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THE INTERACTION BETWEEN PUBLIC AND PRIVATE SPENDING WHEN GOVERNMENT IS RESPONSIVE TO THE PREFERENCES OF CITIZENS

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ABSTRACT

This paper uses simple models of private and public behavior to model the
relationship between public and private spending on public goods. The standard discussion
of the relationship between public and private spending assumes that public spending is
exogenous. When public spending is exogenous, each dollar of public spending reduces
private spending by a dollar, unless public spending is large enough to drive donors to a
corner solution. When government decision-making is endogenous, responding to the
preferences of citizens, the observed relationship between public and private spending is
never dollar-for-dollar, nor does government have to push citizens to a corner solution in
order to have real effects. The relationship between public and private spending depends
in predictable ways on the structure of preferences, the degree of heterogeneity among
citizens, the flexibility of taxation, and the motivation for the the increase in government
spending.

I. INTRODUCTION

The effect of an increase in government spending on private spending is a central theoretical and empirical question in macroeconomics and public finance. What is the effect of public borrowing on private investment? What is the effect of government housing on private housing? What is the effect of food stamp expenditure on private food consumption? What is the effect of social security spending on private saving? What is the effect of government welfare programs on private charity?

The standard theoretical answer to these questions is that government will either reduce private spending or leave it unchanged—the case of neutrality. These analyses almost always assume the increase in government spending is random or exogenous.[1]

This paper studies the interaction between public and private spending on public goods when government is endogenous, responding to the preferences of citizens. The paper begins with what I call the "simple model" of the private provision of public goods followed by a brief literature review. The succeeding sections look at the relationship between public and private spending on the poor and the elderly, under different assumptions about how government responds to the preferences of citizens. The main results of the analysis are:

1. Public spending is <u>never</u> neutral in equilibrium.

2. When public spending is exogenous, an increase in public spending must drive some donors to a comer solution in order to be non-neutral. But when public spending is endogenous, corner solutions are no longer necessary for non-neutrality. The relationship between public and private spending can be positive in equilibrium.

3. When public spending is endogenous, the relationship between public and private spending depends on the source of the change in public spending as well as the structure of preferences, the heterogeneity of citizens, the flexibility of taxation and the distribution of benefits.

4. Efficiency considerations push public spending towards a level large enough to crowd out all private spending. Whether public and private spending coexist depends on the structure of preferences, the heterogeneity of citizens, the flexibility of taxation and the distribution of benefits.

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[1]The only papers that I am aware of that examine the tradeoff between public and private spending when government is endogenous are Roberts (1984,1985) and Gramlich (1989). Roberts (1984.1985) focused on the case where public spending reduces all private spending to zero, ruling out any interaction between public and private spending after government intervention. Here, because of the inflexibility of taxation and heterogeneity discussed below, public and private spending can coexist This allows a discussion of the interaction of public and private spending after government intervention, and reveals the unimportance of corner solutions for government to have real effects. Gramlich (1989) contrasts endogenous and exogenous politicians and provides some empirical support for endogenous government budget deficits.

II. THE SIMPLE MODEL OF PRIVATE SPENDING ON PUBLIC GOODS

The simplest model of private spending on public goods is to assume that individual i cares about his private consumption and the total amount of the public good:

$$U_i = U_i (x_i, x_p) \qquad (1)$$

where x_i is own consumption, and x_p is the total amount of the public good. The public good may be a public good such as national defense, or an altruistic public good such as the consumption of the poor.

Individuals may make private contributions to the public good, T_i, out of their fixed income, Y_i:

$$Y_i = x_i + T_i \qquad (2)$$

I assume the public good is produced at constant marginal cost of unity. This implies:

$$x_p = \Sigma T_i + G \qquad (3)$$

where G is government spending which may be zero. Individuals make the Cournot-Nash assumption that one's own spending does not affect spending of others.[2] In the Cournot-Nash equilibrium, all donors have a marginal rate of substitution between the private and public good of unity, and non-donors have a marginal rate of substitution of less than unity. I call this the simple model--individuals make the Cournot-Nash assumption about the contributions of others, and the level of the public good is what enters the utility function, so that all contributions to the public good, regardless of the source, are perfect substitutes.

Warr (1982) and Roberts (1984) showed that in the simple model, a $1 increase in government spending would reduce private spending by exactly $1, leaving total spending unchanged.[3] Much of the theoretical and empirical application of this result examines the effect of government welfare programs on private transfers. Empirical estimates of the tradeoff between public welfare spending and private charity are much less than dollar-for-dollar (Clotfelter (1985), Steinberg (1989)). A number of authors (including Schiff (1985), Steinberg (1987), and Andreoni (1987)) argue that

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[2]Models that explore alternatives to the Cournot-Nash assumption in the provision of public goods include Margolis (1982), Sugden (1984) and Cornes and Sandler (1984).

[3]The same result holds when government spending is on private goods. This is the essence of Barro's (1974) analysis of Ricardian equivalence, Becker's (1974) Rotten Kid Theorem, and Bailey's (1971) discussion of when the Keynesian multiplier is zero.

this finding invalidates the simple model. They argue that the appropriate model is where individuals get utility from one's own transfer or the act of spending, so that government spending is no longer a perfect substitute for private spending.

Two recent papers make an even stronger indictment Bemheim and Bagwell (1988) show that a redistribution of income across two <u>unrelated</u> individuals is neutral as long as the individuals are linked indirectly through a set of altruistically motivated transfers.[4] This result leads them to reject altruism as a motivation for imergenerational transfers. Bemheim (1986) also demonstrated the neutrality of transfers between two unrelated individuals linked by contributions to overlapping charities. The theoretical conclusion of these two papers is that every government program is potentially neutral. Bemheim and Bagwell view their neutrality result as a reductio ad absurdum indictment of altruism and the dynastic model that links generations through altruism: "Since these results are not at all descriptive of the real world, we conclude that, in some fundamental sense, the world is not even approximately dynastic." They conclude:

"...when results stretch the bounds of credulity past the breaking point, it is natural to question the validity of underlying assumptions...refusal to accept the practical implications of our results is tantamount to a rejection of the dynastic framework and calls into serious question the results (such as Ricardian equivalence) that follow from it" (Bemheim and Bagwell (1988) p. 310.)

Bemheim (1986) derives similar neutrality results in attacking the altruistic motivation (where individuals care about the total level of spending on the public good) behind voluntary contributions to spending on public goods. His concluding verdict on such models based on altruism:

"In order to avoid the implausible implications of equilibrium behavior in models of contributions and transfers, one is naturally and inevitably drawn to... alternatives." (Bemheim (1986), p.)

This literature rarely makes an explicit assumption about why government spending increases. One can think of two types of changes in government spending. The first is random—changes in the level of public spending are exogenous. Virtually all of the theoretical and empirical literature on the tradeoff between public and private spending implicidy assumes government spending is exogenous. When government is exogenous, despite the claims in the literature, government can

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[4]See Warr (1983) and Bergstrom, Blume, and Varian (1986) for oilier neutrality results.

always have a real effect by driving donors to corners.[5] To argue that the simple model predicts neutrality is to argue that government is not only exogenous but irrational: it chooses levels of spending that have no effect

An alternative assumption about government is that it is purposive or non-random. When government is acting purposefully, it may be pursuing an agenda of its own, or responding in some way to the preferences of citizens. It is hard to imagine a positive model of government where government does not in some way respond to the preferences of citizens. I will define government spending as endogenous when, rather than being random, it responds to the preferences of citizens. When government spending is endogenous, comer solutions are no longer necessary for government to have real effects. When government behavior is endogenous, theory no longer implies a doUar-for-dollar tradeoff between public and private spending. The relationship between public and private spending depends on the source of the change in public spending and identifiable attributes of the citizens and their preferences.

HI. THE INTERACTION BETWEEN PUBLIC AND PRIVATE AID TO THE POOR WHEN GOVERNMENT IS ENDOGENOUS

In this section I combine the simple model with a model of government and examine the relationship between public and private aid to the poor, I consider the case where individuals are identical and where they are different and allow for public decisions to be made by majority rule or interest group competition.

I assume that there are n taxpayers all of whom are altruistic with possibly different utility functions:

$$U_i = U_i(x_i, x_p) \qquad (4)$$

where x_j is own consumption and X_p is the consumption of a single poor person. The constraints are the same as (2) and (3) above. In addition I assume:

Assumption I: Holding price constant, individuals with higher income prefer higher levels of the public good.

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[5]Warr (1982) and Roberts (1984) acknowledge that comer solutions result in a tradeoff of less than dollar-for-dollar, or non-neutrality. Bergstrom, Blume, and Varian (1986) model the role of comers using the simple model

Assumption II: Both goods are normal.

These two assumptions insure that there is a unique and stable majority rule equilibrium.

Assumption HI: The poor have no income of their own.

This assumption simplifies the diagrams without changing any of the results.

Identical Individuals

In Cournot-Nash equilibrium, when individuals have identical incomes and preferences, individuals make identical positive contributions, or each contributes zero. I show the case of identical positive contributions when there is no government spending in figure 1:
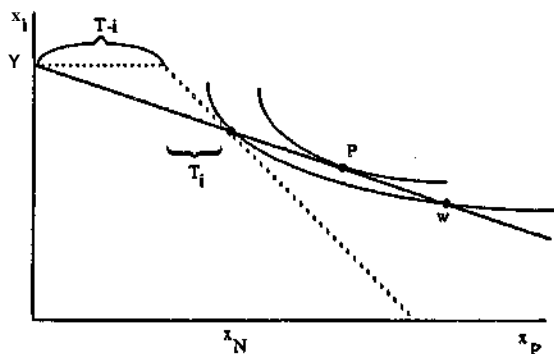

Figure 1

The figure shows the Cournot-Nash equilibrium for individual i, when there are three identical altruists. The opportunities for individual i, given that the others' contributions sum to T_{-i}, are shown as the dotted line. Individual i takes the spending of the other altruists as given, and makes his own contribution, T_i, bringing the total level of spending to x_N, the level in Cournot-Nash equilibrium. Because all three players are identical, T_i equals 1/3 of x_N.

Government intervention will be unanimously favored by altruists and the poor. The altruists unanimously prefer point P, which can be achieved by a head tax. With a head tax, individual income is divided between own consumption, donations to the poor, and the head tax, t:

$$Y_i = x_i + T_i + t \qquad (5)$$

The level of the public good is the sum of public spending, nt, and private contributions:

$$x_p = nt + \Sigma T_i \qquad (6)$$

The head tax allows the altruists to move away from their private endowment Y, along the solid line of slope -1/3. Under majority rule, assuming that there are more altruists than poor, P is the majority rule outcome. If the poor have some political power, they may be able to increase the level of spending beyond the level at P, a possibility I discuss below. As long as the altruists are not carried past w, they will be better off under government intervention than in the private equilibrium.

What is the effect of a one dollar increase in public spending on private spending?

The answer to the question depends on which situation is being considered--out of equilibrium, in equilibrium, or the move from one equilibrium to another. As long as government spending is less than x_N, government spending financed by a head tax is neutral, crowding out private spending dollar-for-dollar. (See Roberts (1984) for proof). But any level of government spending less than x_N has no effect, receives no political support, and therefore is not observed. In equilibrium, the level of government spending is always large enough to crowd out all private spending.

In the move from the pre-government equilibrium to the post-government equilibrium, from x_N to P (or to the right of P), government spending is not neutral. Specifically, the observed tradeoff between public and private spending is less than dollar-for-dollar--the initiation of any government program of P dollars or more causes private spending to fall by x_N.

Once the level of government spending is positive, many factors can increase government spending. These include an increase in the income of altruists, an increase in the political power of the poor, and a decrease in the cost of making a transfer.[6] But the increase in government spending has no effect on private spending when individuals are identical because at every equilibrium with government spending, private spending is zero--there is nothing to be reduced. In the move from one government equilibrium to another there is no meaningful relationship between public and private spending.

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[6]In Roberts (1989b) I show how changes in the scale of population decrease the cost of giving.

In the Cournot-Nash equilibrium before government intervention, individuals are linked by a network of private transfers. Small changes in government spending going from rich to poor, or redistributions across altruists are neutral. But in political equilibrium, government chooses a non-neutral level of spending and eliminates all private spending.

The Role of Heterogeneous Demand-The Case of Non-identical Individuals

Now allow individuals to differ by income and preferences. A world of three non-identical individuals is shown in figure 2:

Figure 2
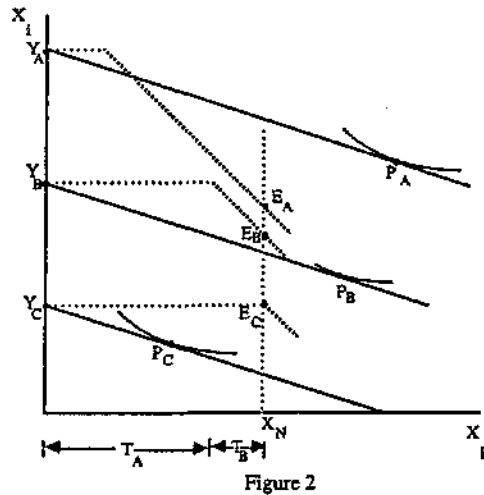
The Cournot-Nash equilibrium for each individual i is Ej. Because Xp is a public good, the equilibrium points must lie on the same vertical line. To keep the diagram uncluttered, I have not drawn in the indifference curves through these points. A, B, and C, are endowed with income Y_i on the vertical axis. The opportunity set in Coumot-Nash equilibrium for each individual is the dashed line beginning at the income endowment, Y_i on the vertical axis. In Cournot-Nash equilibrium, each individual takes the spending of others as given. C takes the spending of A and B as fixed and can move away from E_C along a line of slope -1. I assume with no loss of generality that C is a free-rider-Cs indifference curve at Ec is flatter than -1. Mr. A takes B's gift

as given, supplements it with T_A and finds a tangency of slope -1 at point E_A. B does the same at E_B.

The level of public spending and the relationship between public and private spending depends on the available range of taxes. If taxes can be tailored to each individual's circumstances, what I will call perfectly flexible taxes, the results are very similar to the case of identical individuals: government spending can make everyone better off, and efficiency requires that private charity is zero.[7]

The interesting case is when taxes cannot be tailored to individual circumstances. Assume that the only tax available is the particularly inflexible head tax. With a head tax, every dollar of taxation leads to an $3 increase in the public good. An individual's after-tax endowment is a point on the solid lines with slope -1/3 out of the individual's income endowment on the vertical axis. (I have drawn these lines with constant slope--in fact, at high levels of government spending, lower income individuals will be devoting all of their income to the public good and eventually the tax lines of the richer individuals will kink and become steeper, an effect I ignore.) To find an individual's after-tax endowment, pick a level of x_p and find the vertical intercept of this level of x_p with each solid line with slope -1/3. An individual's preferred level of taxation is at the tangency between his solid tax endowment line and his indifference curves. The three preferred points are shown as P_A, P_B, and P_C.

The level of public spending depends on the nature of the political process. Assume political decisions are made by majority rule and that there is majority support for government intervention.[8] Mr. B is the median voter, and x_M will be the majority rule equilibrium. Neither B nor C will supplement government spending of x_M. B's private spending will be zero because his MRS in political equilibrium will be 1/3. He will be worse off spending privately at the private

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[7]Efficiency requires that the sum of the marginal rates of substitution over the n altruists who care about the poor must be less than or equal to unity. (For proof of why the Samuelson condition must be modified when the public good is the consumption of a group in society, see Roberts (1989a)). If even a single individual makes a private contribution, his marginal rate of substitution equals one, so the sum across all individuals would exceed one (unless there are individuals with negative marginal rates of substitution).

[8]Despite the inefficiency of the private equilibrium without government, a majority need not support government intervention. For proof and discussion, see Roberts (1989b).

price of 1. Mr. *C,* and anyone who made zero contributions when government spending is zero
will not supplement as long as both goods are normal.[9]

Mr A may supplement government spending with spending of his own—it depends on the
relationship between xM, his income expansion path and the tax endowment line. This is shown
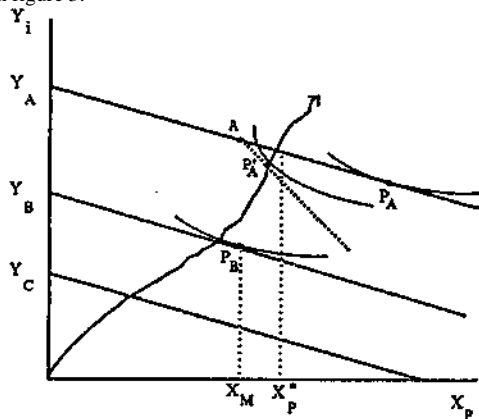below in figure 3:

Figure 3

The curve with the arrow is Mr. A's income expansion path-the set of points where Mr. A's
indifference curves have slope -1. Below the arrowed line, Mr. A's marginal rate of substitution is
less than one. Above the arrowed line, Mr. A's MRS is greater than one. Mr. A can always
choose a different combination of own consumption and Xp from the one he is endowed with by
moving in a southeastern direction along a line with slope -1. If endowed with a point above the
arrowed line his marginal rate of substitution will be greater than one, so a movement along a line
of slope -1 makes him better off. If he is endowed at a point below the line, his MRS is less than
one and further increases in Xp at his own expense make him worse off. Whether an individual
supplements public spending with spending of his own depends on whether his MRS at his
endowment point is greater or less than unity.

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[9]Positive public spending endows a free-rider at a point southeast of the endowment point before government
intervention. If both goods are normal, the MRS at a point to the southeast must be less than it was before. The
free-rider before government interventions remains a free-rider after government intervention.

As drawn in figure 3, given B's preferred point, P3, Mr. A is endowed with the combination
at point A where his MRS greater than one. So a move in a southeastern direction along the
dashed line of slope -1, down to the arrowed line, makes Mr. A better off. Public and private
spending coexist because taxes cannot be tailored perfectly to demands.[10]

What is the tradeoff between public and private spending?

The question is not well-defined because government spending is endogenous. But there is an
observed relationship between public and private spending. Suppose private spending by A is not
zero in political equilibrium, the case shown in figure 3. The relationship between public and
private spending if public spending increases depends on the source of the increase in public
spending.

Consider, for example, a 10% increase in the income of all altruists. Mr. B remains the median
voter. His tax-endowment line shift out parallel leading to a new preferred point with higher public
spending because of the assumption that the consumption of the poor is a normal good. Mr. B's
private spending remains at zero at the new political equilibrium. A's spending may go up or
down. The effect on A's opportunities of an increase in government spending caused by an
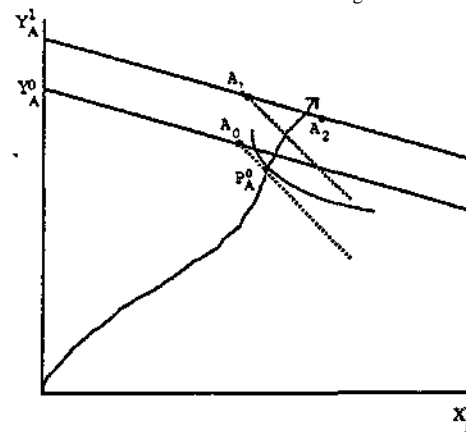increase in altruist income is shown in figure 4:

Figure 4

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[10]An alternative political model assumes A is in control and the level of public spending is the level associated
with P_A. It is easy to show that total private spending is zero in this world, just as in the case of identical altruists.

In the original political equilibrium, before the increase in income, A is endowed at point A_0 and chooses to supplement public spending moving to point $P_A{}^0$. The increase in income results in a new endowment point. The new endowment point lies along the new parallel budget line because A's income has gone up from $Y_A{}^0$ to $Y_A{}^1$. The endowment point must also lie to the right of A_0. How far the new endowment point moves to the right compared to A_0 depends on B's income elasticity for the public good. The figure shows two interesting possibilities--A_1 and A_2. If the new endowment point is A_2, A will continue to supplement private spending--in fact, he increases his spending.

The intuition behind A's increase is that there are two effects of the change in income. One effect is to increase his demand for the public good. If B's preferred point in the new equilibrium left the level of the public good unchanged, then A would unambiguously increase his private spending. But when B prefers an increase in spending, this moves A in a southeastern direction along his tax-endowment line decreasing desired giving. The net effect is ambiguous. If B's income elasticity is sufficiently large, A's new endowment point can be at a point like A_2, a point to the right of A's expansion path where A's private spending is zero.

Government spending in response to increased demand by altruists for public spending is not neutral. But there are no simple restrictions on the relationship between public and private spending. Some restrictions can be derived by restricting the relative income elasticities of A and B--the donors and the decisive voter.

In figure 2, B's spending is positive before government intervention. When government intervenes using majority rule, B pushes himself to a corner. Note however that government spending can have a real effect without driving spenders to a corner. This can be true even in looking at the change from no government intervention to a positive level of government spending.

Suppose for example that B and C both spend zero before government intervention, while A is the only contributor. At the level of public spending preferred by B, A can continues to spend a positive amount after government intervention because of the same intuition shown in figure 4. The increase in government spending from zero spending to a positive amount has a real effect even though no one has been pushed to a corner. When government spending is exogenous,

whether individuals are pushed to a corner depends on whether an individual's tax burden happens to be larger than his private spending before government intervention. When government is endogenous, whether individuals are pushed to a corner depends on the flexibility of taxation and the heterogeneity of demand.

There is a change in public spending that does have a predictable effect on private spending. Suppose there is an increase in the political power of the poor. In a majority rule model, there are no marginal increases in the political power of the poor—either the median voter is poor or an altruist. To allow for small changes in the political power of the poor, suppose the political process no longer chooses the preferred point of the altruists' median voter, but goes beyond this level by an amount that depends on the political power of the poor.[11]

An increase in the political power of the poor moves A's endowment point from a point like A_0 to a point to the southeast along his original tax-endowment line. This change in public spending is exogenous from the perspective of the altruists. It must reduce private spending and may reduce it to zero. It is this change in public spending that is implicit in the literature's discussion of the tradeoff between public and private spending-an exogenous change that endows donors with less private consumption and increased consumption of the public good.

A standard empirical exercise is to regress public welfare spending on a form of private charitable giving. The above analysis implies that the coefficients from such an exercise are only measured accurately if the changes in government spending over the sample period are caused by In increase in the political power of the recipients, an unlikely scenario. Another problem with these empirical estimates is that about half of contemporary private charity is spending on religion, with the rest going to the arts, education, and health. If measured private charitable giving in these areas are not substitutes for public spending, the measured coefficients are meaningless. The appropriate application of the simple model is to find an area where private and public spending coexist because of sufficient heterogeneity and inflexible taxation. Possible places include

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[11]For more formal models of the political process where political outcomes result from conflict among competing interest groups, see Peltzman (1976), Becker (1982), Roberts (1984) and Hirshleifer (1988).

spending on public radio, or spending on state universities.[12] Another example is private and public aid to a foreign country such as Israel.

An Application: Aid to Israel

Consider the relationship between private aid to Israel and U.S. government aid. Let X_p be a measure of Israel's security. For many Jews, Israel's security is a public good. Other Americans may feel it is in America's interest to aid Israel, while others may be indifferent or opposed to aid to Israel. If Israel's security is a public good, the level of private donations to Israel is inefficiently low because of the free-rider problem. A tax on Jews, with the proceeds going to Israel, could solve the free-rider problem and make all Jews better off. Such a tax might be unconstitutional and would certainly be difficult to enforce. Jews use social pressure and other methods to try to overcome the free-riding problem, but they also join with non-Jews supporting Israel to lobby the government for public aid.

Because the taxes are spread out over the entire population, the median Jewish voter desires a much larger level of aid than he or she would want under a tax imposed only on Jews. The median Jewish voter's preferred level of public aid is also much larger than the median voter in the entire population. The political system chooses a level of aid that weights the preferences of Jews and non-Jews who support Israel, and those indifferent or opposed to such aid. At this compromise level of aid, Jewish demand is still positive, even at the private price of a dollar. Private and public aid coexist.

• A threat to Israel's security, such as the Six Day War in 1967, is a decrease in the endowment of the public good. If Israel's security is a normal good, this increases desired public aid by the median Jewish voter. But the political process will choose a smaller increase in public aid because of the compromise between the most ardent supporters of Israel and those who are less ardent. As a result, some supporters of Israel may have higher unsatisfied demand for aid than they did before.[13] The model does not predict that the increase in public aid to Israel would crowd out private aid dollar-for-dollar, or at all.

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[12]See Kingma (forthcoming) for an analysis of crowding out in giving to national public radio.
[13]There may be an increase in private demand even without the role of compromise with non-supporters of Israel as long as their is sufficient heterogeneity in the population of supporters.

In fact, both private and public aid increased in 1967. Using an analysis where government is exogenous, one would have to conclude that supporters of Israel were not motivated by altruism towards Israel or that government spending has some ad hoc "seeding" effect-when government spending increases, individuals are somehow encouraged to give on their own. When government is endogenous, the positive relationship between private and public spending is consistent with altruism as a motivation for private spending.

IV. THE INTERACTION BETWEEN PUBLIC AND PRIVATE AID TO THE ELDERLY WHEN GOVERNMENT IS ENDOGENOUS

The previous section explored the interaction between private and public aid to the poor. This section examines private and public aid to the elderly. The analysis changes because the structure of preferences that produces a demand for public aid to the poor, and degree of heterogeneity is different when examining aid to the elderly. The result is a set of additional results about why public and private aid to the elderly coexist, and how they interact when public aid becomes more generous.

When children value the consumption of their own parents and there is more than one child in a family, the consumption of the parents is a public good.[14] If children can cooperate and agree on the level of transfers to their parents and the division among the children of the responsibility for support, then the parents' consumption will be at an efficient level, and there will be no demand for government intervention on efficiency grounds. This is the world of Barro (1974). There may still be a demand for government aid to the elderly for purely redistributive purposes unrelated to altruism, a possibility discussed below. For now I focus on the case where free-riding among the children within a family produces a demand for a social security system.[15]

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[14]Individuals do not care only about the elderly in their own family. They also care about the elderly who are poor in other families. Today, people rarely make private transfers to other people's parents, only to their own. In Roberts (1989b) I show why we would expect private spending on other people's parents to be zero. At the turn of the century there were numerous private charities that aided the poor elderly. With the advent of social security, and later, the Supplemental Security Income program, these charities disappeared.

[15]In Becker and Murphy (1988), the problem of cooperation between generations generates a demand for social security spending when children and parents are "insufficiently" altruistic. Children would be willing to compensate their parents in return for educational expenditures. But children have an incentive to welch on the agreement after schooling is completed. Social security spending combined with public educational expenditures solves the commitment problem.

I make assumptions I, II, and III, as before, where here assumption HI is that the elderly have no income of their own. This last assumption is not as innocuous as in the case of aid to the poor. It allows me to ignore issues of reciprocal altruism going from old to young and combined with Assumption I defines a median voter when I wish to examine majority rule.[16]

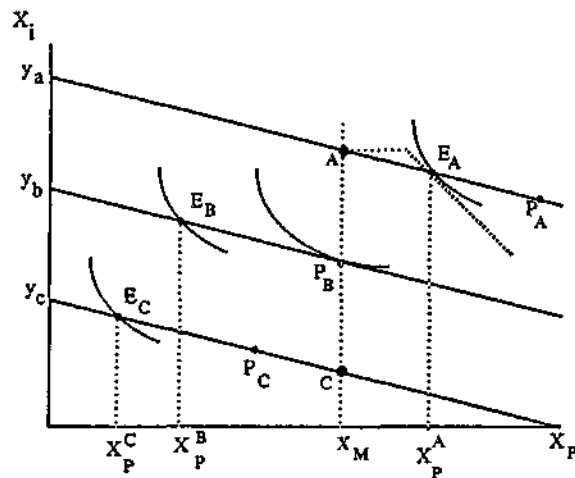The equilibrium is shown in Figure 5 below:

Figure 5

The vertical axis is the consumption of a typical child of the elderly within a particular family. The horizontal axis measures the consumption of the elderly in the family. Assume that each elderly individual is loved by three identical children but who differ across families. As in the case of the poor, I assume for simplicity that the endowment of the elderly is zero. A young member of a family can, in principle, move along a line of slope $-1/3$~a $1 increase in own consumption could, if matched by contributions of siblings, lead to a $3 increase in the consumption of the elderly. These lines of slope $-1/3$ are shown in figure 5 as solid lines out of the endowment point on the vertical axis. I have labeled the endowment points on the vertical axis in lower case to emphasize that they are for an individual and not the family.

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[16]See Becker (1981), Altig and Davis (1989) and Roberts (1989b) for discussions of reciprocal altruism.

To dramatize the difficulty of cooperation, I again make the Cournot-Nash assumption--within a family, family members treat the gifts of others as fixed when making their own contribution. The consumption allocations between young and old under Cournot-Nash equilibrium are shown in the figure as E_A, E_B, and E_C, with associated levels of consumption for the elderly of each family equal to x_p^A, x_p^B, and x_p^C. The indifference curve farthest to the right belongs to an A family child, the two in the middle belong to a B family child and the leftmost one belongs to a C family child.

Each child has an MRS equal to 1 in Cournot-Nash equilibrium, the slope of the budget line, given the contributions of the other siblings. Each family's equilibrium can be represented by the identical altruist case in figure 1, with each family enjoying a different level of the public good. The sum of the MRS within a family is three, an inefficiently low level of consumption by the elderly in the family. Each family would prefer the points shown as P_A, P_B, and P_C where family members cooperate and where each individual has an MRS equal to $1/3$. I have not drawn in A and C's indifference curves at these points.

In this world, an efficient social security system would tax each family a unique amount depending on its resources and preferences, and transfer the proceeds to elderly family members in order to achieve the preferred points, P_j. If such a scheme were possible, public aid to the elderly would eliminate all private transfers. In the real world, the level of aid to the elderly cannot be tailored to the circumstances and tastes of each family. The result will be a level of aid that will be supplemented by those families with larger demands for redistribution.

For example, consider the political equilibrium under a head tax with the proceeds divided equally by the elderly. As long as the level of social security benefits for the elderly is less than x_p^C, government spending will have no effect. Private spending on the elderly will fall dollar-for-dollar with social security spending. No one supports such a small social security system. Small increases in the social security benefit beyond x_p^C, make the poorest family better off and leave the other families indifferent. (If families are not the same size, then the head tax will not leave families on the budget lines of slope $-1/3$. Small, poor families have an incentive to use the social security system as a way of expropriating wealth from large, rich families.)

Under majority rule, the level of social security spending is the level at P_B. As drawn in the figure, the A family re-establishes the old Cournot-Nash equilibrium. Each of the three siblings faces the dashed budget line out of the endowment point "A" and achieves the old allocation. Whether there is private supplementation depends on whether Xp^A is to the left or the right of *PQ*. But there is no tendency for private aid to be zero. Think of the diversity in the level of transfers when there are millions of families. Efficiency may require a level of public aid high enough to wipe out all private aid if the richest families are unable to cooperate. But imposing a social security benefit equal to the level associated with P_A will make all those at lower incomes dramatically worse off. Avoiding the harm that would come to B and C would require a flexibility in social security benefits and taxes that we do not see in the real world.

One way to solve the inflexibility of taxes is to make benefits non-uniform. The system will try to tailor benefits to family circumstances. If richer children prefer larger benefits, and if parents of rich children had larger incomes during working years, then the current system of having benefits be a positive function of previous earnings makes sense. This mechanism will be imperfect for a variety of reasons: some rich children will have even richer parents and will want a small level of benefits; some rich children will have poorer siblings. The median voter may be the poor child of a rich family and still prefer a small benefit level if taxes are inflexible. The assumption of uniform benefits highlights the role of heterogeneous demand.

What is the relationship between public and private spending on the elderly?

• In this simple model with uniform benefits, the establishment of social security is neutral for those families still making positive transfers. For those families with income equal to or below the median, the effect is non-neutral because families are endogenously pushed to a corner. As long as C's demands at price 1/3 are large enough, every family is either indifferent to social security or better off.

What about the effect of an increase in social security spending once it has been established? As in the case of public and private aid to the poor, the relationship between public and private spending depends on the source of the increase in public spending. Figure 6 shows the effect of an increase in the income of the young holding the income of the elderly constant:
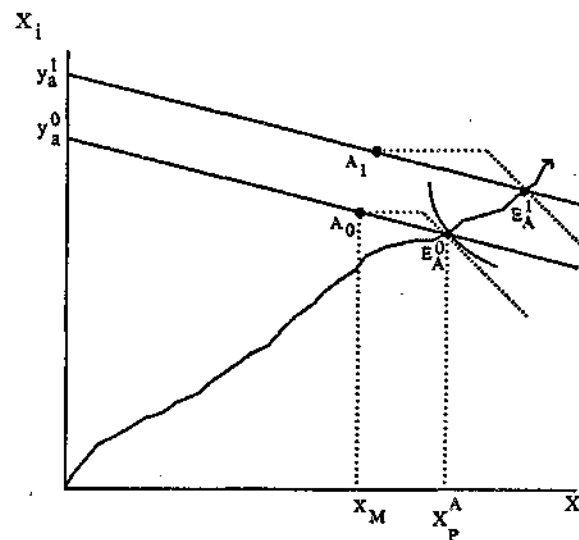
Figure 6

The rich A siblings are initially endowed with allocation Ao by the political choice of the B family members. When income increases, social security becomes more generous, as the tangency of the B family members (not shown) moves to the right. Now the A family siblings are endowed at a point like Aj, vertically to the right of A_0, along the new income line that begins at y_a1. The arrowed line is the income expansion path of the A family. The figure shows a case where the A family makes larger private contributions after the expansion of social security than before. The A family contributions may fall if the new endowment allocation is far enough to the right along the new income line. Private spending by the A siblings falls to zero if the new tangency for B is to the right of the income expansion path, to the right of $E_A{}^1$, the new Cournot-Nash equilibrium of the A family when income of each sibling is y_a1.

Purely redistributive factors play in role in determining the size and existence of social security. To allow a role for redistribution for reasons other than altruism, let parents have different numbers of children including zero. A recent survey of the elderly in Massachusetts (Kotlikoff and Morris (1987)) found that 20% of the elderly did not have living children. This group will prefer larger

levels of social security benefits than those with children.[17] Suppose as before that the political process takes the preferred point of the median young person and increases social security spending beyond this point depending on the political power of the childless elderly. Then an increase in the political power of the elderly is a southeastern movement along a tax-endowment line. This crowds out spending of those making positive contributions, dollar-for-dollar. The aggregate effect is less than dollar-for-doUar, as some families are already at a corner. The case of aid to the elderly differs from the case of aid to the poor because the consumption of the elderly is essentially a local public good with uniform public provision. This is what causes the effect of an exogenous increase in government spending to crowd out spending dollar-for-dollar for those who remain donors.

As in the case of aid to the poor, the relationship between public and private spending is ambiguous unless public spending changes because of a change in the political power of recipients. This is also the only case when the standard exogenous model of government is appropriate.

Ricardian Equivalence

A much debated issue in the literature is Ricardian equivalcnce-whether transfers from young to old such as social security or debt finance are neutral. Two senses of "neutral" are used in this debate-whether policies are neutral with respect to the consumption of the elderly, and whether policies are neutral with respect to some aggregate variable such as national savings. If an intergenerational transfer is neutral with respect to the consumption of the elderly, it is likely to be neutral with respect to aggregate variables. But the reverse does not hold-an intergenerational transfer that is neutral with respect to aggregate saving may still have a real impact on the consumption of the elderly. Here I discuss the stronger sense of Ricardian equivalence-whether intergenerational transfers are neutral with respect to the consumption of the elderly.

In Barro's world (Barro 1974,1989), there is no externality in private transfers going from young to old or from old to young. A single family head is linked to future generations by altruism from the old towards the young. Barro (1989) argues that Ricardian equivalence is a useful

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[17]In addition, when a family's tax burden is not tied to a family's benefit (as it is not in the real world), social security redistributes resources across families. Beneficiaries of such redistribution also favor starting a social security system. Other than these types of beneficiaries among the young, the young will oppose a social security system.

approximation as a benchmark for evaluating government policies. Ricardian equivalence only holds approximately because a sufficiently large increase in government spending can push people to comers.

There are two problems with this perspective. The first is that if the effect of social security on the consumption of the elderly is approximately zero, why is there a social security system? Even if there is a "small" effect of social security, the beneficiaries of social security spending in Barro's world are elderly with no children, elderly with children who at the margin do not love their children, and families whose tax contribution to social security is less than the size of their benefits. Increases in social security spending must come from increases in the political power of these groups.

Bernheim and Bagwell raise an additional criticism of Barro: when families are linked by marriage, the intergenerational altruism in Barro's world leads to absurd neutrality results. But these neutrality results only apply to exogenous changes. Even when government spending is exogenous, government can be non-neutral by driving donors to a corner solution. When government spending is endogenous, it does not have to drive people to comers in order to have real effects.

If public aid to the elderly improves a problem caused by free-riding, Ricardian equivalence is not likely to be a useful benchmark in predicting the interaction between public and private transfers across generations. It is more likely to be a useful benchmark for cases of "exogenous" changes where the generation receiving the transfer does so because of an increase in its political power or where private aid to the elderly is at an efficient level, but social security exists for purely redistributive reasons.

The results here also suggest that the effect of deficit finance may be very different from social security depending on the motivation behind the policy. Each program has a very different set of implicit or explicit taxes and transfers. If, for example, the goal of deficit finance is not to redistribute income across generations, but rather to smooth the burden of taxation, then it may be neutral, or have a smaller effect on intergenerational consumption than a social security system that is designed to increase the consumption of the elderly.

V. CONCLUSION

This paper uses simple models of private and public behavior to model the relationship between public and private spending. When government decision-making is responsive to the preferences of citizens, the observed relationship between public and private spending is not dollar-for-dollar, nor does government have to push citizens to a corner solution in order to have real effects. The standard discussion of the relationship between public and private spending assumes that public spending is exogenous. The two approaches are analytically similar only when the source of the increase in government spending is an increase in political power by the recipients or when there is a truly exogenous change.

Bemheim and Bagwell (1988) are ultimately bothered not by any particular false empirical implication of the simple model but by its sheer implausibility.[18] Their model of families linked by marriage is Becker's rotten kid theorem with a vengeance-an entire society can acts as if it is part of one enormous family, which seems absurd. Bemheim and Bagwell's argument is essentially argument by disbelief.

Believability is a tough requirement for an economic theory. It might lead to the rejection of general equilibrium theory-how could an increase in the income of Englishmen increase the demand for tea, drive up the price of sugar, lower the demand for soft drinks, increase the demand for fruit juice and result in more oranges being grown in Florida? How absurd! For many changes we would ignore the impact of an increase in English income on the number of orange trees in Florida. For other problems, it might be more important.

What is absurd to some may appear plausible to others. Suppose a tornado damages some houses but not others in a small town where everyone makes donations to the same church. The simple model predicts that the net effect on the variance of private consumption is going to be very

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[18] For example, Bemheim and Bagwell reject the possibility that corner solutions can explain the non-neutrality of real-world redistributions: "While there are both empirical and theoretical reasons for doubting that most individuals make positive transfers, we are unable to fully attribute oar disbelief to this assumption. We suspect that the thrill of victory aside, most individuals would prefer winning $1,000 in a lottery to learning that one of their siblings has won $1,000, despite the expectation of future transfers from the parent. Yet dynasticism implies that one should be indifferent." But certainly some siblings are. Even so, the simple model does not imply that siblings are always indifferent. As the size of the prize increases, the parent is increasingly unable to offset its effects and siblings are increasingly less likely to be indifferent. See also the quote from Bemheim and Bagwell (1988) in section II above.

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different than if New York City were hit by a similar natural disaster. If the tornado that hits the small town is small enough, the simple model implies that people making contributions to the church adjust their donations in a way that largely neutralizes the effect of the tornado. Complete neutralization is more likely if the tornado somehow benefitted some families by the amount it harmed others. If some families are harmed by an amount that exceeds their religious contributions, complete neutralization is unlikely without interfamily altruism. If a tornado hits a large city where private spending on public goods is less prevalent, there are fewer links to allow individuals to offset the effects of the natural disaster. These implications of the simple model using a true exogenous change are testable.

Alternatives to the simple model assume that individuals receive private benefits from making transfers such as attention from their children in the case of transfers from old to young, or a "warm glow" in the case of donations to private charity. Adding private motivations to the simple model does lead to additional implications.[19] Adding private motivations to the simple model can result in non-neutrality for even random increases in government spending. But unrelated individuals are still linked by a network of transfers so that a transfer between two unrelated individuals can be offset (although only partially perhaps) by a change in private spending.

What assumption is responsible for the linking and the subsequent neutrality results for exogenous redistributions? The key is the publicness of the object of the transfers-either a charity or a family. One way to avoid the implications of linked individuals is to assume that all transfers, Before and after government intervention, are motivated by entirely private motives. The empirical evidence for completely private motivation is weak at best in either the family context or the case of contributions to the poor.[20] The theoretical implications are just as ludicrous as the incorrect

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[19] Recent papers that explore a private motive for giving include Andreoni (1987), Roberts (1987), Steinberg (1987), and Schiff (1985).

[20] Two papers that have examined the exchange motive behind intrafamily transfers are Bemheim, Shleifer, and Summers (1985) and Cox (1987). Bemheim, Shleifer, and Summers assume that at the margin, transfers from parents to children are not motivated by love but by a desire to purchase services such as attention through visits and letters. Their test of the model is that parents with more than one child are able to expropriate surplus from their children by threatening disinheritance. They are unable to convincingly commit to such a policy when there is only a single child. In the multiple child case, one child is played off against another. Bemheim, Shleifer, and Summers find that parents with larger estates get more attention from children in multiple child families, but find no relationship in single child families. They argue that this empirical finding is not predicted by a pure altruism model. But the finding is misleading. The finding holds for families with two children, but not for families of three children. These latter families should have even a stronger relationship between size of estate and the amount of attention, since three children are less able to collude against the parents than two. In addition, the results are biased

interpretation of the all-public motivation of the simple model. If all transfers are private then all government transfer programs are pure redistributions unanimously favored by recipients and unanimously opposed by the taxpayers.

The simple model does not capture every aspect of voluntary transfers. The appropriate model depends on the problem being considered. When looking at some problems it may be useful to assume that individuals get a private return from giving or that social pressure can be used to overcome free-riding. Sometimes it may be useful to assume that people have a purely private exchange motive in making transfers to others. The simple model, like every model in economics, is "wrong." But when combined with a model of government behavior, it is a powerful framework for analyzing government spending, corner solutions, the flexibility of government policies, and the heterogeneity of citizens.

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by the correlation between income and family size. Holding wealth constant, a family with many children will provide less attention per child than a family with fewer children, since there are more children available to provide attention. Since wealthy families are smaller than poorer ones, there will be a spurious correlation between wealth and attention per child built into the data. This bias will be worse in the likely case that attention is a normal good: wealthier parents will want more attention than less wealthy ones, and will have fewer children to provide the larger total. Cox (1987) finds indirect evidence for an exchange motive --increases in the income of children increase transfers from parents, which runs counter to the altruism model. Unfortunately, Cox does not have data on donor's income, though he has some results which suggest his proxies for donor income are successful. For a discussion of the empirical work on the publicness of private charity, see Roberts (1986).

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