THE IMPACT OF FEMALE WORK ON FAMILY INCOME DISTRIBUTION IN THE UNITED STATES: BLACK–WHITE DIFFERENTIALS*

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Using data from the 1973 National Survey of Family Growth, the present study analyzes, for blacks and whites separately, the impact of female market activity on the inequality of the income distribution among households. The family life cycle is divided into three stages, according to the presence and age of children: (1) the interval between marriage and the birth of the first child, (2) the child-rearing interval, and (3) a final period which begins when all the children have reached school age. Using the coefficient of variation as an indicator of inequality, the empirical results show that in period 1, the contribution of white working wives has a large equalizing impact, while that of their black counterparts results in a slight increase in dispersion. In the child-rearing and post child-rearing stages, the labor supply of mothers decreases family income inequality by a small amount for both black and white households. A decomposition of the squared coefficient of variation of family income is presented to aid in the interpretation of these findings.

A. INTRODUCTION

While the *determinants* of female labor supply decisions have received considerable attention in the literature, little is known about the *effects* associated with these decisions. The present paper focuses on one important effect: the impact of married women's time allocation decisions over the life cycle on the inequality of the income distribution across households. Do women who work in the market narrow or widen the income gap between rich and poor families? If the female labor force participation rate were zero, the distribution of family earnings would coincide with that of the husband's earnings. As soon as some women enter the labor market, these distributions diverge. The empirical question is which is characterized by less dispersion.

The first rigorous attempt to address this issue is due to Mincer (1974, pp. 121–126). His work suggests that the employment of married women improves the income distribution. In recent years, the most rapid increases in female labor-force participation rates have occurred among women from high-income families. This has caused some speculation that women's market activity may accentuate inequality (Shariff, 1979; Thurow, 1975, cited in Danziger, 1978). Using data from the Current Population Surveys of March 1968 and March 1975, Danziger (1978) presents some evidence against this hypothesis. He finds

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that white working wives improve the distribution by a small amount. For blacks, the effects uncovered are negligible: the 1968 CPS data show that female work improves the distribution slightly, while the 1975 CPS data indicate that female work increases inequality slightly.

A recent study by Smith (1979), based on data from the 1960 and 1970 U.S. Censuses, contains similar findings. Summing up his conclusions, the author notes that "... wives' earnings have a quite distinct impact between black and white families, reducing measured inequality far more in white families." Smith's article goes one step beyond Danziger's by attempting to explain this racial differential. As Smith points out, the differential reflects, in part, the following factors: "(1) black wives account for a larger proportion of family earnings, (2) the coefficient of variation of black female earnings exceeds those of white females, and (3) covariances in earnings of spouses are positive for blacks and negative for whites." (Pp. S171–S172).

This paper presents additional evidence on this issue, based on data on married men and women from the 1973 National Survey of Family Growth. (See Pratt, 1978.) As shown below, while some of our empirical findings agree qualitatively with those of Smith, a decomposition of the squared coefficient of variation of family earnings suggests somewhat different explanations for the results.

As a measure of inequality, the coefficient of variation is superior to the variance, used by Smith. This can easily be seen from the following example: If, say, each woman were to earn exactly the same amount as her husband, so that for each household family earnings were equal to twice male earnings, the variance of family earnings would be four times as large as the variance of male earnings, even though the shapes of the two distributions would be identical. The coefficient of variation, which standardizes the variance by the mean income, is not subject to this difficulty. The variance of the logarithm of income, which Smith also employs, is a more useful measure, in that it indicates relative as opposed to absolute variability. In addition, the fact that it may be decomposed into two parts, reflecting between and within group dispersion, makes it attractive in many applications. For the present purposes, however, the coefficient of variation seems preferable, since this statistic may be decomposed in a way which throws considerable light on the differential impact of working wives on income distribution among black and white families.[1]

We also extend Smith's work by refining his life-cycle analysis, which basically consists in a stratification of the sample according to husband's age. Noting that the most marked life-cycle variations in labor supply behavior occur among women, in a manner which reflects the impact of the presence and age of children, we divide the family life cycle into three major stages: (1) the interval between marriage and the birth of the first child, (2) the child-rearing stage and (3) a final period which begins when all the children have reached school age.[2]

[1]Although the coefficient of variation is convenient, for the reasons indicated in the text, it is by no means an ideal measure of inequality. For a good discussion of the advantages and shortcomings of this and other measures of inequality, see Cowell (1977).

[2]The empirical analysis excludes from the samples corresponding to period 1 childless couples who reported plans not to have children in the future.

Our previous work (Lehrer and Nerlove, 1980) indicates that female labor supply behavior varies markedly among these stages.

B. Analytical Framework

Considering only income from employment, we can write, for any period:[3]

$$Y_T = Y_M + Y_F, \tag{1}$$

where Y_T is total family income, Y_M is the husband's income, and Y_F is the wife's income. The squared coefficient of variation of family earnings may be expressed as follows:

$$C_T^2 = \alpha^2 C_M^2 + \beta^2 C_F^2 + 2\alpha\beta r C_M C_F, \tag{2}$$

where

C_T, C_M, C_F = coefficients of variation of total, male and female earnings, respectively.

r = correlation coefficient between spouses' earnings

$\alpha = \bar{Y}_M / \bar{Y}_T$

$\beta = \bar{Y}_F / \bar{Y}_T$.

For positive values of r, the smaller the variability of male earnings on the one hand and female earnings on the other, the more equal the distribution of family earnings will be. For given r and for given coefficients of variation of male and female earnings, the dispersion of family earnings will be smallest if $\alpha = (C_F^2 - rC_MC_F)/(C_M^2 + C_F^2 - 2rC_MC_F)$. In particular, if the coefficients of variation of husband's and wife's earnings are equal, the inequality of family earnings will be lowest if $\alpha = \beta = \frac{1}{2}$, i.e. if, "on the average," the shares of male and female earnings in total income are equal. Equation (2) also suggests that family earnings will have a smaller variability the closer to zero, or the more negative, the correlation between husband's and wife's earnings. In turn, this correlation depends on the association between husband's earnings and wife's wages and on the relationship between husband's earnings and wife's labor supply.[4]

[3]Throughout this paper, income from sources other than employment is omitted. The terms income and earnings are used interchangeably.

[4]Assuming monotonicity, the sign of cov (Y_M, Y_F) is the same as that of cov $(\ln Y_M, \ln Y_F)$ We can express $\ln Y_F$ as $\ln W_F + \ln H_F$, where W_F is the wife's wage and H_F is the number of hours she works in the market in the year under consideration. We do not decompose $\ln Y_F$, under the assumption that most husbands work full time. Thus:

$$\begin{aligned}\text{cov}(\ln Y_M, \ln Y_F) &= E(\ln Y_M, \ln W_F) + E(\ln Y_M, \ln H_F) - E(\ln Y_M)E(\ln Y_F) \\ &= \text{cov}(\ln Y_M, \ln W_F) + \text{cov}(\ln Y_M, \ln H_F).\end{aligned}$$

It follows that family earnings will tend to be more equally distributed than husband's earnings (a) the more negative, or the less positive, the association between husband's earnings and wife's wage, and (b) the more negative the association between husband's earnings and female labor supply.

TABLE 1

DECOMPOSITION OF THE SQUARED COEFFICIENT OF VARIATION*

Panel A: White Families

	C_T^2	α^2	C_M^2	$\alpha^2 \cdot C_M^2$	β^2	C_F^2	$\beta^2 \cdot C_F^2$	r (p-value in parentheses)	$\alpha \cdot \beta$	$C_M \cdot C_F$	$2r\alpha\beta C_M C_F$	N
Period between marriage and first birth	0.386	0.46	0.524	0.241	0.10	0.632	0.0632	0.316 (0.001)	0.218	0.576	0.0794	705
Child-rearing period	0.411	0.83	0.447	0.371	0.0081	4.48	0.0363	0.0199 (0.359)	0.0819	1.42	0.00463	2,124
Post child-rearing period	0.365	0.72	0.423	0.305	0.0225	1.98	0.0446	0.0606 (0.022)	0.127	0.916	0.0141	1,429

Panel B: Black Families

	C_T^2	α^2	C_M^2	$\alpha^2 \cdot C_M^2$	β^2	C_F^2	$\beta^2 \cdot C_F^2$	r (p-value in parentheses)	$\alpha \cdot \beta$	$C_M \cdot C_F$	$2r\alpha\beta C_M C_F$	N
Period between marriage and first birth	0.302	0.49	0.293	0.144	0.09	0.789	0.0710	0.430 (0.001)	0.210	0.480	0.0867	178
Child-rearing period	0.463	0.58	0.492	0.285	0.058	1.52	0.0882	0.291 (0.001)	0.182	0.862	0.0913	1,019
Post child-rearing period	0.448	0.49	0.517	0.253	0.09	1.01	0.0909	0.343 (0.001)	0.210	0.719	0.104	446

*The terms of equation (2) may not exactly add up to C_T^2 due to rounding errors.

C. Empirical Results

Table 1 presents a decomposition of the squared coefficient of variation of family earnings for white households (Panel A) and for black households (Panel B).[5] Tables 2–4 are helpful in interpreting these results. Table 2 displays the life-cycle variation of mean incomes,[6] α and β, and Table 3 reports the labor force participation rates of women at the various stages. The figures in Table 3 are based on whether or not each woman worked in the market at any time in the twelve months prior to the date of the survey. Table 4 shows the correlation coefficients between husband's and wife's earnings for the group of two-earner families.

TABLE 2

The Life Cycle Variation of Mean Incomes, α and β

Panel A: White Families

	$\bar{Y}_T$	$\bar{Y}_M$	$\bar{Y}_F$	α	β
Period between marriage and first birth	13,474	9,169	4,305	0.68	0.32
Child-rearing period	12,521	11,430	1,091	0.91	0.09
Post child-rearing period	16,317	13,890	2,427	0.85	0.15

Panel B: Black Families

	$\bar{Y}_T$	$\bar{Y}_M$	$\bar{Y}_F$	α	β
Period between marriage and first birth	11,803	8,238	3,565	0.70	0.30
Child-rearing period	10,157	7,738	2,419	0.76	0.24
Post child-rearing period	12,401	8,634	3,767	0.70	0.30

TABLE 3

Female Labor Force Participation Rates

	Whites	Blacks
Period between marriage and first birth	87%	78%
Child-rearing period	36%	60%
Post child-rearing period	60%	75%

[5]Some respondents reported an exact figure when asked about their own and their husband's earnings. Those who did not wish to do so were shown a card containing various income categories and asked to select the most appropriate one. For these latter cases, we follow Schultz (1969), who, instead of using the midpoint as the average income level in each closed income interval, employs the geometric mean, in accordance with the approximately log-normal distribution of income. For the open-end interval ($25,000 or more) we follow Miller's (1963) suggestion by fitting a Pareto curve to the data. The Pareto fit was found to be appropriate for our data. This procedure led us to use $37,610 and $36,016 as the average incomes in the open-end intervals for men and women, respectively.

[6]It is interesting to note that whereas white average male earnings increase over the life cycle, the same is not true for blacks. This may reflect a cohort effect.

TABLE 4

CORRELATION COEFFICIENTS BETWEEN HUSBAND'S AND WIFE'S EARNINGS. WORKING-WIFE FAMILIES ONLY*

	Whites	Blacks
Period between marriage and first birth	0.337	0.462
Child-rearing period	0.181	0.329
Post child-rearing period	0.174	0.366

*All p-values are less than or equal to 0.001.

Inspection of the first two columns of Table 1 reveals that the relationship between male and family earnings inequality, as measured by the squared coefficient of variation, varies between the two racial groups, and, within each group, among the periods. For whites, the difference between family and male earnings inequality is 30.3 percent in period 1, 8.39 percent in period 2 and 14.7 percent in period 3. The corresponding figures for blacks are—3.02 percent, 6.07 percent and 14.3 percent. While the racial difference is extremely pronounced in the first stage, the differences in the second and third periods are minor.[7]

The apparent similarity among the racial groups in periods 2 and 3 masks important, countervailing differences. On the one hand, the correlation coefficients between the spouses' earnings are substantially larger and more significant among blacks than among whites. For black, working-wife families, the correlation coefficients are 0.329 and 0.366 in periods 2 and 3, respectively; the corresponding figures for white, working-wife households are 0.181 and 0.174. The racial difference is even more pronounced when the labor force participation effect is taken into account, i.e. when all families are considered: the correlations for blacks are 0.291 and 0.343, while those for whites are 0.0199 and 0.0606. This phenomenon tends to make the contribution of white wives more equalizing than that of their black counterparts. On the other hand, the greater labor force involvement of black mothers results in female coefficients

[7]The discussion in the text is based on the point estimates reported in Table 1. The following are approximate standard errors for the coefficients of variation:

	Whites			Blacks		
	$s(C_T)$	$s(C_M)$	$s(C_F)$	$s(C_T)$	$s(C_M)$	$s(C_F)$
Period 1	0.0220	0.0276	0.0318	0.0369	0.0361	0.0756
Period 2	0.0133	0.0141	0.0103	0.0209	0.0219	0.0547
Period 3	0.0148	0.0165	0.0588	0.0308	0.0343	0.0582

Underlying these standard errors is the assumption that the distributions of total, male and female incomes are normal—not an innocuous assumption, particularly for the latter group. Although these figures constitute only very rough approximations, they are presented to caution the reader that since our sample sizes for blacks are relatively small, there may be considerable variability around our point estimates for this group.

of variation which are substantially lower than those of white mothers. While for the former group, the squared coefficients are 4.48 and 1.98 in the child-rearing and post child-rearing stages, respectively, for the latter group they are 1.52 and 1.01. This effect tends to make the contribution of black mothers more equalizing.[8] The net result of these opposing influences is that the magnitude of the improvement in the distribution of family income due to female market activity is about the same for blacks and whites in periods 2 and 3.

The picture for period 1 is rather different. In this stage, the contribution of white wives improves the distribution substantially, while that of black wives actually exacerbates inequality, albeit by a very small amount. To a large extent, this pronounced difference between the two racial groups may be attributed to the fact that the correlation coefficient between the spouses' earnings is markedly higher among blacks; further, the coefficient of variation of female earnings is also larger in the black group, reflecting in part the lower participation rates of black wives in this interval.

In what follows, we concentrate attention on comparisons with Smith's results, since these are both most recent and take some account of race and life-cycle effects. We find, as Smith does, that with few exceptions, female labor force participation leads to greater equality in the income distribution among families. This finding may seem puzzling at first, in view of the relatively high inequality of female income, and the absence of a large, negative correlation between the spouses' earnings. This result is due to the fact that, in most cases, the income of wives adds more to the mean than to the variance of family earnings. It must be noted also that the inequality of family income is not an average of the coefficients of variation of male and female earnings.[9]

In addition, our study supports Smith's finding that white female earnings have a greater equalizing effect than black female earnings. Further, our estimates show that while the racial difference is dramatic in the first period, it tends to vanish as families advance to subsequent stages of the life cycle. Interestingly, a comparison of columns 1 and 4 in Table 1 of Smith's paper leads to a similar conclusion.

Some differences between Smith's results and our own should also be noted. While our data indicate positive correlation coefficients between husband's and wife's earnings for both whites and blacks, Smith finds some negative correlations among whites; however, most of these negative numbers are quite small in magnitude. More importantly, Smith states that "the coefficient of variation of black female earnings exceeds those of white females." This conflicts with our findings for the child-rearing and post child-rearing periods, in which most families are likely to be. It is very plausible that the *variance* of the earnings of black wives may exceed that of the earnings of white wives. Indeed, this is the case in our data, for periods 2 and 3. This results from the fact that black mothers

[8]These differences are somewhat less pronounced when only working wives are considered. The squared coefficients of variation for periods 2 and 3 in this case are 1.12 and 0.832 for whites, and 0.580 and 0.534 for blacks.

[9]When male and female characteristics are identical, i.e. $\bar{Y}_M = \bar{Y}_F$ and var (Y_M) = var (Y_F), the coefficient of variation of family income is always less than that of male (or female) income alone, except when $r = 1$, in which case they are equal. This special case is of interest, since as the trend of rising female labor force participation rates continues to unfold, we move in this direction.

participate in the market more than white mothers; thus, their earnings are characterized by a higher mean and greater absolute dispersion. But Smith's statement with regard to the coefficient of variation is puzzling.

Our analysis also departs from Smith's in that it suggests other reasons for the differential impact of female earnings in the two racial groups. Qualitatively, we agree with Smith's point (3) quoted in Section A. Our results indicate that the weaker correlation between the spouses' earnings among whites is an important force leading to the greater equalizing impact that white female earnings exert. But we disagree on points (1) and (2). With regard to the first point, we note that although in the child-rearing and post child-rearing periods, black mothers indeed account for a larger proportion of family earnings than do white mothers (i.e. the values of β are larger among blacks), this factor does not make the contribution of black mothers less equalizing. Indeed, if instead of having $\beta = 0.24$ and $\beta = 0.30$ for blacks in periods 2 and 3, respectively, the white weights applied, namely, $\beta = 0.09$ and $\beta = 0.15$, it can easily be verified that family income inequality among blacks would change very little, increasing by a small amount in period 3 and decreasing slightly in period 2.[10] With respect to Smith's second point, our study suggests, as indicated above, that since black mothers participate more in the market than their white counterparts, relative inequality is smaller in the former group.

D. Summary

The following statements sum up our conclusions. (1) With the exception of blacks in period 1, female labor supply tends to reduce inequality in the distribution of income among families. (2) The equalizing impact of white female income is larger than that of black female income; the difference between the two racial groups is very large in the interval preceding the birth of the first child, but small in the subsequent periods. (3) An important reason for the fact that among blacks, period 1 family earnings are slightly less equally distributed than male earnings is that the correlation coefficient between the spouses' earnings is strongly positive and large in magnitude in this group. (4) While black and white female income have equalizing impacts of similar size in periods 2 and 3, this apparent similarity masks two important forces. The coefficients of variation associated with the earnings of black mothers are smaller than those of their white counterparts. This increases the stabilizing effect of the contribution of black females. The larger, positive correlation coefficients between husband's and wife's income displayed by black households exerts a force in the opposite direction.

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[10]If we let $D = C_T^2 - C_M^2$, it may be shown that

$$\frac{\partial D}{\partial \beta} \gtreqless 0 \quad \text{as} \quad \beta \gtreqless \frac{C_M^2 - C_M C_F r}{C_F^2 + C_M^2 - 2C_M C_F r}$$

Thus, the influence of β on D is not monotonic; it depends on the magnitudes of β, C_M, C_F and r.

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