The Taxation of Earnings Under Public Assistance

By N. A. Barr and R. E. Hall[1]

In recent years there has been increasing interest in the implicit taxation imposed by income support schemes. Such taxation arises from the withdrawal of income-related benefits as income rises. If, for instance, a poor family loses fifty cents of benefit for an extra dollar of earnings then it faces an implicit marginal tax rate of 50 per cent. The size of these tax rates is of acute relevance to the labour supply impacts of income support schemes, all of which face an inherent conflict between the desire on the one hand to encourage work effort by keeping tax rates low, and on the other, by means of high tax rates, to focus the benefits of redistributive schemes most strongly on the poorest families.

A second trend in recent tax analysis has been the distinction between nominal (i.e. as legislatively defined) and effective tax rates. Pechman (1971, pp. 298–299) has estimated the difference between the two for US federal individual income tax, and Bailey (1969, pp. 15–25) for US capital gains tax.

This paper combines these two strands of thought by estimating and analysing the effective, as opposed to the nominal, implicit taxation imposed by Aid to Families with Dependent Children (AFDC), which is the major support scheme for the non-aged, non-disabled in the United States. Schemes such as this, offering income-related benefits not dependent on any previous contributions, exist in most countries—for instance the Supplementary Benefits scheme in the United Kingdom.

The deviation of effective from nominal rates in the case of AFDC arises from the discretion exercised by caseworkers in the amount of benefits they award (though such powers are not granted to them in law). This suggests that a similar divergence from implicit tax rates embodied in legislation may arise in other schemes, even those in which little formal discretion is given in the determination of benefits. An analysis of whether or not this actually happens requires an investigation of each individual programme, thus suggesting that caution is required in making generalizations about phenomena such as the "poverty trap" (i.e. implicit marginal tax rates in excess of 100 per cent) without a careful study of each programme. This is true also for income support schemes in other countries, as illustrated by Barr and Stein (1975) for the United Kingdom.

The extent to which caseworkers systematically ignore certain types of income in computing benefits, thus reducing effective tax rates, is

therefore a question of considerable importance. We attempt to answer this question for AFDC for which there exists a large body of data on the circumstances and benefit receipts of individual families. Though similar work has been done by Rowlatt (1972) for Alberta, no work contains either the same degree of detail as this study, which disaggregates both by city and by type of income, or the same precision of estimation, given the large number of observations at our disposal.

In general, analysis such as ours of the impact of government schemes like AFDC involves two distinct steps. The first is the characterization of the impact of the scheme on the individual participant in terms of a limited set of economic variables. The second is the study of the individual's response to alternative levels of these variables. For some schemes only the second step is econometric, since the legislative definition of the programme is sufficiently precise that there is little doubt about the magnitude of the taxes, subsidies and transfers provided by the programme. Studies of the economic impact of income tax, social security benefits and excise taxes, other than those cited earlier, have generally taken taxes and transfers as given. In the case of AFDC, however, the legislative definition is much less clear.

Our interest centres on the influence of the crucial variables of the programme on the decision of poor families to seek assistance and on the labour supply of those receiving assistance. This second step, namely the response of poor families to AFDC, is analysed in Barr and Hall (1974). The specific purpose of this paper is to provide a detailed economic characterization of AFDC in terms of its tax and transfer components. We believe that the proper characterization of the programme requires an examination of its actual operation using econometric methods. AFDC simply provides too much discretion for the caseworker to make reliable estimates of its economic impact on individual families from its legislative and administrative description alone. A secondary purpose is more generally to highlight the difference between the nominal and effective tax rates of income support schemes.

I. AFDC AND ITS INTERACTION WITH OTHER TAXES AND TRANSFERS

AFDC provides cash benefits to a family in the following way. A caseworker determines the "needs" of the family according to rules and practices that vary by jurisdiction and to a certain extent among caseworkers. Needs take account of the number of children, their ages, the health of the mother and other family characteristics. In most states benefits are the difference between a family's needs and its income from other sources, where income is defined according to certain rules. In two of the states in our study the procedure is modified by paying as benefits only a fraction of the difference between needs and income. Other states impose a maximum level on benefits somewhat below the level that would otherwise be paid to families with no other income.

Details of the administration of AFDC appear in Lurie (1973), Lerman (1972), Hausman (1972) and Joint Economic Committee (1972).

AFDC is by no means the only programme affecting the earnings and incomes of the poor. The social security tax (FICA) and federal and state income taxes reduce effective earnings, while social security benefits, food stamps, public housing and other forms of public assistance are sometimes available to supplement incomes. Some of these transfer programmes also impose implicit taxes on earnings, although this was less true in 1967 (to which the data relate) than it is today.

To formalize our discussion of the interaction of these programmes and of the operation of AFDC we define the following variables and functions:

y = gross earnings;

$T(y)$ = social security and income taxes;

$D(y)$ = work expenses other than taxes deductible under AFDC; these include costs of clothing, commuting, meals and other rather broadly defined expenses;

$S(y)$ = benefits under transfer programmes other than AFDC;

s = income from sources other than earnings or AFDC; in the discussion we assume, for simplicity, $s = S(y)$;

z = net earnings for AFDC purposes ("AFDC earnings"); from above, $z = y - T(y) - D(y)$;

$B(z, s)$ = benefits paid under AFDC after adjustment for other income, z and s.

Next we define the *AFDC tax rate on AFDC earnings*, t_A, as the incremental reduction in benefits per dollar increase in AFDC earnings:

$$(1) \qquad t_A = -\frac{\partial B(z, s)}{\partial z}.$$

This is the tax rate that appears to be set by AFDC laws and regulations; in most states in our study it was supposed to be 100 per cent in 1967. It must be distinguished from the economically more relevant *AFDC tax rate on gross earnings*, t_G, which we define as the incremental reduction in benefits per dollar increase in gross earnings:

$$(2) \qquad t_G = -\frac{\partial B}{\partial z}\frac{dz}{dy}$$

$$= \{1 - T'(y) - D'(y)\}t_A.$$

The two tax rates differ because of the deductibility of income taxes and work expenses under AFDC. Finally, we define the *total tax rate on gross earnings*, t_T, as the incremental reduction in total disposable income per dollar increase in gross earnings:

$$t_T = T'(y) - \frac{d}{dy}\{B(z, s) + S(y)\}$$

$$=T'(y)-\left\{\frac{\partial B}{\partial z}\frac{\partial z}{\partial y}+\frac{\partial B}{\partial s}\,S'(y)+S'(y)\right\},$$

$$(3)\qquad =T'(y)+t_G-\left(1+\frac{\partial B}{\partial s}\right)S'(y).$$

We suggest that the total tax rate is the relevant economic magnitude for decisions about hours of work. It is equal to the sum of the marginal income tax rate, the AFDC tax rate on gross earnings and the tax rate on earnings implicit in other transfer programmes, adjusted for the implicit tax that AFDC imposes on those programmes.

In 1967 very few AFDC families received income-conditioned transfers from other schemes. For those few who did the main sources of additional assistance were public housing and food stamps. Until 1969 the implicit marginal tax rate in both these programmes was zero until a cut-off level of income, where transfers dropped discontinuously to zero. Currently both programmes impose taxes on earnings of approximately 25 per cent as outlined in Hausman (1972). Further, our results suggest that AFDC imposes high marginal tax rates on other transfer income (i.e. $\partial B/\partial s$ is approximately -1). Together these make the third term in equation (3) negligible. So, to a good approximation, the total tax rate on gross earnings, t_T, is the sum of the marginal rate of income and social security taxation and the AFDC tax rate on gross earnings.

These considerations justify focusing on the AFDC tax rate on gross earnings as the key economic variable in characterizing the impact of the implicit taxation imposed by AFDC. The deductibility of income taxes, $T(y)$, and the generous definition of work expenses, $D(y)$, under AFDC accounts for a rather large gap between the AFDC tax rate on gross earnings and the AFDC tax rate on AFDC earnings. On the basis of data on the average earnings and average deductions for Illinois in 1967, Hausman (1972) estimates that the AFDC tax rate on gross earnings is only 71 per cent, even though he accepts the apparent legislative provision for an AFDC tax rate on AFDC earnings of 100 per cent. In general he finds that about 25 per cent of gross earnings are deducted in the determination of AFDC benefits. These figures would not apply today, however, since starting in 1968 AFDC earnings were redefined as two-thirds of gross earnings minus deductions minus $30 per month. This raises the gap between gross earnings and AFDC earnings to 60 per cent.

Previous studies have concluded that AFDC provided only a limited incentive to work in 1967 because the confiscatory AFDC tax rate on AFDC earnings, t_A, was ameliorated only somewhat by the generous deductibility of work expenses. In this paper we put this conclusion to an empirical test by direct estimation of the economically relevant AFDC tax rate on gross earnings, t_G. We find that this tax rate is much lower in most jurisdictions than could be explained by the hypothesis that the AFDC tax rate on AFDC earnings was 100 per cent.

II. Data and Specification

Our data were obtained from a detailed survey of three out of every hundred families receiving assistance under AFDC in November 1967. The questionnaires were filled in by the caseworker, not by the families receiving aid. Consequently, our results measure the implicit tax rates that caseworkers think they are imposing, and may exceed the tax rates as perceived by family members to the extent that they are able to conceal their true earnings from the caseworker. The data report total monthly benefits received under AFDC in the survey month for each of 14,244 families in nine cities, together with income from other sources broken down into four types of earned income (earnings of the mother, earnings of the father (if present), earnings of children and earnings of other family members), and six types of non-wage income (contributions from an absent father, benefits under social security, proceeds of unemployment insurance, contributions from other persons, other cash income and income in kind). The relation we wish to study has the general form

$$(4) \qquad B_i = B_0 - \sum_{j=1}^{10} t_j y_{ij}$$

where B_i is the level of benefits received by family i, B_0 is the level of benefits received by a family with no other source of income, t_1 to t_{10} are the AFDC tax rates on the ten different kinds of income (i.e. t_G as given in equation (2)), and y_{i1} to y_{i10} are the levels of the different kinds of income for the ith family.

This model is not in itself adequate for our study. The base level of benefits, B_0, varies across families as a consequence of aspects of AFDC that are not concerned with adjusting benefits in accordance with income. We found it appropriate to take account of the race of the family head, the presence or absence of the father, the health of the mother and father, and the number and ages of the children. Our final specification is

$$(5) \qquad B_i = \sum_{k=1}^{12} b_k x_{ik} - \sum_{j=1}^{10} t_j y_{ij}.$$

The x-variables are a constant, a set of dummy variables describing the presence and health of the mother and father and the interaction between them, a dummy variable for families whose head is white, and a set of dummy variables describing the number and ages of the children.

The sample consists of 12,292 one-parent families, of which all but 370 are families having mothers only. Of the parents of these families 10,979 had no earnings, 307 earned less than $100 per month, 560 earned between $100 and $250 per month and 446 earned $250 per month or more. In addition, the sample contains 1,932 families with two parents, of which 1,585 had no earnings from either parent, 87 had joint earnings of less than $100, 127 had earnings between $100 and

$250, and 133 had earnings of $250 or more. In the regressions, families without earnings make no direct contribution to estimation of the implicit tax rates on earnings. Rather, their role is to make the estimates of the other determinants of benefits more precise and thus to reduce the variance of the estimated tax rates.

A brief comment should be made about the statistical validity of the regression coefficients and standard errors for variables that are zero for a substantial fraction of the observations. Since none of the assumptions of the Gauss–Markoff theorem is violated by these variables their coefficients are unbiased and have minimum variance, and the squares of their standard errors are unbiased estimates of their variance.

III. RESULTS AND POLICY IMPLICATIONS

Table 1 presents the important coefficients and standard errors for the nine separate regressions. The first two columns report the negative of the estimated coefficients for the gross earnings of the mother and father. These are estimates of the AFDC tax rates on gross earnings, t_G, defined earlier. In the case of the earnings of the mother six of the nine cities have estimated tax rates below 40 per cent, and only in Washington DC is the tax rate not significantly less than the rate of 75 per cent suggested by the hypothesis that the AFDC tax rate on AFDC earnings, t_A, is 100 per cent. Similarly, only Washington DC seems to put a confiscatory tax on the earnings of the father. Overall, these rates are considerably lower than those of Lerman (1972) and Hausman (1972), both of whose analyses were in terms of legislatively defined tax rates.

The third and fourth columns give estimates of the tax rates on two important sources of income other than earnings. Generally these rates are higher than those on earned income. In the case of contributions from an absent father the estimated rate is 80 per cent or above in five of the nine cities. Since this component of income is probably the easiest of all to conceal from the caseworker, the true tax rates may well be less than these estimates. In the case of benefits under social security also, the estimated tax rates are high, being 90 per cent or more in four cities. This differential in the rates on earned and unearned income has important implications for income support schemes that are discussed further below.

In the fifth column the constant term estimates the benefits received by a family with no income other than from AFDC, and whose characteristics are such that all of the x-variables in equation (5) are zero. These families have a non-white mother in good health, no father, and one child who is of school age. The variation among cities in the level of benefits paid to families with these characteristics is very substantial. Column six suggests that only Chicago discriminates substantially by race, paying approximately $42 per month more to families headed by whites than to those headed by a non-white.

TABLE 1

Summary of the Determinants of AFDC Benefits

City	Tax rates on gross earnings of		Tax rates on other income		Other parameters			Summary statistics		
	Mother	Father	Contributions of absent Father	Social Security benefits	Constant ($ per month)	Race effect ($ per month additional for whites)	Benefits for second child ($ per month)	R^2	Standard error ($ per month)	Number of observations
Baltimore	0·50 (0·03)	0·21 (0·28)	0·81 (0·05)	0·91 (0·07)	112 (4)	7 (8)	41 (4)	0·68	36	680
Chicago	0·39 (0·02)	0·32 (0·08)	0·89 (0·04)	0·66 (0·06)	146 (4)	42 (11)	3 (5)	0·66	50	1,328
Detroit	0·55 (0·03)	0·68 (0·05)	0·84 (0·05)	0·94 (0·06)	135 (5)	2 (12)	41 (5)	0·77	44	796
Houston	0·21 (0·02)	—	0·34 (0·05)	0·22 (0·05)	66 (4)	2 (7)	18 (5)	0·71	17	234
Los Angeles	0·35 (0·01)	0·39 (0·01)	0·75 (0·03)	0·69 (0·02)	133 (2)	7 (3)	30 (2)	0·85	34	2,667
New York	0·34 (0·01)	0·63 (0·02)	0·82 (0·02)	0·84 (0·03)	168 (2)	−1 (4)	44 (2)	0·70	53	5,917
Pittsburgh	0·18 (0·05)	0·38 (0·06)	0·88 (0·05)	1·00 (0·06)	117 (4)	−5 (7)	32 (5)	0·81	33	461
San Francisco	0·39 (0·02)	0·32 (0·03)	0·60 (0·04)	0·35 (0·03)	138 (4)	11 (6)	33 (4)	0·72	45	1,162
Washington DC	0·72 (0·05)	0·86 (0·10)	0·73 (0·04)	1·00 (0·05)	98 (3)	6 (14)	31 (3)	0·82	28	979

Figures in parentheses are standard errors.

We should discuss briefly the regression results not reported in Table 1 (complete results are available from the authors). Our estimates of the tax rates on the earnings of children had relatively large standard errors, but the coefficients suggest that this source of income was taxed at a very low rate. This is probably because an amendment to the Social Security Act in 1965 permitted (but did not require) states to disregard the earnings of children up to a monthly maximum of $50 per child and $150 per family. Our results suggest that only New York did not avail itself of this option (i.e., only for New York is it possible to reject the hypothesis that the true AFDC tax rate on the gross earnings of the children is zero). Our estimates of the tax rates for other sources of unearned income (e.g. unemployment insurance) also had large sampling variation. With few exceptions they were higher than the tax rates on earnings in the same city.

Turning to the effects of family characteristics, the reported health of the parents does not seem to have any systematic effect on the level of benefits that a family receives. In every city the benefits paid for additional children declines as the number of children grows. In Houston the second child adds $18 to monthly benefits, while the sixth child adds only $1. Finally, there is no evidence of any substantial subsidy to mothers who are unable to work because of the need to look after young children.

In discussing the implications of the estimated tax rates, we postpone for the moment the question of possible statistical biases in our estimates of the tax rates on earnings. Further, we concentrate on the tax rate for mothers, since they are the great majority of the welfare population. Except for Washington DC, the tax rates in the first column of Table 1 are inconsistent with the prevailing view of the economic impact of AFDC. The reader will recall from our introductory remarks that we have estimated the AFDC tax rate on gross earnings and that this rate differs from the total tax rate by the marginal income tax rate on the one hand, and differs from the AFDC tax rate on AFDC earnings by the deductibility of income taxes and work expenses on the other. The prevailing view—as expressed by Aaron (1973), Lerman (1972), Hausman (1972) and others—holds that the AFDC tax rate on AFDC earnings was (and is) 100 per cent. According to this view we should have found AFDC tax rates on gross earnings of roughly 75 per cent for those states that pay all of the differences between needs and income (of the eight states in our sample only California and Texas paid less than 100 per cent of the gap). Instead, we find rates of 50 per cent or lower in all but two of the cities.

Table 2 shows in its first column the AFDC tax rate on AFDC income implied by our estimates, on Hausman's (1972) figure that about 25 per cent of gross earnings are deductible. Only Washington DC conforms to the prevailing view. All of the other cities fail to reduce benefits dollar for dollar as earnings rise, even when earnings are defined net of the deductions permitted by AFDC. Apparently benefits themselves are

TABLE 2

Implied Tax Rates

City	AFDC tax rate on AFDC income t_A (1)	AFDC tax rate on gross earnings t_G (2)	Total tax rate on gross earnings t_T (3)
Baltimore	0·67	0·50	0·68
Chicago	0·52	0·39	0·57
Detroit	0·73	0·55	0·73
Houston	0·28	0·21	0·39
Los Angeles	0·47	0·35	0·53
New York	0·45	0·34	0·52
Pittsburgh	0·24	0·18	0·36
San Francisco	0·52	0·39	0·57
Washington DC	0·96	0·72	0·90

Sources: Column (1): $t_A = \dfrac{t_G}{1 - T'(y) - D'(y)}$ from equation (2).

Column (2): Estimates from Table 1, column (1).

Column (3): $t_T = t_G + T'(y) = t_G + 0·18$.

adjusted in a way that limits the tax on earnings and preserves a substantial part of the incentive to earn on the part of recipients of AFDC. The third column of Table 2 gives an estimate of the total tax rate on earnings facing AFDC families, on the assumption that the combined rate of taxation of income tax and social security contributions is 18 per cent. Except in Washington DC and Detroit, the total marginal tax rate is comparable to that imposed by the federal income tax on the incomes of better paid professionals, and could not reasonably be described as confiscatory. Six of the cities have total marginal rates of below 60 per cent, and two are below 40 per cent.

Legislation that has taken effect since 1967 would change Table 2 considerably. First, one-third of gross earnings is now disregarded in computing AFDC earnings. If t_A remained constant after this change, t_G and t_T would fall considerably. Only a study like the present one for a more recent year would reveal how much t_A and t_G actually changed. Second, several other transfer programmes, notably public housing and food stamps, now embody marginal taxes on earnings. Hausman (1972) shows that the combined marginal tax rate of all transfer programmes can be close to 100 per cent, under the assumption that all of the programmes operate according to their legislative definitions.

Regarding the differential treatment of earned and unearned income, the fact that the latter is taxed more heavily than earnings, and in most cases considerably more heavily, has an important implication for the ability of AFDC to redistribute income. The high tax rates on unearned income will have an income effect on work effort, but (in contrast to a

tax on earnings) no substitution effect. Thus heavy taxation of un-earned income focuses benefits strongly on the poorest families, while the lower rates of tax on earnings encourage work effort. Whether or not this is the result of deliberate policy, the differential rates of tax apply in all the nine cities of our study. Since such an arrangement offers at least a partial resolution of the conflict between encouraging work effort and concentrating benefits where the need is greatest, there is possibly a general lesson for the construction of income support schemes.

IV. POSSIBLE SOURCES OF BIAS

In this section we consider four potential sources of bias in our estimates of the tax rate on earnings under AFDC.

(1) *Simultaneity.* Earnings are an endogenous variable, so its coefficient may be biased for the usual reason when ordinary least squares is applied to a structural equation. Now families whose benefits are unusually high given their characteristics will generally earn less than those with lower benefits. If so, the disturbance in our equation will be negatively correlated with the earnings variables. The coefficients of earnings in our regressions are negative, so the negative correlation would bias them towards a more negative value. This consideration strengthens our conclusion in two respects. Weight is added to our assertions firstly that the taxation of earnings is lower than previously supposed, and secondly that a significant differential exists between the taxation of earnings and of unearned income (since the latter is an exogenous variable, its estimated coefficients would not be biased in the presence of simultaneity).

(2) *Errors in observing income.* A familiar econometric argument establishes that purely random errors in observing a right-hand variable bias the coefficient towards zero. We experimented with instrumental variable estimators and found no evidence for such a downward bias. Any important errors in the data almost certainly arise from systematic under-reporting of earnings by clients. From their point of view, our estimates measure the tax rate on earnings conditional on the report-ing of earnings. The true effective tax rate is even lower if there is some probability that earnings will escape taxation altogether. Again, this consideration strengthens our conclusion.

(3) *Truncation of the sample.* A family enters our regression only if it receives positive benefits. Thus at higher levels of earnings it is less likely that a family will appear in the sample than at lower levels of earnings. Those families that have high earnings and do appear in the sample are likely to be those who receive unusually high benefits given their characteristics. This suggests a positive correlation between earnings and the disturbance in our regressions, which would bias our estimated tax rates downwards. Although there is surely some bias in our results on this account, there is evidence that it is not too severe.

All of the estimated tax rates should be equally biased because of it, and unearned income should drive families out of the sample just as surely as earned income. Our finding that the tax rates on earned income are substantially lower than those for unearned income cannot be explained by the nature of the sample.

(4) *Non-linearity of the tax schedule.* Contrary to our assumption, the marginal tax rate may not be the same for all levels of earnings. In particular, the marginal rate may be zero, or close to zero, for earnings below some threshold. In that case, our estimates would be averages of the marginal rates—there would be no systematic bias within the sample, but our results would overstate the tax rate for low earnings and understate it for high earnings. This possibility was investigated for one city, Los Angeles, where the legislative definition of the programme suggested that below some threshold level earnings escaped taxation. We introduced the square of earnings into the regression, expecting to find a negative coefficient, corresponding to a linear, increasing, marginal tax rate. The parabolic tax schedule can approximate the segmented schedule prescribed in California law reasonably well. To our surprise, we found that the square of earnings had a positive coefficient, implying a *falling* marginal tax rate. Since the effect was very small and in an implausible direction, we decided that the linear tax schedule provided a more reasonable characterization. In any case there is no reason to expect our assumption of linearity to cause a systematic bias in our estimate of the marginal tax rate on earnings.

V. Conclusions

The specific conclusions are that the data do not support the proposition that the AFDC tax rate on AFDC earnings is 100 per cent, and that the implicit marginal tax rate imposed on gross earnings by AFDC is frequently no greater than the explicit marginal tax rates paid by those in the upper–middle income ranges.

More generally, the results show how great the difference can be between the nominal tax rates prescribed in the legal definition of income support schemes and the effective tax rates imposed by the actual operation of the schemes. In the context of the United States one can ask whether food stamps and public housing subsidies do, in fact, charge the 25 per cent implicit marginal tax rate contained in their legislative definition, or whether the effective rate is lower. Similar questions can be framed for other countries.

It is not unreasonable to suspect that any deviations of the effective from the nominal rate are likely to be in a downwards direction. This contention is supported not only by our study, but also by Pechman (1971) and Bailey (1969), and is in any case in accord with one's anecdotal knowledge of the actual operation of various taxes and benefits. To the extent that this contention is correct, and is perceived to be correct, it suggests that worries about the labour supply effects of

high implicit marginal tax rates embodied in income support schemes may be misplaced, or at least overstated.

London School of Economics
Massachusetts Institute of Technology

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