a non-contributor is being taxed, which is shown above to increase the equilibrium level of the public good. Thus we get the result that, “if the government collects some of the taxes that pay for its contribution by taxing any contributor by more than the amount of his contribution, the equilibrium total supply of the public good must increase.”\textsuperscript{19}

IV SUMMARY OF COMPARATIVE STATIC RESULTS

The pure public good model provides some important comparative static results.

\textsuperscript{18} Bergstrom et al. (1986) Theorem 6 part (ii).

\textsuperscript{19} Ibid., Theorem 6 part (iii).
Specifically, consider the two main comparative static results of the pure public good model of charitable contributions. First, it was shown that, in general, an exogenous increase in the contributions of others will increase the equilibrium level of a public good. Next, it was shown that the equilibrium level of a public good is invariant to a pure redistribution of wealth. These results were then used to examine the effect of government tax and transfer programs to the public good. In the pure public good model, contributors view their own contribution and the contribution of the government as perfect substitutes. Thus, the pure substitution effect results in dollar for dollar crowd-out. The income effect, however, depends on whether the consumer is under-satisfied, over-satisfied or just satisfied with the level of public good provision.

The comparative static analysis was then extended to examine the inclusion of non-contributors to the tax and transfer program and the situation in which contributors were taxed an amount greater than their voluntary contribution. Since those contributing to the public good are likely to be a subset of the tax paying population, it seems reasonable to relax the assumption that only contributors are taxed. The comparative results showed that taxing non-contributors and transferring these funds towards the provision of the public good will cause a decrease (i.e., crowding out) of private contributions among current contributors but will lead to an increase in the total provision of the public good. Even among contributors, it is likely that some are taxed an amount greater than their voluntary contribution. The comparative static analysis shows that taxing current contributors more than their voluntary contribution and transferring the revenue to the public good will result in an increase the total provision of
the public good.

The results so far indicate that government tax and transfer programs may lead to perfect crowding out among some contributors at the individual level but to only partial crowding out at aggregate level, thereby resulting in an increase in the level of public good provision. Partial crowding out can also be explained using an alternate form of the public goods model.

V THE IMPURE PUBLIC GOOD MODEL

Consider now an alternate form of the public goods model that includes a private good element to voluntarily contributing to the public good, i.e., the welfare of the poor in the current context. That is, contributing to the poor in addition to being motivated by altruism can also be motivated by self-interest. Consumers in this case receive some personal satisfaction or “warm glow” from the act of giving. Including this element into the analysis changes the structure of the pure public goods model examined above. Instead of consumers being concerned with only the total level of the public good, consumers are also concerned about their own individual contributions. Thus, preferences under impure altruism are of the form $U_i (x_i, G, g_i)$. The budget constraint is unaffected by the inclusion of impure altruism, so the individual optimization problem now becomes:

$$\text{(6)} \quad \text{Max}_{x_i, G, g_i} \quad U_i (x_i, G, g_i) \quad \text{s.t.} \quad G = p_g \left[ \omega_i (1-t) - x_i \right] + \sum_{j \neq i} \left[ \omega_j (1-t) - x_j \right] + p_T \sum_{i=1}^n \omega_i t$$

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20 Steinberg (1986) and Andreoni (1989) have developed models of this type.

21 The term “warm glow” is used by Andreoni (1989).
Under impure altruism, because consumers no longer care only about the total level of the public good but also about their own voluntary contribution, the impure altruist will, therefore, no longer view government transfers $T_G$ and her own voluntary contributions $g_i$ as perfect substitutes. As Andreoni states, “this perfect substitutability is at the heart of the neutrality hypothesis” and similarly, is at the heart of perfect crowd-out. If the consumer views $T_G$ and $g_i$ as perfect substitutes, then a one dollar increase in government transfers will cause the consumer to reduce her voluntary contribution by exactly one dollar. If, however, the consumer gains utility from the act of giving itself, then a one dollar increase in $T_G$ will cause the consumer to reduce her contribution by less than one dollar. There will then be only partial crowding out.\textsuperscript{22}

A final model to be examined incorporates the private good element of contributing to a public good, while further distinguishing among the various sources of contributions to the public good. The “joint crowd-out” model, developed by Steinberg (1987), examines the effect of federal contributions to the public good and the subsequent effect on state and private contributions to the public good. Thus the concept of crowding-out must now incorporate the separate effects of changes in federal and state expenditures.

Following the nomenclature of Steinberg, consider first “simple crowd-out.” Simple crowd-out is the effect of changes in government spending both state and federal on private charitable contributions and is form analyzed in the previous analysis.

Consider next “Simple government crowd-out,” or the effect of changes in federal expenditures.

\textsuperscript{22} This excludes the income effect of the change in the governments contribution.
expenditures on state spending alone. Finally, “joint crowd-out,” is the combined effect of simple and simple government crowd-out.

In a model of joint crowd-out, changes in federal expenditures induce changes in both state and private contributions to the public good (i.e., simple and simple government crowd-out). The subsequent changes in state and private contributions will induce “feedback effects.” That is, state spending will respond to the induced changes in private donations, while private donations will respond to the induced changes in state spending. The combined effect of exogenous changes in federal changes on state spending and private charitable contributions including the feedback effects is referred to as joint crowd-out.

A central point of concern in the joint crowd-out model, as with the previously examined models, is the substitutability among the various sources of contributions to the public good. If the individual contributor derives utility from the act of giving (i.e., if there is a private good element to giving), then own contributions will be viewed as different from the other sources of contributions: Giving by others $G_i$, state contributions $T^S$ and federal contributions $T^F$. How individual contributors view those sources of contributions other than their own then becomes an additional factor in this model. Steinberg (1987), presents a model in which the contributions of others, state expenditures and federal expenditures are viewed by economic agents as perfect

\[ \text{Schiff and Steinberg (1988) p.9.} \]

\[ \text{Lindsey and Steinberg (1990) p. 8. For a mathematical derivation of joint crowdout see Steinberg (1987).} \]
substitutes. However, there are two immediately apparent reasons why state and federal expenditures on social welfare may be viewed differently. The first is that agents may view state and federal expenditures as different because changes in state expenditures are necessarily accompanied by tax changes while changes in federal expenditures may not.25 The second is that economic agents may be more cognizant of the use and efficacy of state welfare expenditures while not being fully aware of the use and efficacy of federal expenditures on social welfare.

VI SURVEY OF EMPIRICAL ANALYSIS

We can now examine the empirical studies of charitable giving to see how well the models presented predict economic behavior. Consider first an examination of the standard variables of neo-classical comparative statics: price and income. That is, how do charitable contributions change in response to changes in price and income? The law of demand predicts a negative price elasticity while the normality assumptions of charitable contributions predicts a positive income elasticity.

Because individuals are allowed to deduct charitable contributions from their taxable income, the effective price or tax price of contributing is $(1-m_i)$ where $m_i$ is individual i’s marginal tax rate.26 Deductibility lowers the effective price of giving with the intent of stimulating charitable activity. Estimations of the price elasticity of

25 Steinberg (1987). This is due to the fact that most states are constitutionally bound to keep a balanced budget while the federal government is not.

26 The actual calculation of the tax price of giving in empirical studies is considerably more complicated. For a further discussion on this point see Clotfelter (1985).
charitable contributions provide a measure of the responsiveness of individuals to changes in the tax price of giving and in turn an examination of the government’s effectiveness in inducing charitable contributions through tax policy.

Clotfelter (1985) provides a summary of the price and income elasticities of various econometric studies of charitable contributions; The results are shown in Table 1. As can be seen, the effect of price on charitable contributions has been extensively examined. Because marginal tax rates are progressive, the price elasticity is shown for different income classes. The estimated price elasticities range from -.01 to -2.54 with the average being minus one. Recall that an elasticity of one in absolute value is the critical level in determining the effectiveness of the charitable deduction. If the price elasticity is greater than one, then the charitable deduction induces more voluntary contributions than the amount the treasury loses in tax revenue. In this case the charitable deduction is effective in increasing total contributions. For values less than one the opposite is true.

The estimated income elasticities of charitable contributions are again shown in Table 1 by income group. All coefficients are positive and range in value from .23 to 3.10 with the average again being approximately one. The empirical studies are thus consistent with the normality assumption of charitable contributions, although of varying degree.

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27 For a more complete discussion on the differences in price elasticities by income class, see Clotfelter (1985) pg. 66, Clotfelter and Steuerle (1981) and Choe and Jeong (1993).

28 Holding government contributions constant.
The effect of contributions by others $G_i$ on own contributions has not been studied as extensively as price and income. However there is evidence that changes in the contributions of others has the predicted negative effect on an individuals own contribution. In a study using data from the National Philanthropy Survey, Schiff (1984, 1985) showed that contributions by others produced negative effects on own contributions. These results are consistent with the free riding behavior of the Nash model.

The next main point of contention concerning the model of charitable contributions is the crowd-out parameter. With respect to the crowd-out parameter, both the sign and magnitude of the coefficient are important. If the estimated crowd-out parameter is negative, then public and private contributions are substitutes and increased government expenditures will crowd-out private contributions. Again a value of minus one is important from a policy perspective. A crowd-out parameter of minus one indicates perfect or dollar for dollar crowd-out. With perfect crowd-out, a one dollar increase in government welfare expenditures decreases private contributions by exactly one dollar. A negative value less than one in absolute value (i.e., $-1 < \beta < 0$) indicates partial crowd-out, in which a dollar increase in government contributions reduces private contributions by less than one dollar. Negative values greater than minus one (i.e., $\beta > -1$) indicate a situation in which a one dollar increase in government contributions reduces private contributions by more than a dollar.

Positive values of the crowd-out parameter indicate a situation in which public and private contributions are complements. That is a increases in government
contributions stimulate private giving.

Steinberg (1993) provides a summary of estimated crowd-out parameters in Table 2. Concentrating on the crowd-out parameters for social services only, estimated crowd-out parameters range in value from -.622 to .344. The majority of the crowd-out estimates are negative and none of the studies produce an estimate close to minus one. We can thus reject the restrictive versions of the pure public goods model of Warr (1982) and Roberts (1984) which predict dollar for dollar crowd-out. The studies are, however, consistent with the models of partial crowd-out. These include the generalized version of the pure public good model of Bergstrom, Blume and Varian (1986) and the impure public good models developed by Andreoni (1989) and others in which there is a private good element to contributing to the public good.

Although rare, there are cases in which there is a positive crowd-out parameter. Schiff (1985), Schiff (1990), Schiff and Steinberg (1988), and Schiff and Weisbrod (1986) all produce positive crowd-in parameters.

The final point of consideration in the public goods model is the assumption of inter-dependent utility. That is, does well being of individual contributors depend on the relative well being of others? Although different studies have used different measures of the well being of others, there has been a consistently positive relationship between the level of giving and the level of need for charity, especially with regard to charitable contributions to the poor. For example, Hochman and Rodgers (1973) found that income dispersion had a positive affect on the level of contributions. Dye (1978) and Schiff (1985) found that the percentage of poor in the donors community had a positive affect
on contributions while Amos (1982) and Abrams and Schmitz (1984) found that the percentage of the donors state population below the poverty level had a positive affect on contributions. Finally, in this study I show a positive correlation between aggregate contributions to social welfare and both income inequality as measured by the standard deviation of weekly earnings, and the percentage of the population below the poverty level. Thus we can be fairly sanguine in accepting altruism as explaining at least some part of charitable behavior.

VII THE ROLE OF GOVERNMENT

Because the Cournot-Nash equilibrium level of contributions to the poor will be below the efficient level, government tax and transfer programs can increase the level of contributions (voluntary and non-voluntary) to the poor resulting in increased efficiency. How the government arrives at the efficient level of contributions is the subject of the next section.

VIII A MODEL OF GOVERNMENT EXPENDITURES

Consider now a model of government redistribution. Assume that the equilibrium amount of government redistribution is determined by a process of competing political groups. Suppose the government maximizes the following political function:

\[
(12) \quad P = P(U_i, U_p) \quad \text{where} \quad \frac{\partial P}{\partial U_i}, \frac{\partial P}{\partial U_p} > 0
\]

The function \( P \) depends on the level of utility of its poor and non-poor constituents. Political competition among the poor and non-poor ensures that \( P \) gets maximized. The

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\(^{29}\) Clotfelter (1985)
This model, used by Roberts, was developed by Becker (1983). Inter-dependant utility functions are not a sufficient condition for an upward sloping utilities possibilities frontier. Charitable contributions will increase the utility of both economic agents, only when the marginal benefit of contributing is greater than the marginal cost. That is, when a one dollar contribution to the poor provides more than one dollars worth of benefit.

Figure 7
Political-Economic Equilibrium

function P then produces convex iso-support curves in utility space. The iso-support curves show a measure of utility among the poor and non-poor that keeps political support constant.30

We can now combine the model of private philanthropy with the model of government redistribution. Inter-dependent utility functions create an upward sloping portion of the utilities possibilities frontier such as that shown in Figure 7.31 A convex iso-support curve, such as that indicated by the curve I₀, is also illustrated in Figure 7.

Consider first a Nash-Cournot solution such as that represented by the point E₁ in

30 This model, used by Roberts, was developed by Becker (1983).

31 Inter-dependant utility functions are not a sufficient condition for an upward sloping utilities possibilities frontier. Charitable contributions will increase the utility of both economic agents, only when the marginal benefit of contributing is greater than the marginal cost. That is, when a one dollar contribution to the poor provides more than one dollars worth of benefit.
Figure 7. Point $E_1$ represents an equilibrium point in the absence of government. The non-poor’s most preferred point is $E^*$, and is also an efficient allocation. Note first that all points on the increasing portion of the utilities possibilities frontier, that is all points to the left of $E^*$, are inefficient (i.e., all points to the right Pareto dominate points to the left). That is both the non-poor and the poor can be made better off by increasing contributions to the poor. Points beyond $E^*$ however are all Pareto-efficient. In order to increase the utility of the poor you must decrease the utility of the non-poor.

A political equilibrium occurs where the highest attainable iso-support curve is tangent to the utilities possibilities frontier, at a point such as $E_p$. Note that the political equilibrium $E_p$ is beyond the non-poor’s most preferred point $E^*$. To see why, assume first that the poor have no political power. In this case the iso-support curves will be horizontal and the non-poor’s most preferred point will be $E^*$. Because of the public good aspect of the poor’s consumption, even in the case where the non-poor outnumber the poor or similarly where the non-poor have more political power than the poor, the non-poor would still choose a policy of redistribution. If the poor have any political power, the iso-support curves will be convex to the origin, and will thus be tangent to the utilities possibilities frontier at a point to the right of $E^*$, resulting in “over-provision.”

Suppose now, however, that the non-poor have no political power (i.e. $\partial G/\partial U_i \leq 0$). In this case the iso-support curves will be vertical. Because the poor are only

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32 Note that if the poor have no political power (i.e. if $\partial G/\partial U_p \leq 0$).

33 The term “over-provision” used by Robert’s may be misleading. Recall that all provisions beyond $E^*$ are Pareto optimal. Thus, although points beyond $E^*$ are beyond the non-poor’s most preferred point, they are still efficient.
concerned with their own consumption, they would choose to maximize their own utility. That is the iso-support curves would intersect at a corner point along the horizontal axis, for example at point $E_2$ in Figure 7, where the utility of the non-poor is zero. Clearly, for any level positive level of political power exerted by each group, the political equilibrium will be beyond $E^*$. 

**VIII POLITICAL-ECONOMIC EQUILIBRIUM**

In the simple crowd-out model the political economic equilibrium results in a level of government expenditures beyond the non-poor’s most preferred point. What are the implications of this result for the level of private contributions? In the simple pure public goods model of Roberts, in which government expenditures crowd-out dollar for dollar private contributions, private charitable contributions go to zero. That is, in order to increase the total level of spending on the public good beyond the Nash equilibrium level, the government must completely crowd-out private sector contributions. These results, however, are due to the restrictive assumptions used to arrive at dollar for dollar crowding out.

In the model of impure altruism, government contributions only partially crowd-out private contributions. Thus, at the margin, government transfers will increase the total level of expenditures to the public good beyond the Nash level. However, depending on the Nash equilibrium level of private contributions, the political equilibrium may result in a considerable increase in the total level expenditures to the public good. For example, suppose the political equilibrium results in a total level of expenditures of $E_p$ shown in Figure 7. This would still be significantly beyond the initial
Nash equilibrium level of private contributions of $E_1$ or the non-poor’s most preferred point of $E^*$. Consequently, although there may be a positive level of private donations at levels of spending just beyond the Nash equilibrium, for large government expenditures on the public good that push the political equilibrium considerably beyond the Nash level, the total level of private voluntary contributions may approach the complete crowding out results obtained by Roberts.

The implications of the political equilibrium arrived by Roberts from the simple form of the pure public goods model are thus applicable, with some qualifications, to this analysis using the model of impure altruism. Specifically, Roberts concludes that:

(a) At the political equilibrium, private contributions are [or will be near] zero.

(b) Private contributions first became negligible when the government first intervened in a “significant” way in the charity market.

(c) At the political equilibrium, the government “over-provides” for the poor.

(d) Once an efficient allocation is reached, marginal reductions in social welfare spending will be ineffective in inducing a “crowding in” of private charitable contributions.

**IX CONCLUSION**

The ramifications for public policy are clear. Marginal reductions in government spending towards the public good will not induce a significant increase in private charitable contributions. Crowding out is a “local” phenomena that occurs near the Nash-Cournot equilibrium level of the public good. At provisions of the public good
well beyond the Nash-Cournot level, the inter-dependence between public and private contributions to the public good will have diminished and private charitable contributions will be reduced to negligible levels.
<table>
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<th>Data Source</th>
<th>Income Class</th>
<th>Estimated Elasticities</th>
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<td>Tax file, 1962</td>
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<td>25-100</td>
<td>1.99 (.05)</td>
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<td>3.10 (.06)</td>
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<td>-1.34 long-run (.65) .67 long-run (.17) -.49 short-run (.23) .24 short-run (.06)</td>
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<td>Wyscarver (1982)</td>
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Source: Clotfelter (1985).
Note: Standard errors in parenthesis when available.
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<td>Jones (1983)</td>
<td>-.015 to -.016&lt;sup&gt;b,d&lt;/sup&gt;</td>
<td>Central and local government spending on social services and housing</td>
<td>Family donations from Family Expenditure Survey (U.K.)</td>
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<td>Abrams and Schmitz (1984)</td>
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</tbody>
</table>
### Table 2 (Continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Crowd-out Parameter&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Measure of Government Spending</th>
<th>Measure of Private Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schiff and Weisbrod (1986)</td>
<td>-.12&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Other state public welfare expenditures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+.02&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Social welfare spending by local governments</td>
<td></td>
</tr>
</tbody>
</table>

Source: Steinberg (1993)

<sup>a</sup> Change in donation caused by a $1 increase in government spending.

<sup>b</sup> Calculated from reported elasticities and available data.

<sup>c</sup> Elasticity; conversion to crowd-out parameter not possible from available data.

<sup>d</sup> Reported coefficients different from zero at .05 significant level or better. Where parameter is a function of estimated coefficient, the significance test is for the estimated coefficients, not the parameter.

<sup>e</sup> This is the effect of an increase in government spending per recipient on giving per donor. Conversion to a crowd-out parameter is not possible with available data.

<sup>f</sup> Although donations are per imitizer, the article does not report the units for government spending, so interpretation as a crowd-out parameter is questionable.