Working Paper #78
Industrial Relations Section
Princeton University
October 1975

Must a Negative Income Tax Reduce Labor Supply?
A Study of the Family's Allocation of Time

Mark R. Killingsworth
Fisk University

Assistant Professor of Economics, Fisk University, and Visiting Research Associate, Industrial Relations Section, Princeton University. While retaining full responsibility for the opinions expressed here, I thank T.A. Finegan, Daniel S. Hamermesh, Jane H. Leuthold, J. Gregg Lewis, Charles Mallar, and Fred M. Westfield for helpful comments and suggestions; the Gary Income Maintenance Experiment for supporting the research which led to the present paper; and Kenneth C. Kehrer, director of research for the Experiment, for his encouragement.

ABSTRACT

Models of the labor supply behavior of single persons predict that a negative income tax (NIT) will always reduce the labor supply and earnings of such persons. I consider three models of family labor supply; and find that in all three, a NIT might raise a given family member's labor supply and might also raise total family labor supply: in one, a NIT could even raise total family earnings. These models and recent empirical estimates (showing positive NIT effects on some family members' labor supply and on some families' earnings) suggest that the work disincentive effects and the cost of a NIT may be less than has previously been thought.

Must a Negative Income Tax Reduce Labor Supply?
A Study of the Family's Allocation of Time

By: Mark R. Killingsworth*

Static neoclassical models of the labor supply behavior of single individuals predict quite unequivocally that if leisure is a normal good to the individual then imposition of a negative income tax (NIT) will always reduce the labor supplied by the individual (see, e.g., Christopher Green and Albert Rees (1973)(1974)).[1] Students of the labor-supply effects of a NIT have generally concluded that in static neoclassical models, a NIT will also always reduce the labor supplied by each of the members of a family.[2] However, some empirical estimates seem to suggest that a NIT might actually increase the labor supply of at least some family members in at least some demographic groups[3] -- estimates for which, one researcher (Rees, 1974, p. 178) has remarked, "...we have no plausible explanation..after the fact."

In what follows I consider three different static neoclassical models of the labor supply behavior of family members and offer one explanation for these apparently contratheoretical results: that they are in fact not contrary to theory at all.[4] Specifically, I show that in all three models the following propositions hold:

(P1) The effect of a NIT on the labor supply of an individual family member is theoretically indeterminate: introduction of a NIT could either raise or reduce the labor supply of any given family member.

(P2) The effect of a NIT on the total labor supply of the family as a whole (all members' supplies combined) is theoretically indeterminate: introduction of a NIT could either raise or reduce the total amount of time devoted to work by the family's members.

I also find that in two of the models (but not in the third) the following propositions also hold:

(P3) The introduction of a NIT will reduce family wage and salary income (i.e., will increase family "expenditure" on leisure).

(P4) Introduction of a NIT could reduce total family labor supply by (i) reducing the supply of each family member or (ii) reducing the supply of the low-wage member by more than it increases the supply of the high-wage member. But a NIT could also raise total supply by (iii) raising the supply of the low-wage member by more than it reduces the supply of the high-wage member. (However, a NIT could never (iv) raise the supply of the high-wage member by more than it reduces the supply of the low-wage member, or (v) raise each member's labor supply.)

I. Preliminaries

Throughout the rest of this paper, I restrict my attention to a husband-and-wife family[5] and assume that the family is constrained to keep its total consumption spending equal to its net or disposable income. Thus, the family's budget constraint is always

$$PC = W_w H_w + W_h H_h + V - T \qquad (1\text{-}1)$$

where P = price of the consumer good, C; V = "nonlabor" income (i.e., receipts such as dividends or interest whose amount is not affected by labor supply or earnings); T = tax payments; W_i = i's wage; H_i = i's hours of work; and w and h subscripts devote wife and husband, respectively. In what follows, I also assume that θ, the total time available to each family member per period, may be allocated between work H and "leisure" L.[6]

so that

$$\theta = L_i + H_i \qquad (i = w \text{ or } h) \qquad (1\text{-}2)$$

Next, I assume for simplicity that the family is subject to no tax or transfer system other than a NIT.[7] Under a NIT, the family "pays" a negative tax, T (<0), i.e., receives a subsidy, if its income is sufficiently low: if its income is zero, it receives a subsidy of G, the "guarantee"; but the subsidy is reduced by 100M per cent of any increase in Y (i.e., earnings or property incomes are "taxed" at a rate of 100M per cent). Thus, under a NIT, T is given by

$$\begin{aligned} T &= -G + MY \qquad \text{when } Y < G/M \\ &= 0 \qquad\quad \text{when } Y \geq G/M \end{aligned} \qquad (G>0,\ 0<M<1) \qquad (1\text{-}3)$$

where G/M is the "breakeven" level of income, i.e., the level of Y at which NIT payments fall to zero.

Finally, I confine the analysis below to families whose total income, Y, is below the breakeven level prior to the introduction of a NIT. By (1-1) - (1-3), the budget constraint (1-1) for such families is

$$PC - G - (1-M)[W_w(\theta - L_w) + W_h(\theta - L_h) + V] = 0 \qquad (1\text{-}4)$$

Note that for families below the breakeven level of income, introduction of a NIT will change T from zero to some negative quantity.

II. The FU Model

I first consider the most widely-used model of family labor supply behavior, which I will call the "family utility - family budget constraint" or FU model.[8] In this model, the husband-wife family is assumed to maximize family utility,[9]

$$U = U(C, L_w, L_h) \qquad (2\text{-}1)$$

subject to the budget constraint (1-4).

Contrary to the statements of many writers to the effect that a NIT must always reduce labor supply, at least in a static world, the effect of a NIT on a family member's labor supply in this static world is in fact theoretically indeterminate; in particular, a NIT could even raise a family member's labor supply. To see this, one need merely recall J.R. Hicks' "composite commodity theorem" (see Hicks, esp. pp. 59-52 and p. 311). This theorem is directly concerned with the purchases subject to a budget constraint of different kinds of consumer goods. But it is equally relevant to a household which "pays" a "price" (i.e., sacrifices) W_w to "consume" an hour of the "good" L_w and W_h to "consume" an hour of the "good" L_h, and whose total "expenditures" on "leisure goods" and consumer goods are constrained to equal total disposable (full) income. As applied to the problem at hand, the theorem says the following: suppose that there are three goods (C, L_w and L_h); that utility maximization implies an interior solution for the family[10]; and that the prices of two of these three goods (say, of L_w and L_h) fall in the same proportion.[11] Then since the relative price of one in terms of the other has not changed, these two goods may be treated as a "composite" commodity in an analysis of a family which maximizes utility (2-1) subject to the budget constraint (1-4). In this case, the theorem says, household expenditure (i.e., the amount of income given up) for the composite commodity (i.e., the relative-price-weighted sum of the purchases of the two goods) will definitely increase if both goods are normal. However, while it does yield the obvious implication that in these circumstances it is not possible for the amount of both L_w and L_h to fall, the theorem says nothing about the effect of

the price reductions on the composition of the composite commodity, i.e., it says that nothing can be said a priori about the effect of the price reductions on the actual amounts of L_w and L_h "bought" by the household. (P1) - (P4) follow at once.

We may obtain exactly the same conclusion in a slightly different way if we assume an interior solution for the household and note that the total effect of a NIT on the leisure time of any given family member, e.g., the wife, can be separated into three distinct components. The first of these is simply the income effect of the NIT -- introduction of a NIT does, after all, raise disposable income -- and will be positive provided the household regards the wife's leisure time as a normal good. The second is what might be called a direct or own-substitution effect: since it taxes family earnings at a positive marginal rate, the NIT reduces the wife's after-tax wage, i.e., reduces the price the household pays (net of tax) when it buys another hour of leisure for the wife. This effect of the NIT on the wife's leisure time will also be positive provided the family utility function is concave.[12/]

However, the NIT also has an "indirect" or cross-substitution effect on the wife's leisure, an effect which is the final component of the NIT's total effect. This cross-substitution effect arises because, since it taxes earnings of either family member at a positive marginal rate, the NIT makes not only the wife's but also the husband's leisure time cheaper; and it is impossible to say a priori whether the effect of this on the wife's leisure time will be positive or negative. All that can be said, following Hicks' definition (pp. 311-312), is that if the husband's and wife's leisure times are complements, like cakes and ale (substitutes,

like ale and cider), then the cross-substitution effects of a NIT on the leisure times of the wife and the husband will be positive (negative).

Of course, the model does not imply anything about whether L_w and L_h are in fact substitutes or complements.[13/] It might seem reasonable to assume the later. (In a rough sense, this amounts to assuming that, at least at the margin, husbands and wives desire to spend their leisure time together.) In this case, the total effect on L_w of a NIT is clearly positive, for all three of its components will be positive. (The same applies to the husband's allocation of time.) In this case, a NIT will reduce the labor supply (raise the leisure time) of each of the family's members.

However, if L_w and L_h are "strong" substitutes, i.e., if the cross-substitution effect is negative and very large in absolute value, then the cross-substitution effect could be larger in absolute value than the own-substitution and income effects on the wife's leisure, which are positive. (Roughly speaking, one might say this situation could occur if, for example, the husband devotes time to leisure (nonmarket work)--e.g., reading Ms. magazine or cooking -- while the wife works, and vice-versa, at least at the margin.) Thus, as (P1) implies, the wife might increase her labor supply and reduce her leisure time as a result of a NIT -- if L_w and L_h are sufficiently "strong" substitutes; and likewise for the husband.

(P3) -- the proposition that a NIT must raise family "expenditure" on leisure (i.e., must raise $\Sigma W_i L_i$, the sum of individual family members' leisure times, weighted by their respective wages) -- follows immediately from the composite commodity theorem. However, even with (P3) it is

impossible to say a priori whether the effect on total family leisure time, $(L_w + L_h)$, will be positive or negative. (P3) implies only that $(dL_w)_N$, the change in the wife's leisure time due to the NIT, must always exceed $(-W_h/W_w)(dL_h)_N$, where $(dL_h)_N$ is the change in the husband's leisure time due to the NIT. Obviously, therefore, $(dL_w)_N$ and $(dL_h)_N$ cannot both he negative, i.e., the NIT cannot reduce the leisure times of both members. But suppose (for example) that the wife's wage is lower than the husband's, i.e., that $(W_h/W_w) > 1$. Then in principle the NIT might lead to any of the following outcomes: (i) both husband and wife could reduce their labor supply; (ii) the wife could reduce her labor supply while the husband increased his by a smaller amount (less than W_w/W_h times the wife's reduction); or (iii) the wife could increase her labor supply while the husband reduces his by a smaller amount (less than W_w/W_h times the wife's increase). Outcomes (i) and (ii) would clearly raise (L_w+L_h), but outcome (iii) would just as clearly lower it; this leads immediately to (P2) and (P4).

For a more detailed discussion of the effects of a NIT in the FU model, see the Mathematical Appendix to this paper, available from the author on request.

III. The IU Model and Other Models

It is now evident that "counterintuitive" NIT effects on labor supply may arise in the FU model because that model assumes a family utility function whose arguments include the leisure times of both the family's members and which therefore generates so-called cross-substitution effects. But these "counterintuitive" effects may also arise in models which preserve separate utility functions fcr both members and which

therefore have no cross-substitution effects.

First, consider briefly the "individual utility - family budget constraint" or IU model which has apparently been used only by Leuthold, who developed it. Like the FU model, the IU model assumes that the husband and wife pool their incomes for the purpose of consuming, and thus maximize subject to (1-4). But unlike the FU model, the IU model assumes that in each case what is maximized is individual utility, which depends only on collective consumption and one's own leisure time: that is, the wife is assumed to maximize her utility,

$$U^w = U^w(C, L_w) \tag{3-1}$$

and the husband is assumed to maximize his utility,[14]

$$U^h = U^h(C, L_h) \tag{3-2}$$

subject to the common budget constraint, (1-4). In this case, it can be shown (after rather a lot of algebraic manipulation of no great intrinsic interest) that -- provided both husband and wive have concave utility functions and regard both C and their own leisure as normal goods -- the NIT-induced change in the wife's leisure time in the IU model consists of three effects. The first two are "direct" effects (an income effect and an own-substitution effect) and are both positive. The third is an "indirect" effect (the effect on the wife's leisure caused by the reduction in family income which occurs when, as a result of the NIT, the husband substitutes leisure for work -- i.e., a negative indirect income effect on the wife caused by the NIT-induced positive substitution effect on the husband) and is negative. (Similar results are obtained for the husband.) It turns out that, as in the FU model, (P1) - (P4) hold in the

IU model, even though the cross-substitution effects of the former do not occur in the latter. (For details, see the Mathematical Appendix.)

Consequently, the FU and IU models of family labor supply have the same properties as regards the effect of a NIT. At least in these two models, status as a family member -- i.e., participation in a group of persons who pool their incomes for purposes of consumption -- generates effects on each member (a cross-substitution effect in the FU model; an indirect income effect, arising from the other member's own-substitution effect, in the IU model) which may offset the conventional work disincentive effects of a NIT, regardless of whether family members maximize something called "family utility" (as in the FU model) or their own individual utilities (as in the IU model).

Other models impose even fewer a priori restrictions on the effects of a NIT. Consider, for example, an "interdependent individual utility - family budget constraint" or IIU model, in which family members pool their incomes and are constrained by (1-4), and maximize their individual utilities, which depend not only on C and their own leisure time but also on the leisure time of their spouses, i.e.,

$$U^w = U^w(C, L_w, L_h) \qquad (3\text{-}3)$$

$$U^h = U^h(C, L_h, L_w) \qquad (3\text{-}4)$$

for the wife and the husband, respectively. Here, it turns out, it is impossible to draw definite a priori conclusions about the effect of a NIT on individual or total family work hours or on total family wage and salary income.[15/] Thus, if family members' utilities are interdependent in this sense, (P3) and (P4) do not necessarily hold. (For more on inter-

dependent utility models, see the Mathematical Appendix.)

IV. Summary and Conclusions

In the preceding pages I have shown that none of the static models considered here implies that a NIT will always reduce the labor supply of any given family member or of the family as a whole. The FU and IU models do predict unequivocally that a NIT will always reduce family wage and salary income and that a NIT cannot raise both members' labor supplies (provided members' leisure times are normal goods); but in the IIU model a NIT might raise both family wage and salary income and the labor supplies of both family members.

However, lest these results be misinterpreted, I stress that they are not equally relevant to all families which are potential NIT recipients, i.e., who are initially below the breakeven level of income. In particular, these results apply only to families which have interior optima prior to introduction of the NIT. The effect of a NIT on families which have corner optima prior to introduction of a NIT -- i.e., families one of whose members does not work at all -- will in general be simply to reduce the labor supply of the family member who does work.[16/] Moreover, these results apply only to families whose members are able to act as labor supply "marginalists," i.e., are fully able to adjust work hours in accordance with plans for utility maximization. Needless to say, the marginal changes of the differential calculus are an inappropriate tool for the analysis of families whose members cannot act as marginalists, e.g., those who are forced by institutional constraints to choose between either (i) a 40-hour (or 30-hour or 20-hour, etc.) work week or (ii) no work at all. Indeed, such families may be unable to make any adjustment at all in response to

a NIT, at least in the short run.[17]

Two simple but important conclusions follow from these theoretical findings. First, certain empirical estimates which seem to show that in some instances a NIT might actually riase labor supply (see n.3) may now be regarded with less perplexity. Many researchers have tended to conclude -- apparently in the belief that these results run counter to economic theory -- that either the estimates must be biased or the theory itself must be invalid. But as the above analysis indicates, many of these findings are in fact quite compatible with "theory," i.e., with the models discussed here, so that the estimates may be perfectly valid. (But see n.4.)

This is not to suggest that all such findings are compatible with all of the models described here, or that the estimates are completely free from biases. For example, the NJ-P experimental data appear to show that a NIT could in some cases raise family wage and salary income (see e.g., Robinson Hollister) -- a finding which directly contradicts (P3). Perhaps this means that the static IU and FU models do not provide a satisfactory account of family labor supply behavior.[18] However, these estimates probably suffer from various biases and are not grounds for rejecting the IU or FU model. For example, the NJ-P research usually excludes the husband's (wife's) wage rate from labor supply regressions for the wife (husband).[19] Thus, since they ignore variables which are relevant to labor supply, such as NJ-P estimates of the labor supply function and of the effects of a NIT suffer from specification bias.

A second conclusion follows from the first: if estimates to the effect that a NIT may raise labor supply are not simply the result of biases, then

policy-makers may now be able to breathe a little more easily about the effects of a NIT. If a NIT had sharp disincentive effects on labor supply, then family members' work effort would drop significantly, the labor incomes of families eligible for the NIT would drop appreciably also and so the amount of NIT subsidy paid them would have to rise. In such circumstances, objections to the NIT on normative grounds ("It encourages loafing") and for budgetary reasons would be widespread. But the above analysis -- which may be confirmed by the "puzzling" findings of the NJ-P experiment -- suggests that the effects of a NIT on labor supply need not be as negative as has previously been assumed, and could in some cases even be positive, so that the cost of a NIT might not be as large as has previously been thought.

*Assistant Professor of Economics, Fisk University, and Visiting Research Associate, Industrial Relations Section, Princeton University. While retaining full responsibility for the opinions expressed here, I thank T.A. Finegan, Daniel S. Hamermesh, Jane H. Leuthold, J. Gregg Lewis, Charles Mallar, and Fred M. Westfield for helpful comments and suggestions; the Gary Income Maintenance Experiment for supporting the research which led to the present paper; and Kenneth C. Kehrer, director of research for the Experiment, for his encouragement.

1. By "static models" I mean those which assume that persons are concerned with the current period only, and which thus ignore activities such as job search, human capital investment, saving, borrowing, etc., which are oriented towards the future. (For dynamic or multi-period models in which a NIT may reduce the labor supplied by family members, see James P. Smith and Charles Mallar.) By "single individuals" I mean persons who do not pool their incomes with others for purposes of consumption; by "family members" I mean persons who do pool their incomes. Thus, "single individuals" are in most cases what the U.S. Bureau of the Census calls "unrelated individuals," while "family members" are in most cases members of what the Census calls a "consumer unit" or of what the University of Michigan Survey Research Center calls a "spending unit."

2. This is certainly true of many of the economists associated with the New Jersey-Pennsylvania Graduated Work Incentive Experiment (NJ-P). For example, David Horner says flatly, "... standard theory indicates that recipients of a negative income tax will reduce their work effort" (p. 2). Rees is somewhat more precise but equally unequivocal: after showing that a NIT will reduce a single person's labor supply, he goes on to say, "If we think of the family as a single decision-making unit

having a collective indifference map, the same analysis would apply to a family" (see 1973, p. 4, or 1974, p. 160). Similarly, after reviewing the analysis for single persons, Irwin Garfinkel concludes that for several reasons "...one would expect a transfer program [such as a NIT] to lead to a larger reduction in the labor supply of wives than of husbands..." (p. 6; emphasis supplied). Mallar is even more explicit about static models: "The usual theoretical model of family labor supply assumes a family decision-making unit that has as its objective function the maximization of a household utility function that is monotonically increasing with respect to each member's consumption of leisure and a composite consumption bundle. [Using this model,] ...we unambiguously predict that the implementation of a negative income tax plan would cause each family member to consume more leisure (i.e., supply less labor)." (See 1973b, p. 1; emphasis supplied.)

3. For example, at least some of the NJ-P research seems to show that NJ-P's experimental NIT increased H_h^B and/or H_w^B (the labor supply of black husbands and wives, respectively). At one point Glen G. Cain et al. (p. 218) appear to conclude that the NIT raised H_w^B; and Rees (1974, p.174 (Table 6) and p. 175) and Harold W. Watts et al. (p. 199) report estimates to the effect that the NIT also raised H_h^B. However, these estimates can scarcely be called conclusive, for none is statistically significant. Moreover, other NJ-P estimates have quite different implications about the effects of the NIT. For example, at one point Rees (1974, p. 175 (Table 7)) reports one set of estimates implying that H_w^B fell (though not by a statistically significant amount), but elsewhere (1973) reports another estimate implying a statistically significant increase in H_w^B

(see Table 8, p. AI-40). Moreover, of two other sets of estimates, one implies a statistically significant one per cent increase in $(H_w^B+H_h^B)$, while the other implies a statistically significant three per cent decrease in $(H_w^B+H_h^B)$. (See Rees, 1973, Table 9, p. AI-40.) Likewise, Jane H. Leuthold's simulation of the effects of a NIT suggests that, on average, a NIT will always increase work hours for family heads and will also, on average, increase work hours for employed spouses (except in the poorest low-income families, where spouses' work effort falls sharply) (see p. 322). Unlike the NJ-P researchers, however, Leuthold apparently is aware that a NIT need not reduce <u>all</u> members' supplies.

4. Needless to say, mine is not the only possible explanation. Leisure may not always be a normal good; the empirical estimates may well be subject to various biases; etc. However, the present paper is complementary with rather than a substitute for these explanations. It argues not that such considerations cannot explain the seemingly contratheoretical findings noted in n. 3, but rather that the findings, if they are indeed valid, are in fact not contrary to theory.

5. Generalization to the case of a family with three or more members is straightforward.

6. "Leisure" may be defined either as "pure" leisure, as "nonmarket work" (e.g., cooking, cleaning, lawn-mowing, etc.) or as a vector of uses of non-market work time; the results are the same in each case.

7. Generalization to the case of multiple taxes and transfers is straightforward.

8. Based on work by Paul A. Samuelson, it was developed by Marvin Kosters (1966) (1969) and has since been used, sometimes with extensions and

elaborations, by a great many writers. (See, for example, Cain and Watts, ed., and the references therein). It is clearly the model which Horner, Mallar, Rees and other NJ-P researchers seem to have had in mind (see especially Rees' and Mallar's comments in n. 2 above). See also Ralph W. Pfouts.

9. I assume that the utility function is strictly concave and twice differentiable, with positive first order partial derivatives and continuous second order partial derivatives.

10. In an interior solution, each family member enjoys some leisure and devotes some time to work. I consider corner solutions (situations in which at least one family member does no work at all) briefly in Part IV below.

11. This might occur due to the introduction of a positive marginal tax rate, M, on earnings, as in the case considered here. The "price" of L_w is reduced by an amount MW_w, but the post-NIT price of L_w relative to L_h, namely $(1-M)W_w/(1-M)W_h$, is the same as the pre-NIT relative price, W_w/W_h; i.e., the prices of L_w and L_h have fallen by the same proportion.

12. If this were a single person, the story would end here. There can be no cross-substitution effects (see below) in a one-person "family," so if the "wife" had no husband the sum of the income and own-substitution effects would give the NIT's total effect exactly. In other words, a NIT will always raise the leisure time (and will always reduce the work supply) of single persons in the kind of static world considered here.

13. Available expirical evidence on this question is contradictory. For example, Orley Ashenfelter and James J. Heckman conclude from a study of

aggregate labour force participation rates across SMSA's that the cross-substitution effect is zero. Thomas J. Kniesner finds in his study of National Longitudinal Survey microdata on husbands and wives aged 45-59 that L_w and L_h are complements. Farrell Bloch's results (based on Survey Research Center microdata on husbands and wives) for husbands usually imply a zero cross-subsitution effect, while his results for wives usually imply that L_w and L_h are substitutes.

14. I assume that the utility functions, (3-1) and (3-2), are strictly concave and twice differentiable, with positive first order partial derivatives and continuous second order partial derivatives. Note that according to (3-1) the wife is "selfish" about enjoying leisure and supplying work, since she maximizes her <u>own</u> utility, which (at least directly) is a function only of her <u>own</u> leisure and is not (except through income and hence C) affected by that of her husband; similarly for the husband. The IU model thus is different from the FU model, which assumes that something called "family utility" is maximized and that both husband and wife follow the "family's " directives.

15. In the IIU model a NIT has three effects on the wife: two positive "direct" effects (an income effect and a substitution effect) and an indirect effect -- the effect on the wife's leisure of the NIT-induced change in the husband's leisure -- whose sign is indeterminate <u>a priori</u>. The indirect effect is indeterminate because it consists of several potentially offsetting components. First, an increase (say) in L_h reduces household income; if leisure is a normal good for the wife, this spurs her to reduce her leisure time. Second, an increase in L_h also raises the marginal utility to the wife of consumer goods (since the husband is

now taking more leisure time in which to enjoy these consumer goods, presumably with the wife); this leads the wife to reduce her leisure time in order to work more to buy still more consumer goods. Finally, an increase in L_h also raises the marginal utility to the wife of her own leisure (since the husband is now taking more leisure time, presumably with her); this encourages the wife to take more leisure time. The net result of these three effects on the wife is of course indeterminate as regards both direction and magnitude; similarly for the husband.

16. For a discussion of family labor supply corner optima which in effect makes this point, though not with specific reference to a NIT, see Kniesner.

17. Presumably institutional constraints on a family member's ability to be a labor supply marginalist are less severe in the long run; for example, someone who wishes to work a 20-hour week year-round but must choose between, say, working a 40-hour week and not working at all <u>might</u> be equally happy (and able) to work a 40-hour week for half a year and stay out of the labor force for the remainder of the year, or work a 40-hour week every other week, etc. But it seems possible that institutional constraints may have some effect even on long-run behavior; and the problem here -- one which is beyond the scope of the present paper -- is to see just how various kinds of institutional constraints might affect the response to a NIT.

18. Of course, these empirical results are <u>not</u> inconsistent with the IIU model.

19. While the NJ-P regressions for the wife's (husband's) labor supply do not include W_h (W_w), they do include a variable V*; apparently (see Watts, p. BI-62) V* consists not only of our V (= nonwork income such as dividends, interest, etc.) but also of the earnings of other family members, including the husband (wife). Since earnings are equal to the wage times work hours, it might seem that NJ-P does not really omit the husband's (wife's) wage rate from its regressions for the wife's (husband's) labor supply. However, use of V* in lieu of V and W_h (W_w) is valid in the context of the FU model only if the cross-substitution effect is zero, and is valid in the context of the IU model only if the indirect income effect is zero. Otherwise, use of V* amounts to a misspecification of the labor supply function.

References

Ashenfelter, Orley and James J. Heckman. "The Estimation of Income and Substitution Effects in a Model of Family Labor Supply." Econometrica 42(1) (January 1974): 73-85.

Bloch, Farrell. "The Allocation of Time to Market and Non-Market Work Within a Family Unit." Technical Report No. 114. Stanford, California: Institute for Mathematical Studies in the Social Sciences, Stanford University, November 1973.

Cain, Glen G., and Harold W. Watts, eds. Income Maintenance and Labor Supply: Econometric Studies. Chicago: Rand McNally & Co., 1973.

Cain, Glen G., Walter Nicholson, Charles D. Mallar and Judith Wooldridge. "The Labor-Supply Response of Married Women, Husband Present." Journal of Human Resources 9(2) (Spring 1974): 201-222.

Cohen, Malcolm S., Samuel A. Rea, Jr., and Robert I. Lerman. A Micro Model of Labor Supply. BLS Staff Paper No. 4, Bureau of Labor Statistics, U.S. Department of Labor. Washington: U.S. Government Printing Office, 1970.

Garfinkel, Irwin. "Income Transfer Programs and Work Effort: A Review." In Subcommittee on Fiscal Policy, Joint Economic Committee of the Congress of the United States, How Income Supplements Can Affect Work Behavior. Studies in Public Welfare Paper No. 13. Washington: U.S. Government Printing Office, February 18, 1974. Pp. 1-32.

Green, Christopher. "Negative Taxes and Monetary Incentives to Work: The Static Theory." Journal of Human Resources 3(3) (Summer 1968): 280-288.

Hicks, John R. Value and Capital (second edition). Oxford: Oxford University Press, 1946.

Hollister, Robinson G., "The Labor-Supply Response of the Family." In Institute for Research on Poverty, Final Report of the Graduated Work Incentive Experiment in New Jersey and Pennsylvania. Ch. B-Va. Madison, Wisconsin: Institute for Research on Poverty, University of Wisconsin, 1973. (An abbreviated version appears as "The Labor-Supply Response of the Family." Journal of Human Resources 9(2) (Spring 1974): 223-252.)

Horner, David. "The Impact of Negative Taxes on the Labor Supply of Low-Income Male Family Heads." In Institute for Research on Poverty, Final Report of the Graduated Work Incentive Experiment in New Jersey and Pennsylvania, Ch. B-IIb. Madison, Wisconsin: Institute for Research on Poverty, University of Wisconsin, 1973.

Kosters, Marvin. "Income and Substitution Effects in a Family Labor Supply Model." Report No. P-3339. Santa Monica, California: The RAND Corp., December 1966.

Kosters, Marvin. "Effects of an Income Tax on Labor Supply." In Arnold C. Harberger and Martin J. Bailey, eds. The Taxation of Income from Capital. Washington: The Brookings Institution, 1969. Pp. 301-324.

Kniesner, Thomas J. "An Indirect Test of Complementarity in a Family Labor Supply Model." (Paper presented at the San Francisco meeting of the Econometric Society, December 1974.) Manuscript. Department of Economics, University of North Carolina at Chapel Hill. January 1975. (Forthcoming, Econometrica.)

Leuthold, Jane H. "An Empirical Study of Formula Income Transfers and the Work Decision of the Poor." Journal of Human Resources 3(3) (Summer 1968): 312-323.

Mallar, Charles. "Concepts Used in the Central Analysis and Their Measurement. 8. Measurement of Non-Earned Income." In Institute for Research on Poverty, Final Report of the Graduated Work Incentive Experiment in New Jersey and Pennsylvania, Ch. BI, Section 8. Madison, Wisconsin: Institute for Research on Poverty, University of Wisconsin, 1973a.

Mallar, Charles. "School Enrollment and Labor-Force Participation Among Young Adults." In Institute for Research on Poverty, Final Report of the Graduated Work Incentive Experiment in New Jersey and Pennsylvania, Ch. B-IV. Madison, Wisconsin: Institute for Research on Poverty, University of Wisconsin, 1973b.

Pfouts, Ralph W. "Some Difficulties in a Certain Concept of Community Indifference." Metroeconomica 7(1) (April 1955): 16-26.

Rees, Albert. "An Overview of the Labor Supply Results." In Institute for Research on Poverty, Final Report of the Graduated Work Incentive Experiment in New Jersey and Pennsylvania, Ch. A-I. Madison, Wisconsin: Institute for Research on Poverty, University of Wisconsin, 1973.

Rees, Albert. "An Overview of the Labor Supply Results." Journal of Human Resources 9(2) (Spring 1974): 155-180.

Smith, James P. "On the Labor-Supply Effects of Age-Related Income Maintenance Programs." Journal of Human Resources 10(1) (Winter 1975): 25-43.

Watts, Harold W. "Concepts Used in the Central Analysis and Their Measurement. 7. The Estimation of Normal Family Income." In Institute for Research on Poverty, Final Report of the Graduated Work Incentive Experiment in New Jersey and Pennsylvania, Ch. BI, Section 7. Madison, Wisconsin: Institute for Research on Poverty, University of Wisconsin, 1973.

Watts, Harold W., Robert Avery, David Elesh, David Horner, M.J. Lefcowitz, John Mamer, Dale Poirier, Seymour Spilerman and Sonia Wright. "The Labor-Supply Response of Husbands." Journal of Human Resources 9(2): 181-200.