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ABSTRACT

In this paper, we formulate and estimate an economic model of the process by which a woman chooses to be married or to head her own household. We used the model to simulate the effects of changes in economic variables on the composition of households and on measured poverty. Five empirical findings emerge: (1) The opportunity cost of female headship is quite high. On average, a woman who heads a household can expect an increase in both her income and her leisure were she to marry. (2) The household headship decision responds to economic variables. Increases in the relative utility of women heading households increases the numbers of such households. (3) If welfare benefits were reduced, there would be fewer female household heads, but the difference would be relatively small. (4) If welfare benefits were reduced, however, there would be a substantial increase in measured poverty. (5) For nonwhites, the effect of wives' working in the market is to reduce female headship; for whites, wives' working in the market increases headship.

Work and Welfare as Determinants of Female Poverty and Household Headship

INTRODUCTION

In recent years the number of households headed by women and the proportion of these households receiving welfare income have grown rapidly. In this paper we model the extent to which these changes in household headship were policy-induced and the extent to which they affect measured poverty. In particular, we test the familiar hypothesis that the welfare system encourages families to break apart by providing benefits primarily to households headed by women. If a household breaks apart in response to welfare policy, the resulting households may be poor even though their combined incomes would have exceeded the poverty line. Changes in household structure thereby affect measured poverty and income inequality among households, and we seek to measure that effect.

We begin with two basic assumptions. First, differences in economic well-being influence a woman's choice of marrying (living in a household headed by her husband) or heading her own household. Second, this choice of headship status is, at any point in time, the woman's decision. Our model, therefore, involves comparing the economic benefits available to a woman in alternative headship statuses. A married woman shares in the income generated by her husband. If she becomes a household head, she looses access to some or all of her husband's income but may gain welfare benefits. Her leisure time may also vary with her headship status.[1]

Our analysis of the headship decision assumes that each woman compares two levels of utility--the level she expects if she chooses to be married, and the one she expects if she chooses to head her own household. Since each woman occupies only one headship status at any point in time, she must calculate the opportunity cost of her given status. For example, consider a woman who is a household head. Her opportunity cost is the utility she expects if she were to marry. The model we present is one in which changes in the opportunity cost of female headship induce changes in the number of women who choose to head their own households.

In the next section we briefly review the literature from which our model derives. We then present the theoretical rationale, the empirical and estimating models, and our empirical findings.

PREVIOUS RESEARCH

The effect of economic variables, and welfare payments in particular on the decision to marry, to divorce, or to remarry has been estimated in numerous recent studies. Comprehensive reviews have been provided by Wolf (1977) and Michael (1979); thus, we limit our review to three closely related papers.

Becker, Landes, and Michael (1977) were among the first to formulate and estimate a model in which an individual chooses a marital status by comparing the utility attainable in alternative statuses. Their model builds on previous work by Becker (1974) on the theory of household production and combines human capital theory and search theory. Maximizing utility through the household production function, marital partners may find that they can achieve higher utility levels if they separate than if they remain married. The marital decision depends on the expected and unexpected gains and losses associated with each marital status. The empirical work of Becker et al., however, does not model the economic situation that a married woman would face if she chose to end her marriage, i.e., the opportunity cost of marriage. Moreover, they did not model the effect of the welfare system on marital decisions.

Hutchens (1979) uses a framework similar to that of Becker et al., and directly accounts for the effects of the welfare system on the remarriage probabilities of female heads of households with children. The search model provides _a priori_ expectations about the signs of the coefficients. Hutchens recognizes the importance of dealing with the counterfactual status (in his case, really, the offer distribution), but notes the considerable difficulty of operationalizing the theoretical variables contained in a fully specified search model. Hutchens then uses a vector of existing-status explanatory variables which includes the parameters of the AFDC system in order to predict the transition probability.

Wolf models the marital disruption decision as a utility maximization problem in which the utilities attainable in alternative marital statuses are compared. He does estimate the arguments of the utility functions in the alternative statuses, so that a woman's labor force participation, earnings, and transfer income can differ across statuses. Thus, unlike the Becker et al. model, which assumes that a nonworking wife would not work if she were to become a female household head, Wolf's model provides estimates of the amount of labor she would provide if she were to become a household head. Wolf found that an increase in the welfare income available to female household heads increased the probability of divorce.

Our model builds directly on that of Wolf. It differs primarily in that he analyzed a sample of married couples and the determinants of the transition to female headship over a three-year period, while we analyze a sample of all women--married as well as household heads--and address the determinants of the equilibrium stock of female heads at a point in time.[2]

THE MODEL

We hypothesize that each woman chooses between two mutually exclusive headship statuses: heading her own household (female head) or living with a husband (married woman).[3] A woman chooses that headship status in which she receives the greatest expected utility. Each headship status is represented by a separate utility function, U_H and U_M for household head and married woman, respectively.[4]

$$\text{STATUS} = \begin{cases} 1 \text{ if } U_H > U_M \\ 0 \text{ if } U_H \leq U_M \end{cases} \quad (1)$$

STATUS is a dichotomous variable equal to 1 if the woman is a female head and 0 if married.

Our assumption that the woman alone makes the headship decision is equivalent to the usual assumption of long-run equilibrium.[5] We study the headship decision of all women at a point in time. Most related studies focus only on the decision of those women who change headship status during the study period. Since a relatively small proportion of woman change headship status in any year, the assumption that the "headship status market" is in long-run equilibrium is at least as descriptive for this as for other "markets." Women who calculate that the utility of being married exceeds the utility of being a household head are, by and large, married. Similarly, women who expect higher utility as household heads are, in the main, just that. Consider a woman who wants to remain married (i.e., she calculates that $U_M > U_H$), but is abandoned by her husband.[6] This creates a short-run disequilibrium, but we assume that in the long-run she will have found a new husband.

We assume that every woman knows the expected utility attainable in each headship status, and that these utilities are determined by the level of income and leisure associated with each status. Income and leisure will differ across headship statuses because: (1) total income if married includes a husband's income, which would not be available to a female head; (2) female heads are eligible to receive welfare income, while married women are generally ineligible; (3) labor force participation varies with available income and with headship status.

We also assume that a woman assesses the utility she can attain in each status by taking her current demographic traits and region of residence as constant. For example, a married woman assumes she would have as many children living with her if she were a female household head as she currently has living with her. The expected levels of income and leisure vary across the headship statuses, not the woman's demographic traits.[7] Finally, we assume income sharing within households, so that utility in each status depends on the total consumption possibilities of all household members. Thus, where Y_H, L_H, Y_M, and L_M are the levels of income and leisure the woman expects to have if a household head or if married, and ε_H and ε_M are unobservable random variables representing tastes for household headship and marriage,

$$U_H = U_H(Y_H, L_H, \varepsilon_H) \tag{2}$$

$$U_M = U_M(Y_M, L_M, \varepsilon_M). \tag{3}$$

Utility increases with income and leisure in each headship status.

ESTIMATING MODEL

We impose the restrictions that U_H and U_M are linear in vectors of unknown parameters, β_M and β_H, and that the disturbances, ε_H and ε_M are normally distributed random variables. Let X be a four by one vector,

$$X = [X_1\ X_2\ X_3\ X_4]' = [Y_H\ L_H\ Y_M\ L_M]' \qquad (4)$$

Leaving detailed specification of X to the next section, we write the two utility indicators as functions of X.

$$U_H = \beta_{1H}X_1 + \beta_{2H}X_2 + \varepsilon_H \qquad \beta_{3H} = \beta_4 H = 0 \qquad (5)$$

$$U_M = \beta_{3M}X_3 + \beta_{4M}X_4 + \varepsilon_M \qquad \beta_{1M} = \beta_{2M} = 0 \qquad (6)$$

The disturbances (unobservable tastes variables ε_H and ε_M) are uncorrelated with X.

Each woman knows U_H and U_M. Thus her choice of headship status is nonstochastic, and is represented by equation (1). For the researcher, the probability that a woman randomly drawn from the population is a household head depends on the distribution of ε_H and ε_M and on the woman's characteristics. Thus,

$$\begin{aligned} \Pr(\text{STATUS} = 1) &= \Pr\ (U_H > U_M) \\ &= \Pr\ (X'\beta_H + \varepsilon_H > X'\beta_M + \varepsilon_M) \qquad (7) \\ &= \Pr\ [(\varepsilon_H - \varepsilon_M) > (X'\beta_M - X'\beta_H)] \end{aligned}$$

Since both ε_H and ε_M are normally distributed, $(\varepsilon_H - \varepsilon_M)$ is normally distributed and equation (7) can be rewritten as

$$\Pr(\text{STATUS} = 1) = 1 - \Phi\ [(X'\beta_M - X'\beta_H)/\sigma], \qquad (8)$$

where σ^2 is the variance of $(\varepsilon_H - \varepsilon_M)$, and $\Phi(\cdot)$ is the cumulative distribution function of a standardized normal variate. Any event which increases the utility of being a household head relative to that of being married increases the probability that a woman will choose to head her own household.

ESTIMATION

To estimate equation (8), which specifies the determinants of female household headship, we must estimate the arguments of the utility functions, Y_H, Y_M, L_H, and L_M. Because each woman occupies only one status, we estimate her choices of income and leisure in the counterfactual status by observing women with similar characteristics who currently occupy the counterfactual status. For example, we begin with data on Y_H and L_H for women who are currently female heads of household, and regress these variables on a set of observable characteristics (Z) of these women.[8] These regressions are used to estimate Y_H and L_H for all women.[9] Similar regressions, estimated using data on women who are currently married, provide our estimates of Y_M and L_M for all women. These estimates of Y_H, Y_M, L_H, L_M comprise elements of the vector X in equation (8).

Before estimating the determinants of Y_H, L_H, Y_M and L_M, we divide household income in each status into three mutually exclusive components:[10] earned income (EY_H, EY_M), welfare income (WY_H, WY_M), and income other than earnings or welfare (OY_H, OY_M).[11] We measure leisure by its complement, labor force participation of the woman (L_H, L_M). This division leaves us with the following equations for each marital status:

$$EY = r_1(Z, \eta_1) \quad (9)$$

$$OY = r_2(Z, \eta_2) \quad (10)$$

$$WY = r_3(Z, \eta_3) \quad (11)$$

$$L = r_4(Z, \eta_4) \quad (12)$$

The disturbances η_i are normally distributed random variables which are independent of Z. Each function r_i has associated with it, a set of different unknown parameters, γ_i, estimates of the impact of any Z on each of the four dependent variables.

We estimate equations (9)-(12) separately for four groups of women--nonwhite and white female heads and nonwhite and white married women. We use the March 1975 Current Population Survey (CPS) data.[12] Since we analyze the choice to be married or to head a household, we limit our sample to women between the ages of 25 and 54. Many younger women live with their parents and many older women live with their adult children; thus, their choices may be constrained. The attributes of the women (the variables in the vector Z) included in the model are age, education, region, suburban location, health status, number of children, whether the household they head contains a female-headed subfamily and whether they have ever been married. Also included are the parameters of the welfare system in geographical state of residence:[13] the income guarantee of the Aid to Families with Dependent Children program (AFDC) appropriate for each woman's family size,[14] the effective AFDC benefit reduction (tax) rate on earned income, and the amount of earnings not subject to the tax rate (the "set aside").[15] For married women these welfare variables are replaced by a single dummy variable which indicates whether or not the state of residence has an AFDC program for unemployed fathers (AFDC-U).

Specifying EY, OY, WY and L as functions of Z allows us to trace the influences of changes in the woman's characteristics (including the welfare system in her region) on the probability of headship status via equation (8). The conditional expectations, given Z, of EY, OY, WY and L for each headship status allow us to form the vector X in equations (5) and (6). Then changes in Z change X and affect the probability of headship in equation (8). For example, an increase in the AFDC guarantee raises welfare income for female heads and, all other variables unchanged, would increase the utility of being a female head relative to the utility of being married and thereby increase the probability of female headship.[16] The increase in the guarantee is also expected to reduce poverty.

Appendix Table A-1 shows our regressions for the income sources of nonwhite female heads while Appendix Table A-2 shows the results for labor force participation. The results for nonwhite married women, white female heads, and white married women are shown in Appendix tables A3-A8.[17]

The equations for earned income (EY) and income other than welfare income or earned income (OY) are each estimated by ordinary least squares. Because most women do not receive welfare income and because it is constrained to be nonnegative, the welfare income equation is estimated by a two-step procedure similar to that suggested by Heckman (1976). In the first step, a probit equation is estimated on a binary dependent variable which takes the value of one if welfare income is received and zero if not. Using the results of the Step 1 estimation procedure, a new variable is constructed. This new variable, denoted LAMBDA in Table A-1, is then used with Z in an equation on WY, where the sample consists only of women for whom WY is positive (i.e., welfare recipients).[18]

We specify the labor force participation decision as a trichotomous one: A woman either did not work last year, worked part of the year (1 through 48 weeks), or worked full year (49 through 52 weeks). This specification is motivated primarily by two observations about our data. First, the CPS data report weeks worked in the preceding year in seven discrete categories. Second, a frequency distribution of weeks worked reveals that most women cluster in the two extreme categories (did not work, worked full year).[19] Labor force participation is, thus, estimated as a multinominal logistic function.[20]

The estimated coefficients for nonwhite female household heads in Tables A-1 and A-2 are used to predict the value of the dependent variables in equations (9)-(12) for all nonwhite women (as well as the coefficients in the other Appendix tables for the other three groups.) Estimates are necessary because the headship status decision depends on the values of two utility functions, values determined by their arguments (EY_i, OY_i, WY_i, L_i; $i = H, M$). Since the sources of income and labor force participation are only observed for one headship status, their values must be imputed for the other unoccupied status. Our prediction for EY_M for women who are currently household heads is simply an estimate of the conditional expectation of EY_M, given Z.[21] We also use this expectation as our prediction for married women.[22] Our predictions for OY, WY, and L are based on the conditional expectations of the other equations.[23]

The predicted components of income in each headship status (EY, OY, WY) were summed to predict total income. This total income measure then was normalized to reflect differences in family composition in different statuses.

Family size necessarily differs across statuses, _ceteris paribus_, due to the presence (or absence) of the husband. Dollar differences in income then do not accurately reflect differences in possible consumption across statuses. One plausible correction is to adjust total household income by an equivalence scale. This is the method chosen here, with the Census poverty lines serving as our equivalence scale.[24] These normalized incomes, or "welfare ratios," based on the conditional expectations, are then substituted for Y_H and Y_M, and denoted $\hat{Y}_H$ and $\hat{Y}_M$. Similarly we substitute the conditional expectations, $\hat{L}_H$ and $\hat{L}_M$ for L_H and L_M. Table 1 presents these expected values for all women, and for women classified by their weeks of work. Because they are derived using all of a woman's observed characteristics, we refer to these as our _baseline_ predictions.

RESULTS

The results in Table 1 and the tables which follow differentiate our analysis from those of Becker et al. and Hutchens. Our analysis proceeds with explicit predictions for every woman of the expected values of the components of economic well-being in both the observed and the counterfactual headship statuses. Using the predicted values, $\hat{Y}_H$, $\hat{L}_H$, $\hat{L}_M$, and $\hat{L}_M$, we are able to analyze the opportunity cost of female headship, the effect of the welfare system on female headship, and the induced effects on measured poverty.

The Opportunity Cost of Female Headship

The ratios shown in columns 3 and 6 of Table 1 are indicators of the opportunity cost of female headship. For example, nonwhite women can expect a welfare ratio of 2.89 if married, but only 1.60 if a female head. While

Table 1

The Opportunity Cost of Female Household Headship

Women by Race and Observed Labor Force Participation	Mean Predicted Values[a] $\hat{Y}_M$ (1)	$\hat{Y}_H$ (2)	Ratio Col.(1)/Col.(2) (3)	Mean Predicted Values[a] $\hat{L}_M$[b] (4)	$\hat{L}_H$[b] (5)	Ratio Col.(1)/Col.(2) (6)
Nonwhite women, all	2.89	1.60	1.80	2.01	2.19	0.92
Did not work	2.57	1.41	1.83	1.88	2.00	0.94
Part-year workers	2.69	1.43	1.89	1.96	2.09	0.94
Full-year workers	3.26	1.86	1.75	2.14	2.40	0.89
White women, all	3.96	2.22	1.78	1.94	2.30	0.84
Did not work	3.61	1.97	1.83	1.84	2.16	0.85
Part-year workers	3.76	2.03	1.85	1.91	2.23	0.86
Full-year workers	4.45	2.60	1.72	2.06	2.49	0.83

[a]Each mean ($\hat{Y}_H$, $\hat{Y}_M$, $\hat{L}_H$, $\hat{L}_M$) is computed over all women, married women as well as female head. Predicted values are denoted by "^".

[b]$\hat{L}_M$ and $\hat{L}_H$ take the value of 1 if the woman did not work at all during the previous year; 2, if she worked less than full-year; and 3, if she worked full-year. For example, the value of $\hat{L}_H$, 2.19 for all nonwhite women, represents the following: 29% are predicted not to work at all; 23% to work part-year; 48% to work full-year.

the levels that white women can expect, 3.96 and 2.22, are higher, the relative difference in well-being between the two headship statuses is similar. On average if a female head were to marry, her welfare ratio would rise by about 80 percent. Similarly, predicted labor force participation is about 10 to 15 percent lower for nonwhite and white married women than for female heads. For both races, and for women classified by age, education, or region (data not shown), the expected welfare ratio is lower and the expected labor force participation is higher for female heads than for married women.

The highest predicted welfare ratios for both whites and nonwhites are those of women who work full-year. The welfare ratio in either headship status for nonwhite women is about 70 percent of the similar ratio for white women. Moreover, the predicted difference in labor force participation between married women and female heads is greater for whites than nonwhites, reflecting the observation that fewer white than nonwhite wives work. Given the high opportunity cost of female headship, it is not surprising that at any point in time most women are married.

The Effects of the Welfare System on Economic Well-being

The estimated equations shown in the Appendix tables are used to simulate the effect of the welfare (AFDC) system on economic well-being. We calculate new predictions of EY, OY, WY, and L by using the estimated coefficients, setting the parameters of the AFDC system equal to zero, and holding the remaining elements of Z at their observed values. In this simulation, changes in the welfare system produce labor supply responses as well as changes in household income. Predicted incomes are again summed and normalized. These normalized simulated predictions are compared to the baseline predictions derived using the actual parameters of the existing welfare system.

Table 2 presents the results of this comparison for all nonwhite and white women in panels 1 and 2, and only for women currently receiving welfare income in panels 3 and 4. A comparison of the baseline predictions to those that would exist in the absence of the AFDC system,[25] reveals that for nonwhites, AFDC increases the predicted welfare ratio of female heads by 10 percent (1.60/1.45), and of married women by 2 percent (2.89/2.83). Nonwhite female heads actually receiving welfare income benefit relatively more from the AFDC system (their welfare ratio increases by about 20 percent). The effects of the AFDC system on labor force participation for nonwhite women and for white wives and on the welfare ratios of white women are negligible. White household heads, however, are predicted to reduce their labor force participation as a result of AFDC (by about 7 percent on average, and by about 11 percent for those receiving welfare).

The Determinants of Female Household Headship

Given our baseline predictions for each woman, we substitute the values of $\hat{Y}_H$ and $\hat{L}_H$ for X_1 and X_2 in equation (5) and $\hat{Y}_M$ and $\hat{L}_M$ for X_3 and X_4 in equation 6. We then proceed to equation (8) and estimate the effects of the arguments of the utility function on the probability that a woman will head her own household. The results of a probit and logistic estimation of equation were virtually identical. We report the results of the logistic estimation in Table 3.

Increases in $\hat{Y}_H$ and decreases in $\hat{L}_H$ that increase the utility of heading a household, and decreases in $\hat{Y}_M$ and increases in $\hat{L}_M$ that decrease

Table 2

The Effects of the Welfare (AFDC) System on Economic Well-Being

	Mean Predicted Values			
	$\hat{Y}_H$	$\hat{L}_H$	$\hat{Y}_M$	$\hat{L}_M$
1. All Nonwhites				
Baseline prediction	1.60	2.19	2.89	2.01
Simulated prediction	1.45	2.19	2.83	2.02
2. All Whites				
Baseline prediction	2.22	2.30	3.96	1.94
Simulated prediction	2.26	2.47	3.98	1.95
3. Nonwhites currently receiving welfare income				
Baseline prediction	1.11	1.87	2.14	1.82
Simulated prediction	0.93	1.85	2.07	1.85
4. Whites currently receiving welfare income				
Baseline prediction	1.53	1.96	2.92	1.76
Simulated prediction	1.55	2.20	2.94	1.78

Notes: Baseline prediction: all variables evaluated at their observed values for each woman for each equation.

Simulated prediction: all variables evaluated at their observed values, but parameters of welfare (AFDC) system (income guarantee, tax rate on earnings, set aside) are set to zero for each woman and for each equation.

Table 3

The Determinants of Female Headship

Independent Variables	Nonwhites Coefficient	Nonwhites Standard Error	Nonwhites Derivative[a]	Whites Coefficient	Whites Standard Error	Whites Derivative[a]
$\hat{Y}_H$	.407**	.147	.097	.654**	.224	.082
$\hat{L}_H$	-.640**	.249	-.153	-1.082**	.427	-.136
$\hat{Y}_M$	-.200*	.106	-.048	-.240+	.145	-.030
$\hat{L}_M$	.064	.332	.015	1.758**	.630	.221
Constant	.771*	.387		-3.164**	.633	

Dependent variable = STATUS = 1 if head, 0 if married

	Nonwhites	Whites
Mean dependent variable =	.396	.155
Predicted probability at means =	.395	.149
Chi sq. (5) =	21.88	34.94
Number of observations =	1333	1366

[a]The derivative of the probability of headship with respect to the ith argument, evaluated at the means (See footnote 26.).

** = significant at 1% level.

* = significant at 5% level.

+ = significant at 10% level.

the utility of being married, are all expected to increase the probability that a woman heads her own household. Thus, in Table 3 where STATUS = 1 for household heads, we expect the following signs:

Variable	$\hat{Y}_H$	$\hat{L}_H$	$\hat{Y}_M$	$\hat{L}_M$
Sign	+	-	-	+

The coefficients on each of the predicted income and labor force participation variables have the expected signs, and seven of these eight coefficients are significantly different from zero. The predicted probabilities at the means of the independent variables, .395 for nonwhites and .149 for whites, are quite close to the actual means of the dependent variables, .396 for nonwhites and .155 for whites.

The derivatives in Table 3 imply that a unit change in $\hat{Y}_H$ for nonwhites increases the probability of headship by .111 and by .087 for whites.[26] Because $\hat{Y}_H$ has been normalized by the poverty line, a unit increase in $\hat{Y}_H$ represents about $5000 for the average woman in 1975. This represents an elasticity of headship with respect to income ($\hat{Y}_H$) of 0.40 for nonwhites and 1.23 for whites. Thus, while white women are less likely on average to head their own households than are nonwhites, the responses of whites to changes in each of the four economic variables are larger.[27] The major difference between the races is the relative magnitude of the estimated positive coefficient on weeks worked by wives: The derivative on $\hat{L}_M$ is the smallest of the four for nonwhites, but the largest for whites. Fewer white than nonwhite wives work, and this work increases headship more for whites, ceteris paribus. Of course, the total net effect of wives' work on female headship is derived from two effects which have opposite signs. The direct effect operates via the positive coefficient on $\hat{L}_M$, while the indirect effect results from changes in $\hat{Y}_M$ (with its negative coefficient) that result from the increased work.[28] We analyze this and other effects on headship in the next section.

The Effects of the Welfare System and of Wives' Work on Household Headship and Measured Poverty

The coefficients in Table 3 show that a woman's decision to head her own household is responsive to changes in expected economic well-being in either headship status. Any change that increases the expected well-being of a married woman reduces the proportion of women choosing to head households; any change that increases the expected well-being of a household head increases this proportion. Because welfare benefits are generally available only to female household heads, they increase the well-being of female heads relative to that of married women, and, thus, are expected to increase the headship proportion. However, welfare benefits are also expected to reduce poverty.

Table 4 presents our estimates of the effect of the welfare system on nonwhite female household headship and on the nonwhite incidence of poverty. Line 1 presents the actual 1975 sample means for Y_H, L_H, Y_M and L_M, the proportion of all households headed by women, and the percentage of households that are poor.[29] Line 2 presents our baseline predictions, the predicted mean values of $\hat{Y}_H$, $\hat{L}_H$, $\hat{Y}_M$, and $\hat{L}_M$ that are derived by evaluating the coefficients from equations (9)-(12) at each

Table 4

The Effects of the Welfare System and of Wives' Work on Female Household Headship and Measured Poverty, Nonwhite Women

	Mean Predicted Values[a]				Proportion of All Households Headed by Women	Incidence of Poverty Among All Women (%)
	$\hat{Y}_H$	$\hat{L}_H$	$\hat{Y}_M$	$\hat{L}_M$		
1. Actual[b]	1.52	2.11	2.90	2.04	.394	25.8
2. Predicted, Baseline	1.60	2.19	2.89	2.01	.396	13.0
3. Predicted, AFDC parameters set to zero	1.45	2.17	2.83	2.02	.387	16.7
4. Predicted, Welfare income ($\hat{WY}$) set to zero	1.42	2.19	2.86	2.01	.380	17.6
5. Predicted, Wives do not work ($\hat{L}_M$=1, $\hat{Y}_M$ adjusted accordingly)	1.60	2.19	2.24	1.00	.412	15.9

[a]The logistic coefficients of the determinants of female headship from Table 3 are evaluated at these predicted values, and yield our estimate of the proportion of all households headed by women. These predicted values are also used to derive our estimate of the incidence of poverty.

[b]The data in line 1 are actual sample means, not predicted values or estimates. While a woman who is actually married has observed values only for Y_M and L_M, she has predicted values for all four variables. Thus, the actual means are derived separately for married women and female heads, while each of the predicted means is derived from the entire sample of women.

woman's observed characteristics. The logistic coefficients of the headship equation (8) from Table 3 are then evaluated at these predicted values for each woman. This estimate of the log odds is then transformed into an estimate of the probability of headship for each woman. We then use the CPS weight for each woman and aggregate over all women to estimate the proportion of households headed by women.

Our estimate of the poverty incidence is derived in two steps. We begin with the regression estimate of the probability that a woman heads her own household. We then multiply the woman's sample weight from the CPS by this probability to estimate the number of household heads this woman represents. If $\hat{Y}_H$ is less than 1.0 for this woman, then we count as the number of poor female heads, the product of the woman's sample weight and her estimated headship probability. We then repeat the computation using the weighted estimated probability of being married, and count the resulting total among the poor if $\hat{Y}_M$ is less than 1.0. The estimated incidence of poverty is then the sum of poor household heads and poor married woman divided by the total number of women.

A comparison of lines 1 and 2 of Table 4 shows that our model predicts the components of economic well-being and the headship proportion well enough, but our estimate of the incidence of poverty falls far below the actual incidence. For example, the actual headship proportion is .394 and the predicted is .396, while the actual poverty incidence is 25.8 percent and our estimate is 13.0 percent. Failure to predict the current incidence of poverty is due to two factors. First, any model fits best around the sample mean, and by definition, poor households are in the lower tail of the income distribution. Second, there is an economic rationale for our underestimate of the poverty incidence. A large proportion of persons will be poor in any period for transitory reasons. Since our estimate is based on observed characteristics that are predictors of permanent income, it does not allow for those transitory fluctuations that cause current income to be abnormally low. Because our model and our data set are designed to evaluate long-run equilibrium in the "headship status market", permanent income poverty is the relevant concept.

While line 1 presents actual data, and line 2 presents the baseline predictions we derive from the women's observed characteristics, lines 3, 4, and 5 present three simulations with which we gauge the effect of the welfare system and of wives' work on headship and poverty. The predictions in line 3 are derived by assuming that the current welfare system did not exist--i.e., the income guarantee, tax rate, and set aside of the AFDC system are set to zero for each woman. We then evaluate the coefficients of equations (9)-(12) at the observed values of all of the woman's other characteristics. This simulation makes full use of our model. When the welfare parameters are set to zero, changes in each component of income (EY, OY, WY) and in labor supply result for each headship status. Each of the four predicted values in line 3 differs from its counterpart in line 2. The new predictions are then used to derive estimates of the headship proportion and the poverty incidence. Compare lines 2 and 3, the "real world" and the "no welfare world". Through its effects on $\hat{Y}_H$, $\hat{L}_H$, $\hat{Y}_M$, $\hat{L}_M$, the welfare system increases the headship proportion from .387 to .396 (a change of 2.3 percent), but reduces the incidence of poverty from 16.7 to 13.0 percent (a change of 22.2 percent).

Line 4 reports another simulation of the effect of the welfare system. Here we merely set predicted welfare income ($\hat{WY}$) equal to zero for all female heads and married women, and leave the predicted values of the other variables [in equations (9), (10), and (12)] unchanged. This simulation does not consider the labor supply responses that result when our full model is used (as in the predictions in line 3). Rather, it measures only the income effect that results from the elimination of welfare income--$\hat{Y}_H$ is the only variable that differs between lines 2 and 4. A comparison of this simulation with the baseline shows that welfare income increases $\hat{Y}_H$ from 1.42 to 1.60 (12.7 percent), reduces poverty from 17.6 to 13.0 percent (26.1 percent), and increases the headship proportion from .380 to .396 (4.2 percent).[30] Thus, both welfare simulations suggest that the current welfare system significantly reduces poverty, but causes a small increase in the headship proportion.

The final simulation in Table 4 focuses not on the effect of the welfare system, but on the effect of working wives. As mentioned above, the direct effect of reduced work increases the attractiveness of marriage, while the reduced earnings reduce this attractiveness. Line 5 shows that if wives did not work, $\hat{L}_M$ would fall from the baseline prediction of 2.01 to 1.00, and $\hat{Y}_M$ would fall from 2.89 to 2.24 (22.5 percent). The net effect of wives working is to reduce the relative attractiveness of female headship: The headship proportion falls from .412 to .396 (3.88 percent) and the poverty incidence falls from 15.9 to 13.0 percent (18.2 percent).

The results in Table 4 suggest that the headship proportion for nonwhites is affected to about the same degree by the current welfare system (which increases headship) and the work and income contributed by wives (which reduce headship). Both contribute to a reduction in the incidence of poverty.

Table 5 repeats our simulation analysis for white women. While the major effect of the welfare system for nonwhite women was to raise the income of female heads, the major effect for white women is to reduce work effort. A comparison of lines 2 and 3 shows that $\hat{L}_H$ falls from 2.47 to 2.30. Because reduced work as a female head increases the attractiveness of female headship, the current welfare system leads to an increase in headship among whites from .132 to .143 (8.33 percent) and an increase in poverty from 1.2 to 1.4 percent. This increase in poverty occurs because the predicted labor supply effect of welfare is so large that $\hat{Y}_H$ is actually higher in the "no welfare" world.

The welfare simulation in line 4 constrains all of the predicted values except $\hat{Y}_H$. Thus, when welfare income is set to zero, $\hat{Y}_H$ falls from 2.22 to 2.13. A comparison of lines 2 and 4 shows that the increase in $\hat{Y}_H$ due to welfare raises headship slightly from .142 to .143, and reduces poverty from 1.9 to 1.4 percent. The results of this simulation are similar to those for nonwhites.

If white wives did not work, $\hat{L}_M$ would fall to 1.00 from 1.94 and $\hat{Y}_M$ would fall from 3.96 to 3.26 (21.5 percent). While the net effect of wives working was to reduce headship for nonwhites, the net effect for whites is a large increase from .004 to .143. For whites, the increase in the headship proportion due to wives' working is much larger than the increase due to the current welfare system.[31]

Table 5

The Effects of the Welfare System and of Wives' Work on Female Household Headship and Measured Poverty, White Women

	Mean Predicted Values[a]				Proportion of All Households Headed by Women	Incidence of Poverty Among All Women (%)
	$\hat{Y}_H$	$\hat{L}_H$	$\hat{Y}_M$	$\hat{L}_M$		
1. Actual[b]	2.51	2.37	3.81	1.91	.156	7.2
2. Predicted, Baseline	2.22	2.30	3.96	1.94	.143	1.4
3. Predicted, AFDC parameters set to zero	2.26	2.47	3.98	1.95	.132	1.2
4. Predicted, Welfare income ($\hat{WY}$) set to zero	2.13	2.30	3.96	1.94	.142	1.9
5. Predicted, Wives do not work ($\hat{L}_M$=1, $\hat{Y}_M$ adjusted accordingly)	2.22	2.30	3.26	1.00	.004	1.8

[a]The logistic coefficients of the determinants of female headship from Table 3 are evaluated at these predicted values, and yield our estimate of the proportion of all households headed by women. These predicted values are also used to derive our estimate of the incidence of poverty.

[b]The data in line 1 are actual sample means, not predicted values or estimates. While a woman who is actually married has observed values only for Y_M and L_M, she has predicted values for all four variables. Thus, the actual means are derived separately for married women and female heads, while each of the predicted means is derived from the entire sample of women.

The analysis in tables 4 and 5 is based on using predicted values for $\hat{Y}_H$, $\hat{L}_H$, $\hat{Y}_M$, and $\hat{L}_M$ in conjunction with the logistic coefficients of Table 3. We now present an analysis of the changes in headship which result from actual changes in the economic status of female heads and wives between 1968 and 1975. Table 6 presents a decomposition which allows us to estimate the separate effects of changes in the well-being of female heads and changes in the well-being of wives on the headship proportion.

Consider lines 1 and 4 for nonwhites. Between 1968 and 1975, Y_H actually increased from 1.24 to 1.52 and L_H decreased from 2.21 to 2.11. Both changes increased the attractiveness of female headship. There was also an increase in actual Y_M from 2.22 to 2.90, and a slight decline in L_M from 2.05 to 2.04. Both of these changes increased the attractiveness of being married. A comparison of lines 1 and 4 shows that when the logistic coefficients from Table 3 are evaluated at these actual values, the predicted headship proportion increases from .389 to .399.

Lines 2 and 3 decompose this change into two components: one due to changing economic status of female household heads, and the second due to the changing economic situation of married women. Line 2 shows that if nonwhite female heads had achieved their 1975 level of well-being, but the well-being of nonwhite married women had remained at their 1968 levels, then the female headship proportion would have been .432. The decline in the predicted probability from .432 to .399 is thus due to the improved economic situation of nonwhite married women during the period. Line 3 shows that the changing economic situation of nonwhite female heads, holding constant the position of married women, caused headship to increase from .357 to .399. Thus, the predicted change in

Table 6

The Effect of Changes in Economic Well-Being Between 1968 and 1975 on Female Household Headship

	Predicted Proportion of All Households Headed by (Values of Y_H, L_H, Y_M, L_M)	
	Nonwhites	Whites
1. Actual 1975 values for all women.	.399 (1.52, 2.11, 2.90, 2.04)	.162 (2.51, 2.37, 3.81, 1.91)
2. Actual 1975 values for female heads; Actual 1968 values for married women.	.432 (1.52, 2.11, 2.22, 2.05)	.154 (2.51, 2.37, 3.26, 1.80)
3. Actual 1968 values for female heads; Actual 1975 values for married women.	.357 (1.24, 2.21, 2.90, 2.04)	.143 (2.33, 2.40, 3.81, 1.91)
4. Actual 1968 values for all women.	.389 (1.24, 2.21, 2.22, 2.05)	.135 (2.33, 2.40, 3.26, 1.80)

[a]Prediction is based on evaluating coefficients from Table 3 at the observed values of Y_H, L_H, Y_M, and L_M shown below each line.

nonwhite headship from .389 to .399 resulted from the offsetting effects of changes in the situation of wives and female heads.

For whites, both changes in the economic well-being of female heads between 1968 and 1975 increased the attractiveness of female headship: Y_H actually increased from 2.33 to 2.51 and L_H declined from 2.40 to 2.37. However, the changes in the economic situation of married women had opposite effects. The increase in Y_M from 3.26 to 3.81 increased the attractiveness of being married, but the increased work of wives (L_M increased from 1.80 to 1.91) decreased the attractiveness. The net effect of these actual changes is an increase in the headship proportion from .135 to .162, a larger net increase than for nonwhites.

While the net effect was an increase in headship for both whites and nonwhites, the effects of the two components differ among the races. While the changing economic situation of nonwhite wives reduced the headship proportion, the changes for white wives led to an increase in the predicted headship probability from .154 to .162. Thus, the pro-marriage effect of the increase in income was more than offset by the pro-headship effect of the increased work of wives. The changing situation of white female heads, holding constant that of married women, also caused headship to increase from .143 to .162. Thus, for whites, the increase in headship is attributable to the changing situations of both wives and female heads.

Between 1968 and 1975 the actual percentage of women ages 25 through 54 (our sample) heading their own households increased from .328 to .396 percent for nonwhites and from .118 to .155 percent for whites. The results presented here show that women are responsive to changes in their economic situation in each headship status. However, the model does not attribute such large increases in headship to the actual changes in the economic situations of wives and married women. One suggestion for further research would be to extend this model to incorporate changes in the "taste for female headship" that may have occurred in the recent past.

SUMMARY

In this paper we have estimated a model of the determinants of female headship and shown that headship responds to variations in the levels of economic well-being a woman can expect if she marries or if she heads her own household. An intermediate step in our modelling process was the estimation for every woman of her expected income and leisure in each headship status. This specification allowed us to simulate the effect of changes in the welfare system and of wives' work on the headship proportion and the incidence of poverty. Five empirical findings emerge: (1) The opportunity cost of female headship is quite high. On average, a woman who heads a household can expect an increase in both her income and her leisure were she to marry. (2) The household headship decision responds to economic variables. Increases in the relative utility of women heading households increases the numbers of such households. (3) If welfare benefits were reduced, there would be fewer female household heads, but the difference would be relatively small. (4) If welfare benefits were reduced, however, there would be a substantial increase in measured poverty. (5) For nonwhites, the effect of wives' working in the market is to reduce female headship; for whites, wives' working in the market increases female headship. Our empirical findings lead us to conclude that the actual increases in female headship that occurred between 1968 and 1975 are substantially larger than those which our model attributes to the observed improvements in the economic situation of female heads and of married women, including those which are attributable to the welfare system.

NOTES

[1]The data indicate that a married woman who becomes a household head is likely to work more and to have less income (Bradbury et al., 1979).

[2]Our decison to analyze the stock of female household heads rather than the transition from marriage to female headship is explained below.

[3]The Census provides three mutually exclusive headship categories for any woman--married woman, female head or member of a subfamily. A woman who lives in a family headed by a relative other than her husband is a member of a subfamily. A female subfamily member can be either a married woman or a female head. In 1975 less than 1 percent of all women ages 25-54 (the sample we analyze) were subfamily members. We exclude these women from the sample because of data deficiencies which prevent us from estimating their expected incomes in the alternative headship statuses.

The Census defines a family as a "group of two or more persons related by blood, marriage or adoption and residing together," and an unrelated individual as a "person not living with any relatives" who "may constitute a one-person household" or "may reside in group quarters." We refer in this paper to households which we define to include all families and unrelated individuals. For example, consider a married couple with no children in which the woman leaves her husband to head her own household. We now classify the woman as a female-headed household with one person. The Census would classify her as a female unrelated individual, and not include her in a count of female family heads.

[4]While we have specified separate utility functions for each headship status, other specifications are possible. For example, specifying a single utility function implies that the utility of each individual woman can be written as

$$U = U(V_i | \beta)$$

where V_i are the attributes of any headship alternative (e.g., Y_i, L_i) and the parameters of the utility function β are constant across alternatives. The model we present can be written as

$$U_i = U_i(V' | \beta_i), \qquad i = H, M$$

where V' contains all the attributes of both alternatives but the parameters vary for each status-specific utility function.

[5]Our model depends on the utility maximizing behavior of individuals. We assume that each individual chooses freely among headship alternatives. Just as an individual chooses one bundle of goods over another in order to maximize utility, that same individual chooses a headship status. If the individual is not satisfied with that bundle, she chooses a different one during the next period. Similarly, if an individual is not satisfied with her headship status, she can choose a different one. Models of the demand for goods ignore the possibility of dissatisfaction with the chosen outcome and assume that observed purchases are the result of utility maximizing choices--that those purchases represent an equilibrium. Similarly, we assume that observed headship statuses represent an equilibrium. The number of dissatisfied individuals, who would change their headship status if they could, is assumed to be small at any point in time.

[6] Becker, Landes, and Michael have another way of dealing with the involuntary imposition of headship status on a woman ("abandonment"). They assume costless compensation between spouses. A marriage breaks apart, in their model, only when one spouse can bribe the other to permit the breakup.

[7] Obviously a married woman has a husband, while a female head does not. The utility derived from a husband is reflected through his impact on the woman's attainable income and leisure, and not through his effects on her characteristics. Because this is an equilibrium model, we assume that the woman does not change her characteristics as she changes headship status. For example, a female household head does not increase her education in order to increase either her income as a female head or her attractiveness as a marriage partner.

[8] Polachek and Horvath (1977) use a similar procedure to obtain instrumental variables in the context of a model of the migration decision.

[9] We assume that there are no unobservable characteristics which systematically affect headship status, that is, we assume no "selection bias." If selection bias were present, then our estimates of Y_H, L_H, Y_M and L_M would depend on the woman's headship status. Preliminary tests suggested that the hypothesis of no selectivity bias could not be rejected.

[10] We estimate each component separately rather than estimate total income with a single equation in order to obtain more precise predictions for total income. Our method takes account of nonlinearities by estimating the welfare equation using a modified Tobit technique. Thus, when we simulate a change in, for example, the income guarantee, we can derive its separate effect on earned income, income other than welfare or earnings, and on welfare income from equations (9)-(11).

[11]Welfare income includes income-tested transfers only (e.g., Aid to Families with Dependent Children, Supplemental Security Income). Income other than earnings or welfare includes property income (e.g., interest, dividends) or non-income-tested transfers (e.g., unemployment compensation, Social Security).

[12]We use the CPS for two reasons. First, a major concern of this study is the measurement of poverty, and most previous analyses of poverty have used the CPS. To the extent that CPS reporting procedures are biased, the same biases are present in the work of others. The second reason for using the CPS is that we need a large sample of both married women and female household heads. The CPS has about 10 times as many observations as the Michigan Panel.

[13]To preserve the anonymity of respondents, the 1975 CPS does not provide detail on each of the 50 states. The data are grouped into 23 regions that are either single states (for large states) or groups of states. For example, New York and California are identified separately, but Wisconsin-Michigan is one of the 23 regions.

[14]Single women and others not eligible to receive AFDC, are assigned zero values for their guarantee, tax rate, and set-aside.

[15]According to statute, the welfare payment can be derived from an exact formula. We do not, however, have all the data necessary to calculate the payment (e.g., work expenses), nor do we have information on the participation decison. We approximate the welfare payment by entering its major determinants--guarantee, tax rate on earned income and set aside--as independent components of the vector Z.

Data on the parameters of the welfare system were constructed as follows: Income guarantees were taken from unpublished statistics provided by the Department of Health, Education, and Welfare for welfare filing units with two and four persons. Linear interpolations and extrapolations yielded guarantees for units of other sizes, subject to the maximum allowable payment which each state imposes. Tax rates on earned income and the set aside were estimated by Bendt (1975).

For each household, the maximum number of potential filing units were constructed and guarantees for each were determined. These were then summed to create the household's guarantee. For example, consider a female household head with one minor child who has living in her household a daughter who also has a child (the daughter is a female subfamily head and is therefore not counted as an independent observation). The woman thus heads a household of four persons. However, the income guarantee is twice the guarantee for a two-person household because these women comprise two distinct filing units. Twice the guarantee for a two-person household is greater than the guarnatee for a four-person household. Filing units ineligible for AFDC (e.g., childless women) were assigned a zero value for the welfare variables.

Because the CPS reports data for only 23 regions, combined regions were given parameters which were weighted averages of the parameters of the states comprising that region. For example, if a region were Wisconsin-Michigan and Michigan had twice the population of Wisconsin, then the guarantee for this region woudl be two-thirds the Michigan guarantee plus one-third of the Wisconsin guarantee.

Very few married women live in households that receive welfare income. The welfare system for them is proxied by a single dummy variable that takes the value of 1 if the state has an AFDC program for unemployed fathers (AFDC-U) and 0 if not. For women living in one of the combined regions, we computed the weighted average of the dummy variable (i.e., it varies between zero and 1 if one state in the region has an AFDC-U program and another does not). The weighted average represents the probability that a woman living in the geographic region lived in a state with an AFDC-U program. We then randomly assigned all women in these states to either a 1 or a 0 so that Pr(1) = the weighted average.

We restrict our attention to the AFDC system for a number of reasons: We are interested in the effect of the welfare system on female headship. The AFDC program provides benefits primarily to female-headed families. For this reasons the incentives for female headship are strongest in relation to the AFDC program. In addition, in-kind benefits such as Food Stamps and Medicaid do not appear on the CPS tape, so we have no data on their benefits. We are also unable to distinguish AFDC benefits from other cash welfare programs like General Assistance or Supplemental Security Income (SSI). To account for SSI we included a dummy variable for disability in the estimation of equations (9)-(12). Since the sample is restricted to women between 25 and 54 years of age, only the disabled would be eligible for SSI. General Assistance varies widely across local jurisdictions, and so for our purposes it represents a random measurement error in the dependent variable. To the extent that in-kind benefits and these other cash benefits affect the woman's comparison of utility levels across alternative headship statuses our estimation is incomplete.

[16]It should be noted that our estimates of the components of economic well-being are based on a similar vector of explanatory variables as that of Hutchens. In a sense, then, Hutchens' estimation does much the same thing as ours.

In another sense, though, our model is more general. Consider our headship equation as a reduced form. Our procedure for estimating the counterfactual serves merely to provide proxy variables for the mean of the offer distribution faced by each individual woman. Our estimates of the determinants of female headship, in principle, can be applied to any set of changes in expected income and leisure and are not tied to the set of variables from which the proxies were derived.

[17]Sample sizes for the estimation of the arguments of the utility functions are as follows: 528 nonwhite female heads, 805 nonwhite married woman, 636 white female heads and 1154 white married women. This represents a one-in-two sampling of observations from the CPS tape for nonwhites, a one-in-five sample of white female heads, and a one-in-fifteen sample for white married women. The same samples of nonwhites and white married women were used to estimate the probability of headship, but a one-in-three sample of the previously selected group of white female heads was chosen for the headship probability estimation so that the mean value of headship for both races is the same as if we had used all the CPS observations. Sampling was done to reduce computational costs.

[18]The welfare income equation (WY) was not estimated for white married women because only a small number of these women actually receive welfare income. Thus predicted welfare income if married was set equal to the mean welfare income, \$21.80, for all whites.

[19]For example, of the 528 nonwhite female heads (see Table 2), 33 percent did not work at all, while 46 percent were full-year workers. The remaining 22 percent of the women were part-year workers, scattered throughout four of the CPS categories. We compress these four categories into part year, and thus have a trichotomous classification. Levy (1979) reports a similar distribution of weeks worked in the Michigan Panel Study of Income Dynamics.

[20]We specify that the probability of being in any of the three (j = 1 to 3) labor force participation categories is

$$\Pr(L = j) = \frac{\exp(Z'\gamma_{4j})}{\sum_{k=1}^{3} \exp(Z'\gamma_{4k})}, \qquad \sum_{j=1}^{3} \hat{\gamma}_{4j} = 0.$$

The γ_{4j} appear in Tables A-2, A-4, A-6, A-8.

We do not explicitly relate the labor force participation decision to an underlying comparison of the reservation wage (the marginal rate of substitution between income and leisure) and the market wage. We assume that the probability of labor force participation is a logistic function of the elements of Z.

Note that the regressor "attended school last year" in Tables A-2, A-4, A-6, and A-8 has large coefficients with enormous standard errors. This represents a classification problem. (Suppose 20 people attended school last year and 19 of them were in a single labor force participation category. The logistic estimation then tries to fit an infinite coefficient to this variable.) The variable was included because all of the elements of Z are regressors in each of the four equations, and the variable does have a "reasonable" effect in the regressions for income sources.

[21]We proxy the woman's known values of the arguments of the utility functions by estimates of the conditional expectations of the dependent variables in equations (9)-(12) for married women and household heads.

[22]The use of predicted values for all women is an attempt to purge the data of transitory variations in income and weeks worked.

[23]For welfare income, our prediction method closely follows our two-step estimation procedure. For each woman we first calculate the predicted probability of welfare recipiency--an estimate of the conditional expectation, given Z, of the dependent variable from the Step 1 probit analysis (Table A-1 for nonwhite female household heads). Then $\hat{\lambda}$ is calculated for all women, and,

$$WY = (Z'\hat{\gamma}_3 + \hat{\sigma}_{\eta_3} \hat{\lambda})\, \Phi(Z'\hat{\gamma}_3),$$

where $(Z'\hat{\gamma}_3 + \hat{\sigma}_{\eta_3} \hat{\lambda})$ is calculated from the Step 2 regression and $\Phi(Z\hat{\gamma}_3)$ is the predicted probability of welfare recipiency from Step 1.

For labor force participation, the relevant conditional expectation is

$$\hat{L} = E(L|Z) = \sum_{j=1}^{3} j \Pr(L = j), \text{ or equivalently}$$

$$= \frac{1 \cdot e^{Z'\gamma_{41}} + 2 \cdot e^{Z'\gamma_{42}} + 3 \cdot e^{Z'\gamma_{43}}}{\sum_{K=1}^{3} e^{Z'\gamma_{4K}}}$$

[24]The adequacy of the poverty lines for these purposes is much debated and will not be discussed here. There are other equivalence scales, but they are neither as familiar nor as readily available as the poverty lines.

[25]The simulation of a case in which the AFDC system did not exist is an extreme counterfactual. We use this assumption to derive upper bound estimates of the effects of the AFDC system. More realistic counterfactuals are discussed below under the discussion of headship status effects. Note that the welfare system has an effect on married women also, because some states have an AFDC program for unemployed parents.

[26]Interpretation of the magnitudes of the coefficients of a logistic estimation is not straightforward. In a linear regression, a coefficient can be interpreted as a partial derivative, but in this nonlinear technique, the partial derivative of the probability that a woman heads her own household with respect to any independent variable (X_i) is

$$\frac{\partial \Pr(\text{STATUS} = 1)}{\partial x_i} = \beta_i(\bar{y}) \cdot (1 - \bar{y})$$

where $\bar{y}$ is the mean of the dependent variable. The elasticity of the probability of headship with respect to X_i, evaluated at the means, is

$$\frac{\partial \Pr(\text{STATUS} = 1)}{\partial x_i} \; \frac{\bar{x}_i}{\bar{y}} = \hat{\beta}_i(1 - \bar{y}) \; \bar{x}_i.$$

[27]The income and labor force participation elasaticities are:

	Nonwhites	Whites
$\hat{Y}_H$	0.40	1.23
$\hat{L}_H$	-0.35	-0.80
$\hat{Y}_M$	-0.85	-2.10
$\hat{L}_M$	0.08	2.88

The pattern of the four elasticities within each race is similar, but the responses are more elastic for whites.

[28]The total net effect of work for female heads is also derived from these two opposing effects.

[29]Because women other than household heads or married women were excluded from our sample, the probability of female household headship is defined as household heads/(household heads + married women). This ratio is somewhat larger than published data which includes all women in the denominator.

[30]Any similar change in $\hat{Y}_H$ that did not change any of the other predictions, for example alimony payments, would yield the same changes in the headship proportion and the poverty incidence.

[31]This effect is traced to the large coefficient on $\hat{L}_M$ in Table 3. See also the elasticity of headship with respect to wives' work in footnote 27.

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Table A-1

The Determinants of Household Income, Nonwhite Female Heads of Household

	Earned Income	Other Income	Welfare Income Step 1	Welfare Income Step 2
Constant	-4000	-1302	-2.11	-1591
	(4291)	(1778)	(10.5)	(1961)
Age	672	75.3	-.145*	27.9
	(224)	(92.7)	(.081)	(127)
Age^2	-8.09***	-.734	.0018	-.407
	(2.85)	(1.18)	(.001)	(1.6)
Education, 7 years or less	-6269***	-702*	4.26	651
	(960)	(398)	(10.4)	(450)
Education, 8 through 11 years	-6674***	-287	4.21	494
	(845)	(350)	(10.4)	(361)
Education, 12 through 15 years	-4270***	-242	3.61	--
	(823)	(341)	(10.4)	--
Northeast region	1426**	380*	.302	1491***
	(562)	(233)	(.205)	(308)
Northcentral region	201	369*	.182	799***
	(543)	(225)	(.198)	(263)
Western region	977	312	.120	1327***
	(649)	(269)	(.241)	(324)
Suburban resident	904*	565***	-.469***	-107
	(493)	(204)	(.184)	(344)

Table A-1 (continued)

	Earned Income	Other Income	Welfare Income Step 1	Welfare Income Step 2
Health problem	-2415*** (531)	209 (220)	.842*** (.184)	523 (424)
Attended school last year	-3665** (1695)	385 (702)	.756 (.663)	-292 (759)
Number of children, less than 3 years old	4.03 (323)	16.6 (133)	.187 (.124)	367*** (129)
Number of children, 4 to 6 years	-747** (362)	-52.3 (150)	.318** (.134)	198 (173)
Number of children, 7 to 17 years	-385*** (152)	127** (62.9)	.148*** (.054)	276*** (87.3)
Female headed subfamily in household	3241*** (911)	232 (377)	.823** (.356)	-497 (434)
Never married	278 (476)	-93.5 (197)	.273 (173)	189 (230)
AFDC tax rate of earnings	2658 (1932)	1418* (800)	-.532 (.690)	9.65 (816)
AFDC guarantee, adjusted for family size	-.177 (.210)	-.089 (.087)	.000084 (.000076)	.414*** (.092)
AFDC setaside	.318 (.651)	-.303 (.270)	.00043* (.00023)	-.470 (.323)

Table A-1 (continued)

	Earned Income	Other Income	Welfare Income Step 1	Welfare Income Step 2
LAMBDA				1075 (854)
R^2	.29	.06	$\chi^2(19)=181$	.52
Number of observations	528	528	528	225
Standard error of regression	4024	1667		1149
Mean of dependent variable	4259	633	.43	2356
Estimation method	OLS	OLS	PROBIT	OLS

Notes: Standard errors appear in parentheses below the regression coefficients; *** = significant at 1% level; ** = significant at 5% level; * = significant at 10% level.

The excluded categories refer to a woman who has completed twelve years of school, lives in the Southern region, in the suburban area of a Standard Metropolican Statistical Area, is in good health, is not currently attending school, does not head a household that contains a female headed subfamily, and has been previously married.

Table A-2

The Determinants of Labor Force Participation, Nonwhite Female Heads of Household

	Multinomial Logistic Equation: Weeks Last Year		
	Did Not Work	Part Year	Full Year
Constant	1.80 (1.59)	-1.93 (1.75)	.12 (1.54)
Age	-.202** (.080)	.130 (.091)	.072 (.081)
Age^2	.003*** (.001)	-.002* (.001)	-.0005 (.001)
Education, 7 years or less	1.14** (.531)	-.173 (.445)	-.971*** (.371)
Education, 8 through 11 years	.981** (.505)	.225 (.413)	-1.21*** (.330)
Education, 12 through 15 years	.622 (.503)	.142 (.408)	-.764** (.328)
Northeast region	.734*** (.207)	-.543** (.225)	-.191 (.202)
Northcentral region	.654*** (.195)	-.143 (.209)	-.510*** (.190)
Western region	.403* (.245)	-.379 (.256)	-.024 (.234)
Suburban resident	.026 (.174)	.005 (.190)	-.031 (.171)

Table A-2 (continued)

	Multinomial Logistic Equation: Weeks Last Year		
	Did Not Work	Part Year	Full Year
Health Problem	1.648*** (.271)	1.10*** (.293)	-2.75*** (.462)
Attended school last year	7.821 (23524)	9.23 (23524)	-17.0 (47048)
Number of children, less than 3 years old	.257** (.119)	.077 (.125)	-.335*** (.134)
Number of children, 4 to 6 years	(.247) (.125)	.218* (.133)	-.466*** (.142)
Number of children, 7 to 17 years	.176*** (.053)	.0018 (.059)	-.178*** (.057)
Member of household	-1.10*** (.348)	.448 (.342)	.653** (.333)
Never married	.381** (.171)	-.348* (.186)	-.033 (.170)
AFDC tax rate on earnings	.429 (.687)	.138 (.734)	-.567 (.679)
AFDC guarantee adjusted for family size	.00006 (.00008)	-.000068 (.00008)	-.000009 (.000080)
AFDC setaside	-.00048** (.00023)	.00008*** (.0003)	.00040 .00023
Number of observations in each category (total = 528)	172	114	242

Notes: Standard errors appear in parentheses below the regression coefficients; *** = significant at 1% level; ** = significant at 5% level; * = significant at 10% level. Chi sq. (38) = 231.27.

See Table 1 for the excluded categories.

Table A-3

The Determinants of Household Income, Nonwhite Married Women

	Earned Income	Other Income	Welfare Income Step 1	Welfare Income Step 2
Constant	3555 (6667)	1809 (1448)	-4.07 (11.4)	-4243 (10620)
Age	813** (356)	-109 (77.3)	-.087 (.096)	-268 (537)
Age^2	-10.3** (4.57)	1.93* (.99)	.0015 (.001)	4.30 (8.66)
Education, 7 years or less	-11661*** (1275)	-98.1 (277)	3.32 (11.2)	1679* (886)
Education, 8 through 11 years	-9420*** (1029)	-122 (223)	3.15 (11.2)	754 (569)
Education, 12 through 15 years	-6086*** (936)	75.7 (203)	3.20 (11.2)	— —
Northeast region	1019 (829)	248 (180)	.132 (.236)	1003 (1018)
Northcentral region	2018** (856)	21.1 (186)	.437 (.218)	1822 (2334)
Western region	3037*** (884)	642*** (192)	.207 (.267)	2770** 1430
Suburban resident	1597** (647)	-163 (141)	-1.05*** (.307)	-2477 (6362)

Table A-3 (continued)

	Earned Income	Other Income	Welfare Income Step 1	Welfare Income Step 2
Health probelm	-2837***	98.5	.717***	2306
	(1033)	(224)	(.206)	3617
Attended school last year	-2547	-56.7	-3.30	none in sample
	(2254)	(490)	(30.0)	
Number of children, less than 3 years old	-1097**	-35.4	.096	232
	(508)	(110)	(.139)	(825)
Number of children, 4 to 6 years	-886*	-1.39	.285**	572
	(502)	(109)	(.130)	(1429)
Number of children, 7 to 17 years	57.6	35.2	.126**	506
	(210)	(45.7)	(.051)	(631)
Female headed subfamily in household	1848	(112)	.195	1785
	(2142)	(465)	(.432)	(1182)
Categorically eligible for AFDC-U	881	-55.8	-.026	630
	(695)	(151)	(.190)	(529)
LAMBDA				3719
				(6609)
R^2	.23	.07	$\chi^2(16)=79$	.45
Number of observations	805	805	805	59
Standard error of regression	7706	1674		1459
Mean of dependent variable	12889	746	.07	2026
Estimation method	OLS	OLS	PROBIT	OLS

Note: Standard errors appear in parentheses below the regression coefficients; *** = significant at 1% level; ** = significant at 5% level; * = significant at 10% level.

Table A-4

The Determinants of Labor Force Participation, Nonwhite Married Women

	Multinomial Logistic Equation: Weeks Last Year		
	Did Not Work	Part Year	Full Year
Constant	-.695	.855	-.159
	(1.21)	(1.30)	(.121)
Age	-.018	-.054	.072
	(.064)	(.069)	(.064)
Age^2	.0005	.0005	-.001
	(.0008)	(.0009)	(.0008)
Education, 7 years or less	.191	.556**	-.747***
	(.230)	(.24)	(.227)
Education, 8 through 11 years	.482***	.071	-.553***
	(.188)	(.201)	(.184)
Education, 12 through 15 years	.312*	.050	-.362**
	(.173)	(.183)	(.167)
Northeast region	.598***	-.569***	-.029
	(.148)	(.173)	(.151)
Northcentral region	.222	.018	-.240
	(.156)	(.166)	(.154)
Western region	.319**	-.238	-.082
	(.162)	(.175)	(.159)
Suburban resident	.161	-.019	-.142
	(.117)	(.125)	(.117)

Table A-4 (continued)

	Multinomial Logistic Equation: Weeks Last Year		
	Did Not Work	Part Year	Full Year
Health Problem	1.099***	.466**	-1.564***
	(.212)	(.239)	(.326)
Attended school last year	8.058	9.38	-17.4
	(28147)	(28147)	(56295)
Number of children, less than 3 years old	.304***	.150	-.454***
	(.090)	(.096)	(.010)
Number of children, 4 to 6 years	.069	.130	-.197**
	(.091)	(.096)	(.091)
Number of children, 7 to 17 years	.015	.050	-.066
	(.038)	(.041)	(.038)
Female headed subfamily in household	-.838***	.378	.460
	(.415)	(.378)	(.417)
Eligible categorically for AFDC-U	.063	-.048	-.016
	(.125)	(.135)	(.126)
Number of observations in each category (total = 805)	290	204	311

Note: Standard errors appear in parentheses below the regression coefficients; *** = significant at 1% level; ** = significant at 5% level; * = significant at 10% level. Chi sq. (32) = 150.

Table A-5

The Determinants of Household Income, White Female Heads of Households

	Earned Income	Other Income	Welfare Income Step 1	Welfare Income Step 2
Constant	-3536 (4593)	1042 (2690)	-2.93 (1.92)	4490 (5221)
Age	600** (238)	-26.6 (139)	-.00098 (.101)	-137 (181)
Age^2	-6.80** (2.99)	1.32 (1.75)	-.0003 (.001)	2.05 (2.36)
Education, 7 years or less	-5346*** (870)	-1610*** (510)	1.94*** (.418)	-344 (2058)
Education, 8 through 11 years	-4668*** (686)	-1506*** (402)	1.74*** (.382)	-415 (1941)
Education, 12 through 15 years	-1782*** (560)	-1199*** (328)	.673* (.370)	360 (1282)
Northeast region	552 (638)	-537 (373)	.800*** (.294)	696 (901)
Northcentral region	688 (592)	-22 (346)	.496* (.274)	-143 (634)
Western region	533 (605)	-408 (355)	.672** (.280)	-91.2 (781)
Suburban resident	235 (402)	150 (235)	.063 (162)	-24.7 (298)

Table A-5 (continued)

	Earned Income	Other Income	Welfare Income Step 1	Welfare Income Step 2
Health problem	-3323*** (804)	4.04 (471)	1.08*** (.254)	-853 (979)
Attended school last year	-4548*** (1275)	2355*** (747)	.413 (.534)	123 (1077)
Number of children, less than 3 years old	-273 (601)	-484 (352)	.525*** (.187)	72.7 (519)
Number of children, 4 to 6 years	-623 (479)	-37.6 (280)	.451*** (.157)	257 (408)
Number of children, 7 to 17 years	.116 (277)	159 (162)	.127 (.094)	116 (179)
Female headed subfamily in household	3395** (1668)	1045 (977)	.373 (.528)	-1250 (789)
Never married	1009* (579)	-274 (339)	-.071 (.256)	787 (546)
AFDC tax rate on earnings	-1730 (2333)	1634 (1367)	.412 (.871)	454 (1632)
AFDC guarantee, adjusted	-.525* (.311)	.185 (.182)	.00014 (.00011)	.177 (.218)
AFDC setaside	.302 (.719)	.255 (.421)	-.00006 (.00025)	-.328 (.405)

Table A-5 (continued)

LAMBDA				-669 (1350)
R^2	.25	.15	$\chi^2(19)=232$	.60
Number of observations	636	636	636	109
Standard error of regression	4792	2806		1280
Mean of dependent variable	6005	1518	.17	2430
Estimation method	OLS	OLS	PROBIT	OLS

Note: Standard errors appear in parentheses below the regression coefficients; *** = significant at 1% level; ** = significant at 5% level; * = significant at 10% level.

Table A-6

The Determinants of Labor Force Participation, White Female Heads of Households

	Multinomial Logistic Equation: Weeks Last Year		
	Did Not Work	Part Year	Full Year
Constant	-1.82 (1.74)	2.33 (1.61)	-.510 (1.46)
Age	-.026 (.089)	-.095 (.084)	.121 (.075)
Age^2	.0008 (.0010)	.0008 (.0010)	-.0016* (.0009)
Education, 7 years or less	.740** (.293)	.074 (.289)	-.814*** (.260)
Education, 8 through 11 years	.703*** (.248)	.115 (.234)	-.818*** (.205)
Education, 12 through 15 years	.137 (.222)	-.149 (.202)	.012 (.171)
Northeast region	.218 (.226)	-.136 (.228)	-.082 (.188)
Northcentral region	.048 (.212)	-.059 (.211)	.011 (.178)
Western region	-.0004 (.213)	-.087 (.215)	.088 (.178)
Suburban resident	.077 (.139)	.037 (.141)	-.114 (.117)

Table A-6 (continued)

	Multinomial Logistic Equation: Weeks Last Year		
	Did Not Work	Part Year	Full Year
Health problem	1.45*** (.300)	1.03*** (.292)	-2.486*** (.450)
Attended school last year	8.41 (14123.)	9.00 (14123.)	17.4 (28247.)
Number of children, less than 3 years old	.894*** (.201)	.093 (.204)	-.987*** (.245)
Number of children, 4 to 6 years	.446*** (.149)	.117 (.151)	-.564*** (.153)
Number of children, 7 to 17 years	.053 (.089)	-.009 (.094)	.044 (.080)
Member of household	-1.65*** (.548)	-.035 (.569)	1.68*** (.521)
Never married	.195 (.210)	-.298 (.214)	.103 (.171)
AFDC tax rate on earnings	.310 (.775)	-.686 (.789)	.376 (.686)
AFDC guarantee, adjusted for family size	.00021** (.00010)	-.000016 (.00011)	-.00019** (.00009)
AFDC setaside	-.0001 (.0002)	.00014 (.00024)	-.000017 (.0002)
Number of observations in each category (total = 636)	136	133	367

Note: Standard errors appear in parentheses below the regression coefficients; *** = significant at 1% level; ** = significant at 5% level; * = significant at 10% level. Chi sq. (38) = 280.

Table A-7

The Determinants of Househld Income, White Married Women

	Earned Income	Other Income	Welfare Income
Constant	-11208* (6652)	1275 (2157)	Too few cases to estimate
Age	1537*** (350)	-72.3 (114)	
Age^2	-17.3*** (4.44)	1.76 (1.44)	
Education, 7 years or less	-13666*** (1500)	-209 (486)	
Education, 8 through 11 years	-7894*** (972)	-411 (315)	
Education, 12 through 15 years	-5247*** (847)	106 (275)	
Northeast region	758 (751)	-106 (243)	
Northcentral region	1537** (734)	-306 (238)	
Western region	685 808	-238 (262)	
Suburban resident	2130*** (529)	124 (171)	

Table A-7 (continued)

	Earned Income	Other Income	Welfare Income
Health problem	-814 (1419)	-718 (460)	
Attended school last year	-1123 (3588)	845 (1163)	
Number of children, less than 3 years old	-1180** (618)	69.5 (200)	
Number of children, 4 to 6 years	-443 (511)	-2.58 (166)	
Number of children, 7 to 17 years	-131 (233)	46.3 (75.5)	
Member of household	-1877 (3990)	-653 (1294)	
Categorically eligible for AFDC-U	6.89 (638)	-185 (207)	
R^2	.15	.05	
Number of observations	1154	1154	
Standard error of regression	8665	2810	
Mean of dependent variable	16613	1075	
Estimation method	OLS	OLS	

Note: Standard errors appear in parentheses below the regression coefficients; *** = significant at 1% level; ** = significant at 5% level; * = significant at 10% level.

Table A-8

The Determinants of Labor Force Participation, White Married Women

	Multinomial Logistic Equation: Weeks Last Year		
	Did Not Work	Part Year	Full Year
Constant	-3.07***	1.71	1.36
	(1.08)	(1.22)	(1.10)
Age	.108*	-.081	-.024
	(.056)	(.065)	(.058)
Age^2	-.0010	.0007	.00031
	(.0007)	(.0008)	(.00073)
Education, 7 years or less	.653***	-.214	-.439*
	(.238)	(.279)	(.245)
Education, 8 through 11 years	.681***	-.046	-.635***
	(.159)	(.177)	(.161)
Education, 12 through 15 years	.298**	-.135	-.163
	(.138)	(.152)	(.138)
Northeast region	.228*	-.152	-.076
	(.118)	(.139)	(.123)
Northcentral region	.085	-.087	.002
	(.116)	(.135)	(.120)
Western region	-.150	.196	-.046
	(.127)	(.141)	(.129)
Suburban resident	.139*	-.010	-.129
	(.083)	(.097)	(.087)

Table A-8 (continued)

	Multinomial Logistic Equation: Weeks Last Year		
	Did Not Work	Part Year	Full Year
Health problem	.208 (.293)	1.47*** (.276)	-1.68*** (.454)
Attended school last year	8.34 (16097)	8.49 (16097)	-16.8 (32194)
Number of children, less than 3 years old	.751*** (.104)	-.079 (.121)	-.672*** (.126)
Number of children, 4 to 6 years	.359*** (.082)	-.155* (.093)	-.205** (.085)
Number of children, 7 to 17 years	.034 (.036)	.066 (.042)	-.101*** (.038)
Member of household	7.08 (15172)	-15.5 (30344)	8.42 (15172)
Categorically eligible for AFDC-U	.042 (.101)	.010 (.117)	-.052 (.104)
Number of observations in each category (total = 1154)	496	255	403

Note: Standard errors appear in parentheses below the regression coefficients; *** = significant at 1% level; ** = significant at 5% level; * = significant at 10% level. Chi sq (32) = 189.