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Maria Schmundt, Eugene Smolensky, Leanna Stiefel

UNIVERSITY OF WISCONSIN - MADISON

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*Instructor and Professor, University of Wisconsin--Madison and Assistant Professor, Michigan State University, respectively.

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## ABSTRACT

A long standing theorem of economics is that if governments wish to make poor people as well-off as they can be made for any given total expenditure level, aid should take the form of cash rather than goods and services. This theorem has been used to impugn the motives of government by implying that hidden objectives other than doing what is best for the poor must be dictating the choice of transfers. The theorem also implies that stating transfers to the poor at cost overestimates the benefits the poor are receiving.

There are, however, many reasons for believing that the theorem is not so generally relevant as is assumed. These reasons are rigorously derived from consumer theory in this paper.

# WHEN DO RECIPIENTS VALUE TRANSFERS AT THEIR COSTS TO TAXPAYERS?

## I. Introduction: A Theorem Used and Abused

A long standing theorem of economics is that if governments wish to make poor people as well-off as they can be made for any given total expenditure level, aid should take the form of cash rather than goods and services. The argument is simply that if cash is given, the recipient can buy what he has been receiving in goods, if that is what he wants, but if he would prefer something else, say less food and more housing than he is being given, he will be worse off than if he were given cash.

This theorem has been used in two important ways. First, it has been used to impugn the motives of government and to imply that hidden objectives are producing inefficient expenditure patterns. The argument again is straightforward. If cash is best from the point of view of the poor, then giving other than cash must mean that the givers do not have the best interests of the recipients at heart. Bang for the buck has been sacrificed to provide income for union men, for farmers, or for social workers who provide the goods and services. Or else it is alleged that the welfare of the poor has been sacrificed to paternalism: the poor will be forced to buy what the government thinks to be best for them. Or, even more Machiavellian--though perhaps economically efficient--the poor are being bribed to do things that make the nonpoor better off. For example, the poor are locked away in public housing so their slums do not lower other people's property values.

The second more technical use of the theorem has been to employ it to argue that the statistics which purport to show how the government has helped the poor overstate that help by using the cost to the government as a measure of benefits. If all benefits were cash transfers then benefits would equal cost, but if benefits are in-kind then in general it follows from the theorem that benefits to the poor are likely to be less than costs. Less aid, but in cash, would keep the poor as well-off as they are with their in-kind transfers.

There are many reasons, however, for believing that the theorem is not so generally relevant as is assumed. In many circumstances, recipients may be as well-off as they would be if they were given the cost of their in-kind transfers in cash. In this paper those circumstances will be rigorously derived from consumer theory. Whether or not the mass of recipients of in-kind transfer are just as well-off as they would be with the money cannot be determined except by empirical analyses. Such analyses are underway, but not completed. However, the significance for policy-makers of knowing just how much cash would be required to keep in-kind transfer recipients exactly as well-off as they now are will be indicated. Some general policy implications are also drawn from the analysis.

## II. The Benefit Weights for In-Kind Transfers

### A. Introduction

The simplest and most frequently used method to measure the benefits of transfer programs is to add the government cost of the income or in-kind transfer to the recipients' pretransfer income.[1] There are three major objections to this procedure.

(1) If the programs or program changes examined are substantial, they may cause changes in relative factor and commodity prices and, thus, pretransfer incomes. Though this problem is important (and has received increasing attention in the tax incidence literature), we will ignore it in the context of this paper by assuming that, in the relevant range, changes in the composition of demand and output due to in-kind transfers are not sufficiently large to influence relative prices and that transfer programs do not affect individual factor supplies.[2]

Of course, the assumption that factor supplies are independent of transfers is probably contrary to fact. The high implicit tax rates built into the transfer programs as earned income rises probably have a substantial effect on work effort, especially since many programs are cumulative (e.g., certain cash transfers lead to automatic eligibility for a whole bundle of in-kind benefits). Although this objection is often important when the aggregate effect of the entire government sector is under consideration, it can be ignored in the context of this paper, since the consequences of in-kind programs will only be compared to equivalent cash transfers.

(2) The benefits from transfer programs may accrue not only to recipients but to other groups as well, if recipient characteristics influenced by such programs create externalities. If the political process is Pareto efficient in the special sense that the transfer programs make nobody worse off, the cost of the program is a lower limit estimate of total benefits to those who bear the burden of financing the programs.[3] That is, the cost may be as appropriate a measure of benefits

to nonrecipients as to recipients. This objection will not be treated here, but it does not affect the substance of what follows.

(3) The objection which will be dealt with is that recipients may not evaluate transfer benefits as equal to their cost. If recipients "purchased" these transfers in the market place, or could resell their options at market prices without incurring transactions costs, or if the quantities transferred were generally less than or equal to what recipients would have consumed had there been costless reselling opportunities, then, of course, recipients would value their in-kind transfers at their market price. Quite apart from the fact that market values and resource cost may differ, these conditions are not characteristic of existing programs.

Given that relative prices and individual factor supplies remain unaffected, the theorem from welfare theory tells us that recipients are at least as well, but very likely better-off, under direct cash transfers than under in-kind transfer programs of equal market value.[4] The value a recipient puts on the transfers he receives differs, therefore, according to the form in which they are given. In the next section a measure of the evaluation by recipients of the various transfer programs is developed which takes the form of the transfer into account.

B. The Range of Benefit Weights

For all practical purposes, income (and/or wealth) rather than utility obtained seems to be the only manageable measure of benefits. Accepting income as a measure of welfare means that the value to recipients of cash subsidies is equal to their money value, but that for measurement

purposes, in-kind transfer expenditures will need to be transformed by appropriate weights into the same units. To express in-kind benefits in income-equivalent units, cash transfer has to be derived which would leave the recipients welfare unaffected if the in-kind programs were to be discontinued and the cash transfer simultaneously substituted.[5] The benefit weight to be applied to each transfer bundle received by each recipient will be the ratio of that recipient's evaluation of his transfer benefits (the welfare equivalent cash transfer) and the cost to taxpayers of those transfers. The benefit weights must be computed simultaneously for the entire bundle of programs in which a recipient participates. The reason why benefit weights cannot be computed program by program is explained in the Appendix.

The Benefit Weight Can Be Greater Than Unity

In general, the benefit weight is at most equal to unity, with two possible exceptions. If recipients are unable to purchase the commodities being transferred at market prices due to recipient-specific market imperfections (such as racial discrimination) and if the in-kind program alleviates this kind of supply discrimination, the benefit weights may exceed unity. This might be the case when the price faced by recipients even without a subsidy is lower under the in-kind program than under a cash transfer program. A similar situation occurs when program expenditures are less than the market value of the in-kind transfer. For example, the government may be more efficient than the market, or it may command resources at lower than market prices. In these cases the effective reduction in market prices (the effective subsidy) faced by recipients may be larger than the nominal subsidy provided by taxpayers. The theorem,

which is based on the market value of commodities, need no longer hold. Of course, if a government is less efficient than the private sector, or if the government pursues (costly) secondary objectives with those programs, the benefit weight may be less than implied by the theorem.

Until stated otherwise, the market values of subsidies will be assumed to equal program expenditures, whether the transfer is given in cash or in-kind.

The Benefit Weight Can Be Unity

With these qualifications, the benefit weight reaches its upper limit of unity when it is cash which is transferred. Under certain conditions the benefit weight may equal unity for in-kind program expenditures as well. To informally explore those conditions assume that a recipient consumes only two goods, one of them being subject to an in-kind program. The benefit weight is unity if:

(1) the other commodity is a perfect substitute for the subsidized good (that is, the indifference curves between them are linear). This will be true whether or not there are restrictions on the quantity of the subsidized commodity which any individual may consume;[6]

(2) the indifference curves between the program commodity and the other good are rectangular and the program imposes on restrictions on the quantity of the subsidized commodity consumed which would force the recipient to consume excess quantities for which he has no use;

(3) the program restricts consumption of the subsidized good to the exact quantity the recipient would have consumed had he received the market value of the implied subsidy as a cash transfer;

(4) the program restricts consumption of the subsidized commodity to less than the quantity just mentioned, but the recipient is free to purchase additional units at market prices and does so. The subsidy then applies only to infra-marginal units.

Furthermore, if both commodities are subject to an in-kind program, the benefit weight is unity if:

(5) both goods are subsidized at the same rate and quantity restrictions are absent.[7]

The Benefit Weight Can Be Negative

A sufficient condition for the lower limit of the benefit weight to exceed zero is that the recipient may purchase as much as he wishes at the subsidized price. Even if there are quantity restrictions in the program, the benefit weights are certain to be non-negative, if recipients are free to opt out of in-kind programs. In the absence of this option negative benefit weights are theoretically possible. They occur if the quantity prescribed forces the recipient to a point which lies outside his pretransfer budget constraint but below his pretransfer indifference curve surface.[8]

A procedure for deriving the benefit weights and a formal statement of the independent variables which enter the weights and the various characteristics of public programs which influence them are presented in the Appendix. We turn now to policy implications.

C. Significance of the Benefit Weight Calculations

Since benefit weights can range from negative values[9] to values in excess of unity, the program cost attributable to recipients may bear no

relationship to their cash equivalent. Using expenditure data to measure the welfare benefits of in-kind programs can be not only misleading but biased. Unless benefit weights turn out to be close to unity, the redistributive effect of recipient in-kind benefits should be measured in terms of the welfare equivalent cash transfer.[10]

The welfare equivalent cash transfer measure is important not only to judge the extent of redistribution. It is also necessary to design transfer programs which promote horizontal and vertical equity and which stimulate work effort. For example, the effective tax rates faced by recipients cannot be derived by looking at the change in expenditures on behalf of recipients when their earned income or income from transfers change. This is true--as should now be clear--when the program bundle leads to a non-unitary benefit weight. It is also true, however, when the income change modifies the program bundle in a way that alters the benefit weight, and a change in any one program may very well influence the evaluation of the others. Suppose an aged public housing tenant receiving food stamps gets a rise in his social security payments. His benefit weight may change because of his getting more cash, and/or because his rent payments and the cost of his food stamps increase.

Similarly, adding program cost to recipient income before a uniform negative income tax schedule is applied may not lead to equity, because cash and various in-kind program combinations need not be evaluated by the recipients in the same way.

Furthermore, the sequential application of tax rates to various transfers with ceilings below 100 percent does not guarantee an overall

tax ceiling of less than 100 percent if in-kind programs are present and tax payments are based on program cost. Finally it will make a difference, too, whether the "tax" consists of a loss in in-kind benefits or disposable cash income.

Consequently, the two most important questions for which the accurate measurement of benefit weights will provide an answer are:

(1) Is the structure of in-kind programs such as to cause benefit weights to approach unity for a large group of recipients, thereby mitigating the major problem connected with the integration of cash and in-kind transfer programs?[11]

(2) If deviations of benefit weights from unity do occur and cannot be ignored, is there a systematic relationship between the size of these deviations and socio-economic characteristics of the different recipient groups? In particular, does there exist a relationship between the benefit weight and recipient income, defined on either a before or an after-tax and cash-transfer basis?

The present state of ignorance about specific program characteristics, about how the benefits of each program are allocated, and about the extent to which families participate in several in-kind programs permits only a guess as to what the answer to these questions might be.

In the following paragraphs, some general considerations are discussed which may aid intuition, facilitate the actual benefit weight calculations, and indicate the significance of different answers to the two questions just posed.

Unless a recipient is made worse off by being forced to participate in an in-kind program, there is always some non-negative differential

between market values and the cost to the government of these programs that would result in a unitary benefit weight. Even though a recipient may value his in-kind program bundle at less than its market value, he may regard it as equivalent to an equal cost cash transfer, if the government provides this program bundle at a cost sufficiently below the market price. For example, low-income families may have limited access to the mortgage or health insurance markets, that is, they may face high prices for these services in the market. Under these circumstances, recipients of subsidies under the 235 housing program or Medicaid may not only derive benefits from the nominal government subsidy, but they may also experience a decline in presubsidy mortgage interest or implicit health insurance premiums, such that the distortion caused by the relative subsidy may be compensated for by improvements in availability. In addition, among the five cases listed in Section II-B which would lead to a benefit weight of unity under the condition that market values equal program cost only case (1), where goods are perfect substitutes, can be excluded a priori. The other cases may--singly, or in combination--cause benefit weights to come considerably closer to unity than the high single-program subsidy rates might lead one to expect.

Since all programs applicable to a certain recipient are evaluated simultaneously, subsidy caused distortions which tend to lower the benefit weight for a single program may be partly offset, because the recipient can purchase other goods at subsidized prices as well. Suppose a family receives an amount of food stamps which commits it to a higher level of food consumption than it would have desired, if it had received the food stamp subsidy in cash. This implies a benefit weight of less than unity.

But, if in addition the family is eligible for public housing it may be that the benefit weight for the two program package will rise due to the increase in the desired food consumption and both subsidies may have been converted, de facto, into a cash transfer. It follows that one way which may be open to governments if they wish to raise the benefit weights on existing programs is to increase the number of programs and the number of goods subsidized.

Furthermore, for certain recipient groups the quantity restrictions imposed by in-kind programs may be such that recipients supplement their consumption of program commodities at market prices, which means that only intramarginal units are subsidized. This will lead to a unitary benefit weight as long as government is neither more nor less efficient than the private sector in providing the goods. For example, the value of food stamps a family receives may buy a smaller amount of food than the family would have wanted under a cost equivalent cash transfer or--even simpler--than it would have consumed without the food subsidy. In this case, the family would spend at least the value of the stamps on food anyway so that the subsidy simply frees the value of the in-kind transfer for whatever the family wants to buy.

The government can raise the benefit weights by appropriately limiting the quantity of goods subsidized. For every set of subsidies confronting a recipient there exists a set of quantity restrictions which will leave him indifferent between his in-kind transfer and a cash transfer of equal cost. If this set of restrictions is chosen by the government, the benefit weight will be unity. That is, for every set of subsidies confronting a recipient there exists a set of quantity restrictions which

will leave him indifferent between his in-kind transfers and a cash transfer equal to the cost of the in-kind transfers he receives, unless government cost exceeds market values. For example, while the benefit weight for a family receiving an open-ended food and rent subsidy will almost certainly be less than unity, the government can convert the food subsidy into an outright cash subsidy by making the food stamp value low enough. It can also offer a particular public housing apartment at a particular subsidy such that the family would rent the same kind of apartment (and, of course, eat the same amount of food) had both in-kind subsidies been given in the form of cash.

Finally, the mix of commodities which the very poor would buy at different relative prices, real income held constant may be very similar, so that subsidy caused budget distortions, as such, are of no practical consequence. Under these conditions a unitary benefit weight would result, if subsidies are de facto open-ended. In sum, benefit weights in the neighborhood of unity may not be uncommon for a considerable number of recipient groups.

Whether there exists a systematic relationship between the benefit weights and recipient income levels is an empirical matter. Theoretically the influence of income on the benefit weight is composed of conflicting tendencies. On the one hand, poorer recipients are likely to be eligible for a larger number of programs and hence substitution effects may be small and the benefit weights large. In addition, the substitution possibilities open to poorer recipients may be very limited, in which case de facto open-ended subsidies come close to equal value cash transfers; and programs

with some maximum subsidized quantity are more likely to be de facto open-ended for recipients with low consumption levels.

On the other hand, subsidy rates of certain programs are inversely correlated with income, which will--ceteris paribus--increase the price distortion and, thus, decrease the benefit weight. Quantity restrictions which prescribe certain minimum consumption levels will tend to lower the benefit weights as well, if they are fixed at relatively high levels. The reason is twofold. The relatively lower substitutability of commodities for poorer recipients makes high prescribed consumption levels of a few commodities comparatively worthless to them. And it is less likely that poorer recipients will supplement or be on the verge of supplementing those subsidized quantities by purchases at market prices.

If these latter factors outweigh the former, benefit weights rise with income. That is, recipient benefits per unit of program expenditures may decline as income declines, and in-kind programs may not only be less redistributive overall, but less progressive within the lower end of the income scale than appears when program costs are allocated by income class. Viewed from the other side, it is probable that the desired distribution of welfare can be achieved with a higher implicit tax rate than would be the case if benefit weights were constant across income classes.

Since benefit weights close to unity may not be exceptional, some further implications of this case should be pointed out. Unitary benefit weights may be due to two basic sets of circumstances. Either recipient and program characteristics are such that the recipient evaluates in-kind programs at their market value and government cost equals market values, or the recipient evaluates in-kind programs at less than their market

value but government costs are sufficiently lower to make him indifferent between those programs and a cost equivalent cash transfer. Although it does not matter for purposes of measurement why a certain benefit weight magnitude is what it is, the two cases need to be distinguished for the following reason.

In recent years the benefits of redistribution activities to donors who are either taxpayers or private charitable donors have received increasing attention.[12] The existence of in-kind transfers has been justified by postulating that donor utility levels depend not only on the overall welfare (income) of recipients but on certain aspects of the recipients' consumption behavior as well.[13] That is, the fact that recipients may evaluate in-kind transfers at less than their cost is compensated for by the additional benefits accruing to donors due to the direct influence on the recipients' consumption pattern.

A benefit weight of unity means that recipients are indifferent between the bundle of in-kind transfers and a cash subsidy of equal cost. But in addition, it can be shown that the consumption level and structure of these recipients are exactly what they would have been under a cost-equivalent cash transfer as long as government cost and market prices (i.e., effective and nominal subsidies) are the same.[14] The reason is simply that if the government is neither more nor less efficient than the private sector a unitary benefit weight is only possible if in-kind programs actually do have the same effect as a value equivalent cash transfer. An important corollary to this proposition is that the benefit weight must be less than unity, if--from the donors' point of view--a desirable recipient consumption response is to be achieved efficiently when the externalities

are caused by certain items of a recipient's consumption bundle and not by the income differential as such.[15] Consequently, if benefit weights turn out to be close to unity, in-kind programs cannot be justified by the Pareto optimal distribution literature, since donors would have no interest in maintaining the in-kind program bundle, which is presumably more expensive to administer than a consolidated cash transfer program. Hence either in-kind transfers should be terminated, or the professional discussion about in-kind transfers should return to where it was in 1968, when a variety of reasons other than the consumption response of recipients were called upon to explain the persistence of in-kind transfers.

NOTES

[1]For example, Gillespie, W. Irwin, "The Effect of Public Expenditures on the Distribution of Income: An Empirical Investigation," Ph.D. dissertation, Johns Hopkins University, 1963, or Gillespie, W. Irwin, "Effect of Public Expenditures on the Distribution of Income," Essays in Fiscal Federalism, ed., R. A. Musgrave, The Brookings Institution, Washington, D.C., 1965.

[2]If factor supplies are independent of the income distribution, sufficient conditions for the invariance of relative market prices are constant returns to scale production functions, identical factor proportions for all industries and perfect markets (including government market activities). The production possibility surface will be a flat, and commodity as well as factor prices are invariant under output changes.

Note that certain market imperfections--like constant relative price differentials--would not impair the independence of relative prices from demand and output structure changes. The more stringent assumption of perfect markets eliminates some complications when the benefit and cost sides are integrated: market values equal resource cost. But it is likely that certain in-kind programs are motivated by imperfections. For example, the oversupply of farm products and the negative effect on the nonfarm poor caused by the agricultural price-support program may have provided the incentive for many in-kind programs administered by the Department of Agriculture.

[3]If the programs make those who finance them better-off, total donor benefits exceed the program cost. This statement does not imply that donor benefits should be accounted for at a higher value than their cost price, unless transfer programs are of an all-or-nothing type. If donors are in a position to decide on the extent of these programs in the same way they determine their "private goods" consumption, inframarginal program units should be evaluated at marginal benefits. That is, if donors equate marginal program benefits to marginal program cost, donor benefits equal donor cost, irrespective of the "donor surplus" involved.

[4]The welfare theoretical argument follows the salvageable part of the standard pre-Little argument concerning the superiority of an income over an excise tax. It will be assumed throughout that indifference curve maps are convex.

Irrational behavior, lack of information and, especially, multi-person households, where budget decisions are made by "proxy," may lead to a nonmaximizing use of income. This gives rise to the argument that in-kind transfers may yield higher benefits to recipient units than cash programs. But, unless it can be shown that recipient budget decisions are systematically inferior to those of nonrecipients (from the individual spending unit's point of view), this objection applies to all households and would necessitate adjustments in the valuation of national income in general.

[5]By analogy to the taxpayer benefit evaluation (see footnote 3), it could be argued that recipient benefits of in-kind programs should be evaluated according to the marginal cash transfer necessary to compensate for a marginal reduction of in-kind programs, if consistency with the evaluation of other goods is to be maintained. But recipients do not have the option to substitute equivalent cash transfers for in-kind transfers at the margin, i.e., for recipients in-kind programs are of the all-or-nothing type, and the "average" evaluation of marginal and inframarginal program units, as outlined above, is legitimate.

[6]By consumption restriction we mean that the recipient is required to purchase a certain quantity of the commodity, which may exceed or fall short of the amount he desires at the subsidized price.

[7]For policy implications it should be noted that the recipient's consumption pattern in cases (2) to (5) is identical to the pattern that would have resulted had the in-kind transfer been given in form of a direct cash subsidy.

[8]A point above the pretransfer budget constraint implies positive program cost, that is, the denominator of the benefit weight is positive. A point below the pretransfer, indifference surface implies a negative welfare equivalent cash transfer, that is, the numerator of the benefit weight is negative.

[9]If "free" education combined with high minimum school attendance laws was the only major program open to some recipients, a negative benefit weight might be more than just a theoretical possibility.

[10]If program costs deviate from recipient benefits, the equivalent cash transfer measure makes a revision of National Accounting procedures necessary. The present authors have suggested a procedure to eliminate the valuation invalances resulting from various in-kind programs. (Cf. L. Stiefel, E. Smolensky, M. Schmundt, "Modifications for In-Kind Transfer Entries in the National Income Accounts," The Impact of Selected Programs on the Distribution of Income, Working Paper No. 7).

[11]Aaron, Henry J. and George von Furstenberg [Western Economic Journal IX, 2 (June 1971), 184-91] show that the benefit weight for public housing programs is quite close to unity. They use a two commodity model (housing services and all other goods) and derive a weight of .96 if a Cobb-Douglas utility function is employed and housing service expenditures amount to 25 percent of recipient incomes. Their high benefit weight is mainly due to the fact that the restriction on the consumption of housing services by recipients comes quite close to what recipients would have consumed had the housing program cost been distributed as direct income transfers. It should be remembered, though, that single-program benefit weight calculations might be quite inaccurate for multiple program recipients [cf. Appendix, pp. 20-21].

[12]Cf. Hochman, Harold M. and James D. Rodgers, "Pareto Optimal Redistribution," The American Economic Review LIX (Part 1, September 1969), pp. 542-57 and subsequent discussion.

[13]See, for example, Johnson, David B., "Some Fundamental Economics of the Charity Market," The Economics of Charity, Center for the Study of Public Choice, Blacksburg, Va., (1970), p. 94; Olsen, Edgar O., "A Normative Theory of Transfers," Public Choice (Spring 1969), p. 42; Olsen, Edgar O., "Some Theorems in the Theory of Efficient Transfers," Journal of Political Economy LXXIX, (January/February 1971), pp. 166-176; Pauly, Mark, "Efficiency in the Provision of Consumption Subsidies," Kyklos XXIII, No. 1 (1970), pp. 33-57; De Salvo, Joseph D., "A Methodology for Evaluating Housing Programs," Journal of Regional Science Vol. II, No. 2 (1971), pp. 178-179.

[14]If, on the other hand, a unitary benefit weight is due to the fact that government costs fall short of market prices, the recipients' consumption structure will not be the same under in-kind and cost equivalent cash programs.

[15]This corollary is implicitly contained in Pauly's article on optimal consumption subsidies (cf. op. cit.).

# APPENDIX

## DERIVING THE BENEFIT WEIGHTS

### A. Some Basic Conceptual Problems

Deriving a system of benefit weights for each transfer for each recipient poses several conceptual problems:

(1) Since the welfare equivalent cash transfer has to be determined, the use of indifference maps and, thus, utility functions cannot be avoided. Since only the shape of the indifference surfaces matters, not their utility index, we only need to choose among classes of utility functions, where a class is defined as a set of utility functions which can be derived from one another by monotonic transformations. But, unless the choice among classes of utility functions is shown to have little influence on the derived benefit weights, or a certain class of utility functions turns out to be particularly suitable, an arbitrary element is thereby introduced.[1]

For practical purposes, the utility function and its parameters have to be assumed identical for all recipients. A feasible exception to this rule may be to calculate different parameter estimates for recipient units which differ in location (e.g., central city, urban, rural), size, age composition and race.

(2) Even if utility functions are assumed to be the same for all recipients, the welfare weight appropriate to any in-kind transfer depends on the recipient's income level, ceteris paribus. If all in-kind programs consisted of outright price subsidization without any restrictions on the amounts consumed by recipients, only utility functions which imply homothetic indifference curve systems would make the welfare weight invariant with

respect to income. If, however, all recipients are required to consume the same amount of the subsidized good, the welfare weight would be the same for recipients with different income levels only if marginal utilities were constant for all goods except the commodity subject to the consumption restriction. Clearly, there is no utility function which could guarantee this invariance for a bundle of programs with different characteristics. This means that recipients have to be disaggregated into income classes to compute the appropriate benefit weights, even if they are subject to identical programs.

(3) Since different groups of recipients are subject to different bundles of in-kind programs, the simplest procedure would be to derive the benefits for each group as the weighted sum of the program expenditures applicable to this group. In addition, this method would simplify the task of determining the effect of program changes and program additions. Unfortunately, such a procedure is inadmissible, since the benefit weight of any one program for any group depends on what other transfers are received by the group.

Computing the benefit weights of every program for each recipient income class on the basis of the assumption that either no other programs are in effect, or that the other programs do exist, may either under or overstate the aggregate recipient benefits from the actual bundle of transfer programs.[2] Hence, for every recipient group within each recipient income class which is subjected to different bundles of programs, a separate benefit weight has to be derived. Moreover, for each program change the same procedure has to be followed for the new program bundles, since the

change will affect the benefit weight attached to the old bundle components.[3] Thus, recipient benefits accruing to each recipient group must be calculated simultaneously for all transfer programs.[4]

B. The Formal Statement

Formally, the computation of the benefit weights would proceed as follows:

All recipient families e, e = 1, . . ., M, are assumed to have the same utility function,[5] with the vector $X_e = (X_{1e}, \ldots, X_{Ne})$ as argument, where $X_{ie}$, i = 1, . . ., N, e = 1, . . ., M, is the amount of commodity i consumed by recipient e, i.e.,

$$(1) \quad U_e = U[X_{ie}, \ldots, X_{Ne}] = U[X_e] \quad e = 1, \ldots, M \ .$$

Each recipient e has a certain actual net income, excluding direct taxes paid and including cash transfers received, $y_e$, e = 1, . . ., M, to be spent on the N commodities. And each recipient is confronted by a vector of market prices and some bundle of in-kind programs. These programs may influence the recipient's consumption decisions in several ways:[6]

(a) They will reduce the prices of certain commodities to the recipient. If $p = (p_1, \ldots, p_N)$ is the (constant) vector of market prices in the absence of in-kind programs--assumed to be the same for all recipients[7]--a recipient e faces a price vector $p\,(1-S_e) = [p_1(1-S_{1e}), \ldots, p_N(1-S_{Ne})]$, where $S_{ie} \cdot 100$ is the effective percentage price reduction for commodity i, i = 1, . . ., N, to recipient e, e = 1, . . ., M, and $1 \geq S_{ie} \geq 0$.[8] Which elements of the subsidy vector $S_e$ are nonzero depends on the programs in which recipient e participates;

(b) Recipient e may be required to consume certain minimum quantities of program commodities and cannot or does not wish to supplement these fixed subsidized quantities by additional purchases at market prices (e.g., public housing or, possibly, food stamps). That is, there may exist some subset $K_e$ of the N goods for which $X_{ke} = \overline{X}_{ke}$, $k \varepsilon K_e$, where $\overline{X}_{ke}$ is the quantity of commodity k to which recipient e is effectively committed. Which goods will belong to this category and the size of $\overline{X}_{ke}$ will depend on specified characteristics of the program and recipient unit e;

(c) Related to the group of commodities $K_e$--but with very different consequences for the benefit weights--are goods for which the quantities subsidized are administratively fixed on the basis of recipient unit e's characteristics, but recipient e has the option and the desire to supplement these quantities by additional purchases at market prices. This possibility may occur either if the subsidized consumption levels are prescribed to the recipient, for example the commodity distribution program, or if there is a certain maximum subsidized consumption level, for example subsidized mortgage rates. That is, for some subset $L_e$ of the N commodites ($L_e \neq K_e$) we have $X_{le} > \overline{X}_{le}$, $l \varepsilon L_e$, where $X_{le}$ is the actual consumption of good l by recipient e and $\overline{X}_{le}$ is the (smaller) subsidized amount. Since the recipient pays $p_l(1-S_{le})$ for the inframarginal units $X_{le}$ and $p_l$ for the marginal units, i.e., for any amount exceeding $\overline{X}_{le}$, the effect of these programs is equivalent to giving recipient e on outright cash transfer of $\sum_{l \varepsilon L_e} p_l S_{le} \overline{X}_{le}$, while commodities $l \varepsilon L_e$ should be regarded as nonsubsidized. Again, whether or not some program commodity is a member of set Le and the size of $\overline{X}_{le}$ will depend on recipient and program characteristics;

(d) Finally there are those commodities for which the subsidy is actually or de facto open-ended. De facto open-ended subsidies occur if recipient e has the option and wishes to consume less than some maximum subsidized quantities at the subsidized prices (e.g., subsidized mortgage rates for low-income families). Together with commodities for which recipient e cannot or does not claim subsidization these goods constitute the remaining set of commodities $(N - K_e - L_e)$.[9]

It follows from the preceding discussion that recipient e maximizes his utility function (1) subject to the following constraints:

$$(2)\quad y_e + \sum_{l\varepsilon L_e} p_l S_{le} \bar{X}_{le} = \sum_{i\varepsilon(N-K_e-L_e)} p_i(1-S_{ie})X_{ie} + \sum_{k\varepsilon K_e} p_k(1-S_{ke})X_{ke} + \sum_{l\varepsilon L_e} p_l X_{le}$$

$$(3)\quad X_{ke} = \bar{X}_{ke} \text{ for all } k\varepsilon K_e,\ e = 1, \ldots, M,$$

where $S_{ie} \geq 0$, $i\varepsilon(N-K_e-L_e)$; $S_{le} > 0$, $l\varepsilon L_e$, $S_{ke} > 0$, $k\varepsilon K_e$.

The (indirect) utility function resulting from this maximization can then be expressed in terms of known parameters:

$$(4)\quad U_e = V[y_e, p, S_e, \bar{X}_{L_e}, \bar{X}_{K_e}]\ e = 1, \ldots, M\ .$$

To determine the income necessary to make recipient e as well-off as under the in-kind programs, $Y_e$, we compute the indirect utility function, which results from the maximization of (1) subject to a budget constraint involving preprogram market prices faced by the recipient

$$(2')\quad Y_e = \sum_{j\varepsilon N} p_j X_{je},\ e = 1, \ldots, M,$$

that is,

$$(5)\quad U_e = V[Y_e, p],$$

equate (4) and (5) and solve for the only unknown $Y_e$. Consequently, recipient e's evaluation of the in-kind programs is measured as $Y_e - y_e$. That is $(Y_e - y_e)$ represents the cash transfer which could be substituted for the bundle of in-kind transfers without changing the welfare of recipient unit e and constitutes the numerator of the benefit weight.

The denominator of the benefit weight is given by the cost of the in-kind programs incurred on behalf of recipient e:

$$(6)\quad T_e = \sum_{i\varepsilon(N-K_e-L_e)} p_i' S_{ie}' X_{ie} + \sum_{k\varepsilon K_e} p_k' S_{ke}' \bar{X}_{ke} + \sum_{l\varepsilon L_e} p_e' S_{le}' \bar{X}_{le}$$

$$= \sum_{i\varepsilon(N-K_e-L_e)} [p_i S_{ie} + (p_i' - p_i)] X_{ie} + \sum_{k\varepsilon K_e} [p_k S_{ke} + (p_k' - p_k)] \bar{X}_{ke}$$

$$+ \sum_{l\varepsilon L_e} [p_l S_{le} + (p_l' - p_l)] \bar{X}_{le},$$

where $p_j$ is the market price in the absence of the program, $p_j'$ the pre-subsidy price in the presence of in-kind programs, $S_{je}$ is the effective subsidy, $S_{je}'$ the nominal subsidy rate, $j = 1, \ldots, N$. Aggregation of (6) over all recipients results in the total expenditures on in-kind programs, that is the total cost of in-kind programs to taxpayers.

As long as in-kind programs consist of outright market price subsidization without direct or indirect government provision $p_j' = p_j$ and, thus, $S_{je}' = S_{je}$, $j = 1, \ldots, N$, and $T_e$ represents the difference between the income a recipient would need to purchase the same bundle of goods as under the in-kind programs paying market prices and the recipient's actual cash income, sufficient to purchase this bundle at subsidized prices.

If, alternatively, in-kind programs combine subsidization with direct or indirect government provision, $p_j'$ may not be equal to $p_j$ and the preceding definition of $T_e$ may no longer hold. The program cost attributable to

recipient e can exceed or fall short of the income change necessary to enable recipient e to purchase the same bundle of goods in the absence of in-kind programs.[10]

Given the in-kind program cost attributable to recipient e, the benefit weight which will transform the cost into this cash equivalent is

$$(7) \quad E_e = \frac{Y_e - y_e}{T_e} = E(y_e, p, p', S_e, \bar{X}_{Ke}, \bar{X}_{Le}), \; e = 1, \ldots, M.^{11}$$

If recipients can opt out of in-kind programs, $E_e$ is non-negative. A sufficient, though not necessary, condition for $E_e$ not to exceed unity is that $p' \geq p$.

Relation (7) implies that $E_e$ will differ among groups of recipients even if they live in the same location (identical p and p' vectors) and even though the U-functions and, thus, the E-functions are assumed to be the same. First, initial net income, $y_e$, may differ. Second, vectors $S_e$, $\bar{X}_{K_e}$ and $\bar{X}_{L_e}$ may vary from one recipient to another, not only because of $y_e$ differences--which may influence the commodity classification (cf. (b) to (d), p. 22 above)--but because recipients participate in different programs. In addition, regional and urban-rural differences will influence p and p', which may lead to further variations in the benefit weight.

If it turns out that there is little correlation between the level of $y_e$ and the magnitude of the benefit weight, $E_e$, even after a geographical (e.g., by state) and urban-rural disaggregation is carried out, general statements about the redistributive effect of in-kind programs by income class become virtually impossible.

To answer the extremely important political questions, recipients have to be aggregated into groups that are relatively homogeneous with respect to the independent variables and parameters which enter the benefit weight computation. For example, they have to be homogeneous with respect to the following characteristics:

(1) size, age composition, race, and possibly urban-rural location, if utility functions are assumed to vary according to these characteristics;

(2) net income, excluding in-kind transfers, i.e., income after direct taxes, but including cash transfers;

(3) bundles of in-kind programs received and their specific characteristics, like pre- and post-transfer prices, effective or nominal subsidies, consumption restrictions and their effectiveness.

If a cross-classification of family units by these three criteria results in small cell populations, especially, if there is little correla- between (2) and (3), after a disaggregation according to (1) has been carried out, and the computation and usefulness of benefit weights are severely hampered. The practical problem of calculating a large number of benefit weights would be less serious than the policy implications of small cells. Only if it could be shown that benefit weights are close to unity for a large majority of cell populations, can an acceptable policy conclusion be drawn, namely, that in-kind and cash transfers should be treated alike for all practical purposes as far as recipients are concerned. But legislators would be unwilling to take significant benefit weight differences into account, unless they are strongly correlated with socioeconomic characteristics like (1) and (2). This means that important horizontal and vertical equity considerations may be disregarded.

At this stage any discussion about cell sizes and patterns is rather hypothetical because most of the relevant information is virtually non-existent. Information about in-kind program overlaps generally, let alone by recipient characteristics is practically nonexistent. The link between (3) and (1) plus (2) is established via the eligibility rules. These rules may vary widely from state to state, so that disaggregation by state becomes mandatory. Apart from the use of subsidiary criteria for eligibility, the income definitions employed do not correspond to (2) and may differ from one program to another. Furthermore, eligibility need not imply that the good is available to the recipient.

This brings us to the more particular data problems, like: What are the effective prices a recipient group in a certain location faces in the absence and presence of in-kind programs, if these programs cause quality or availability changes? Should the effective subsidy implied by health programs be measured on the basis of "units of health insurance" or "units of medical services"? How do effective or nominal subsidies and consumption restrictions vary with recipient characteristics? How do we find out whether program consumption restrictions are effective or ineffective?

Savings by recipients have been ignored thus far. To derive the redistributive effect of in-kind programs $y_e$ and $Y_e$ may be defined as income net of savings, since the only arguments in the utility function (1) are commodity quantities consumed during a certain time period. Consequently, the limiting variable in the budget constraints (2) and (2') is not income, but income minus current saving plus current dissaving.

That is, in our model $y_e$ and $Y_e$ are implicitly defined as total expenditures on goods and services during a certain period. A consistent integration of savings decisions into the utility function and budget constraint seems to be out of the question. The two simplest ways to deal with (avoid) this difficulty are either to assume that on the average total expenditure equal income for low-income families, or to assume that saving or dissaving is strictly proportional to total expenditures and then adjust $(Y_e - y_e)$ correspondingly.[12]

## APPENDIX NOTES

[1]Computational feasibility and data requirements drastically restrict the feasible classes of utility functions. Since we have no direct information about utility function parameters, we have to infer those parameters from demand or expenditure data. This means that the utility function chosen must not only be characterized by parameter economy, it must also lead to a very simple system of demand or expenditure relations such that reasonable parameter estimates or guesses are possible, in spite of the poor quality of budget data for low-income families.

[2]Aggregate recipient benefits are likely to be understated, if the bundle of subsidies affects commodities which are mainly substitutes for each other. Loosely speaking and ceteris paribus, the benefit weight is larger the smaller the substitution effect, and the substitution effect is reduced as more substitutes are subsidized at similar rates. Consequently, the weighted average of program-by-program benefit weights may be smaller than the benefit weight attached to the program bundle as a whole. [Cf. footnote 3].

Alternatively, aggregate benefits may be overstated, if the bundle of subsidies affects largely complementary goods. If we regard this bundle of complementary goods as one composite commodity, the effective subsidy on this commodity is low and, thus, the benefit weights high, if they are computed on a program-by-program basis. But the cumulative effect of the bundle of subsidies raises the effective subsidization of the composite commodity. And in general, the benefit weight declines as the effective subsidy increases. Consequently, the benefit weight attached to the program bundle may be lower than the weighted average of the program-by-program benefit weights.

[3]To give an example: Suppose that all but one item in a recipient's budget is subsidized at the same rate and that there are no restrictions on the quantity he can demand. Suppose further that the benefit weight for this program bundle is less than unity. If the last item is now subsidized as well (at the same rate), the benefit weight of this change is at most unity, whether it is computed on the basis of the existence or nonexistence of the other programs. This implies that after the addition of the new in-kind transfer, recipient benefits are still less than the market value of the new program bundle, though we know that the new program bundle is completely equivalent to a cash transfer.

[4]This means that the increasing number of studies which try to measure recipient benefits of various in-kind programs, concentrating on one program at a time, cannot be used to determine the redistributive effect of the existing set of in-kind transfers, unless it can be shown that as a matter of fact the aggregation of program-by-program results comes close to the benefit measures based on program bundles.

[5]If the number and age of family members or some other characteristics influence the budget pattern of recipients in the same income class considerably, the utility function parameters should be estimated separately for different family unit characteristics, if the data available permit such a procedure.

[6]Throughout we assume implicitly that the effect of in-kind programs is to change the budget constraints, but not the commodity space or the preferences of recipients. Clearly, some government provided goods are substantially different from their market counterparts, which would necessitate an expansion of the commodity space. And in-kind programs very likely do influence preference patterns. But to take these aspects into account would severely impair empirical implementation.

[7]Data permitting, this assumption can be relaxed. Some locational differentiation seems important and feasible. In addition to the problem of finding the market prices of certain goods, these prices may not be the same to recipients and nonrecipients as well as among recipient groups with different socio-economic characteristics. But it is likely that many of these latter differences are sufficiently captured by the locational variable.

[8]Note that $S_{ie}$ is the effective subsidy rate, computed on the basis of the price faced by the recipient in the absence of in-kind programs ($p_i$), not the nominal subsidy rate ($S'_{ie}$) based on the postprogram, presubsidy price of the commodity ($p'_i$), which may differ due to direct or indirect government provision. The relation between the two price subsidies is given by $p_i S_{ie} = p'_i S'_{ie} + (p_i - p'_i)$.

[9]Although of vital importance for the magnitude of benefit weights, the distinction between group $K_e$, $L_e$ and $(N-K_e-L_e)$ commodities creates considerable difficulties. The reason is that in many cases the classification will depend on recipient e's utility maximization itself. That is, for many program commodities we do not know a priori which group they belong to. [For a diagrammatic exposition of various cases of program restrictions cf. Olsen, Edgar O., "Some Theorems in the Theory of Efficient Transfers," Journal of Political Economy LXXIX, (January/February, 1971), pp. 76, 166].

[10]In the case of public housing, for example, $p'_j$ exceeds $p_j$, possibly because of side effects or subsidiary goals unrelated to redistribution. On the other hand, any program related improvement in the availability of commodities to recipients will, ceteris paribus, be reflected in a negative $(p'_j - p_j)$ differential. Some insurance type programs might lead to a price decline due to the risk reducing effect of large scale coverage and the absence of a profit margin. It should be noted that the nominal presubsidy program price $p'_j$ might have to be adjusted, if indirect rationing occurs caused by supply-limitations of the program commodity.

[11]We labelled the benefit weight "E", because E is often described as the "efficiency ratio" of in-kind transfer programs, since it is the ratio of the recipient's valuation of his in-kind transfers (which is equal to the taxpayer cost of the welfare equivalent cash transfer) and the government resource cost of the program expenditures (which is equal to the taxpayer cost of the in-kind program); the percentage "inefficiency" of in-kind transfers usually being measures as I = 1-E, where I is the ratio of the valuation difference and total program expenditures. If there are non-recipient benefits associated with in-kind transfers, both of these labels are misleading.

[12]Only the first alternative is consistent with the assumption of fixed individual factor supplies.