SOME EFFICIENCY EFFECTS OF PUBLIC AND PRIVATE TRANSFERS: A CROSS-SECTIONAL ANALYSIS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

In the U. S., a significant amount of income is redistributed through transfers in both the public and private sectors. Although there has been a great deal of attention focused on public transfers, the role of private transfers, and their interaction with public transfers, have been relatively neglected. The objective of this study is to evaluate and compare both types of transfers. This chapter begins with a discussion of the criteria used for this evaluation, followed by a brief statement of the nature of the problem, and the purposes, and organization of the study.

The Criteria

In general, to evaluate income transfers, the criteria employed are adequacy, equity, efficiency and effects on capacity output.[1] Efficiency includes: (a) technical efficiency (transfers should be managed at the least cost, and we should spend the least amount on transfers while still achieving social goals), (b) allocative efficiency (the aggregate level of income transfers should be Pareto optimal), and

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[1]Lampman (1972) specifies that there are four competing mentalities in making the income transfer decision: the minimum-provision mentality, the replacement of loss mentality, the horizontal and vertical equity mentality, and the efficiency of investment mentality. The criteria here are mainly derived from Report of Joint Economic Committee (1974).

(c) other efficiency (social welfare losses caused by transfers should be reduced or eliminated[2]). This study will address the technical and allocative efficiencies of public and private transfers with respect to income redistribution. Specifically, we focus on ways to improve income equality in an aggregate sense; namely, the relative advantages of privately funded income transfers as against publicly funded programs in achieving an efficient redistribution of income and supply of transfer incomes are examined.

In the dispensation of benefits, both public and private income transfers have features that are detrimental to achieving the objective of reducing poverty and income inequality. The alimony and child support payments involved with divorce decrees do not necessarily represent an income transfer from the rich to the poor. In addition, gifts and estates do not necessarily convey the message of philanthropy. It is easy to imagine that a significant part of inter-family transfers would go to persons associated with the donors genetically or socially. For some voluntary charitable activities, transfers are from lower to higher income people. In the United Way, for example, contributions from lower income people are used to support the Boy Scouts, medical research, and

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[2]There are other efficiency problems caused by income transfers. Many students have assumed that transfers are costless economically and raise essentially noneconomic problems. Tullock (1971b) argues that the transfers, either public or private, may be costless, but that transfers lead to conflict, and the investment of resources in obtaining transfers or attempting to avoid transfers being taken away represent net social waste. In voluntary charity, the takers would invest resources in becoming a more suitable object of charitable activity and the givers would try to avoid its happening. In public transfers, the conflicts could be envisioned in the form of lobbying costs people spend. While income transfer may create welfare losses (Browning, 1978), transfers may also increase efficiency--e.g., improved job-worker matches (Danzinger, Haveman, and Plotnick, 1981).

other organizations and activities which benefit higher income people.

As for the public income transfers, transfers through the political process are related to political power and, consequently, are generally to politically powerful groups not defined by income, including farmers, college students, older people, and "the intellectual class" (Tullock, 1971a, p. 383). Director's Law of Public Expenditures indicates that the primary beneficiary of income transfers is the middle class, not the poor.[3] In reality, transfers occur through a wide variety of programs, but the groups benefitting from these programs are often not defined by income.

As for the supply of income transfers, according to Friedman (1962), the poor would receive a sub-optimal amount of redistribution through private charity. This implies that the greater equality of income may be in the nature of public goods. Charity indicates utility interdependence, which, in turn, generates an externality. Thus, by uncoordinated individual activity, income transfers will not be sufficiently provided; there is an allocative efficiency problem. In comparison with private transfers, public transfers will not have this problem, no matter what philosophies they are based on--a matter of legal right or charity.[4] Therefore, in examining allocative efficiency

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[3]The philosophy of Director's Law is as follows. Government has coercive power, which allows it to engage in acts which could not be performed by voluntary agreement of the members of a society. Any portion of the society which can secure control of the state's machinery will employ the machinery to improve its own position. Under some conditions, this dominant group will be the middle income classes. For details, see Stigler (1970).

[4]Orr (1976) concludes that the public goods theory of income transfers perfectly explains the reality of AFDC programs. But Tullock (1971b, p. 637) contends that "the government income redistribution is carried well beyond the point where those who are paying for the

of income transfers, only private income transfers will be covered. Furthermore, it is necessary to differentiate the insurance type from welfare type of private transfers.[5] Economic theory (Rea, 1981) suggests that the decision to purchase insurance is just like any consumption decision. The only difference is that the insurance decision involves a choice between the amount of utility the consumer will have under each alternative outcome or state of nature. Through the free market mechanism, Pareto optimality could be obtained. Therefore, the allocative efficiency of income transfers should be limited to the welfare type of private income transfers.

In summary, there are problems of market failure and government failure in income redistribution. The possible free-rider problem may result in a sub-optimal supply of private transfers. Some features of private transfers may make the redistribution from the rich to the poor trivial in amount. All these seem to lead to a conclusion that private transfers are associated with both technical and allocative inefficiencies in income redistribution. However, there is strong evidence that some government redistribution takes place within the middle class. Therefore, any assessment of private transfers logically requires an assessment of the non-market failures associated with public transfers.

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[4](Continued) redistribution benefit in utility" and the view of Pareto optimal redistribution only explains a small amount of government redistribution. Kennett (1980b, p. 343), in the second part of a series of papers discussing altruism and economic behavior, says that "the size of the Welfare State should not be perceived as being motivated by an increase in collective altruism. In a real sense it is in response to a demand from below, rather than the result of sympathy from above."

[5]Income transfers can be divided into two categories--insurance (contributory), where the recipient has contributed to the funds, and welfare (non-contributory), where the funds are provided entirely by someone other than recipient.

In this study, the effects caused by revenues to finance these transfers will be neglected intentionally. In addition, only money income transfers are considered.

Brief Statement of the Problem

In recent years there have been many studies on the income redistribution effect of government income transfers. Some of the studies are those by Gottschalk (1981); Smeeding (1977, 1979, 1981); Danziger (1977); Danziger and Plotnick (1977); Danziger, Haveman, and Plotnick (1980); Browning (1976, 1979); Benus and Morgan (1975); and Reynolds and Smolensky (1977, 1978). Despite substantial variation with respect to the income unit, income definition, income accounting period, valuation of in-kind benefits, and choice of ranking methodology, these studies are in basic agreement that the redistribution impact of various government transfer programs has increased over time, but not as rapidly as the increase in transfer expenditures (Danziger, Haveman, and Plotnick, 1981). However, although the literature has steadily improved due to new data sets and econometric advances, there is no unanimity of agreement on the magnitude of this effect.

Furthermore, these redistribution studies do not adjust for the replacement of public by private income transfers in the absence of the former. This leads to two questions:

1. Is there a difference between the redistribution effects of public and private income transfers and how large is this difference?
2. Is there some substitution between public and private income transfers, and how large is this effect?

Surprisingly, there have been only a few studies (Morgan, David, Cohen, and Brazer, 1962; Lampman, 1972, 1982; Vickery, 1962; Kennett, 1980a, 1980b) of the comparison of the redistributive effects of public and private income transfers. Furthermore, in addition to some casual observations, the existing studies rely on relatively simple calculations on aggregate or micro-data bases to derive the magnitude of the redistributive effects. For example, after transfers are distributed, these authors either compare the pretransfer income with the posttransfer income for the lowest quintile of population or compare the Gini coefficients between pre- and posttransfer incomes. As a result, the range of estimated redistributive effects is quite narrow.

Furthermore, the resulting estimates are highly aggregated; of the total redistributive effect we do not know how much should be attributed to the variation in the overall level of transfers, how much should be attributed to the change in the degree of transfer progressivity,[6] what the effect is of the interaction between the overall transfer level and the degree of progressivity in terms of income redistribution, and how this interaction can be captured in a more systematic way. These are problems which have not been resolved.

There are several studies on the determinants of private charitable giving, of which the public income transfer is considered to be an element. Among these studies are those by Schwartz (1970), Nelson (1975), Abrams and Schmitz (1981), and Reece (1979). The empirical results, however, have failed to show clearly the nature of the relationship between public social welfare expenditures and private charitable giving.

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[6]The degree of transfer progressivity refers to the distribution of transfer payments, as measured by a concentration ratio.

In addition, the discussion of private philanthropy gives rise to an immediate question of the public goods character of private charitable activity. Suppose that the concern about others is an argument in an individual's utility function. Is the consumption of this "concern" non-rival? Is exclusion possible? If it is in the nature of a public good and Pareto optimality is used as a guide to income redistribution, the optimal transfer mechanism would be governmental redistributive activities, rather than private ones. There has been considerable controversy among economists on this subject (Thurow, 1971; Hochman, 1972; Hochman and Rodgers, 1969, 1973, 1974; Von Furstenberg and Mueller, 1971; Becker, 1974; Orr, 1976; Pasour, 1981; Mckenzie, 1981; Warr, 1982; Sugden, 1982; Ben-Zion and Spiegel, 1983). Despite the controversies, the previous studies all focus on the giving side of private philanthropy, leaving out the receiving side; i.e., they neglect distributional aspect of private giving. People not only decide how much they will give to others, but they also decide how this giving will be allocated among many recipients. Furthermore, the relationship between public welfare expenditures and private giving has been ingeniously connected in the public goods theory of private giving. However, testing of this theory has been limited to the case of utility interdependence, which is only one of three assumptions that can be employed in the public goods theory of private giving.

Purposes of the Study

This study is an attempt to address the shortcomings and controversial issues discussed above. The first purpose of this study is to review and evaluate the literature on redistributive effects and to

develop a theoretical model for decomposing the total effect on distribution into the separate effects of transfer progressivity, the overall level of transfers, and the underlying distribution of income.

The redistributive effect of private income transfers is a subject which has been relatively neglected, to my knowledge. But it is an alternative to public income transfers as a means of redistributing income. Thus, any full assessment of the redistributive effect of public income transfers must also consider the impact of private income transfers. In this study, a decomposition rule is developed for this purpose, and a thorough comparison of public and private cash income transfers, in terms of their redistributive effect, will be accomplished. This part, in other words, focuses on the technical efficiency of income transfers in achieving the objective of reducing income inequality.

The traditional economic analysis of private giving will also be reviewed and evaluated, and some modifications and extensions of this analysis will be made. This study focuses specifically on those private gifts which result in cash income transfers and will examine the substitution relationship between public cash income transfers and private cash welfare income transfers. As opposed to the private insurance income transfers, the private welfare income transfers may take on the character of public goods. This matters very much for policy in light of the efficiency differences in income redistribution between public and private income transfers. By this undertaking, both the substitution relationship between public cash income transfers and private cash welfare income transfers and the public goods character of private cash

welfare income transfers can be examined simultaneously.[7] This part, in other words, focuses on the allocative efficiency aspects of private welfare income transfers in relation to income redistribution.

Organization of the Study

The chapters of this study are organized as follows. Chapter II reviews and evaluates the previous studies on the redistributive effects of public and private income transfers and the public goods character of private charitable giving. Chapter III explains the methodology employed in this study. Chapter IV develops theoretical models of income transfers for comparing the efficiency of public and private income transfers in achieving the goal of reducing inequality and for analyzing private welfare income transfers. Chapter V presents the regression equations and describes the data sources and variables used in the study. Chapter VI presents the empirical results. Chapter VII provides a brief summary and conclusion of the study.

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[7]The interrelationship between public income maintenance benefits and private insurance will not be discussed here. There has been some analysis (Ehrlich and Becker, 1972; Rea, 1974, 1981; Musgrave, 1968) of the impact of the public welfare programs on the decision to purchase insurance against loss of income. Rea (1981) has demonstrated that income-tested welfare programs will induce a substitution of public for private disability insurance coverage. In addition, the private retirement system is built on the foundation of the much more comprehensive retirement system--social security. The level of benefits under private retirement plans are established, consciously or unconsciously, as a supplement to anticipated OASDI benefits (Taggart, 1973). The expansion of social security taxes and benefits over several years would squeeze the private retirement system.

CHAPTER II

REVIEW OF PREVIOUS STUDIES

In constructing the test discussed in this study, we refer to and build upon previous studies in the areas of income redistribution and private philanthropy. In this chapter we briefly survey some of this work.

Redistributive Effects of Public and Private Income Transfers

Any analysis of the effects of transfers on the size distribution of income must begin with a choice from each of four constructs: the pretransfer and posttransfer income concepts, the income unit and the income accounting period. As stated in Danziger, Haveman, and Plotnick (1981, p. 982), the agreement on the principles of the choice of these constructs is that "an ideal study should measure inequality in command over resources, among income-sharing units, over some specified time period, adjusting for 'needs' and life-cycle differences."

Any measure of redistribution involves comparing a distribution of income before transfers with a distribution after. This implies that a basic conceptual and empirical problem in measuring redistributive effects concerns the definition of the counterfactual--what would the distribution of income be in the absence of existing transfers? The full set of general equilibrium changes in relative prices and incomes that would occur if transfers were removed should be recognized in defining the

counterfactual. Among them, the labor supply, savings, and changes in living arrangements, are the most obvious behavioral responses. Reynolds and Smolensky (1977) have addressed the definition of the counterfactual, examined four different concepts of redistribution and concluded that the "true" pretransfer income can not be measured. Therefore, most studies measure redistribution as the simple difference between final income (posttransfer income) and income excluding transfers (pretransfer income). This comparison assumes that transfers elicit no behavioral responses that would cause income without transfers to deviate from observed pretransfer income. However, there are potential labor supply, savings, and living arrangement effects induced by transfers. Hence, to the extent that the availability of transfers induces individuals to alter their behavioral responses, estimates of the redistributive effects of transfers will be biased.

Size distributions of income for any time period are constructed by assigning incomes to income units and then arraying the units by size of income. Economists are well aware that such measures are imperfect. The income concept, the income unit, and the income accounting period used in constructing size distributions of income are far from ideal.

Family units are the conventional base for many income statistics and represent the unit which shares decisions concerning living arrangement and means of support. Distributions based on other income units, e.g., the individual income recipient, the household, or the spending unit, have also been constructed. The aggregate nature of the family unit has been criticized, and cited as a source of bias in the measurement of inequality. Kuznets (1974) and Danziger and Plotnick (1977) have shown that the failure to account for changes in the demographic

composition of units, e.g., the increase in the number of single person units or units headed by the aged, has imparted an upward bias to the trend in measured inequality. Danziger and Taussig (1979) have addressed the problem of the treatment of the income unit as an aspect of the choice of weighting schemes in the construction of size distributions of income. They argue that the conventional measurement, in which the weight given to each income is the same for all family units independent of their size, is not consistent with individualistic welfare functions and has upwardly biased both the level and the trend in income inequality.

The differences in income concept also affect the measures of income inequality. The income employed could be factor income, money income (factor income plus transfers), disposable money income (money income less federal income taxes) or net real income (disposable money income less cost of earning income, plus nonmoney income). The differences in them have substantial impact on the Gini coefficients (Benus and Morgan, 1975). The valuation of nonmoney income is a controversial subject. Another empirical problem is that many sources of income--especially transfers received by the poor and property income received by the rich--are underreported.

For many transfers--especially those that are age-related--a multi-year or even lifetime accounting period is relevant for analyzing redistribution. The allocation of transfer benefits implies that we in fact compare an average individual in one income bracket with an average individual in another income bracket. There are few average people and the position of individuals within each bracket is dispersed. If the transfers tend to accrue in line with certain characteristics such as

age and employment, the single year measurement is not meaningful anymore and a longer period or lifetime pattern is called for (Musgrave, 1980). For example, social security payments are age-related and would mainly represent a transfer of resources by each individual from an earlier to a later period. Hence, the payment should be treated in the same manner as private savings and their redistributive effect on lifetime income would actually be zero.

Recently, several methods for both refining the income concept (Browning, 1976, 1979; Smeeding, 1977, 1979, 1982) and adjusting for changes in income unit (Danziger and Plotnick, 1977; Danziger and Taussig, 1979) have been suggested. Economists have also begun to address the problem of moving from a size distribution of annual income to one of multiyear or even lifetime income (Benus and Morgan, 1975; Mayer, 1974; Carlton and Hall, 1978; David and Menchik, 1979; Von Weizsacker; 1978). In general, we can summarize that (1) as the unit of analysis is broadened to include the earnings of all family members, the distribution of income becomes more equal, (2) the choice of income concept substantially affects the results on income inequality, and (3) annual income inequality exceeds that of lifetime income by more than it exceeds inequality in multiyear income. According to Benus and Morgan (1975), except for some subgroups, the unit of analysis and the measures of income seem to have more effect on measures of inequality than the length of the accounting period.

Public Income Transfers

A large number of empirical studies have focused on the effect of public income transfers on the income distribution. Only a few of

these studies will be mentioned here. For a comprehensive review of studies on redistributive effect of public income transfers, the readers are referred to Danziger, Haveman, and Plotnick (1981).

Previous redistributive studies focus on three aspects of the effect of transfers; (1) the effect on income poverty, (2) the effect on the lowest quintiles income share, and (3) the effect on the Gini coefficients. The first one refers to the absolute impact of transfer on the incomes of the poorest units. The others refer to a relative dimension.

Smeeding (1977) adjusts the census data for underreporting, and imputes values for federal personal income and payroll taxes, and for in-kind transfers (food, housing, and medical care). He finds that transfers significantly reduce poverty and that this redistributive effect has grown over time as the amount of transfers has increased. In 1968, cash transfers reduced poverty from 23.1 percent to 12.3 percent, a reduction of 47 percent. By 1972, cash transfers reduced poverty from 24.9 percent to 10.7 percent, a reduction of 57 percent. If in-kind transfers are added, the total percentage reduction of poverty are 53 percent and 73 percent for 1968 and 1972, respectively.

Gottschalk (1981), in his projections of poverty into the 1980's, also presents the evidence of the incidence of poverty before and after cash transfers for various years. The cash transfers reduced poverty from 31.3 percent to 21.7 percent, a reduction of 31 percent in 1963. In 1975, poverty has been decreased from 31.8 percent to 13.7 percent, a reduction of 57 percent.

All of the studies show a large impact of transfers on the share of the lowest quintile. Danziger and Plotnick (1977) find that the income

share of bottom quintile before transfer is 1.4 percent in 1965, and 0.9 percent in 1974. After transfers, they are increased to 4.0 percent and 3.8 percent, respectively. Browning (1979), valuing in-kind transfers at taxpayer costs, concludes that in-kind transfers increase the share of the bottom quintile by 1.59 percentage point (from 5.69 percent to 7.28 percent); Smeeding (1979), valuing benefits at recipient values, finds a gain of 1.06 percentage points (from 5.69 percent to 6.75 percent).

As for the effect of transfers across the entire income distribution, Benus and Morgan (1975) find that due to cash transfers the Gini coefficient is reduced by 15.1 percent. Danziger and Plotnick (1977) find a 11 percent and a 14.4 percent reduction in Gini coefficients due to cash transfers in 1965 and 1974, respectively. Reynolds and Smolensky (1977) estimate that cash and in-kind transfers both reduce the Gini coefficients by 6.4 percent in 1965; 9.5 percent in 1961; and 13.5 percent in 1970. Smeeding (1977) suggests that cash transfers reduce the Gini coefficient by 17.4 percent in 1968 and 20 percent in 1972.

In summary, all of the studies show that the redistributive effect of transfers has increased over time as the amount of transfers has increased. However, relative to the increase in transfers, the redistributive impacts have increased only slightly. This is what Reynolds and Smolensky (1978) called "diminishing redistributive returns." Therefore, Danziger, Haveman, and Plotnick (1981, p. 1019), in their conclusion, project that a proportional increase in current transfers is not likely to produce a sizable reduction in poverty and income inequality, for most of the "easy gains have been made" already. Unless a reform is proposed which would change the way current programs benefits

are targeted, an increase in the level of transfers would have a slight redistributive effect. Finally, the estimates of the magnitudes of redistributive effects are varied. The variance in the estimates could result from differences in the unit of analysis, the specific transfers included, the assumptions for valuing in-kind transfers, corrections for underreporting, or the year of the analysis.

Private Income Transfers

In sharp contrast to the redistributive studies of public income transfers, there have been few studies on the redistributive effect of private transfers. Danziger, Haveman, and Plotnick (1981) recognize this deficiency and argue that the existing studies do not adjust for the replacement of public by private transfers in the absence of the former.

Morgan, David, Cohen, and Brazer (1962) note that private philanthropy adds its redistribution to that accomplished by public transfer programs. But they are less concerned with the different redistributive effects between public and private transfers; instead, they focus more on the motives of and attitudes toward private transfers.

One possible advantage of privately-funded redistribution as opposed to the publicly-funded kind is that it can be more flexible. Vickrey (1962) argues that private transfers offer the advantages of greater freedom and scope, less bureaucracy, and greater temporal and spatial immediacy than do government transfers. However, an examination of the aims of philanthropic activity reveals that not a great deal of it is directed toward redistributional purposes. That is, the activity is not intended to effect income transfers to people from the givers.

Vickrey (1962) cites a Bureau of Labor Statistics and Wharton School study (1950) that shows that of total givings, 32.6 percent were in the nature of family and reciprocity gifts having a small redistributional content, 21.4 percent were gifts for the support of individuals as alimony representing some redistribution, and a further 29.4 percent were to religious organizations which are not of obviously redistributive nature. The Consumer Expendure Survey, 1972-73, reported by the Bureau of Labor Statistics (1978), shows that 33.4 percent of private transfers were to persons not in the family in the form of cash, 24.4 percent were to persons not in the family in the form of goods and services, and 30.8 percent were to religious organizations.

This seems to suggest that private charity cannot be relied upon to provide a significant level of transfers to the poor. The charity market is not necessarily in conflict with the governmental redistributive network since the areas of operation have a limited overlap; the redistributive content of private charity appears to be slight.

Kennett (1980a, 1980b) discusses the area in which private activity can achieve more efficiently the redistributive objective. The relative advantages of private charitable organizations as against government agencies in achieving efficient redistribution of income and supply of services are examined. One reason for entrusting some redistributive responsibility to the private sector is that there are possible gains in efficiency which can be attributed to more conscientious costing behavior and relatively lower wages demanded by workers who work for non-profit organizations than workers who work for the government. Another reason is that some people gain satisfaction from giving, whereas few people actually gain satisfaction from paying their taxes. Moreover,

the "excess burden" is substantially decreased, because the avoidance costs of charitable giving are much lower. The extra dollar of tax revenue procured by increasing existing tax rates or by instituting some new tax could encourage some taxpayers to adopt some alteration of their lifestyle and activity, which would generate a misallocation of resources.

On the other hand, there are some possible disadvantages of privately funded income transfers in comparison with publicly funded income transfers in achieving an efficient redistribution of income. The solicitation and administration costs for private philanthropy may be high. The larger charitable organizations are remarkable for the low percentage of contributions that are actually applied to the agencies' field activities relative to the percentage used to maintain the organization and the percentage spent on fund raising. Grimes (1977) cites a study which concluded that fund raising costs can reach as high as 300 percent of contributions, and finds in his own research that administration and fund raising costs in the major medical charities vary from 19 to 48 percent.[1] In contrast, the administration costs as a percent of total benefits paid in 1981 are 1.1 percent for OASI (Old Age and Survivors Insurance), 2.5 percent for DI (Disability Insurance), 1.3 percent for HI (Health Insurance), and 7.0 percent for SMI (Supplementary Medical Insurance).[2]

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[1]One of the original intents of the founding of United Funds was to benefit the donors because less money would be wasted on persuading a person to donate to one charity rather than another and to avoid the frantic competition between agencies for resources (Rose-Ackerman, 1980). Two national sample surveys of philanthropy found that excessive fund-raising and administrative costs were most frequently mentioned of the things which the donors did not like about the way their contributions were used (Morgan, Dye, and Hybels, 1977).

[2]These figures are cited from Social Security Bulletin, Annual Statistical Supplement, 1981, p. 2.

The comparative redistributive effects of public and private income transfers have been the subject of empirical study. Lampman (1972) has computed the percentage of public and private income transfers received by pretransfer poor households for 1967. Danziger, Haveman, and Plotnick (1980) have done this calculation for public income transfers for 1974. Table I shows that the percentage spent on the pretransfer poor through public programs is over 50 percent of the total expenditures for all but veterans benefits. The percentage increase from 50 to 59 for social insurance programs may indicate that its initial wage-replacement function has been changed in the direction of income support. As for private income transfers, only direct interfamily gifts allocates half of its share to the pretransfer poor. Compared to social insurance, privately-insured benefits dispense a share only one-tenth as large to the pretransfer poor. This rough estimate seems to indicate that the income redistribution provided by the private sector is far less technically efficient than that provided by government.

Lampman and Smeeding (982) criticize the traditional approach of comparing the current level of government transfers with the unrealistic counterfactual of a zero-transfer situation. Taking the fact that non-government transfers existed before government transfers, they conclude that the conversion of private transfers to public transfers is unlikely to have much effect on the size distribution of income. However, this conclusion is based on two rather unrealistic assumptions: (1) that the total amount of transfers, either publicly-provided or privately-provided, is fixed; (2) that the government transfers will go to the same persons and in exact amounts that the private transfers did. Even if public transfers are perfect substitutes for private transfers, the way they distribute benefits among benefit recipients is not necessarily alike.

TABLE I

PUBLIC AND PRIVATE INCOME TRANSFERS RECEIVED BY PRETRANSFER POOR HOUSEHOLDS, 1967 AND 1974

	Percentage Spent on Pretransfer Poor	
	1967	1974
Benefits of social welfare expenditures under public programs	40	NA
a. Social insurance	50*	58.8
b. Public aid	93*	85.9
c. Veterans	46*	43
d. Other welfare services and public housing	50	65**
e. Health	50	58
Privately insured benefits related to health and income maintenance	5*	NA
Direct interfamily gifts	50*	NA
Gifts via philanthropic institutions	23*	NA

NA means that the data are not available.

*The numbers computed by Lampman (1972) based on Survey of Economic Opportunity data (table 7 in his study), when accounted for money income benefits only, are different. They are 53, 93, 46, 5, 33, and 33, respectively, in order of items arranged in this table.

**In 1974 it is housing assistance which includes public housing, rent supplements, home ownership and rental housing assistance, sec. 236 and other.

Sources: Lampman (1972), table 1 for 1967 data. Danziger, Haveman, and Plotnick (1980), for 1974 data.

Until now, all redistributive studies reviewed, either on public or private income transfers, provide aggregate estimates of redistributive effects. They have not separated the effect of transfer progressivity--how transfers are distributed among income classes--from the effect of the transfer rate--the size of transfers. Reynolds and Smolensky (1977) have attempted to disaggregate the redistributive effects for explaining "the puzzle"; namely, that the difference between the pre-fisc and the post-fisc distribution is large each year but that the differences among post-fisc distributions in different years, are quite small. In order to isolate the effect of the distributor from the effect of the budget share, they let the budget share change, keeping the distributor and the pre-fisc distribution constant, and vice versa. By using this rather simple technique, they failed to further separate the effect of pre-fisc distribution from the effect of distribution of government taxes and expenditures. Analytically, a more systematic approach is demanded.

Private Charitable Giving

The subject of philanthropy is a broad academic area. The majority of the theoretical and empirical literature involves the relationship between charitable contributions and income taxes (for example, Feldstein, 1975a, 1975b; Feldstein and Clotfelter, 1976; Feldstein and Taylor, 1976; Schwartz, 1970; Taussig, 1967; Boskin and Feldstein, 1977; Clotfelter and Steuerle, 1981). Other studies examine the public goods character (Pareto optimal redistribution) of private charitable contributions and are extremely relevant to this study.

Economic theory is generally concerned with the exchange of economic goods. Philanthropic behavior, or the voluntary one-way

transfer of economic goods to individuals or organizations outside the family unit, has been rationalized in the economics literature by the hypothesis that individuals' preferences are defined over levels of consumption of unrelated persons as well as levels of their own consumption. Boulding (1962) and Vickrey (1962) were among the first modern economists to suggest this rationalization of charitable giving.

Friedman (1962) argues that private charity is one of the means to alleviate poverty, but--

> . . . it can be argued that private charity is insufficient because the benefits from it accrue to people other than those who make the gifts . . . . We might all of us be willing to contribute to the relief of poverty, provided everyone else did. We might not be willing to contribute the same amount without such assurance (pp. 190-191).

This indicates that if matters are left to uncoordinated private philanthropy, a free-rider problem will arise.

Buchanan (1968) makes a distinction between redistribution and allocation motives for transfer. He argues that the traditional allocation-distribution dichotomy, deriving criteria for optimality in allocation from individual evaluations and calling upon external, non-individualistic weights for deriving distributive norms, is methodologically inconsistent. The individual evaluations should be allowed to enter into the norms in distribution.

This line of argument has been used, in a series of papers commencing with Hochman and Rodgers (1969), to justify fiscal intervention of income redistribution on the grounds of Pareto efficiency. Hochman and Rodgers (1969, 1974) postulate interdependent utility as a rational explanation for income redistribution by government. Studies by Thurow (1971) and Zeckhauser (1971) based on utility interdependence assume that those who are well off use the state as a mechanism for making

gifts to the poor. These studies suggest that greater equality of income may be in the nature of a public goods.

Von Furstenberg and Mueller (1971) criticize the two-person case outlined by Hochman and Rodgers and contend that by recognizing the possible public goods nature of voluntary transfers, the justification and feasibility of government-enforced Pareto optimal redistribution must be discussed beyond the two-person care. After the simulation of a derived Pareto optimal redistributive tax scheme, however, they emphasize the conceptual and practical obstacles of implementing the Pareto approach to redistribution.

Polinky (1971) points out that Hochman and Rodgers employ a deficient concept of the utility possibility frontier. But, after the "true" welfare frontier is obtained, the redistribution of income through public institutions can be justified on efficiency grounds even more strongly than was argued by Hochman and Rodgers.

Contrary to the Von Furstenberg-Mueller assertion, Brennan (1973) argues that the assumption of universal altruism is not required for Pareto optimal redistribution. Malice and envy may establish a case for redistribution within the Pareto framework. Redistribution from rich to poor retains its public goods property. It is simply that the nature of benefits conferred varies according to motivation--individuals motivated by malice and envy may also contribute, not because they value increased consumption by the poor, but because they value reduced consumption by the rich.

Among the studies attempting to provide empirical evidence on the determinants of the level of private charitable giving whose main interest is in the relationship between private charitable giving and

income taxes, some have also tested the interdependence hypothesis. Schwartz (1970) attempted this by including in his equation per capita non-donor income as a proxy for the consumption of the relevant recipient group. This variable had a highly significant negative coefficient, supporting the interdependent utility hypothesis.

Hochman and Rodgers (1973) also tested a variant of the interdependence hypothesis by including in the equation a variable measuring the dispersion of income within the metropolitan area. This variable had a highly significant coefficient with the predicted positive sign. Abrams and Schmitz (1978) present evidence that there is a negative relationship between social welfare expenditures and private charitable giving. Amos (1981) also shows that increased government aid to potential recipients would reduce private charitable giving. All these results indicate that the utility interdependence hypothesis is statistically acceptable. However, even if the utility interdependence receives much supports empirically, it does not necessarily imply that private charitable giving will be inefficiently supplied. Hochman and Rodgers (1973) tested the public goods character by including in the equation the number of persons in the metropolitan area. Although they had a coefficient with expected negative sign, this coefficient is not statistically significant. Therefore, the question of whether the private charitable giving is efficiently provided remains undecided. In summary, it should be noted that the utility interdependence hypothesis is only a necessary, not a sufficient condition of public goods theory of optimal private charitable giving.

Becker (1974) provides a formal model of this kind of argument and uses it to derive some empirical implications of the utility

interdependence hypothesis. Becker's model is based on the maximization, subject to the individual's budget constraint, of a utility function representing the individual's preferences over the levels of his own consumption and the consumption of others about whom the individual is concerned. It is assumed that there are N philanthropic persons in the society. For each of them, the utility function is:

$$U^i = U^i (x_i, Z) \qquad i = 1, \ldots, N \tag{2.1}$$

where x_i denotes the consumption of individual i and Z is the extent of charitable activity as a whole. The first partial derivatives of each individual's utility with respect to both own income and recipients' incomes are all positive; the second partials are all negative.
Each individual faces the budget constraint:

$$x_i + p_i w_i - y_i = 0 \qquad i = 1, \ldots, N \tag{2.2}$$

where p_i denotes the price of the charitable contributions which equals 1 minus the marginal tax rate of individual i, w_i is the charitable giving of individual i, and y_i is the given income which can be spent on individual i or on charitable contributions. The price of contributions is less than unity because many charitable contributions are deductible when computing personal income tax liability. According to Becker's theory of social interactions, each individual has a set of production functions that determine how much of the commodities (or basic wants) can be produced with the market goods, time, and other resources available to him. In his explanation, the "environmental" variables, which will affect the individual's decision making, include the characteristics of other persons. Under the assumption that the effect of other

variables on this characteristic is independent of the individual i's effort, Z can be illustrated as follows:

$$Z = \sum_{i=1}^{N} w_i + g \tag{2.3}$$

where g is other sources of charity income from government. If the total income of the charity from all sources other than i's giving is denoted by C_i, the budget constraint can be now rewritten as:

$$x_i + p_i Z - (p_i C_i + y_i) = 0 \quad i = 1,\ldots,N \tag{2.4}$$

where $x_i + p_i Z$ (or $p_i C_i + y_i$) represents the "social income" of individual i.

To maximize the utility function given by (2.1) subject to the constraint on social income, given by (2.4) taking C_i as given, the equilibrium condition is

$$(\partial U^i/\partial x_i)/(\partial U^i/\partial Z) = 1/p_i \tag{2.5}$$

If we denote $U_i^i = \partial U^i/\partial x_i$, $U_Z^i = \partial U^i/\partial Z$, (2.5) becomes

$$p_i U_i^i = U_Z^i \quad i = 1, \ldots, N \tag{2.6}$$

For each individual, Figure 1 presents this optimality condition graphically. The function mb (marginal benefit) gives the value of the right-hand term of (2.6). It is monotonically decreasing, because the individual's marginal utility of transfers to recipients is monotonically decreasing. The schedule mc (marginal cost) shows the value of the left-hand term of (2.6). It is monotonically increasing because the

individual has decreasing marginal utility of own-income and, therefore, his marginal utility of own-income rises with w_i.[3] The level of transfers which maximizes the individual's utility, given his tastes, initial income, and price of contribution, is given by the intersection of two curves at w_i^*. In other words, this model implies the individual's optimal level of contributions varies directly with his income, and inversely with price of contributions and the level of consumption of others in the absence of contributions.

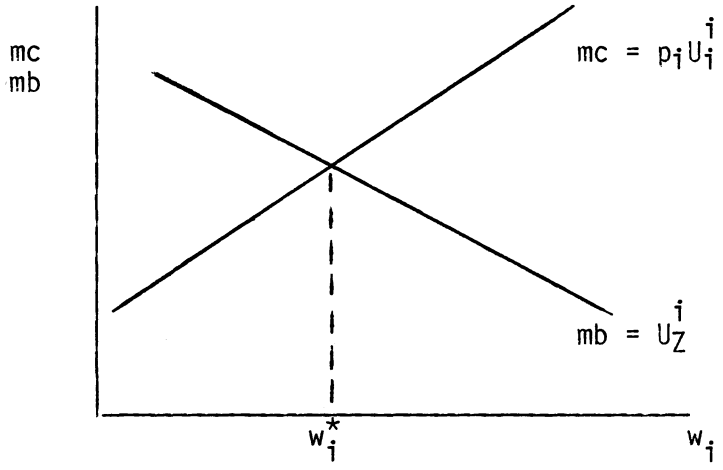

Figure 1. Equilibrium Condition of Private Charitable Giving

To prove that this equilibrium is not Pareto optimal, Warr (1982) employs a three-person case, where individual 1 and 2 are transferors; individual 3 is the recipient. Given the price is equal to unity, if

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[3]For ease of exposition, schedules mb and mc are both drawn as straight lines.

individual 1 and 2 each agrees to increase his contributions to individual 3 by one unit, the effect of this on individual i's welfare, where i=1,2, is given by

$$dU^i = -U^i_1 + 2U^i_3 .$$

This, from (2.6), is necessarily positive. Thus, both transferors benefit from this additional contributions and so, obviously, does the recipient. In other words, the condition of (2.6) is not one of Pareto optimality. Furthermore, Warr illustrates that as long as private transfers are at a positive level, the substitution between government transfers and private transfers will be unity. Thus, incremental fiscal redistribution cannot achieve a Paretian welfare improvement. This, however, will not be the case, if the fiscal measures will affect private transferors' marginal incentives to donate.

For opposition, Reece (1979) adopts a Tobit estimating procedure to analyze charitable contributions. By including average public assistance per recipient and lower quintile family income for the metropolitan area, he concludes that the utility interdependence hypothesis receives little support from his results.

McKenzie (1981) criticizes economists for their frequent failure to recognize some critical but hidden assumptions relating to the construction of the demand for a public goods. Therefore, they have incorrectly concluded, especially in discussions of income redistribution, that independent, non-collective purchases of a public goods by individuals in large group setting will necessarily lead to under-consumption and production of the public goods. Two hidden assumptions embedded in standard analysis of income redistribution are: (1) it is assumed that

everyone is aware of, and benefits from, the poverty relief provided by anyone to the recipients and (2) it is assumed that the individual demand curves for income redistribution lie totally above the horizontal axis. The second is similar to what Brennan (1973) calls the disutility of transfers. A central conclusion drawn from this analysis is that corrections for these assumptions indicate a move from private to public charity that may very well lead to a reduction in the amount of aid received by the poor and may, therefore, be Pareto inefficient.

Pasour (1981) argues that there appear to be no beneficial consumption externalities associated with most real world transfers. As McKenzie, he also contends that, (1) even if there are positive externalities associated with transfers, government redistribution cannot achieve Pareto optimality so long as there are one or more persons who are opposed to redistribution policies and (2) it is not costless to inform additional people about the transfer. Finally, due to the existence of deficiencies in redistributing income for both public and private transfers, he suggests making a direct private and public transfers comparison in income redistribution.

Sugden (1982) points out that the public goods theory of optimal private charitable giving relies on three principal assumptions; first, publicness (the charitable activity is a common argument in many individuals' utility functions); second, utility maximization (each individual's decisions concerning his charitable activity are determined solely by the objective of maximising his utility); third, the existence of Nash conjectures (each individual, when deciding how much to contribute, takes everyone else's contributions as given). He argues that public goods theory is inconsistent with certain well-established

observations and is therefore untenable. Among others he derives mathematically a condition for Nash conjectures; if Nash conjectures are true, then the gifts of different donors and/or government welfare spending and private giving will be close substitutes.

In summary, in regard to the income redistribution supplied by the private sector, economists' arguments center on two subjects; (1) whether it is of a public goods character (and inefficiently supplied) and (2) whether the public or the private sector can achieve Pareto optimality, if redistribution is a public good. The second subject is concerned with the problem of disutility of transfers felt by some persons; in other words, the non-uniform tastes problem. However, Brennan (1973) ingeniously resolves this problem and concludes that the problem of non-uniform tastes may well be less intractable with regard to income redistribution than with other public goods. Thus, this study is interested in the first subject, despite the still growing disputes on the second one.

CHAPTER III

METHODOLOGY OF THE STUDY

Much of the research for the present study is concerned with the development and quantification of (1) a measure which decomposes redistributive effects and (2) of a measure which captures the public goods character of private welfare transfers. Data for 28 metropolitan areas will be employed for hypothesis testing. Ordinary least squares techniques are employed in the study to estimate the parameters of the regression equations. The theoretical arguments on which the methodology of this study is based will be addressed in the following chapter. This chapter consists of two sections. The first section deals with redistributive effects of income transfers. The second section provides the logic of the examination of the public goods character of private welfare income transfers.

The elements of the methodology used in this study can be best envisioned by a graphic presentation of the detailed steps and logic employed, as illustrated in Figures 2 and 3.

Redistributive Effects of Income Transfers

As Figure 2 shows, the process begins by asking the question of what causes the differences in family income distribution among geographic entities. Next, several major variables which are expected to explain these differences are selected. These can be classified into two

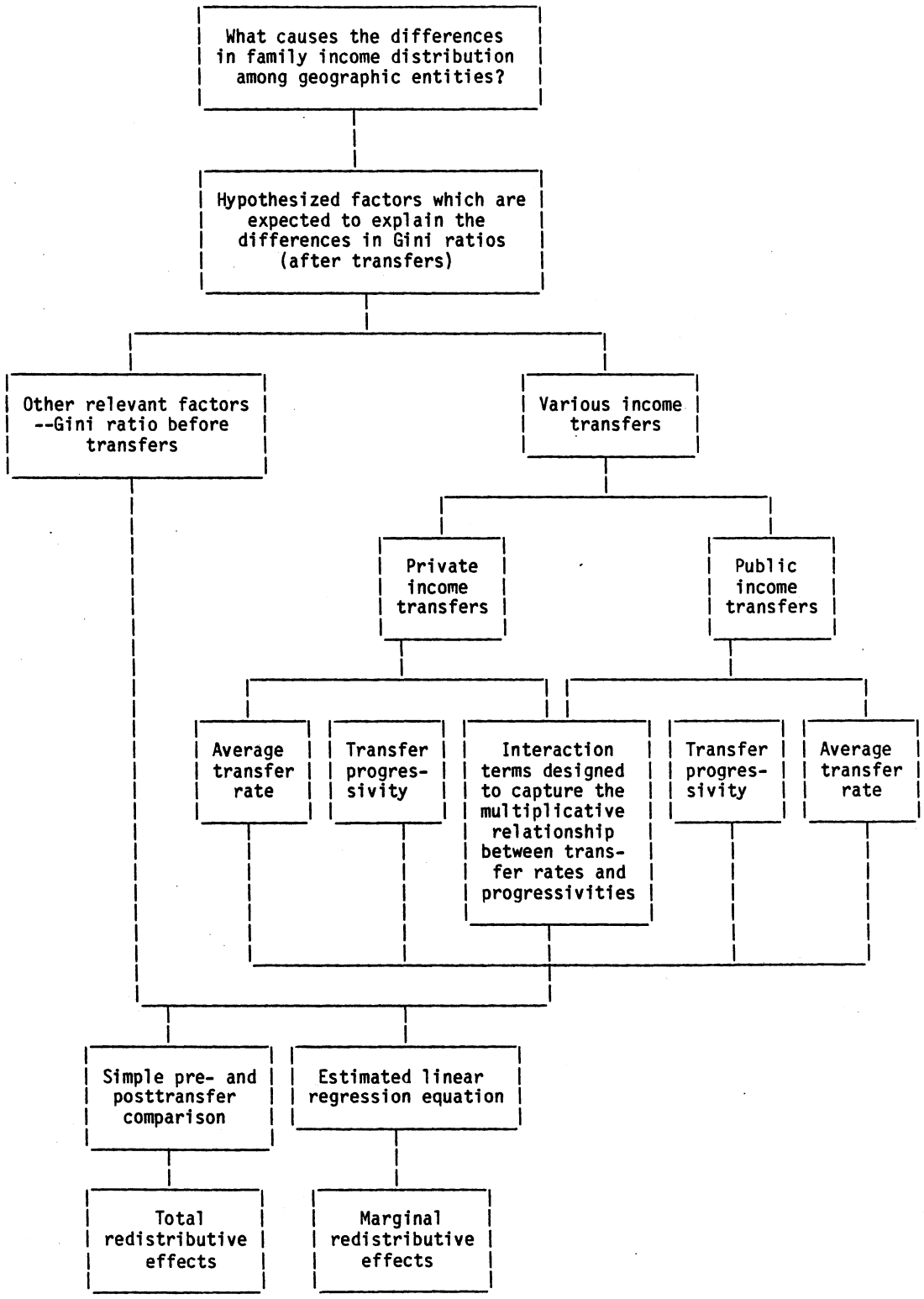

Figure 2. Logic of Decomposition of Redistributive Effects

groups; various income transfers and other relevant factors. The latter is represented by a summary index--the Gini coefficient before transfers. According to the decomposition rule developed, in Chapter IV total income transfers, either public or private, are disaggregated into the average transfer rate and the degree of transfer progressivity. Because part of the redistributive effects of transfers depends on the multiplicative relationships between transfer rates and progressivities, two interaction variables are developed specifically to capture this impact. Finally, the Gini coefficients representing a comprehensive measure of income distribution are regressed on all these variables. Then, the marginal redistributive effects of public and private transfers, depending either on the average transfer rates or on the degrees of transfer progressivity, can be estimated and compared. In addition, by simple calculations, the total redistributive effects for each geographic entity can be obtained.

Public Goods Character of Private Welfare Income Transfers

The conceptual processes used in examining the public goods character of private welfare transfers are shown in Figure 3. This process begins with the question of what causes behavioral differences with respect to private contributions. The theoretical model rests on: (1) the assumption of utility interdependence (which means that higher income people benefit from increases on incomes of lower income people), (2) Nash conjectures (which mean that each individual, when deciding how much to contribute to a charitable activity, takes everyone else's contributions as given), and (3) utility maximization. Accordingly, the

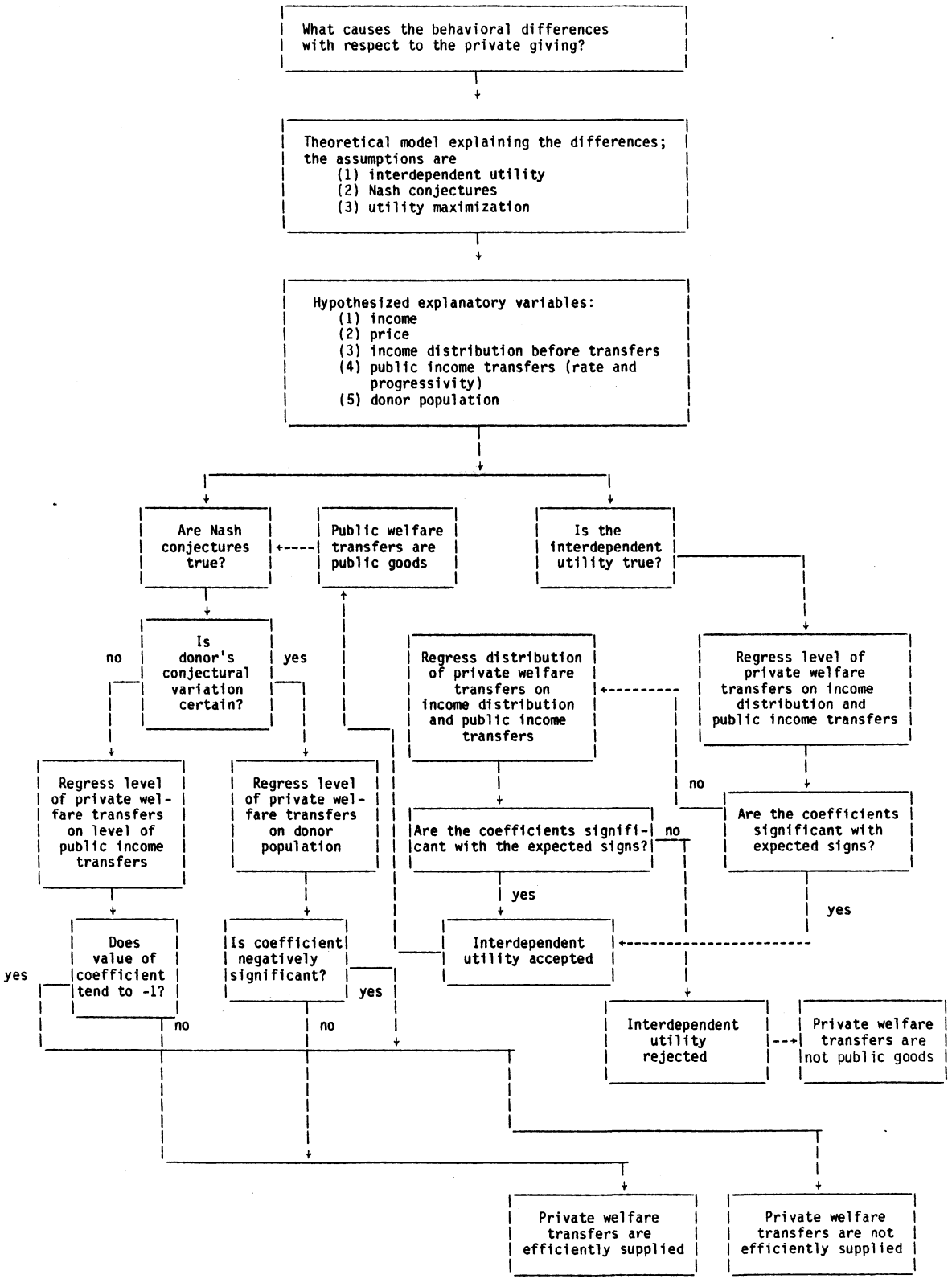

Figure 3. Logic of Testing for the Public Goods Character of Private Welare Transfers

hypothesized explanatory variables are obtained. They include income, the "price" of contributions, income distribution (before transfers), the level and distribution of public income transfers, and the size of the donor population. The three assumptions provide the basis for a public goods theory of private contributions. If any one of the assumptions is violated, the allocative inefficiency of private contributions is not necessarily proven.

This study will concentrate on the hypotheses of utility interdependence and Nash conjectures. To investigate the utility interdependence hypothesis, both the relationships of the income distribution (before transfers) and the level and distribution of public income transfers with respect to the level and distribution of private welfare income transfers, respectively, are considered. The utility interdependence assumption will be relaxed only when testing with respect to both the level and distribution of private welfare income transfers rejects the hypothesis simultaneously. In other words, even if utility interdependence does not appear in the testing with respect to the level of private welfare income transfers, it may still be discovered in the testing for the distribution of private welfare income transfers.

After this examination, if utility interdependence is violated, it can be concluded that the private welfare income transfers are not public goods. However, if the hypothesis is accepted, then whether the public goods theory is tenable must further depend on the investigation of Nash conjectures.

For the examination of Nash conjectures, two variables--size of donor population and level of public income transfers--are employed with respect to the level of private welfare income transfers. If the

donor's conjectural variation--the individual's conjecture about related other's behavior--in the small-numbers case is certain, the simple relationship between donor population and level of private welfare income transfers is an appropriate measure for testing the public goods character. If, on the contrary, the donor's conjectural variation is uncertain (skill and strategy are involved), then in addition, the relationship between the level of public income transfers and the level of private welfare income transfers needs to be introduced to supplement the testing. Therefore, in this study the level of public income transfers plays a role both in the examination of the utility interdependence hypothesis, and in the verification of Nash conjectures. Whether there is a substitution relationship between public income transfers and private welfare income transfers is used as one of the ways of examining the public goods character of private welfare income transfers.

CHAPTER IV

THE THEORETICAL FRAMEWORK

This chapter contains two sections. The first discusses the decomposition of total redistributive effects of transfers into the separate effects of transfer progressivity and the overall level of the transfers. The second section develops a modified and extended traditional theoretical model for explaining the public goods character of private welfare income transfers.

The Decomposition of Redistributive Effects

There are many differences among the techniques used in redistributive studies. By adjusting or employing different income concepts, income units or accounting periods, the magnitudes of the income distribution effect can be varied. Until now, few studies intending explicitly to decompose the redistributive effects of income transfers, both public and private, have been done. But, as is well-known, the income distribution can be affected by taxes through two different channels; the progressivity of the tax and the overall level of the tax (Musgrave and Musgrave, 1980; Jacobson, 1976). Although the tax can be defined in a broad sense including its negative counterpart, a transfer, here the disaggregation of the redistributive effect of transfers is stressed. Other than transfers, there are many other factors which play a decisive role in determining the distribution of income. Therefore,

the complete picture is that the total effect on distribution depends not only on how progressive transfers are and on the overall level of transfers, but also on the underlying (before-transfer) distribution of income. By applying the theorems and corollaries derived by Kakwani (1977), which are presented in the Appendix, the relationship above can be illustrated.

Lorenz and Concentration Curves

Let y be a given income level, F(y) be the distribution which represents the proportion of income units having income less than or equal to y, and $F_1(y)$ be the distribution which represents the proportion of total income earned by income units having income less than or equal to y. Then, the Lorenz curve can be defined in terms of the relationship between F(y) and $F_1(y)$. The most widely used Gini index is simply equal to one minus twice the area under the Lorenz curve (Miller, 1966). The smaller the area under the Lorenz curve, the greater is the income inequality. In other words, the less the Gini, the greater is the income equality.

Assuming that g(y) is a continuous function of y, $F_1[g(y)]$ is the distribution function which represents the proportion of total g(y) owned by income units having income less than or equal to y. The relationship between $F_1[g(y)]$ and F(y) will be called the concentration curve of the function g(y). It can be seen that the Lorenz curve of y is a special case of the concentration curve for the function g(y) when g(y) = y. Similarly, the concentration index for g(y) is defined as one

minus twice the area under the concentration curve for g(y).[1]

For example, transfer income (T) is a function of total income, i.e., T = g(y). Therefore, to derive the concentration curve of transfer income, the income units need to be ranked according to the total income (y). But to obtain the Lorenz curve of transfer income requires the ranking of income units according to transfer income, not total income.

Effects of Transfers on Income Distribution

Kakwani ingeniously extends and generalizes the concept of the Lorenz curve to study the relationships among the distributions of different economic variables. He also gives the theorems and corollaries relating the concentration curve of the function g(y) and its elasticity, which provide the basis for analyzing the relationships among the distribution of different economic variables. In this study, we will apply the theorems discussed by Kakwani to the case of income transfers, although we shall change his notation and make one refinement, taking the underlying income distribution into account in the application.

Let y be the before-transfer income (public and/or private transfers) of an individual and T(y) the transfer function. Then, the disposable income is given by:

$$y_d(y) = y + T(y).$$

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[1]It should be pointed out that the concentration curve for g(y) is not the same thing as the Lorenz curve for g(y). The condition for them to be identical is that g(y) is a non-decreasing function of y, i.e., the function is convex. For proof, see Kakwani (1977) and Cowell (1977).

By using Theorem 2, we have[2]

$$E[y_d(y)]\, F_1[y_d(y)] = \{E(y) + E[T(y)]\}\, F_1[y_d(y)]$$
$$= E(y)\, F_1(y) + E[T(y)]\, F_1[T(y)].$$

where E is the expected value operator. After simplifying the result, we obtain

$$F_1[y_d(y)] - F_1(y) = A/(1+A)\ \{F_1[T(y)] - F_1(y)\} \qquad (4.1)$$

where A is the average transfer rate of the society, defined as $E[T(y)]/E(y)$.

If the transfer elasticity is less than unity for all y, which indicates that the transfer is regressive, then Corollary 2 implies that $F_1[T(y)] > F_1(y)$ for all y, i.e., $F_1[T(y)] - F_1(y) > 0$.[3] Since A is a positive proportion, i.e., $0 < A < 1$, $A/(1+A)$ will rise as A increases. From (4.1), we can conclude that when the transfer elasticity is given, as long as it is less than unity, the after-transfer income distribution (concentration curve of y_d) will be more equal than the before-transfer distribution (concentration curve of y) when the average transfer rate is increasing. The results would be reversed if the transfer elasticity is progressive, i.e., its value is greater than unity.

From Theorem 1, we know that the distance between $F_1(y)$ and $F_1[T(y)]$

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[2]In this section, whenever the theorems and corollaries are cited, they are all from Kakwani (1977). The numbers used here refer to the same numbers used in that study.

[3]Both taxes and transfers are progressive when the ratio of taxes paid or transfers received to income rises as income rises, i.e., tax or transfer elasticity is greater than 1. Thus, progressive taxes favor lower income groups, while progressive transfers favor higher income groups; i.e., both progressive taxes and regressive transfers are pro-poor.

depends on the transfer elasticity. It follows that if the transfer elasticity is less (greater) than unity, the less the transfer elasticity, with the A value given and the concentration curve of T(y) above (below) the concentration curve of y, the greater (less) is the distance between $F_1(y)$ and $F_1[T(y)]$, i.e., the greater the value of $F_1[T(y)] - F_1(y)$. Accordingly, the income after transfers will be more equally distributed than the income before transfers.

Therefore, both the average transfer rate and the transfer elasticity (progressivity) are determinants of the magnitude of the transfer's redistributive effect. In addition, it is noted that the relationship between the average transfer rate, through A/1+A, and the transfer progressivity, through $F_1[T(y)] - F_1(y)$, is multiplicative. This indicates that the effect of the average transfer rate (transfer progressivity) on income distribution depends on the level of transfer progressivity (average transfer rate). In other words, it is deduced that the average transfer rate (transfer progressivity) does not have the same redistributive effect regardless of the value of transfer progressivity (average transfer rate).

The relationship among the concentration curves in (4.1) can be best envisioned as in Figure 4. The before- and after-transfer income distributions and transfer distribution, $F_1(y)$, $F_1[y_d(y)]$ and $F_1[T(y)]$ versus F(y), respectively, are illustrated. The distances between $F_1(y)$ and $F_1[y_d(y)]$ and between $F_1(y)$ and $F_1[T(y)]$ are shown as crescent areas OABC and OABD, respectively. If the transfer is regressive, i.e., $F_1[T(y)] > F_1(y)$, the concentration curve of T(y) and, accordingly, the concentration curve of y_d, will be above the concentration curve of y. Then, the larger the area of OABD, i.e., the higher the

degree of transfer regressivity, the larger is the area of OABC, given the average transfer rate. Thus, the after-transfer distribution is more equal than before-transfer distribution. It is noted that the concentration curve of T(y) and, accordingly, the concentration curve of y_d, will be below the concentration curve of y, if the transfer is progressive and the results would be reversed.

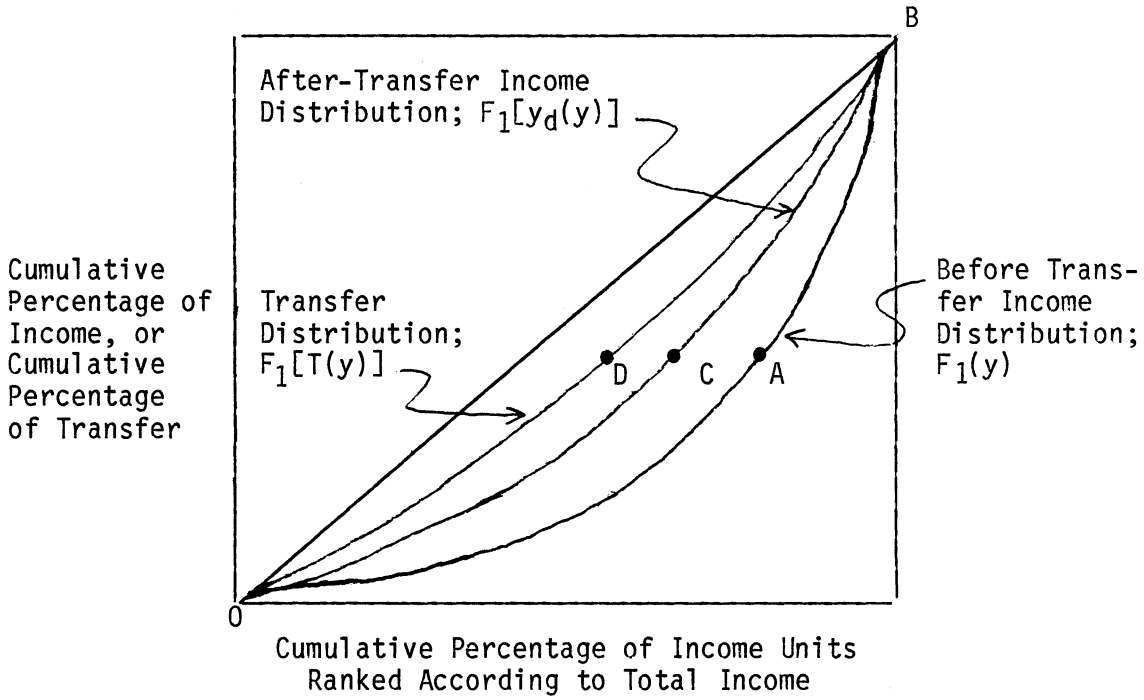

Figure 4. Relationships Between Transfer Distribution and Before- and After-Transfer Income Distributions

Effect of Underlying Income Distribution

Until now, the underlying (before-transfer) income distribution is held constant. A further task is required if there exists a variation in the underlying income distribution.

Let $F_1^1(y)$ and $F_1^2(y)$ represent two before-transfer income distributions and $T_1(y)$ and $T_2(y)$ be two transfer functions. Then, from (4.1), it follows

$$F_1[y_d^1(y)] - F_1^1(y) = [A_1/(1+A_1)]\ \{F_1[T_1(y)] - F_1^1(y)\} \qquad (4.1a)$$

$$F_1[y_d^2(y)] - F_1^2(y) = [A_2/(1+A_2)]\ \{F_1[T_2(y)] - F_1^2(y)\} \qquad (4.1b)$$

Subtracting (4.1b) from (4.1a), we obtain

$$F_1[y_d^1(y)] - F_1[y_d^2(y)] = [A_1/(1+A_1)]\ F_1[T_1(y)] +$$

$$\{1 - [A_1/(1+A_1)]\}\ F_1^1(y) - [A_2/(1+A_2)]\ F_1[T_2(y)] -$$

$$\{1 - [A_2/(1+A_2)]\}\ F_1^2(y).$$

It is noted that other than average transfer rates and transfer elasticities (progressivities), the underlying distributions have impacts on the after-transfer distributions. Additionally, the characteristic of multiplicity is also found, i.e., $\{1 - [A_1/(1+A_1)]\}F_1^1(y)$ and $\{1 - [A_2/(1+A_2)]\}F_1^2(y)$.

In order to specify the effect of the underlying distributions, it is assumed that the average transfer rate and transfer elasticity (progressivity) are constants and the same in both cases, i.e., $A_1 = A_2$ and $F_1[T_1(y)] = F_1[T_2(y)]$. Thus, we can obtain

(1) If $F_1^1(y) = F_1^2(y)$, then $F_1[y_d^1(y)] = F_1[y_d^2(y)]$. This indicates that two after-transfer income distributions will be of no difference because their before-transfer income distributions are the same.

(2) If $F_1^1(y) \neq F_1^2(y)$, after simplifying the result, we have

$$F_1[y_d^1(y)] - F_1[y_d^2(y)] = \{1 - [A_1/(1+A_1)]\}\,[F_1^1(y) - F_1^2(y)].$$

Because $1 - [A_1/(1+A_1)]$ is always greater than zero, the sign of $F_1[y_d^1(y)] - F_1[y_d^2(y)]$ will be determined by $F_1^1(y) - F_1^2(y)$ alone. Therefore, if $F_1^1(y) > F_1^2(y)$, $F_1[y_d^1(y)] > F_1[y_d^2(y)]$ and vice versa. This indicates that a more (less) equal before-transfer distribution will automatically have a more (less) equal after-transfer distribution, given the same average transfer rates and transfer elasticities.

In summary, the above analysis gives rise to the conclusion that the total effect on the income distribution depends on the public and private transfer rates and progressivities, and on the underlying income distribution. So far as the empirical study of redistribution is concerned, the decomposition of transfers into average rates and progressivities, which are multiplicative with respect to income distribution, and the isolation of the effect of the underlying income distribution are very critical.

The Economic Analysis of Private Welfare Income Transfers

The aforementioned redistributive effect of transfers concerns technical efficiency with respect to income redistribution, or the contributions to income (in)equality through the distribution and the size of transfers, either publicly or privately provided. Whether or not the amount of private welfare transfers is efficiently determined was not addressed.

Private welfare transfers are a part of private charitable contributions, although not all private charitable contributions result in

income transfers. In this section the implications of the public goods theory of private charitable contributions are extended and modified. Although the three assumptions of interdependent utility, Nash conjectures, and utility maximization are applied here, we will examine the first two more deeply.

Nash Conjectures

It seems reasonable to assume Nash conjectures in the large-numbers case. The preference-revelation problem, the consumption benefit externality, and the absence of exclusion all encourage individuals to act as free-riders. People will believe that their individual contributions will not affect the total supply of income transfers significantly. This implies that independent, non-collective provision of income transfers by individuals in the large group setting will necessarily lead to under-consumption and production of income transfers.

On the face of it, public goods theory might seem more applicable to transfers with many donors than to transfers with few. The reason is that in the case of transfers with only a few donors, donors would soon become aware of each other's existence and then strategic considerations would come into play. Only a naive person would hold Nash conjectures in such circumstances. But, while strategic bargaining between individuals would lead to an efficient solution, which implies no free-rider problem, there is little reason to assume that individuals will definitely behave in this fashion. In other words, in the small-numbers case, the bargaining model of public expenditures (Buchanan, 1968; Musgrave and Musgrave, 1980; Shibata, 1971; Bresnahan, 1981) so thoroughly developed already could be applied. This model demonstrates

that bilateral monopoly theory is applicable to the pure theory of public expenditures in the small-numbers case.

Imagine an economy with two rich individuals, denoted 1 and 2, and one poor, denoted 3, in which the consumption of the poor individual enters the utility functions of the rich. To keep the discussion simple, it is supposed that the two rich individuals are each unconcerned about the consumption of the other. The rich have the utility functions $U^n = U^n(x_n, x_3)$, $n = 1, 2$, where x_i, $i = 1, 2, 3$, denotes the consumption of individual i. Individual 3 has the utility function $U^3 = U^3(x_3)$. The functions U^i, $i = 1, 2, 3$, are each concave, twice differentiable, and strictly increasing in all arguments (thus, there is no "envy" or malice"), i.e., $\partial U^n/\partial x_3 > 0$, $\partial U^i/\partial x_i > 0$, $\partial^2 U^i/\partial x_i^2 < 0$. Each individual receives a lump-sum income, denoted y_i, which is determined outside the present model. It is considered given for each individual here. Let w_1 and w_2 be the contributions to individual 3 from individuals 1 and 2, respectively. For brevity, the price of contributions is assumed unity for every individual.

Case 1: If Nash Conjectures Hold. Under the traditional assumptions, individuals 1 and 2 maximize their own utilty, taking other's donations as given, subject to the constraints as follows:

$$\begin{aligned} x_1 &= y_1 - w_1 \\ x_2 &= y_2 - w_2 \\ x_3 &= y_3 + w_1 + w_2 \end{aligned} \tag{4.2}$$

For the Kuhn-Tucker conditions to be fulfilled, this implies that $w_i(U_i^i - U_3^i) = 0$ and $U_i^i - U_3^i \geq 0$, where $i = 1, 2$, and $U_i^i = \partial U^i/\partial x_i$.

If $w_i > 0$, then $U_i^i = U_3^i$, which indicates that the individuals will

set their levels of contributions where the marginal utilities attaching to their own and the recipient's consumption are equated. This is the same as the result derived by Becker (1974). Therefore, as compared to the Pareto conditions for the optimal consumption of a public goods, it demonstrates that the free-rider problem arises in this occasion; i.e., an efficient amount of transfers is not obtained.

But, because there are only two donors involved, the free-rider problem may disappear. Individuals will find it worthwhile to bargain, since individual contributions now significantly affect their own position and that of others. The characteristic of conjectural variation is that individuals conjecture about related others' (individuals or government) behavior. This implies that in the small-numbers situation, the conjectural variation of decision makers with respect to either other individuals or government should not be treated as constant. The conjectural variation between individuals is discussed first, followed by that between individuals and government.

Case 2: Relaxation of Nash Conjectures--The Conjectural Variation Between Individuals Is Not Constant. Here it is assumed that $w_2 = v(w_1)$, which indicates the conjecture of individual 1 about the behavior of individual 2 in response to the action of individual 1. By maximizing his (individual 1) utility, subject to the constraints (4.2) and $w_2 = v(w_1)$, he will determine an optimal level of contributions. This implies the Kuhn-Tucker condition $w_1(U_1^1 - U_3^1 - v'U_3^1) = 0$ and $U_1^1 - U_3^1 - v'U_3^1 \geq 0$, where $v' = \partial w_2/\partial w_1$.

If $w_1 > 0$, then $U_1^1 - U_3^1 - v'U_3^1 = 0$ which can be shown as $U_1^1 = (1 + v')U_3^1$. This indicates that the level of contributions of individual 1 depends upon the value of v', or the conjectural variation

of individual 1 with respect to individual 2. As shown in Figure 5 (refer to Figure 1), if $v' > 0$, the mb curve will shift upward to mb', and the equilibrium level of contributions is w^1, this is an increase in contributions as compared to the equilibrium with the assumption of Nash conjectures, w^*. If $v' < 0$, then the mb curve will shift downward to mb", and the equilibrium level of contributions will decrease to w^2. Individual 1 will contribute nothing if he conjectures that the reaction from individual 2 totally offsets the contribution he would make, i.e., $v' = -1$.

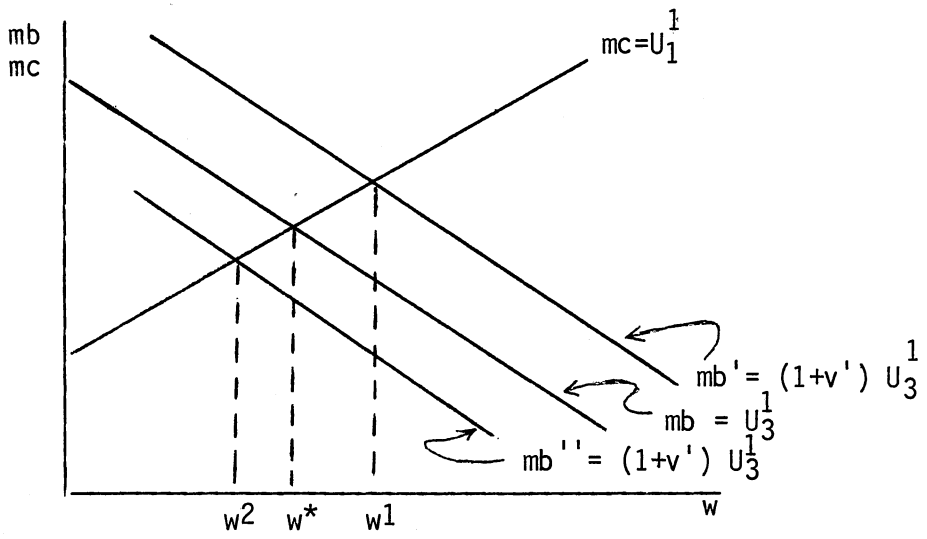

Figure 5. Equilibrium Conditions of Private Giving--Relaxation of Nash Conjectures

Case 3: Relaxation of Nash Conjectures--The Conjectural Variation Between Individuals and Government Is Not Constant. Up to this stage, the government has played no role in the analysis. In this case, it

will be taken into account. For the function $w_2 = v(w_1)$, it is assumed, instead, that $g = m(w_i)$, where g is government transfers spent on individual 3 and i = 1, 2. This function incorporates the conjectures of individuals about the behavior of government in response to action taken by the individuals. The government transfers should be added to the consumption function of individual 3; i.e., $x_3 = y_3 + w_1 + w_2 + g$.

Similarly, the Kuhn-Tucker conditions can be derived as $w_i(U_i^i - U_3^i - m'U_3^i) = 0$ and $U_i^i - U_3^i - m'U_3^i \geq 0$, where $m' = \partial g/\partial w_i$. If $w_i > 0$, then $U_i^i - U_3^i - m'U_3^i = 0$, or $U_i^i = (1 + m')U_3^i$. This implies that the level of contributions of individuals depends upon the value of m', or the conjectural variation of individual i with respect to the government. When m' is substituted for v', the implications derived above can be applied to this case. The individual's contributions, taking the conjectural variation of individuals with respect to the government into account, would not necessarily be the same as the contributions determined with the assumption of Nash conjectures.

Case 4: An Extreme--Ultrarationality. The assumption of ultrarationality means that each individual perceives other individuals or the government as agents or intermediaries in the transfer of income. For brevity, only the relationship between individuals and government is discussed here. There are two interesting situations which deserve attention. First, if the taxes imposed upon individuals are earmarked to transfer income to individual 3, then (4.2) will become:

$$x_1 = y_1 - w_1 - g_1$$

$$x_2 = y_2 - w_2 - g_2$$

$$x_3 = y_3 + w_1 + w_2 + g_1 + g_2$$

where g_1, g_2 are the taxes paid by individual 1 and 2, respectively. The Kuhn-Tucker conditions under Nash conjectures are $w_i(U_i^i - U_3^i) = 0$ and $U_i^i - U_3^i \geq 0$, $i = 1, 2$, which are identical to those of Case 1. This implies that if $w_i > 0$, taxing donors in this way simply induces each to contract his voluntary donations by exactly the amount of the tax, so as to re-establish his marginal equilibrium condition, $U_i^i = U_3^i$. As a result, the sum of his private contributions and the amount government gives "in his name" remains the same.

Secondly, even if the conjectural variation function is introduced into this occasion, the equilibrium condition does not change at all; namely, $(1+m')U_i^i = (1+m')U_3^i$, which is equivalent to $U_i^i = U_3^i$, if $m' \neq -1$. This implies that if the individuals perceive the government as an agent which transfers income from them to recipients, taking the conjectural variation into account as a variable does not change the level of contributions which would have been made under the assumption of Nash conjectures. But there is one exception; if $m' = -1$, the action of individuals is totally offset by government, and there will be no individual contributions at all. In this case, individuals perceive that the government will contribute all that they would have contributed in the absence of government transfers. These two sub-cases are examples of ultrarationality of individual behavior and can be generalized to the large numbers case.

In summary, only in the case of ultrarationality is the assumption of Nash conjectures logically acceptable, for the result is no different from the case of removing Nash conjectures, except that $m' = -1$. This confirms the result obtained by Sugden (1982). Furthermore, whether or not the efficient solution can be obtained in the small numbers case

depends on the values of conjectural variations representing bargaining strategies and skills between individuals or between individuals and government; i.e., on v' and m'. In the small numbers case, being a free rider is not easy to do. Therefore, the problem of concern in this occasion is the strategic behaviors between individuals and/or between individuals and government, rather than the existence of free riders.

Interdependent Utility--An Extension

The assumption that individual's utility function depends on both own-consumption and other individuals' consumptions is one of the necessary conditions for income redistribution to have the character of a public goods. Therefore, empirical evidence on the existence of interdependent utility has been discussed often in previous studies. (For example, Hochman and Rodgers, 1973; Reece, 1979; Sugden, 1982.) The approach normally used in these studies is to regress the level of private charitable giving on the variables, which represent the absolute or relative consumptions of the potential recipients; for example, the income dispersion before transfers, the level of government transfers, and the distribution of government transfers. The weakness of this approach is that it only considers the interdependent relationship between individuals in terms of the size of private charitable giving. Theoretically, the implications of interdependent utility can be extended to the distribution aspect of private charitable contributions.

In addition to the notations used in the small-numbers case mentioned above, it is now assumed that there are two income recipients, individuals 3 and 4. The donations of the rich are allocated between individuals 3 and 4. Now under the traditional assumptions, individuals

1 and 2 each maximize their utility function, $U^i = U^i(x_i, x_3, x_4)$, where $i = 1, 2$, taking other's donations as given, subject to these constraints:

$$x_1 = y_1 - w_{13} - w_{14}$$

$$x_2 = y_2 - w_{23} - w_{24}$$

$$x_3 = y_3 + w_{13} + w_{23}$$

$$x_4 = y_4 + w_{14} + w_{24}$$

$$w_{13} + w_{14} = w_1$$

$$w_{23} + w_{24} = w_2$$

where w_{ij} indicates the contributions to individual j from individual i. If it is assumed that individual 3 is less poor than individual 4, i.e., $y_3 > y_4$, then according to the assumption of the utility function, this indicates that $U_3^i < U_4^i$.

For the Kuhn-Tucker conditions to be fulfilled, this implies that $w_{ij}(U_i^i - U_j^i) = 0$ and $U_i^i - U_j^i \geq 0$, where $i = 1, 2$; $j = 3, 4$. If $w_{ij} > 0$, then $U_i^i = U_j^i$. For individual 1, the equilibrium conditions are $U_1^1 = U_3^1$ and $U_1^1 = U_4^1$. Aggregating the marginal benefits horizontally from individuals 3 and 4, $U_3^1 + U_4^1$, yields the total marginal benefits from contributions of individual 1, U_{3+4}^1. Thus, the general equilibrium condition for individual 1 is $U_1^1 = U_{3+4}^1$ in an aggregate sense. From this, the optimal allocation of contributions between individuals 3 and 4 requires each recipient to have the amount of contributions for which the marginal benefit from each recipient is equal to the common value of marginal cost and total marginal benefits at the equilibrium

contribution. Because the marginal utility of individual 1 with respect to the consumption of individual 3 is less than that with respect to the consumption of individual 4 before the donations are made, for the equilibrium conditions to be attained, the allocation of donations to individual 4 should be greater than that to individual 3 at equilibrium. This is shown in Figure 6. The mb'(= U_4^1) line is above the mb(= U_3^1) line which indicates that $U_4^1 > U_3^1$. At the equilibrium, individual 1's contributions to the poor (individuals 3 and 4) are $w_1 = w_{13} + w_{14}$, where $w_{14} > w_{13}$ indicates that individual 4 is given more than individual 3.

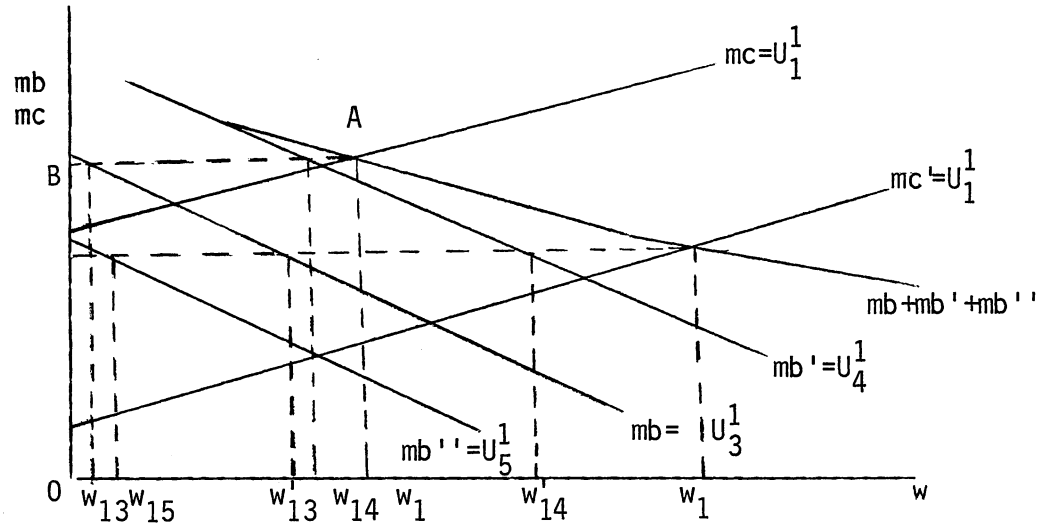

Figure 6. Allocations of Private Giving Among Recipients

Assume now that there is another person, individual 5, whose income y_5 is greater than y_3 or y_4, but less than y_1. Accordingly, $U_4^1 > U_3^1 > U_5^1$. The equilibrium conditions can be extended as $U_1^1 = U_3^1$, $U_1^1 = U_4^1$, and

$U_1^1 = U_5^1$. In Figure 6, the mb"($= U_5^1$) curve is far below mb and mb' curves, and there is no intersection between mb" and AB, which represents the common value of marginal cost and total marginal benefits at the equilibrium level. This indicates that the income of individual 5 is relatively high and the utility benefit for individual 1 from giving to individual 5 is less than the utility loss he sacrifices due to the reduction of his own consumption, or is less than the utility benefits from giving to individuals 3 and 4. There will be, therefore, no giving to individual 5 from individual 1.

However, if the income of individual 1 is increased from y_1 to y_1', the marginal cost curve of individual 1 will shift downward to mc', due to the decreasing marginal utility of his own consumption. Now, giving to individual 5 becomes beneficial to individual 1. Thus, the equilibrium condition is obtained and the amount of giving is w_{15}.

From this analysis, it can be generalized that donors may give to some non-poor people such as individual 5 when their incomes are increased. This will definitely change the distribution of donors' giving and make the contribution in general more progressive, although the amounts of giving to the poor (individuals 3 and 4) would also be raised, w_{13}' and w_{14}'.

From Becker's (1974) theory, we know that the effect of the price of giving is introduced through the marginal cost side, i.e., $mc = p_1 U_1^1$. Thus, other things unchanged, a decrease in the price of giving will have the same effect as an increase of donors' income. Therefore, the implications of interdependent utility not only lie in the size of private contributions, but also in the distribution of private contributions.

In summary, the nature of utility interdependence is related to both the size and distribution of private contributions. Thus, variables such as income, the "price" of contribution, the income distribution before transfers, the size of government transfers and their distributions, which determine the size of private contributions, may well affect the distribution of private contributions. Also, as in the case of bilateral monopoly, in small numbers case, there are several different strategies which depend upon the reactions of others conjectured by individuals; i.e., different possible values for v' and m'. Therefore, the final outcome depends on the bargaining strength and skills of the parties involved. In other words, the relaxation of Nash conjectures in the small numbers case need not have an efficient outcome. This implies that the relationship between private welfare transfers and the number of donors might not be negative even if private welfare transfers actually take on the character of public goods. Fortunately, there is another way to examine the Nash conjectures hypothesis. From the analysis we know that the perfect substitution relationship between government transfers and private welfare transfers (minus unity) is the sufficient and necessary condition for the Nash conjectures hypothesis. The relationship between private and public transfers, therefore, is useful in the investigation of both utility interdependence and Nash conjectures.

CHAPTER V

THE EMPIRICAL MODEL AND DATA

Data Sources

For testing the redistributive effects of public and private income transfers and the public goods character of private welfare income transfers, cross-sectional data on the 28 SMSA's (Standard Metropolitan Statistical Area) for the year 1972-73 have been collected. The primary data are from Consumer Expenditure Survey: Integrated Survey Data for Metropolitan Areas, 1972-73 (U.S. Department of Labor, 1981). This survey was conducted by the Bureau of Labor Statistics primarily to revise the Consumer Price Index, but it is a valuable base for distributive studies because of its provision of information on numerous expenditures and income sources by income class for SMSA's.

The Consumer Expenditure Survey (CES) offers a clear classification of family income sources, including public transfers such as social security, railroad retirment, public assistance, veteran's compensation, and government retirement, and private transfers including private pensions, income from estates and trusts, and regular contributions for support (e.g., regular private contributions, alimony and child support). Public assistance, income from estates and trusts, and regular contributions for support are defined in this study as welfare-type income transfers; the rest of the above are insurance-type transfers. Two transfer incomes, incomes from estates and trusts and workmen's

compensation, were deleted from our sample because they are lumped with other non-transfer incomes and it is not possible to identify them separately.

One weakness of the CES is that the income transfers are distributed in a rather rough manner by income class. Furthermore, there is inconsistency in grouping among SMSA's, eighteen have 2 income intervals, six have 3 income intervals, and four have 7 income intervals. The income intervals are: under $12,000 and over $12,000 in the 2-interval case; under $6,000, $6,000-12,000, and over $12,000 in the 3-interval case; under $4,000, two $2,000 increments up to $8,000, $8,000-12,000, $12,000-15,000, $15,000-20,000, and over $20,000 in the 7-interval case. In order to be consistent and to conform with theoretical requirements, two income intervals will be used in calculations for all SMSA's.

The Empirical Model and the Variables

In this section an empirical model is presented based on the conceptual framework developed for this study. This model consists of an examination of redistributive effects of public and private income transfers and a test of the public goods character of private welfare income transfers. Additionally, a description is provided of the variables employed in the regressions. The variables are:

GINI = the Gini coefficient of after-transfer (both public and private) family income.

GINIG = the Gini coefficient of family income after public transfers.

GINIP = the Gini coefficient of family income after private transfers.

BINI = the Gini coefficient of before-transfer (both public and private) family income.

APTR = the average (effective) private transfer rate.

AGTR = the average (effective) public transfer rate.

MPTR = the degree of private transfer progressivity, or the distribution of private transfers.

MGTR = the degree of public transfer progressivity, or the distribution of public transfers.

APWTR = the average private welfare income transfer per family.

MPWTR = the degree of private welfare income transfer progressivity, or the distribution of private welfare transfers.

AGTRV = the average public income transfer per family.

(APTR)(MPTR), (AGTR)(MGTR) = the interaction variables.

INCOM = the average income per family.

PRICE = the average price of private charitable giving.

POP = the population size.

u_1, u_2, u_3 = error terms.

i = a geographic entity (SMSA).

Redistributive Effects

Total Effects. Total redistributive effect is defined as comparing an income distribution before transfers with an income distribution after transfers. Both total redistributive effects of public and

private transfers will be calculated for each SMSA. According to the decomposition analysis developed in Chapter IV, it notes that to compare the redistributive effects between public and private transfers, we need to isolate the effect of underlying distribution from the effect of transfers on final income distribution. Therefore, we calculate the total redistributive effects of public and private transfers, respectively, by employing the same basis of underlying distribution. This can be expressed as follows:

$$R_{gi} = (BINI_i - GINIG_i)/BINI_i \tag{5.1}$$

and

$$R_{pi} = (BINI_i - GINIP_i)/BINI_i \tag{5.2}$$

where R_{gi} and R_{pi} are the total redistributive effects of public and private transfers, respectively.

Marginal Effects. In examining the marginal redistributive effects of income transfers, the regression test will be run with cross-sectional data for 28 SMSA's (1972-73), in an attempt to explain differences in income distribution between SMSA's. The perfect equality of incomes is used as an implicit standard even though it may be rejected as the ultimate equity objective. It is hypothesized that income inequality is associated with a number of independent variables, as depicted in the following regression equation:

$$\begin{aligned} GINI_i = {} & a_1 + a_2(APTR_i) + a_3(MPTR_i) + a_4(AGTR_i) \\ & + a_5(MGTR_i) + a_6(APTR_i)(MPTR_i) + a_7(AGTR_i)(MGTR_i) \\ & + a_8(BINI_i) + u_1 \end{aligned} \tag{5.3}$$

Although there is a nonlinearity in the equation, it applies only to the independent variables (interaction terms), not to the parameters. Therefore, conventional least squares techniques can still be used to estimate the regression coefficients (Pindyck and Rubinfeld, 1981).

By taking partial derivatives, the marginal effects of public and private transfer rates and degrees of progressivity on after-transfer income distribution, the marginal redistributive effects, are derived as follows:

$$\partial(GINI)/\partial(AGTR) = a_4 + a_7(MGTR) \tag{5.4}$$

$$\partial(GINI)/\partial(APTR) = a_2 + a_6(MPTR) \tag{5.5}$$

$$\partial(GINI)/\partial(MGTR) = a_5 + a_7(AGTR) \tag{5.6}$$

$$\partial(GINI)/\partial(MPTR) = a_3 + a_6(APTR) \tag{5.7}$$

The magnitudes of the marginal redistributive effects of public and private transfer rates (progressivities) depend on the values of their transfer progressivities (rates), respectively. Setting (5.4), (5.5), (5.6), and (5.7) each equal to zero, we have

$$MGTR = -a_4/a_7$$

$$MPTR = -a_2/a_6$$

$$AGTR = -a_5/a_7$$

$$APTR = -a_3/a_6$$

Accordingly, we expect that

$$\partial(GINI)/\partial(AGTR) \gtreqless 0, \text{ if } MGTR \gtreqless -a_4/a_7 \text{ and } a_7 > 0,$$

$$\partial(GINI)/\partial(APTR) \gtreqless 0, \text{ if } MPTR \gtreqless -a_2/a_6 \text{ and } a_6 > 0,$$

$$\partial(GINI)/\partial(MGTR) \gtreqless 0, \text{ if } AGTR \gtreqless -a_5/a_7 \text{ and } a_7 > 0,$$

$$\partial(GINI)/\partial(MPTR) \gtreqless 0, \text{ if } APTR \gtreqless -a_3/a_6 \text{ and } a_6 > 0;$$

and

$$\partial(GINI)/\partial(AGTR) \gtreqless 0, \text{ if } MGTR \lesseqgtr -a_4/a_7 \text{ and } a_7 < 0,$$

$$\partial(GINI)/\partial(APTR) \gtreqless 0, \text{ if } MPTR \lesseqgtr -a_2/a_6 \text{ and } a_6 < 0,$$

$$\partial(GINI)/\partial(MGTR) \gtreqless 0, \text{ if } AGTR \lesseqgtr -a_5/a_7 \text{ and } a_7 < 0,$$

$$\partial(GINI)/\partial(MPTR) \gtreqless 0, \text{ if } APTR \lesseqgtr -a_3/a_6 \text{ and } a_6 < 0.$$

$\partial(GINI)/\partial(AGTR) > 0$ ($\partial(GINI)/\partial(APTR) > 0$) indicates that the redistributive effect of public (private) income transfers is against the poor, i.e., the increase in the public (private) income transfer rate will cause the final income to be less equally distributed. On the contrary, if $\partial(GINI)/\partial(AGTR) < 0$ ($\partial(GINI)/\partial(APTR) < 0$), then the increase in the public (private) income transfer rate will have a pro-poor marginal redistributive effect. Of course, there is no marginal redistributive effect whatsoever, if $\partial(GINI)/\partial(AGTR) = 0$ ($\partial(GINI)/\partial(APTR) = 0$). Similarly, $\partial(GINI)/\partial(MGTR) > 0$ ($\partial(GINI)/\partial(MPTR) > 0$) means that the increase in the degree of public (private) transfer progressivity will make the final income distribution less equal. On the contrary, if

$\partial(GINI)/\partial(MGTR) < 0$ ($\partial(GINI)/\partial(MPTR) < 0$), the increase in the degree of public (private) transfer progressivity will have a pro-poor marginal redistributive effect. There will be no effect, if $\partial(GINI)/\partial(MGTR) = 0$ ($\partial(GINI)/\partial(MPTR) = 0$). Whether the marginal redistributive effects of public and private transfer rates and progressivities are pro-poor, pro-rich, or neutral depends on the values of their multiplicative counterparts which, in turn, are determined by the coefficients in (5.3). Further, by setting

$$\partial(GINI)/\partial(AGTR) = \partial(GINI)/\partial(APTR)$$

and

$$\partial(GINI)/\partial(MGTR) = \partial(GINI)/\partial(MPTR),$$

we have that

$$MGTR = (a_2/a_7) - (a_4/a_7) + (a_6/a_7)(MPTR) \tag{5.8}$$

and

$$AGTR = (a_3/a_7) - (a_5/a_7) + a_6/a_7)(APTR). \tag{5.9}$$

From (5.8) ((5.9)), we can derive numerous pairs of values of public and private transfer progressivities (rates), for which the marginal redistributive effect of the public income transfer rate (progressivity) is equal to the marginal redistributive effect of the private income transfer rate (progressivity), i.e., "isoeffect" curves. These two relationships are plotted in Figure 7. The shape of the lines depends on the values and signs of intercept terms, $(a_2/a_7) - (a_4/a_7)$ and $(a_3/a_7 - a_5/a_7)$, respectively, and slope coefficients, a_6/a_7. Each has four possible cases:

For (5.8),

(a) $(a_2/a_7) - (a_4/a_7) > 0$ and $(a_6/a_7) > 0$,

(b) $(a_2/a_7) - (a_4/a_7) > 0$ and $(a_6/a_7) < 0$,

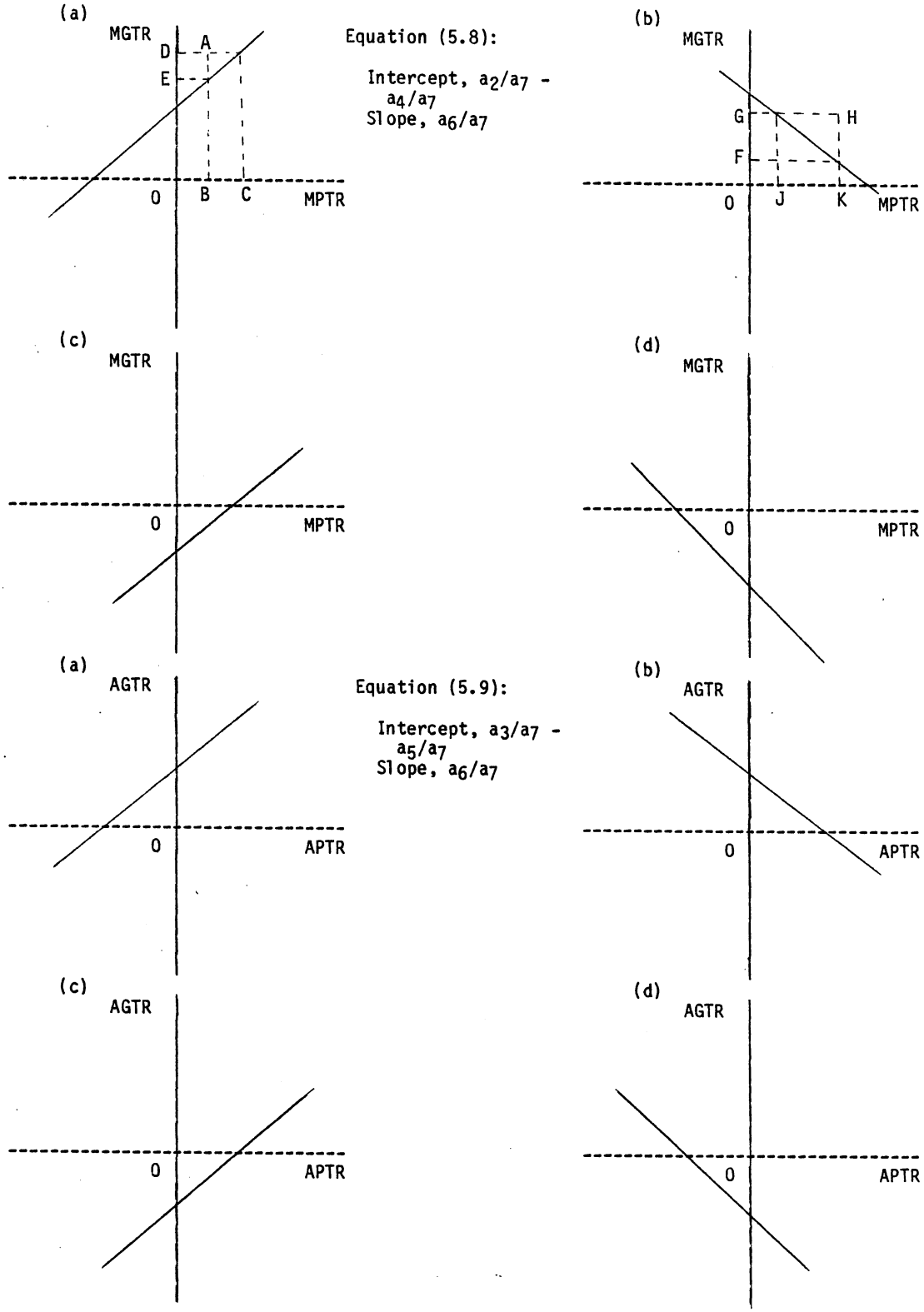

Figure 7. "Isoeffect" Curves

(c) $(a_2/a_7) - (a_4/a_7) < 0$ and $(a_6/a_7) > 0$,

(d) $(a_2/a_7) - (a_4/a_7) < 0$ and $(a_6/a_7) < 0$.

For (5.9),

(a) $(a_3/a_7) - (a_5/a_7) > 0$ and $(a_6/a_7) > 0$,

(b) $(a_3/a_7) - (a_5/a_7) > 0$ and $(a_6/a_7) < 0$,

(c) $(a_3/a_7) - (a_5/a_7) < 0$ and $(a_6/a_7) > 0$,

(d) $(a_3/a_7) - (a_5/a_7) < 0$ and $(a_6/a_7) < 0$.

The case notations here correspond to the notation used in Figure 7.

The points along the lines represent the combinations of public and private transfer progressivities (rates), for which the marginal effects of public and private transfer rates (progressivities) upon income distribution are the same. For the points off the lines, the comparison of the marginal redistributive effects of public and private transfer rates depends on the signs of the coefficients, a_6 and a_7.

(1) If $a_6/a_7 > 0$, i.e., cases (a) and (c), the signs of a_6 and a_7 will be either both positive or both negative (see Figure 7).

(i) $a_6 > 0$, $a_7 > 0$

The points appearing above the lines indicates that the actual value of MGTR (OD) exceeds the value on the line (OE), given the value of MPTR (OB); or that the actual value of MPTR (OB) is far less than the value on the line (OC), given the value of MGTR (OD). Thus, from (5.4) and (5.5), we know that

$$\partial(\text{GINI})/\partial(\text{AGTR}) > \partial(\text{GINI})/\partial(\text{APTR}).$$

This implies that the public transfer rate should play a relatively smaller role than the private transfer rate with respect to the redistribution of income. Thus, if both have negative (pro-poor) marginal

redistributive effects, the private transfer rate should be increased relatively more than the public transfer rate; if both have positive (pro-rich) marginal redistributive effects, the public transfer rate should be decreased relatively more than the private transfer rate.

(ii) $a_6 < 0$, $a_7 < 0$

Again from (5.4) and (5.5), the points above the lines indicate that

$$\partial(GINI)/\partial(AGTR) < \partial(GINI)/\partial(APTR).$$

This implies that the public transfer rate should play a relatively larger role than the private transfer rate with respect to income redistribution.

For points below the lines, the results will be reversed.

(2) If $a_6/a_7 < 0$, i.e., cases (b) and (d), the signs of a_6 and a_7 will be either $a_6 > 0$, $a_7 < 0$ or $a_6 < 0$, $a_7 > 0$ (see Figure 7).

(i) $a_6 < 0$, $a_7 > 0$

The points above the line indicate that the actual value of MGTR (OG) exceeds the value on the line (OF), given the value of MPTR (OK); or that the actual value of MPTR (OK) exceeds the value on the line (OJ), given the value of MGTR (OG). Thus, from (5.4) and (5.5), we know that

$$\partial(GINI)/\partial(AGTR) > \partial(GINI)/\partial(APTR).$$

Therefore, the implication is the same as (1)--(i) above.

(ii) $a_6 > 0$, $a_7 < 0$

Again from (5.4) and (5.5), the points above the line indicate that

$$\partial(GINI)/\partial(AGTR) < \partial(GINI)/\partial(APTR).$$

Thus, the implication is the same as (1)--(ii).

For points below the lines, the results will be reversed.

In a similar manner, we can derive the following conclusions for the comparison of public and private transfer progressivities:

(1) If $a_6/a_7 > 0$,

(i) and $a_6 > 0$, $a_7 > 0$,

then $\partial(GINI)/\partial(MGTR) > \partial(GINI)/\partial(MPTR)$.

(ii) When $a_6 < 0$, $a_7 < 0$,

then $\partial(GINI)/\partial(MGTR) < \partial(GINI)/\partial(MPTR)$.

(2) If $a_6/a_7 < 0$,

(i) and $a_6 < 0$, $a_7 > 0$,

then $\partial(GINI)/\partial(MGTR) > \partial(GINI)/\partial(MPTR)$.

(ii) When $a_6 > 0$, $a_7 < 0$,

then $\partial(GINI)/\partial(MGTR) < \partial(GINI)/\partial(MPTR)$.

For ease of exposition, we present the summary results in Table II.

A Test of the Public Goods Character of Private Welfare Income Transfers

In the investigation of the interdependent utility and Nash conjectures hypotheses in testing the allocative efficiency of private welfare income transfers, the relationships of primary analytic interest should be translated into operational form, suitable for explaining interarea differences in welfare income transfers. The fitted equations are, in linear form:

TABLE II

CHARACTERISTICS OF MARGINAL REDISTRIBUTIVE EFFECTS OF PUBLIC AND PRIVATE TRANSFER RATES AND PROGRESSIVITIES

A. Transfer rates		
a. Points on the line		No differences in redistributive effects between public and private transfer rates.
b. Points above the line		
1. $a_6/a_7 > 0$	Cases (a) and (c) in Figure 7 for equation (5.8).	
(i) $a_6>0$, $a_7>0$		Public transfer rate should play a relatively smaller role in income redistribution than private transfer rate.
(ii) $a_6<0$, $a_7<0$		Public transfer rate should play a relatively larger role in income redistribution than private transfer rate.
2. $a_6/a_7<0$	Cases (b) and (d) in Figure 7 for equation (5.8).	
(i) $a_6<0$, $a_7>0$		As (1)--(i) above.
(ii) $a_6>0$, $a_7<0$		As (1)--(ii) above.
c. Points below the line		
1. $a_6/a_7>0$	Cases (a) and (c) in Figure 7 for equation (5.8).	
(i) $a_6>0$, $a_7>0$		Public transfer rate should play a relatively larger role in income redistribution than private transfer rate.
(ii) $a_6<0$, $a_7<0$		Public transfer rate should play a relatively smaller role in income redistribution than private transfer rate.
2. $a_6/a_7<0$	Cases (b) and (d) in Figure 7 for equation (5.8).	
(i) $a_6<0$, $a_7>0$		As (1)--(i) above.
(ii) $a_6>0$, $a_7<0$		As (1)--(ii) above.
B. Transfer progressivities--The conditions and results are the same as (A), except that the corresponding cases are for equation (5.9).		

$$APWTR_i = b_1 + b_2(INCOM_i) + b_3(PRICE_i) + b_4(BINI_i) + b_5(POP_i) + b_6(AGTRV_i) + b_7(MGTR_i) + u_2, \quad (5.10)$$

and

$$MPWTR_i = c_1 + c_2(INCOM_i) + c_3(PRICE_i) + c_4(BINI_i) + c_5(AGTRV_i) + c_6(MGTR_i) + u_3, \quad (5.11)$$

and, in logarithmic form:

$$\text{Log}(APWTR_i) = b_1 + b_2\ \text{Log}(INCOM_i) + b_3\ \text{Log}(PRICE_i) + b_4\ \text{Log}(BINI_i) + b_5\ \text{Log}(POP_i) + b_6\ \text{Log}\ (AGTRV_i) + b_7\ \text{Log}(MGTR_i) + u_2, \quad (5.12)$$

and

$$\text{Log}(MPWTR_i) = c_1 + c_2\ \text{Log}(INCOM_i) + c_3\ \text{Log}(PRICE_i) + c_4\ \text{Log}(BINI_i) + c_5\ \text{Log}(AGTRV_i) + c_6\ \text{Log}\ (MGTR_i) + u_3. \quad (5.13)$$

Both linear and logarithmic fits will be attempted. The meaning of coefficients in these two forms is distinctive; the coefficient of the logarithmic form represents the elasticity of the independent variables with respect to the dependent variable. Furthermore, in the logarithmic form we assume that independent variables have a multiplicative effect on the dependent variable. From previous studies (for example, Hochman and Rodgers, 1973; Schwartz, 1970; Feldstein, 1975a), we expect that the logarithmic form will be of greater statistical significance than the linear form. It is worthwhile, at this point, to note that the measurement of MPWTR and MGTR in (5.12) and (5.13) is quite different from the one employed in the other equations. Due to the special characteristic of logarithmic functions, only positive values can have logarithms. This will be further explained in the following section.

Variables

The above equations indicate the relationships we wish to estimate. Values for most of the variables are derived indirectly from primary data sources through technical operations. Therefore, it is necessary here to illuminate and display, in more detail, the variables employed in the analysis, their calculations, and relationship to the models.

Before- and After-Transfer Income Distributions (BINI, GINIG, GINIP, and GINI). The Gini concentration ratio will be used in the quantification of these four variables to show the dispersion of (money) income before and after income transfers. Among its weaknesses, Gastwirth (1972) argues that the estimation of Gini ratios from grouped data has a bias that makes the numerical estimates systematically too low. The Gini estimates are lower bounds on the true concentration ratio because income variability within groups is neglected. The bias is smaller the more observations there are. The data used in this study have far fewer intervals than are necessary for small magnitudes of error. For CES data, there is inconsistency in grouping among SMSA's; eighteen with 2 intervals, six with 3 intervals, and four with 7 intervals. Fortunately, the burden of this analysis is to trace the differences in the size distribution of income among areas. The basic criticism of numerical studies of this kind carries less force in this case because the differences, if any, in a more comprehensive measure of the size distribution of income is at issue. The calculations need not be formally correct in all dimensions but must only yield an unbiased approximation of the differences in income distributions among areas. It is assumed that any biases are in the same direction and of similar

magnitude in all areas. This ensures that the exaggerated effect caused by the measure of the distribution itself would be alleviated and the distributive differences will be of the appropriate direction and magnitude (Reynolds and Smolensky, 1977; Benus and Morgan, 1975). Therefore, to be consistent, we chose a two-income intervals case--under $12,000 and over $12,000--as the basis for computing the Gini ratios for all 28 SMSA's.

The formula used in computing the Gini index is expressed as follows:

$$GINI = 1 - \sum_{i=1}^{n} (F_{i+1} - F_i)\ (Y_i + Y_{i+1}).$$

Where F_1 is the cumulative population share of the ith group ranked according to total income and Y_i is its cumulative income share. This is a trapezoidal derivation of the Gini ratio (Bronfenbrenner, 1971; Miller, 1966).[1]

The income figures presented in the CES represent the amounts of income received by families before deduction for personal income taxes, but they include transfer incomes. To derive the before-transfer income distribution, a decomposition of the inequality index into the contributions arising from different income sources is necessary. The following formula is employed[2]

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[1]For other approximations of Gini ratio, refer to the excellent discussions in Theil (1972), Kakwani and Podder (1976), and Kakwani (1976).

[2]This is one of the applications of the Lorenz curve discussed in Kakwani (1977). For the discussions on the impact of income components on the distribution of income, see Fei, Ranis, and Kuo (1978); Pyatt, Chen, and Fei (1980); and Shorrocks (1983). Note that if Gini indices of income components are instead employed in the formula, it will only

$$GINI = 1/\mu \sum_{k=1}^{n} \mu_k C_k. \qquad (5.14)$$

Where μ is the mean income of all income units, C_k is the concentration index of the kth income component (see the explanation of measures of transfer progressivity in latter section) and μ_k is the mean of the kth income component of all income units.

This indicates that the concentration ratio of total incomes is a weighted average of concentration ratios of its income components and the weight is each income components' share of total incomes. For example, if the first income component is defined as transfer incomes including both public and private transfers, then the income distribution before transfers is as follows.

First,

$$GINI = 1/\mu(\mu_1 C_1 + \mu_2 C_2),$$

where C_1 is the concentration ratio of transfer incomes, C_2 is the concentration ratio of non-transfer incomes, $\mu_1(\mu_2)$ is the mean of transfer (non-transfer) incomes of all income units, μ_1/μ (μ_2/μ) is the transfer (non-transfer) income share of total incomes.

Then, we have

$$BINI = C_2 = \mu/\mu_2 \ (GINI - (\mu_1/\mu)C_1).$$

This before-transfer income distribution fails to adjust for

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[2](Continued) provide the upper bound of the Gini index of the total income. This is because the income components may be any function of total income; but not necessarily be a nondecreasing function of total income. Consult Kakwani (1977) for details.

transfer-induced labor supply and living arrangements effects, a common omission in studies of this type. Therefore, we expect that the true before-transfer income is likely to be less unequally distributed than measured before-transfer income (see Reynolds and Smolensky, 1977; Danziger, Haveman, and Plotnick, 1981). The income disperson before transfers is used (1) as a summary measure representing all other factors which have effects on income distribution and (2) to examine the interdependent relationship between income transferors and transferees. It is noted that because the relevant potential recipient groups are not known, the measurement of income dispersion for all groups is used as a substitute here.

Similarly, the income distribution after public transfers (GINIG) and the income distribution after private transfers (GINIP) can be derived as follows:

$$GINIG = (\mu_{11}C_{11} + \mu_2 C_2)/(\mu_{11} + \mu_2),$$

$$GINIP = (\mu_{12}C_{12} + \mu_2 C_2)/(\mu_{12} + \mu_2),$$

where $\mu_{11}(\mu_{12})$ is the mean of public (private) transfer incomes of all income units, $\mu_{11} + \mu_{12} = \mu_1$, and $C_{11}(C_{12})$ is the concentration ratio of public (private) transfer incomes.

Average Transfer Rates and Transfer Progressivities (APTR, AGTR, MPTR, MGTR, and MPWTR). The average transfer rates, APTR and AGTR, are measured by computing the values of private and public income transfers as a percentage of the total before-transfer income, respectively. Specifically, they can be expressed as:

$$\text{APTR(AGTR)} = \frac{\text{Value of private income transfers (public income transfers) in each SMSA}}{\text{Value of total before-transfer income in each SMSA}}$$

All these values can be directly obtained from the CES. It is assumed that the total incomes before or after transfers will be the same. It should be noted here that the average transfer rate is identical to the proportion that transfer income is of total income as defined above.

In this study, two summary measures of transfer progressivity are employed. One of them is inspired by and related to the aforementioned concentration ratio. Its calculation is expressed as follows:

$$C_k = 1 - \sum_{i=1}^{n} (F_{i+1} - F_i)(Y_{i,k} + Y_{i+1,\,k}),$$

where C_k is the concentration ratio of transfer income, $Y_{i,k}$ is the cumulative transfer income share of ith group ranked according to the total income, and F_i is its cumulative popuatlion share.

From the definition of a concentration ratio, we know that C_k represents the distribution of transfer income. Similarly, it can be applied to the derivation of a single statistic to describe whether a transfer is progressive, proportional, or regressive. According to the analysis developed, the smaller is the value of C_k (MPTR, MGTR, or MPWTR), the more regressive or less progressive the transfer will be, given the underlying income distribution. If C_k is less (greater) than the Gini of the before-transfer income distribution (BINI), the transfer is defined as regressive (progressive).

For the progressivity index, C_k, as for the Gini index, a single measure can be misleading. For example, two concentration curves which intersect can be associated with identical concentration indexes. The

index, C_k, measures the average progressivity of a transfer across the entire income range, yet some transfers, as shown in Figure 8, are progressive over one range of incomes and regressive over another (Atkinson, 1970; Davies, 1980). Although careful interpretation and caution are warranted, this limitation is common to all averages and indexes. Thus, it is still here assumed to be a useful measure (Suits, 1980).

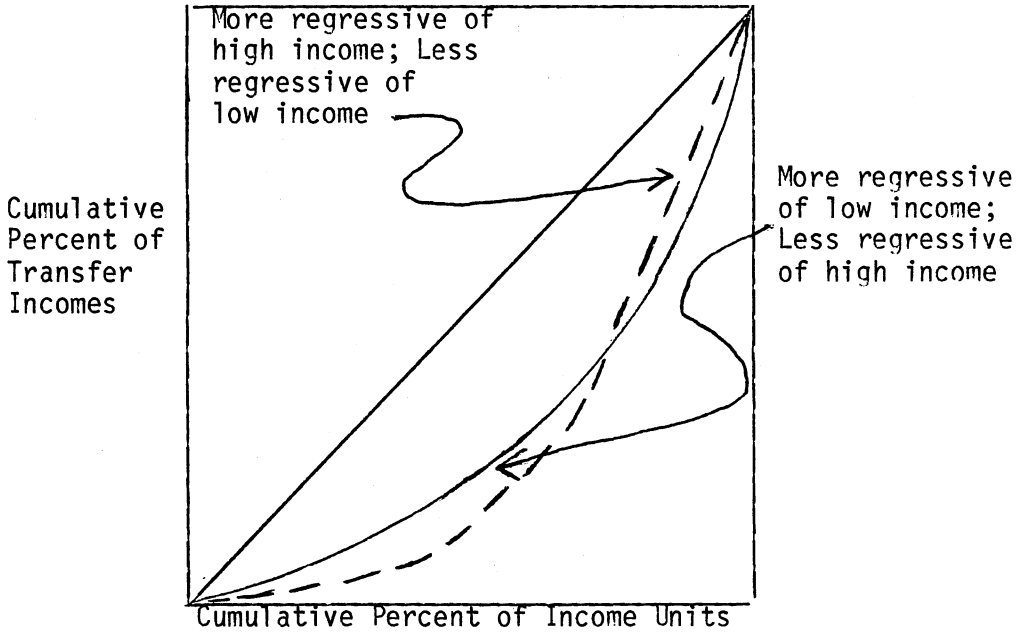

Figure 8. Concentration Curves for Transfer Incomes

The values of C_k could be positive or negative. Mathematically, we cannot take logarithms on negative values. Therefore, the estimation of (5.12) and (5.13) cannot be done. To solve this problem, we need to change the measures of MGTR and MPWTR in (5.12) and (5.13).

Suits (1977) attempts to attack the old problem of discovering a single index to represent the degree of tax progressivity. To do so, he applies the concept of the Lorenz curve to the derivation of a summary index of progressivity. Instead of focusing on the relationship between the cumulative percent of income units and the cumulative percent of income, he develops an index indicating the relationship between the cumulative percent of total tax burden and the cumulative percent of total income. Applying Suits' index to the case of transfers, it can be expressed as follows:

$$S = 1 - \sum_{i=1}^{n} (Y_{i+1} - Y_i)\,(T_i + T_{i+1}).$$

Where Y_1 is the cumulative income share of the ith group ranked according to total income and T_i is its cumulative transfer share.

With a regressive transfer, S will be negative since the Lorenz-like curve lies above the diagonal; with a progressive transfer, S will be positive since the Lorenz-like curve lies below the diagonal. Because the transfers are expected to be regressive in an aggregate sense, the S indexes of MPWTR and MGTR would be negative for most SMSA's.[3] One way of transforming the values of S into positive figures is to reverse the variables on the two axes used in plotting the Lorenz-like curve, i.e., as opposed to Suits' illustration, we set the

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[3]By using the measurement of S index, all 28 observations have negative values for MGTR and, of them, 26 observations have negative values for MPWTR. Although the transfers are expected to be regressive in an aggregate sense, the signs of MGTR and MPWTR measured by C_k will still be vague, since a transfer is defined as regressive, if C_k is less than BINI, not zero. As a matter of fact, by using the measurement of C_k, only 25 and 16 observations have negative values for MGTR and MPWTR, respectively.

cumulative percent of income on the vertical axis and cumulative percent of the transfers on the horizontal axis. In other words, the definition of the S index is refined as

$$S_1 = 1 - \sum_{i=1}^{n} (T_{i+1} - T_i)(Y_i + Y_{i+1}).$$

By applying this approach to measures of MPWTR and MGTR, we can transform all values into positive figures, except two in MPWTR. Accordingly, the estimation of (5.12) and (5.13) can be performed. Deleting the two exceptions from our sample, we conduct the estimation of (5.13) with 26 observations. For comparison, we also utilize S_1 to estimate the linear equations of (5.10) and (5.11). It should be noted that, although Suits' index is useful in this respect, it does not have the arithmetically additive relationship shown in (5.14). In addition, contrary to the case for the C_k and the S indices, a transfer is defined as regressive (progressive), if S_1 is greater (less) than zero.

Interaction Terms [(APTR)(MPTR), (AGTR)(MGTR)]. According to the analysis developed, there is a multiplicative effect of transfer rates and progressivities on income distribution. Statistically, interaction terms are often included in models in which one does not believe that right-hand explanatory variables have the same effect on dependent variables, whatever the values of the other right-hand variables. In the case of transfers, this means that the effect of the private (public) transfer rate upon the Gini index is dependent on the value of its counterpart, transfer progressivity, and vice versa.

Average Public Income Transfers Per Family and Average Private Welfare Income Transfers Per Family (AGTRV and APWTR). AGTRV is derived

by adding up the values of the separate transfer components shown in the CES, divided by total families in each SMSA. The reported private welfare income transfers, divided by total families in each SMSA, are used as the empirical counterpart of APWTR. The private welfare income transfer here is defined from the receiving, not the giving, side. This indicates that it includes the welfare incomes from individuals and other intermediaries. Here it is assumed that the theory of individual giving can be extended to other private philanthropic counterparts; namely, the behaviors of intermediaries would depend on their donors.[4]

Income, Price, and Donors (INCOM, PRICE, and POP). The measure of per family income is obtained from average income before tax per family in each SMSA. There have been several definitions of income employed in previous studies. Taussig (1967) uses income net of taxes paid. Feldstein and Taylor (1976) argue that to avoid the dependence of income upon contributions, the correct variable should be income net of the taxes that would have been paid if there had been no charitable deduction. Reece (1979) argues, however, that the income variable could be endogenous in the model, since it is possible for contributions plus expenditures on goods to exceed income as defined by Feldstein and Taylor. Thus, the correct definition seems to be gross income. In this study, Reece's suggestion is employed.

The average price is measured as: 1 minus the average value of personal income taxes paid per family as a percentage of the average income before taxes per family. This is considered to be a very rough

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[4]See Orr (1976) for a discussion about a similar application to the government.

approximation of the price for each individual. The income variable in the denominator should be measured by taxable income, since not all income are subject to the personal income tax. The taxes paid in the numerator should be defined as the taxes which would have been paid before taking account of charitable deductions (Reece, 1979). Therefore, the measure used here must be interpreted with caution.

The actual population of income transfer donors for each SMSA is not available. Thus, the general population (families) is used as a rough proxy.

Hypotheses About the Signs of the Regression Coefficients

Table III illustrates the expected signs of coefficients in the regression models. As opposed to the C_k measurement of MGTR and MPWTR in equations (5.10) and (5.11), the S_1 index is employed in equations (5.10a) and (5.11a). If the interactive relationship between the transfer rate and progressivity does not exist, intuitively a regressive (progressive) income transfer will make the after-transfer income more (less) equally distributed, given other factors constant. In other words, positive signs are expected on the coefficients of MPTR and MGTR (i.e., a_3 and a_5). The responses of average transfer rates with respect to the Gini coefficient of after-transfer income depend on the natures of the progressivity indexes. Average transfer rates will respond positively (negatively) to the Gini coefficient of after-transfer income, if the progressivity indexes indicate that the income transfers are progressive (regressive), given other factors constant (including the progressivity index). Although some features of public and private income

TABLE III

EXPECTED SIGNS OF COEFFICIENTS

Equation Numbers	Dependent Variable	APTR	AGTR	MPTR	MGTR	(APTR)(MPTR)	(AGTR)(MGTR)	BINI	INCOM	PRICE	POP	AGTRV
(5.3)	GINI	±	±	±	±	+	+	±				
(5.10)	APWTR				+			+	+	-	-	-
(5.10a)	APWTR				-			+	+	-	-	-
(5.11)	MPWTR				-			-	+	-		+
(5.11a)	MPWTR				-			+	-	+		-
(5.12)	APWTR				-			+	+	-	-	-
(5.13)	MPWTR				-			+	-	+		-

transfers are detrimental to the achievement of the objective of reducing poverty and income inequality, still their redistributive effects are likely to be pro-poor in an aggregate sense (Danziger, Haveman, and Plotnick, 1981; Lampman, 1972; Morgan, David, Cohen, and Brazer, 1962). In other words, they are regressive in general. Accordingly, negative signs are expected on the coefficients of APTR and AGTR (i.e., a_2 and a_4).

However, as the interaction terms representing the multiplicative relationship between transfer rate and progressivity are employed, the responses of them with respect to the Gini coefficient of after-transfer income become vague, i.e., the signs of a_2, a_3, a_4, and a_5 are uncertain. Other than themselves, the marginal redistributive effects of transfer rate and progressivity depend on the value of their multiplicative counterparts. For example, the marginal redistributive effect of AGTR is as follows

$$\partial(GINI)/\partial(AGTR) = a_4 + a_7(MGTR).$$

Here, a_4 becomes the intercept term and it could be either positive or negative.

According to the arithmetically additive relationship developed, it is noted that the average transfer rate is regarded as a "scalar" to transfer progressivity in determining the magnitude of the redistributive effect. For example, from (5.14) and definitions of variables described above, we have

$$\begin{aligned} GINI &= (\mu_{11}/\mu)C_{11} + (\mu_{12}/\mu)C_{12} + (\mu_2/\mu)C_2 \\ &= (AGTR)(MGTR) + (APTR)(MPTR) + (\mu_2/\mu)(BINI). \end{aligned}$$

Therefore, we expect that the signs of the interaction variables in (5.3)

are all positive. As MGTR and MPTR, due to the multiplicative relationship between non-transfer income proportion (μ_2/μ) and before-transfer distribution, the expected sign of BINI could be either positive or negative.[5]

Higher income among individuals will result in higher transfers. The lower the price of transfers, the more transfers that will be supplied. In addition, higher income and lower price may cause the distribution of private welfare transfers (MPWTR) to be less sensitive to the poor relative to others. Therefore, in (5.10) and (5.11), positive signs are expected on the coefficients of INCOM with respect to APWTR and MPWTR. As for the coefficients of PRICE with respect to APWTR and MPWTR, negative signs are expected.

A less equal income distribution may encourage philanthropic behavior and make the rich more sensitive to the poor in distributing their welfare income transfers. Public income transfers can substitute for some of the welfare recipients' incomes. Therefore, the larger or more regressive are public income transfers, the more they might discourage private welfare income transfers and make the rich less sensitive to the poor in the distribution of transfers. In summary, in (5.10) these considerations indicate that positive signs are expected on the coefficients of BINI and MGTR; and a negative sign is expected on the coefficient of AGTRV with respect to APWTR. Furthermore, in (5.11) negative signs are expected on the coefficients of BINI and MGTR; and a positive sign is expected on the coefficient of AGTRV with respect to MPWTR.

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[5]We have attempted to employ the interaction term, (μ_2/μ)(BINI), in (5.3). Unfortunately, the multicollinearity between BINI and (μ_2/μ)(BINI) causes the estimates of them to have high variances. Hence, this interaction term is dropped from (5.3).

Finally, the sign of the coefficient of POP is expected to be negative in accordance with the public goods character of private welfare income transfers. In contrast to equation (5.10), a negative sign is expected on the coefficient of MGTR in (5.10a) and, as opposed to the signs of coefficients in (5.11), all but the sign of the coefficient of MGTR are expected to be reversed in (5.11a). It is noted that the expected signs of the coefficients in (5.10a) and (5.11a) are the same as in (5.12) and (5.13), respectively.

CHAPTER VI

EMPIRICAL RESULTS

In Chapter IV we presented the theoretical framework of this study and in Chapter V we described the empirical model. The empirical results, based on regression analysis, are presented and evaluated in this chapter. The order of presentation follows the previously encountered two part division of redistributive effects and public goods character of private welfare income transfers. The results of OLS linear regression are provided in both the redistributive effects and public goods sections. Additionally, the results for two alternative measures of progressivity and two alternative functional forms are reported for the public goods equations.

Redistributive Effects

Total Effects

The total redistributive effects of public and private transfers among 28 SMSA's are presented in Table IV. These figures are derived by using equations (5.1) and (5.2) in Chapter V.

Table IV shows that the Gini coefficients after transfers are both variable and significantly different from the Gini coefficients before transfers (BINI) for all 28 SMSA's. The transfers, both publicly and privately provided, have reduced the Gini coefficient by 13.70 percent on average. Accounting for the contributions of public and private

TABLE IV

TOTAL REDISTRIBUTIVE EFFECTS OF PUBLIC AND PRIVATE TRANSFERS AMONG 28 SMSA'S

SMSA	APTR%	MPTR	AGTR%	MGTR	GINI	BINI	Percentage Reduction in GINI Due to Both Public and Private Transfers	Percentage Reduction in GINI Due to Public Income Transfers	Percentage Reduction in GINI Due to Private Income Transfers
1	1.62	-0.302	7.37	-0.102	0.300	0.343	12.54	9.72	3.29
2	1.85	-0.053	6.04	-0.347	0.256	0.302	15.23	13.22	2.31
3	2.90	-0.247	6.19	-0.291	0.270	0.325	16.92	12.08	5.44
4	1.70	0.133	2.99	-0.242	0.405	0.430	5.81	4.75	1.21
5	0.66	0.079	4.29	-0.187	0.279	0.302	7.62	6.99	0.51
6	3.50	0.113	6.99	-0.056	0.267	0.298	10.40	8.60	2.34
7	1.77	0.196	5.07	-0.160	0.262	0.287	8.71	8.03	0.59
8	1.57	-0.227	7.38	-0.239	0.248	0.296	16.22	13.57	3.18
9	0.62	0.022	2.31	-0.044	0.239	0.337	29.08	2.63	0.59
10	0.83	-0.107	5.71	-0.068	0.235	0.257	8.56	7.28	1.24
11	1.71	-0.111	12.02	0.016	0.321	0.372	13.71	11.70	2.53
12	1.11	-0.378	7.98	-0.166	0.302	0.351	13.96	11.89	2.51
13	2.40	-0.170	8.19	-0.211	0.262	0.317	17.35	13.98	4.02
14	1.26	-0.157	7.49	-0.172	0.267	0.309	13.59	11.81	2.05
15	1.66	-0.074	14.05	-0.075	0.219	0.274	20.07	18.20	2.46
16	2.26	0.101	5.69	-0.081	0.286	0.313	8.63	7.33	1.63
17	1.61	0.325	7.72	-0.192	0.296	0.337	12.17	12.32	0.06
18	1.44	-0.124	8.38	-0.224	0.308	0.365	15.62	13.72	2.11
19	1.39	-0.239	6.53	-0.261	0.254	0.298	14.77	12.42	2.58
20	1.32	0.124	7.46	-0.071	0.298	0.331	9.97	9.18	0.89
21	1.81	0.037	6.49	-0.317	0.270	0.316	14.56	13.24	1.71
22	2.23	-0.190	11.88	0.016	0.282	0.331	14.80	11.56	3.98
23	2.70	0.005	10.53	-0.228	0.290	0.362	19.89	17.64	2.97
24	0.86	0.024	9.25	0.146	0.253	0.266	4.89	4.21	0.87
25	1.52	-0.169	5.89	-0.226	0.270	0.309	12.62	10.36	2.50
26	1.68	-0.091	9.55	-0.185	0.308	0.368	16.30	14.60	2.32
27	2.21	-0.104	8.43	-0.165	0.257	0.305	15.74	13.28	3.24
28	2.30	-0.041	8.19	-0.153	0.307	0.357	14.01	11.98	2.80
Mean	1.74	-0.058	7.50	-0.153	0.279	0.324	13.70	10.94	2.21

transfers to income redistribution separately, we find that the average percentage reduction in the Gini coefficients are 10.94 for public transfers and 2.21 for private transfers, respectively. The Gini reduction for public transfers is smaller here than in previous studies (see Danziger, Haveman, and Plotnick, 1981). It is not surprising that public transfers have a much larger total redistributive effect than private transfers do. An examination of the values of transfer rates and progressivities indicates that (1) the average size of public transfers (7.50 percent) is larger than that of private transfers (1.74 percent), and (2) public transfers are distributed, on average, more pro-poor (-0.153) than private transfers are (-0.058).

Marginal Effects

In Table V we present a regression of after-transfer Gini coefficients on various independent variables. This equation represents the fully-specified marginal redistributive effects equation.

For equation (5.1), about 85 percent of the variation in Gini coefficients can be explained by the seven independent variables. The coefficients of these variables have the predicted signs and, except for the average private transfer rate variable (APTR) and the private transfer progressivity variable (MPTR), all are significant at the 90 percent level. In order to make statements about the relative importance of the independent variables in a multiple regression model, the beta coefficients are used. As a result of the normalization process, the beta coefficient of the constant term is undefined and dropped out (Pindyck and Rubinfeld, 1981). It is noted that before-transfer income distribution (BINI), public transfer progressivity (MGTR), and the interaction term for public transfers appear to be three relatively most important

TABLE V

MARGINAL REDISTRIBUTIVE EFFECTS OF PUBLIC AND PRIVATE TRANSFERS

Equation Number	Dependent Variable	Constant	APTR	MPTR	AGTR	MGTR	(APTR)(MPTR)	(AGTR)(MGTR)	BINI	$\bar{R}^2$	N	Durbin-Watson Statistic
(5.3)	GINI	-0.018	0.002	-0.068	0.003	-0.288	0.055	0.040	0.839	0.85**	28	2.61
		(0.72)	(0.48)	(1.34)	(1.77)*	(3.21)**	(1.92)*	(3.62)**	(11.81)**			
		[0]	[0.039]	[-0.311]	[0.211]	[-0.906]	[0.449]	[0.950]	[0.884]			

t ratios are given in parentheses.

Beta coefficients, standardized regression coefficients, are given in brackets.

*indicates coefficient is statistically significant at the 90 percent level.

**indicates coefficient is statistically significant at the 99 percent level.

N = number of observations.

variables. A standard deviation change in the BINI, MGTR, and (AGTR)(MGTR) will lead to 0.884, 0.906, and 0.950 standard deviation changes in the GINI, respectively. Moreover, the sign of the coefficient of BINI is positive; this indicates that a less equal before-transfer distribution will have a less equal after-transfer distribution.

Table VI shows that the simple correlation coefficients between public and private transfer progressivities and their interaction terms are 0.91 and 0.94, respectively, and highly significant. Hence, the multicollinearity problem is present. This will lead to OLS estimates of parameters having high variances. Normally the presence of high variances means that the parameter estimates are not precise and hypothesis testing is not very conclusive. However, this effect seems minor here. Although high collinearity exists, we still obtain good estimates; MGTR and (AGTR)(MGTR) are significant at a 99 percent level, and (APTR)(MPTR) is significant at a 90 percent level. In order to avoid the possible bias on the remaining variables due to dropping a relevant variable, we decided not to change the specification of the equation. The Durbin-Watson test was performed. The result shows that there is no serious serial correlation problem in (5.3).

The marginal redistributive effects of public and private transfer rates and progressivities can be obtained as follows:

$$\partial(\text{GINI})/\partial(\text{AGTR}) = 0.003 + 0.040\ (\text{MGTR})$$

$$\partial(\text{GINI})/\partial(\text{APTR}) = 0.055\ (\text{MPTR})$$

$$\partial(\text{GINI})/\partial(\text{MGTR}) = -0.288 + 0.040\ (\text{AGTR})$$

$$\partial(\text{GINI})/\partial(\text{MPTR}) = 0.055\ (\text{APTR}).$$

TABLE VI

SIMPLE CORRELATION COEFFICIENTS OF GINI AND THE DETERMINANTS OF GINI

	GINI	APTR	MPTR	AGTR	MGTR	(APTR)(MPTR)	(AGTR)(MGTR)	BINI
GINI	1.00	0.10	0.17	-0.11	-0.12	0.16	-0.00	0.89
APTR		1.00	0.03	0.25	-0.19	-0.02	-0.29	0.14
MPTR			1.00	-0.26	0.11	0.94	0.20	0.02
AGTR				1.00	0.34	-0.26	0.04	-0.03
MGTR					1.00	0.15	0.91	-0.20
(APTR)(MPTR)						1.00	0.22	-0.00
(AGTR)(MGTR)							1.00	-0.17
BINI								1.00

In taking the derivatives, the coefficients which are not significant at the 90 percent level are ommitted. Setting each equal to zero, we have

$$MGTR = -0.072$$

$$MPTR = 0$$

$$AGTR = 7.27 \quad \text{(percent)}$$

$$APTR = 0 \quad \text{(percent)}$$

Accordingly, we expect that

$$\partial(GINI)/\partial(AGTR) \gtrless 0, \text{ if } MGTR \gtrless -0.072$$

$$\partial(GINI)/\partial(APTR) \gtrless 0, \text{ if } MPTR \gtrless 0$$

$$\partial(GINI)/\partial(MGTR) \gtrless 0, \text{ if } AGTR \gtrless 7.27 \text{ (percent)}$$

$$\partial(GINI)/\partial(MPTR) \gtrless 0, \text{ if } APTR \gtrless 0 \text{ (percent)}$$

It is demonstrated that the sign and magnitude of the marginal redistributive effects of changes in transfer rates depend upon the level of transfer progressivity, and vice versa. The signs of the coefficients of the two interaction terms are both positive (0.055 and 0.04). This indicates that a higher value for the degree of transfer progressivity (transfer rate) will increase the pro-rich or decrease the pro-poor marginal redistributive effect of the transfer rate (the degree of transfer progressivity). For example, the marginal effect of changes in the public transfer rate on income distribution is 0.003 (pro-rich),

when public transfer progressivity is zero. The marginal redistributive effect will become more pro-rich (0.007), if the public transfer progressivity is changed from zero to 0.01.

Whether the marginal redistributive effect of the public transfer rate is pro-poor depends on the value of its progressivity. If the progressivity is less than -0.072, the public transfer rate will have a pro-poor marginal redistributive effect. Similarly, the public transfer progressivity will have a pro-poor marginal redistributive effect only when the transfer rate is less than 7.27 percent. In other words, an increase in public transfer progressivity, i.e., transfers becoming more progressive and pro-rich, does not necessarily have a pro-rich effect on the income distribution in a marginal sense. This is due to the multiplicative interaction between the transfer rate and progressivity. The marginal redistributive effect is composed of the impacts of the change of one factor and the level of the other. The marginal redistributive effects of private transfer rate and progressivity are related in the same manner, except that the critical value of determination is zero for both the transfer rate and progressivity. Public income transfers are larger in size and more pro-poor than the private transfers; hence, the conditions for public transfers to have a further income-equalizing effect are much more strict than for private transfers. Further income equalization can be realized more easily by changing the private (rather than public) transfer rate and progressivity, for most of the "easy gains have been made" already for public transfers.

To compare public transfers with private transfers further, we derive the equations of the lines representing equal public and private transfer redistributive effects discussed in Chapter V:

$$MGTR = -0.075 + 1.375\ (MPTR)$$

$$AGTR = 7.2 + 1.375\ (APTR).$$

Because the coefficients of two interaction terms are positive, i.e., $a_6 > 0$, $a_7 > 0$, case (1) - (i) in Chapter V applies here. It is illustrated in Figure 9.

Given this case, we conclude that to reduce income inequality: (1) there is no marginal redistributive effect difference if the combinations of the public transfer rate (progressivity) and private transfer rate (progressivity) lie on the "isoeffect" line CD (AB), (2) for all combinations above the lines, the private transfer rate (progressivity) should either be increased more or reduced less than the public transfer rate (progressivity), and (3) for all combinations below the lines, the public transfer rate (progressivity) should be either increased more or reduced less than private transfer rate (progressivity).

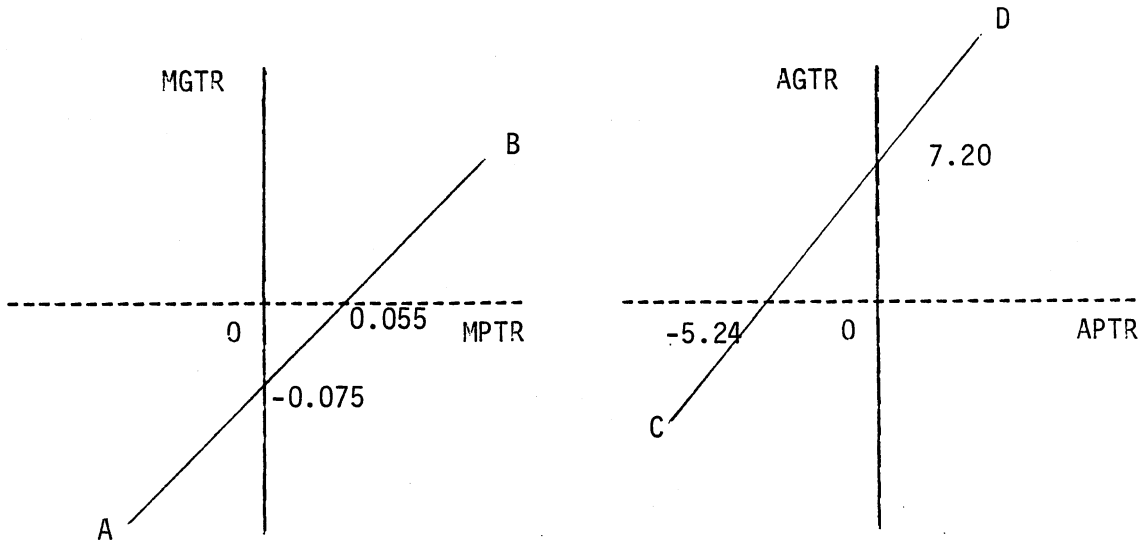

Figure 9. "Isoeffect" Curves for Public and Private Transfer Rates and Progressivities

Public Goods Character of Private Welfare Transfers

In Table VII we present the results of regressions derived from testing for the public goods character of private welfare transfers. Two equations were estimated for each alternative measure of transfer progressivity (C_k and S_1), first in linear and then in log form.

Explanatory power ($\bar{R}^2$) ranged from -0.13 to 0.23. Without exception, $\bar{R}^2$ for the log form of (5.12) is higher than its linear counterpart (5.10a), indicating that the relationship between average private welfare transfers per family and the independent variables is exponential rather than linear.[1] Although this conforms to the finding of previous studies, there is no apparent theoretical reason to explain this fact. The relationship between the distribution of private welfare transfers and the independent variables does not have this characteristic, i.e., equation (5.13) as compared to equation (5.11a). It is noted, furthermore, that $\bar{R}^2$ of (5.12) is the only one which is statistically significant (at 90 percent level). These low and insignificant values indicate that the level and distribution of private welfare transfers are not well modeled in our empirical specification, except in equation (5.12). In other words, the specification based upon the theoretical model developed has more power in explaining the level than the distribution of private welfare transfers.

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[1] R^2 (or $\bar{R}^2$) is often informally used as a goodness-of-fit statistic and to compare the validity of regression results under alternative specifications of the independent variables in the model. Strictly speaking, however, we have no statistical procedure to compare alternative specifications, because all our statistical results follow from the initial assumption that the model is correct.

TABLE VII

A TEST OF PUBLIC GOODS CHARACTER OF PRIVATE WELFARE INCOME TRANSFERS

Equation Numbers	Dependent Variable	Constant	INCOM	PRICE	BINI	POP	AGTRV	MGTR	$\bar{R}^2$	N	Durbin-Watson Statistics
(5.10)	APWTR	16.41 (0.05)	0.002 (0.51)	46.86 (0.12)	- 7.51 (0.03)	0.01 (1.09)	0.004 (0.10)	70.05 (0.78)	-0.12	28	1.85
(5.10a)	APWTR	-10.19 (0.03)	0.002 (0.63)	74.31 (0.19)	28.15 (0.12)	0.01 (1.08)	0.007 (0.19)	-62.58 (0.75)	-0.13	28	1.82
(5.11)	MPWTR	2.86 (1.51)	0.00 0.70	- 3.03 (1.32)	0.18 (0.13)		-0.0003 (1.24)	- 0.24 (0.46)	0.01	28	1.72
(5.11a)	MPWTR	- 3.21 (1.74)	0.00 (0.75)	3.53 (1.57)	1.02 (0.69)		-0.0003 (1.17)	- 0.44 (0.95)	0.09	28	1.87
(5.12)	APWTR	-10.23 (0.92)	1.51 (1.75)*	- 2.34 (0.48)	0.80 (0.65)	0.31 (2.12)**	-0.23 (0.36)	- 0.31 (0.64)	0.23*	28	1.51
(5.13)	MPWTR	- 6.34 (0.42)	0.40 (0.34)	7.86 (1.10)	1.34 (0.78)		0.53 (0.69)	- 0.58 (1.03)	-0.01	26	2.09

t ratios are given in parentheses.

* indicates coefficient is statistically significant at 90 percent level.

**indicates coefficient is statistically significant at 95 percent level.

N = number of observations.

Closer inspection of each independent variable in Table VII reveals that all but two coefficients, those of INCOM and POP in (5.12), are not significantly different from zero. Additionally, some are not of the expected signs. In the examination of the level of private welfare transfers--equations (5.10), (5.10a), and (5.12)--the coefficient of INCOM is of the expected sign in all three equations, but the coefficient of PRICE is of the expected sign in (5.12) only. The income elasticity exceeds unity (1.51) and is significantly different from zero. The price elasticity is rather high, -2.34, although not significantly different from zero. This conforms to the earlier results obtained by Reece (1979). It is not surprising that the price elasticity is not statistically significant, if we note that the measure of PRICE is obtained from cross-section, aggregate SMSA data. The BINI coefficient is not of the expected sign in (5.10); but the MGTR coefficient is of the expected sign in all cases. The AGTRV coefficient is of the expected sign in (5.12) only.

Finally, the POP coefficient is contrary to the expected sign in all cases, of which the one in (5.12) is also statistically significant. This allows us to make a statement that the coefficients of variables used in testing the interdependent utility and Nash conjectures either have the signs contrary to the expected, or have the expected signs but are not significantly different from zero. Thus, the interdependent utility and Nash conjectures hypotheses in the public goods theory do not receive much support from our results. For example, in (5.12) those variables intended to represent the absolute and relative consumption of potential recipients, AGTRV, BINI, and MGTR, have the correct sign but are insignificant. This suggests that the utility interdependence hypothesis receives little support from our results. POP has significant,

positive coefficient, 0.31. This may be due to a data problem, the observations we selected are all over a minimum size which is larger than the defined "small-numbers case"; or to the bargaining strength and skills between individuals, which will distort the efficient solution usually obtained in small-numbers case. Therefore, the relationship between public and private welfare transfers (AGTRV and APWTR) is examined. The coefficient of AGTRV is negative, but rather small, -0.23, and insignificant. Referring to the analytic chart described in Chapter V, all these results lead to the conclusion that private welfare transfers are not inefficiently provided.

In the investigation of the distribution of private welfare transfers, (5.11), (5.11a), and (5.13), the coefficient of INCOM is of the expected sign in (5.11) only, but the coefficient of PRICE has the expected sign in all cases, although they are not significantly different from zero. For the variables used to test for interdependent utility, the results are contradictory and confusing. MGTR has the correct sign in all cases, BINI has the expected sign in (5.11a) and (5.13); AGTRV, however, has none. Among them none are significantly different from zero. Therefore, the utility interdependence hypothesis does not receive much support in the distribution equation either. In summary, it seems reasonable to conclude that as a result of the tests presented in this study, little or no support has been provided for the public goods theory of private welfare income transfers.

Table VIII shows the simple correlation coefficients between various variables in the test of the public goods character of private welfare transfers. They are all low. Hence, there is no evidence of multicollinearity. In addition, the Durbin-Watson test was performed and the results indicate no serious serial correlation problem.

TABLE VIII

SIMPLE CORRELATION COEFFICIENTS OF VARIOUS VARIABLES IN A TEST OF PUBLICS GOODS CHARACTER

	APWTR	INCOM	PRICE	BINI	POP	AGTRV	MGTR(C_k)	MGTR(S_1)	MPWTR(C_k)	MPWTR(S_1)
APWTR	1.00	0.14	-0.05	0.03	0.23	0.16	0.21	-0.16	-0.04	0.05
INCOM		1.00	-0.04	0.19	-0.00	-0.33	0.12	-0.02	-0.05	0.09
PRICE			1.00	0.39	-0.14	-0.08	-0.16	0.29	-0.22	0.29
BINI				1.00	0.39	-0.11	-0.20	0.42	-0.09	0.22
POP					1.00	0.27	-0.17	0.22	-0.12	0.15
AGTRV						1.00	0.49	-0.42	0.30	0.29
MGTR(C_k)							1.00	-0.95	-0.25	0.22
MGTR(S_1)								1.00	0.25	-0.19
MPWTR(C_k)									1.00	-0.99
MPWTR(S_1)										1.00

CHAPTER VII

SUMMARY AND CONCLUSIONS

The primary objectives of this study were to assess public and private income transfers in regard to technical and allocative efficiency in redistributing income. Technical efficiency refers to the effectiveness of public or private transfers in achieving the goal of reducing income inequality. Allocative efficiency addresses the supply and public goods nature of private welfare transfers.

To determine redistributive effects of public and private transfers, the effect on the income distribution was theoretically and empirically separated into the effects due to transfer rates, transfer progressivities, and underlying income distributions. To examine the public goods nature of private welfare transfers, the public goods theory of private giving was evaluated by investigating the implications of both Nash conjectures and utility interdependence hypotheses. In the existing literature, the relationship between private welfare transfers and public transfers has been utilized to test only the utility interdependence hypothesis. In this study we have extended this relationship to the testing of the Nash conjectures hypothesis. Moreover, the public goods theory of private giving has been extended from emphasis on the amount of the giving to the distributional aspect of giving.

We have found that the total redistributive effects of public income transfers are greater as compared to private income transfers,

in so far as both are captured in the data available to us, for public income transfers are larger in size and more pro-poor in distribution. For marginal redistributive effects, the income distribution before transfers, the public transfer rate and progressivity, and the interaction terms for public and private transfers were all found to be statistically significant. Among them, the interaction term for public transfers, the public transfer progressivity, and the income distribution before transfers are the three relatively most important variables. Disaggregation reveals that, for either public or private transfers, the marginal effect of changes in the transfer rate on income distribution depends on the level of transfer progressivity, and vice versa. Moreover, the conditions for public transfers to have a further income-equalizing effect are much more strict than for private transfers. Finally, the "isoeffect" curves for transfer rates and progressivities were derived, respectively.

In regard to the public goods nature of private welfare transfers, the results obtained do not support the hypothesis of utility interdependence in either the level or the distribution of private welfare transfers. The positively significant relationship between the number of donors and private welfare transfers, and the small and insignificant negative relationship between private welfare transfers and public transfers strongly suggest that the private welfare transfers examined in this study are not inefficiently supplied and do not exhibit significant public goods characterisics. This conforms to the earlier results obtained by Reece (1979) and Sugden (1982).

The unresolved problems with the income unit, income definition, income accounting period, and choice of ranking methodology all apply

to this study. In addition, although it is the best currently available, a sample of 28 SMSA's is rather small for the purpose of statistical testing. Similar to the approach employed by Hochman and Rodgers (1973), two income intervals were used in calculating distribution indices. Although this will result in an underestimation bias, we believe, like Benus and Morgan (1975, p. 211) that: ". . . the consistent underestimation due to grouping the data . . . . is unlikely to affect our results." Finally, cross-section aggregate data are expected to be troublesome. For example, the lump-sum of regular private contributions, alimony, and child support could possibly distort the validity of testing for the public goods nature of private welfare transfers, for alimony and child support are not expected to be of a voluntary nature. We consider this a weakness of this study, although Reece (1979) has demonstrated that the separation of alimony and child support from regular contributions does not change the evidence of little support for the utility interdependence hypothesis.

After due celebration of the weaknesses of data and limitations of method, it seems nevertheless possible to draw the following conclusions based on the findings of this study:

(a) Although the total redistributive effects of public transfers are greater than private transfers, and this study provides no rationale or evidence for reducing this effort, further reduction in income inequality could also be achieved through creative management of private transfers. In fact, for either public or private transfers, both the way transfers are targeted (transfer progressivity) and the level of transfers (transfer rate) are important in determining the redistributive effects.

(b) To compare public transfers with private transfers further, the "isoeffect" curves are critical. If combinations of current public transfer progressivity and private transfer progressivity lie above the relevant "isoeffect" curve, increases in private transfers relative to public transfers are suggested. Similarly, if combinations of current public transfer rates and private transfer rates lie above the relevant "isoeffect" curve, an effort in making public transfers more pro-poor relative to private transfers is demanded. The implications are reversed if the combinations lie below the "isoeffect" curves.

(c) There is no allocative inefficiency problem with the private welfare transfers examined in this study. Thus, although public sector action to increase private giving may be justified in terms of the marginal effect on technical efficiency there is not a "market failure" case for such action.

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APPENDIX

Let x be the income, F(x) be its distribution function and $F_1(x)$ be its first moment distribution. Let g(x) be a continuous function of x such that its first derivative exists and $g(x) \geq 0$, and $F_1[g(x)]$ be its first moment distribution. In addition, denote by $\eta_g(x)$ and $\eta_g{}^*(x)$ the elasticities of g(x) and g*(x) with respect to x, respectively: then we can state the following theorems and corollaries.

THEOREM 1: The concentration curve for the function g(x) will lie above (below) the concentration curve for the function g*(x) if $\eta_g(x)$ is less (greater) than $\eta_g{}^*(x)$ for all $x \geq 0$.

CORROLLARY 1: The concentration curve for the function g(x) will be above (below) the egalitarian line if $\eta_g(x)$ is less (greater) than zero for all $x \geq 0$.

COROLLARY 2: The concentration curve for the functiuon g(x) lies above (below) the Lorenz curve for the distribution of x if $\eta_g(x)$ is less (greater) than unity for all $x \geq 0$.

THEOREM 2: If $g(x) = \sum_{i=1}^{k} g_i(x)$ so that $E[g(x)] = \sum_{i=1}^{k} E[g_i(x)]$

where E is the expected value operator, then

$$E\,[g(x)]\; F_1\,[g(x)] = \sum_{i=1}^{k} E[g_i(x)]\; F_1[g_i(x)]$$

COROLLARY 3: If $g(x) = \sum_{i=1}^{k} g_i(x)$ and Cg and Cgi are concentration

indices of $g(x)$ and $g_i(x)$, respectively, then

$$E[g(x)]\ Cg = \sum_{i=1}^{k} E[g_i(x)]\ Cgi.$$

2

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