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An empirical analysis of joint decisions on labour supply and welfare participation

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Economic and welfare programme factors affect the wellbeing of low-income families and their labour supply decisions. This study uses recent data from the US Survey of Income and Programme Participation. A nested logit model is estimated to explain the joint decisions to participate in Temporary Assistance for Needy Families (TANF) and the labour market for the population of families potentially eligible for TANF. The empirical findings indicate that higher wages increase labour and decrease welfare programme participation; an increase in non-labour income decreases both labour market and welfare participation.

I. INTRODUCTION

The Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) enacted in 1996 brought major changes in the scope, structure and impact of programmes targeted to the low-income population in the USA. Changes in the linkages among social assistance programmes under the welfare reform have significant effects on the behaviour of the low-income individuals and families. The goal of PRWORA was to reduce low-income individuals' and families' dependence on government assistance by promoting participation in the labour market. Evaluations of the Act's programmatic and labour market effects are now being considered in its renewal. To date, a number of studies have evaluated the effects of the welfare system on work incentives, welfare dependency, family structure, migration (Moffitt, 1992; Keane and Moffitt, 1998; Hagstrom, 1996).

The overall purpose of this study is to examine the economic and welfare programme factors affecting the wellbeing of low-income families and the effects of welfare reform on their labour supply decisions. The major programmatic changes of the welfare reform were incorporated in the programme Temporary Assistance to Needy Families (TANF). The recent Survey of Programme Participation (SIPP) provides data well-suited to analysis of labour market and TANF participation decisions among targeted families. A static model of family behaviour is developed where work and programme participation outcomes are chosen to maximize the family utility function, given a resource constraint. The model can be used to explain the joint decisions to participate in TANF and the labour market for the population of families potentially eligible for TANF. The model and its application to SIPP make a new contribution in terms of method and data source. The SIPP is a survey designed specifically to track labour market and programmes interactions.

II. MODEL

The family head is assumed to choose its labour supply and TANF participation simultaneously to maximize utility subject to its budget constraint. Assume that the family's utility is a function of leisure time and disposable income and is represented by

$$U = U(H, Y, \delta) \qquad (1)$$

where H is monthly hours of work supplied by the family, Y is monthly disposable income, and δ represents tastes

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for receiving TANF benefits. The monthly disposable income is:

$$Y(H,P_T) = WH + N + P_T[B(H,N) - C] \qquad (2)$$

where W is the hourly wage rate, N is non-labour income, P_T is an indicator equal to 1 if family participates in TANF and 0 otherwise, $B(\cdot)$is the TANF benefit, and C is the monetary cost of participating in TANF. The family simultaneously chooses H and P_T that maximize utility in Equation 1 subject to the budget constraint in Equation 2.

Labour supply decisions depend on the TANF benefit through its effect on budget constraints; TANF participation depends on labour supply through the labour supply's effect on the TANF benefit. Therefore, TANF participation and labour supply decisions are both endogenous and interdependent. The resulting choice set has four alternatives, each of which is a combination of labour supply and TANF status. Each alternative provides indirect utility V_{lt}, where subscripts l and t denote a combination of the labour and TANF participation decisions. The family chooses the alternative lt such that $V_{lt} \geqslant V_{(lt)'}$ for all$(lt)' \neq lt$. The indirect utility V_{lt} is assumed to be a function of known measured variables and an unobserved stochastic component that captures the effect of unmeasured variables and unobserved differences in preferences across families.

Several models are available for estimating the random utility model based on different assumptions about the stochastic component of V_{lt}.[1] One of the widely used models in the discrete choice literature is the multinomial logit model, which assumes that the stochastic errors are uncorrelated across alternatives. When the independence of irrelevant alternatives assumption does not hold, a nested multinomial logit model can be used. The nested multinomial logit model allows the error terms to be correlated across alternatives in a group, but to be independent of alternatives in a different group. Figure 1 shows the nesting structure of the model to be estimated.

The indirect utility function V_{lt} is decomposed into components in the following way:

$$V_{lt} = X_{lt}\alpha + X\alpha_t + Y_l\beta + Y\beta_l + \varepsilon_{lt} \qquad (3)$$

where X_{lt} is a vector of observed attributes that vary across TANF participation alternatives, Y_l is a vector of observed attributes that vary across the family's labour supply alternatives, and the l and t take on values to indicate participation (y) or not (n) in the labour force (l) or in TANF (t). In addition to these choice-specific variables, we also include the vectors X and Y that vary by individual family rather than by alternatives.

In our specification X_{lt} is a measure of the TANF benefit that varies across the family's labour supply choices, Y_l is a vector of wage variables that differ across labour supply alternatives. The individual-specific characteristics include components of the budget constraint, variables that capture variations in preferences. The joint probability of choosing alternative lt can be written as

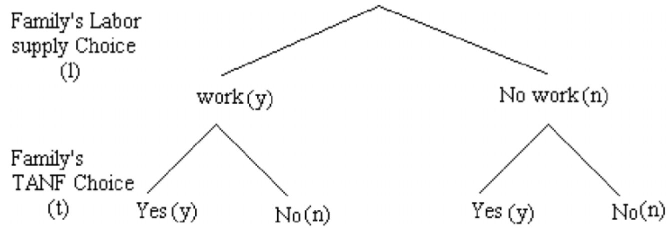

Fig. 1. *Tree structure for the nested logit model*

$$P(l,t) = P(t|l) * P(l) \qquad (4)$$

where $P(t|l)$ is the probability of choosing t conditional on the choice of l, $P(l)$ is the marginal probability of choosing l for the family. If the ε is extreme-value distributed, then the probabilities in Equation 4 can be written as

$$P(t|l) = \frac{\exp(X_{lt}\alpha + X\alpha_t)}{\sum_{t' \in T} \exp(X_{lt}\alpha + X\alpha_t)} \qquad (5)$$

$$P(l) = \frac{\exp(Y_l\beta + Y\beta_l + \tau_l I_l)}{\sum_{l' \in L} \exp(Y_l\beta + Y\beta_l + \tau_l I_l)} \qquad (6)$$

where

$$I_l = \log \sum_{t' \in T} \exp(X_{lt}\alpha + X\alpha_t) \qquad (7)$$

The term I_l is the inclusive value in the labour supply equation and can be interpreted as a measure of the sum of the utility for choice t given choice of l. The 'nested logit' aspect of the model arises when the coefficients of the inclusive values, τ_l differ from 1.

To be consistent with the random utility model, the utility function for the four alternatives can be specified in the following way:

$$\begin{aligned}
V_{yy} &= \alpha_{yy} + \beta_b B_{yy} + \beta_r * BRR + (\gamma_{W,l} + \gamma_{W,t})W \\
&\quad + (\gamma_{M,l} + \gamma_{M,t})M + (\gamma_{C,l} + \gamma_{C,t})C + (\gamma_{N,l} + \gamma_{N,t})N \\
&\quad + (\gamma_{U,l} + \gamma_{U,t})U + \varepsilon_{yy} \\
V_{yn} &= \alpha_{yn} + \beta_b B_{yn} + \beta_r * BRR + \gamma_{W,l}W + \gamma_{M,l}M + \gamma_{C,l}C \\
&\quad + \gamma_{N,l}N + \gamma_{U,l}U + \varepsilon_{yn} \\
V_{ny} &= \alpha_{ny} + \beta_b B_{ny} + \beta_r * BRR + \gamma_{W,t}W + \gamma_{M,t}M + +\gamma_{C,t}C \\
&\quad + \gamma_{N,t}N + \gamma_{U,t}U + \varepsilon_{ny} \\
V_{nn} &= \beta_b B_{nn} + \beta_r * BRR + \varepsilon_{nn}
\end{aligned} \qquad (8)$$

[1] Maddala (1983) presents an extensive discussion of limited-dependent and qualitative-variable models in econometrics.

Table 1. *Definitions, mean and standard deviations of variables (N=6404)*

Variable	Mean (Std. deviation)	Definition
Age	36.09 (8.74)	Age of family head
Education	12.25 (2.66)	Years of schooling of family head
Male	0.45 (0.5)	Dichotomous variable equal to 1 if family head is male
Married	0.58 (0.49)	Dichotomous variable equal to 1 if family head is married
White	0.75 (0.43)	Dichotomous variable equal to 1 if family head is white
Metro	0.78 (0.41)	Dichotomous variable equal to 1 if family head lives in metro
Kids6	0.71 (0.83)	Number of children under 6
Experience	18.26 (9.05)	Age–education–s6
Unemployment rate	5.25 (1.05)	Local state unemployment rate (%)
Non-labour income	128.68 (344.06)	Family non-labour income per month ($)
Wage	9.46 (1.99)	Predicted hourly wage ($)
Payment standard	445 (213)	Maximum TANF grant per month given participation ($)
BRR	0.53 (0.18)	The benefit reduction rate is the rate at which additional dollars of earned income reduce the amount transferred
Labour force participation	0.84 (0.37)	Dichotomous variable equal to 1 if family head works
TANF participation	0.09 (0.29)	Dichotomous variable equal to 1 if family head participate in TANF

where B_{lt} is the pay standard, *BRR* is the benefit reduction rate,[2] *W* is the predicted wage,[3] *M* is a family head's gender, *C* is the number of children in the family, *N* is non-labour income to the family, *U* is the state unemployment rate and *y, n* indicate participation or not in work and in the TANF programme (Fig. 1).

Table 2. *Distribution of the sample by labour market and welfare participation*

	Welfare (TANF) Participation		No participation		All	
Work	199	3%	5165	81%	5364	84%
Not work	397	6%	643	10%	1040	16%
All	596	9%	5808	91%	6404	100%

III. RESULTS

The 1996 SIPP (wave 3) data were used in this study. Only non-elderly (age less than 65), non-disabled family heads with children under age 18 and with assets below the asset limits set for the TANF programme are included in the sample. These families are the target population for the TANF programme. Table 1 displays the means, standard deviations and definitions of variables used in the analysis. Table 2 shows the distribution of the dependent variables – labour market and welfare programme participation. 9% of the asset-eligible families receive a TANF grant, and 84% of them participate in the labour market. The workers are concentrated in the TANF non-participation cell: 81% of the sample. 10% of the sample do not work or participate in TANF. Only 3% of the sample works and participates in TANF.

The FIML estimates of the nested logit model are presented in Table 3. The estimated coefficients are interpreted with respect to the 'not work-no TANF participation' category. Higher wages lead to less participation in TANF ($\gamma_{W,t}$) and, although not statistically significant, make family heads work more ($\gamma_{W,l}$). The coefficients on TANF benefits (β_b) and BRR (β_r) are not statistically significant. Male family heads tend to work more ($\gamma_{M,l}$) and participate less in TANF ($\gamma_{M,t}$). Families with more young children (age less than 6 years) participate more in TANF ($\gamma_{C,t}$). Family heads with more unearned income and participate less in TANF ($\gamma_{N,t}$) and, although not statistically significant, tend to work less ($\gamma_{N,l}$). The unemployment rate has a positive and statistically significant effect on the probability of TANF participation ($\gamma_{U,t}$).

Elasticities for the relationship between the TANF benefit and wages and the probability of choosing alternative *lt* (labour supply and TANF participation) are reported in Table 4. A 10% increase in the pay standard will increase by 1.60% the probability of the choice to

[2] B_{lt} is the maximum TANF grant per month, *BRR* is the benefit reduction rate, the rate at which additional dollars of earned income reduce the TANF benefit.
[3] The empirical specification of the human-capital based wage equation is: $ln(W) = \beta_0 + \beta_1 O' + \varepsilon_w$, where O' is a vector of exogenous variables including education, marital status, gender, race, and metro/non-metro location of family head, local unemployment rate, experience, and an interaction term between experience and education, and ε_w is a normal random error. The wage equation is corrected for potential selection bias. The results from the estimation are available from the authors.

Table 3. *FIML estimates of nested logit model*

Coefficient	Estimate
α_{yy}	2.818 (10.894)
α_{yn}	3.687 (10.875)
α_{ny}	1.187 (0.424)***
β_b	0.040 (0.034)
β_r	0.001 (0.003)
$\gamma_{W,l}$	0.060 (0.189)
$\gamma_{W,t}$	−0.263 (0.036)***
$\gamma_{M,l}$	0.891 (2.651)
$\gamma_{M,t}$	−1.481 (0.191)***
$\gamma_{C,l}$	0.035 (0.136)
$\gamma_{C,t}$	0.271 (0.049)***
$\gamma_{N,l}$	−0.115 (0.333)
$\gamma_{N,t}$	−0.117 (0.017)***
$\gamma_{U,l}$	−0.099 (0.311)
$\gamma_{U,t}$	0.065 (0.039)*
IV_{work}	0.853 (2.486)
$IV_{no\ work}$	3.260 (0.772)***
Log likelihood	−3707.024

* Statistically significant at the 10% level.
** Statistically significant at the 5% level.
*** Statistically significant at the 1% level
Standard errors in parentheses.

Table 4. *Elasticities of labour supply and TANF participation decisions with respect to pay standard and wages*

	Direct elasticities
Pay standard	
L-T	0.160
L-N	0.025
N-T	0.261
N-N	0.370
Wages:	
L-T	0.472
L-N	0.071
N-T	−2.835
N-N	n/a

L-T is choice to work and to participate in TANF.
L-N is choice to work and not to participate in TANF.
N-T is choice not to work and to participate in TANF.
N-N is choice not to work and not to participate in TANF.

participate in the labour market and in TANF (L-T), while a 10% increase in the wage will increase by 4.72% the probability of that choice. The elasticity with respect to the (predicted) wage is quite large in the choice in which the family has determined to not work and to participate in TANF (N-T). An increase in the wage by 10% decreases the probability of this choice (N-T) by 28.35%. This result suggests the importance of improved wages for moving families into the labour force and away from welfare programme participation.

IV. CONCLUSIONS

This study analyses the labour force and welfare participation choices made by low-wealth families. Based on a nested logit model of the joint household choices, the findings suggest that higher wages increase the labour force and decrease the welfare programme participation; an increase in the non-labour income decreases both labour force and welfare programme participation. The results support strategies to improve wage and other non-labour income for low resource families as a means to reduce reliance on welfare programmes.

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