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The Effectiveness of Public Assistance Payments in Reducing Poverty

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ABSTRACT. This study investigates the effectiveness of *income transfer* in reducing *poverty* in the *U.S.A.* It does so by applying the concepts of set theory to the population segments in poverty and under public assistance. The extent of their intersection versus either subset, *i.e.*, their conditional probability, as well as the extent of either of the non-intersected segments of the union versus the respective subset, are shown to be reliable indicators of this effectiveness. The last two segments, representing errors of "omission" or of "commission," are analyzed for their uniform patterns by type of *residence* and *race*. Probable reasons for their occurrence are discussed, and certain limitations of the used data are examined.

I

INTRODUCTION

IN ANY FREE ECONOMY there is always a section of the population at the lower end of the wealth and income distribution. For example, in the United States during 1962, the lower fifth of consumer units ranked by size of wealth owned only 0.2 percent of the wealth (1), while the lower fifth of families ranked by income, participated in only 5.1 p.c. of it (2), (the corresponding figures for the highest fifth are 76 p.c. and 42 p.c.) Wealth estimates are, of course, subject to significant errors and probably their best use would be in defining secular trends—since increasing polarization leads historically to force-

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ful redistribution. Unfortunately the above study (1) was never repeated either by the Government or private institutions.

The nation redistributes income through a variety of transfer mechanisms, thus slowly succeeding in increasing the share of the lower classes (*e.g.*, the lower fifth from 4.9 p.c. in 1951 to 5.5 p.c. in 1971) (2), (3). Thus in the U.S. during 1977, $27 billion were transfered through four such major mechanisms: Medicaid, Aid for Dependent Children (AFDC), Food Stamps and Supplemental Security Income. However the total income-support benefits for that year—Social Security, Welfare, Unemployment Insurance, Direct Payments, Tax Benefits, etc.—approached a quarter trillion dollars (4) and accounted for 70 p.c. of federal tax receipts, 29 p.c. of Personal Consumption Expenditures and 19 p.c. of Gross National Product (5).

One question that immediately arises is to what extent these sizable amounts reach the intended target population. Many studies on the subject deal with the number of persons, by a variety of parameters, that are assisted; or with the number of persons that are in need of assistance (6–8).

This paper combines the two approaches in order to explore the effectiveness of income transfer. It does so by treating the two population segments—those in need and those in receipt of income transfer—as two subsets of the total. In an ideal situation, these two would have perfectly overlapped; as a matter of fact they do not, and as a result they leave two "error" segments, namely those in need without assistance and those not in need with assistance. The extent of the intersection in the union of the two subsets, as well as the proportionate size of the two error cells, can be simple but reliable indicators of the effectiveness of income transfer.

II

DATA

THERE IS A WIDE VARIETY of definitions of poverty or of need of income support; an overall discussion is presented by Brown and Miller (9). In a broad sense, poverty is the lack of goods and services needed for an adequate standard of living (10), depending on whatever the society's own wealth and attitudes define as adequate. Poverty is usually delineated in a dichotomous way of yes/no (11), though it is essentially a continuous phenomenon of lack of goods, amenities, dignity and opportunity (12). Income, though not perfect, is probably the best and most measurable indicator of poverty (13,

14), and it is on income that the U.S. Government bases its definition of the poverty level: This is the cost of a low-budget nutritious diet by family size, multiplied by three to reflect the fact that food typically represents one-third of the expense of a low-income family (15). The Bureau of Census provides information on poverty by many parameters; and for the present paper, the proportion of "families" and of "persons" below the poverty level as of the latest census year of 1970 is considered (16).

There are different levels of "public assistance" but again for the purpose of this paper, the U.S. Bureau of Census definition is applied (17). Though this is the official Government definition, there are certain reservations about it: It counts only cash income (*i.e.*, payments under AFDC, Old Age, Blind, Disabled, etc.,) and excludes payments for Medicaid, Food Stamps, Public Housing and other in-kind; yet the excluded part is considerable and the fastest growing.

Based on the above two official definitions of poverty and assistance, the 1972 U.S. Census determined that, of the then 51,168,599 American families, 10.7 p.c. were in poverty and 5.3 p.c. were receiving public assistance. The Census also specified that 21.5 p.c. of the above 10.7 p.c. of families in poverty were receiving public assistance

Table I. Subsets and intersections of poverty and assistance, U.S. families, 1970. Expressed as percentages of the total set.

		Poverty			
		Yes	No	Total	
	Yes	2.3	3.0	5.3	(b)
Assistance	No	8.4	86.3	94.7	($\bar{b}$)
	Total	10.7 (a)	89.3 ($\bar{a}$)	100.0	

10.7 and 5.3 are taken from the Bureau of Census.[18] 2.3% is 21.5% of 10.7. All the remaining cells are derived through substraction. If the whole set is 1, the following subsets are easily identified,

$a = .107$ $b = .053$ $\bar{a} = .893$ $\bar{b} = .947$

as well as the following intersections: $ab = .023$ $\bar{a}\bar{b} = .863$
which represent the conditional probabilities $P(b/a) = \frac{P(a\ b)}{P(a)}$

(probability of being assisted given being in poverty) and $P(\bar{b}/\bar{a}) = \frac{P(\bar{a}\bar{b})}{P\bar{a}}$

(probability of non-assistance, given not being in poverty) (19, 20).

(18). These proportions are better understood in a set arrangement, as in Table 1.

III

FINDINGS AND THEIR LIMITATIONS

IN A NARRATIVE WAY, the table indicates that 2.3 p.c. of all American families (1970) were in poverty and under public assistance; however, the great majority of families in poverty (78.5 p.c., *i.e.*, 8.4 ÷ 10.7) were reporting that they received no assistance. Inversely, more than half of the families receiving public assistance were not in poverty, at least officially (56.6 p.c., *i.e.*, 3.0–5.3). Finally most families, 86 p.c., were at the intersection of the two "no" sets, that is, were not in poverty and were receiving no assistance

Both the 8.4 p.c. and 3.0 p.c. cells of the table ($a\bar{b}$ and $\bar{a}b$) can be considered as "error" cells (ideally, they should have been 0 p.c.); the former, error of "omission" and the latter, error of "commission." However, there are certain limitations on these interpretations:

(a) *Data validity:* It is possible that income is over-reported (out of pride, for example) which will tend to increase the "commission" error, or under-reported which will tend to increase the "omission" error.

(b) *Effect of income support in cash:* This obviously elevates a significant proportion above the poverty line; others may be assisted while just above the line. In both cases this shows as assistance while not in need, although the effect is really insignificant: Much of the movement into and out of the poverty line is really movement close to the line (21) and a good part is due to social security income and not to public assistance.

For example, in 1976, 25.5 p.c. of all American families were below the poverty line, but the proportions dropped to 14.1 p.c. post-social security income, and to 11.4 p.c. post-money transfer. As a result, the lowest 20 p.c. of all families when classified by income, increased their participation in the national income 15-fold from 0.3 p.c. to 4.5 p.c. (22). These effects varied by single persons or multi-person families, by race (most pronounced in Whites), and age (most pronounced in age 65 and over) (23).

(c) *Effect of income support in-kind:* This is not counted in the Census poverty figures, as noted above; as a result, the poverty set of the population (a) is significantly increased and since the public

Table II. Proportions of families (1970) in poverty or not, under assistance or not; also, proportions in poverty without assistance or under assistance while not in poverty. By residency and ethnicity.

ALL FAMILIES

(Row)	Race & type of residence		% In Poverty: Under Assistance (ab)	% In Poverty: Under No Assistance ($a\bar{b}$)	% In Poverty: Total (a)	% Not in Poverty: Under Assistance ($\bar{a}b$)	% Not in Poverty: Under No Assistance ($\bar{a}\bar{b}$)	% Not in Poverty: Total ($\bar{a}$)	Total % Under Assistance (b)	% in Poverty With No Assistance $\left(\frac{a\bar{b}}{a}\%\right)$	% Receiving Assistance Not in Poverty $\left(\frac{\bar{a}b}{b}\%\right)$
(1)	U.S.	White	1.4	7.2	8.6	2.6	88.8	91.4	4.0	84	65
(2)		Black	10.4	19.4	29.8	7.2	63.0	70.2	17.6	65	41
(3)		Spanish	6.2	14.2	20.4	6.4	67.0	79.6	12.6	70	51
(4)	Urban	White	1.2	5.7	6.9	2.7	90.4	93.1	3.9	83	69
(5)		Black	9.6	16.3	25.9	7.6	66.5	74.1	17.2	63	44
(6)		Spanish	6.2	13.0	19.2	6.6	74.2	80.8	12.8	68	52
(7)	Rural	White	2.0	10.5	12.5	2.4	85.1	87.5	4.4	84	55
(8)	Non-farm	Black	14.6	34.6	49.2	5.3	45.5	50.8	19.9	70	27
(9)		Spanish	6.3	24.0	30.3	4.9	64.8	69.7	11.2	79	44
(10)	Rural	White	0.9	13.1	14.0	2.0	84.0	86.0	2.9	94	69
(11)	Farm	Black	12.0	37.0	49.0	6.2	44.8	51.0	18.2	76	34
(12)		Spanish	3.6	23.7	27.3	4.2	68.5	72.7	7.8	87	54

Two-way analysis of variance (26) was performed among selected columns and rows with the following results;

		F Ratio		d.f.		Q(F)=Pr(F F)		Significance at .05 level	
Columns	Rows	Column Effect	Row Effect	Columns	Rows	Columns	Rows	Columns	Rows
ab, $a\bar{b}$	1,2,3	64.66	42.10	1,2	2,2	.015	.023	Yes	Yes
ab, $a\bar{b}$	4,7,10	14.27	.94	1,2	2,2	.063	.515	No	No
ab, $a\bar{b}$	5,8,11	9.96	2.18	1,2	2,2	.087	.314	No	No

assistance set (b) remains constant the "omission" error ($a\bar{b}$) is greatly increased as well. In fact, it is claimed that the Census figures overstate poverty by 410 p.c. (24), in which case the above 1976 post-social security and post-money transfer proportion of 11.4 p.c. of families in poverty declines to 2.8 p.c.

(d) *Family size:* This normally should play no role, since poverty level as defined takes family size into account; however, if the average family size in the two "error" cells is varying by area, race, etc., this will mean differences in the numbers of affected persons.

(e) *Residence and Ethicity:* These variables are explored in Table II (25). Each type of residency is analyzed by ethnicity, and the proportion in poverty or not, under assistance or not, is presented. The last three columns show the total proportion under assistance and the proportions in the aforementioned "error" cells. Certain uniform patterns emerge from the table. Black families, viewed in their total, have everywhere the highest proportion of non-assisted in poverty ($a\bar{b}$); as for the ones only in poverty, they have the lowest ratio of "omission" ($a\bar{b} \div a$). This means that although their poor families are assisted in higher proportion than any other racial group, poverty is so widespread among them (a), as to leave large proportions of their total families unassisted. For Whites, the exact reverse observations can be made, while Spanish-American families occupy an in-between position. For all groups the "omission" rate ($a\bar{b} \div a$) is highest in rural farming areas or among the Whites, and in combination reaches such magnitude that only one out of twenty poor families is assisted. The reasons for this alarming observation are not clear, but possibly

Table III. Total U.S. persons in poverty (1970) with or without social security income, and proportions of those in poverty with social security income for whites and blacks.

Race	Percentage in poverty at all ages			Proportion in poverty with S.S. Income
	With S.S. Income (1)	Without S.S. Income (2)	Total	All Ages $\frac{(1)}{(2)}$%
White	2.50	8.40	10.90	22.9
Black	3.47	31.53	35.00	9.9

pertain to attitudes towards requesting public assistance, awareness, accessibility, etc.

Social security may underlie some of the above differences and in Table III the proportions of persons in poverty for all ages with or without such income are given (27). (Data are not provided for families.) A higher proportion of Whites in poverty, about one fourth, receive such income versus about one tenth of Blacks in poverty.

IV

SUMMARY

BASED ON 1970 CENSUS DATA, the majority of American families that were in poverty were receiving no public assistance, while half of the families receiving assistance were not officially in poverty. The proportions differ significantly by type of residency and by race.

The "omission" rates were highest among Black families in poverty, if considering their total; they were the lowest among poor White families, again for their total. Considering only the families in poverty, the reverse is observed: The omission rates are the highest among the White poor families and lowest among the Black poor families. This seeming paradox is due to the widespread poverty among Blacks, as discussed above. (In technical terms their poverty subset (a) covers a larger part of the total set, so as the non-intersected part of it ($a\bar{b}$) is proportionately smaller to the subset but larger to the set).

In reality, what matters is the rate of omission in the poverty subset, ($a\bar{b}/a$), a true measure of public assistance effectiveness, while the rate of omission in the total set ($a\bar{b}/1$), reflects spread of poverty rather than effectiveness of assistance. As such it is among the White poor families where public assistance is mostly missing the target (Table II column ($a\bar{b} \div a$)), to an extent varying by type of residency but reaching appalling levels for all groups in rural farming areas. (This also is the case with the non-counted by the Census in-kind assistance: In 1970 a person of 17 or less with a family income of under $6,000 received $76 of personal health care services in Standard Metropolitan Statistical Area central cities, $58 in other urban and only $5 in rural, *i.e.*, 15 times less (28).)

Spanish-American families occupy in all categories a middle ground between the two other groups' positions.

In terms of receiving cash assistance while not in poverty ($\bar{a}b \div b$) the rates are highest for Whites, lowest for Blacks, with Spanish-

Americans in between and with no clear patterns by type of residency. The magnitude of the error here is always less than in the previous case of non-assisted poverty and probably indicates families that were lifted just above the poverty line by the cash assistance.

Differences in the U.S. proportions of Table II were significant, when tested for their covariance. No inferential statistics were applied in the other two tables since they refer to total population data. Data limitations pertain to the accuracy of reported income, to the effect of income support in cash, of income support in-kind, of family size, and of residence; uniformly patterned differences noted in Table II are partially caused by the above limitations.

Factors for the failure of transferred income to reach all intended recipients include: The eligibility determination process itself, which varies markedly both from state to state and within states (29); also unclear federal regulations, inadequate training and shortness of staff in the state agencies, application forms hard for the average recipient to understand, problems of accessibility to and awareness of welfare services, and in certain areas, attitudes towards requesting public assistance. Finally, possible factors for excess payments, other than fraud, include: Failure of the client to report income changes (29), assistance while just above the poverty line, and inaccurate reporting of income.

Data used in this paper were global and as such indicated national trends and patterns; however, analytical specific studies are needed to elucidate the exact causes of transferred income misallocations, and the means of properly defining poverty and subsequently reducing it.

CONCLUDING, this paper presented a technique for evaluating the effectiveness of pubic assistance in reducing poverty. With the expansion of transfer payments from the productive sectors of the society, financed mostly through budget deficits and underwritten through inflation, it is vital that these transfers are made to the rightful recipients; that no such recipients are left unprotected and that no unjustified payments are transferred. Since both these errors occur, however, it is essential that their size be measured and followed in a secular pattern.

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