MARCH 1994
WORKING PAPER 54

The Effect of Food Subsidies on Labor Supply in Sri Lanka

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CORNELL FOOD AND NUTRITION POLICY PROGRAM

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The authors wish to express their gratitude to Yisehac Yohannes for his excellent research assistance and to Nancy Birdsall for comments on an earlier draft.

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CFNPP is funded by several donors including the Agency for International Development, the World Bank, UNICEF, the United States Department of Agriculture, the New York State Department of Health, The Thrasher Research Fund, and individual country governments.

 ISBN 1-56401-154-2

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This document was word processed by Diane Cook. The text was formatted and the cover produced by Brent Beckley.

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LIST OF TABLES

APPENDIX TABLES

ABSTRACT

There are few studies on the effect of targeted subsidies on labor supply, although such choice may influence the level of net benefits of targeted programs. This study addresses that gap, using household-level data from Sri Lanka to investigate the extent to which labor supply decisions of males and females in rural and urban areas are affected by access to a subsidized food ration. In addressing that issue, we also distinguish between the effects on the probability of labor market participation, and the response in terms of the number of days worked conditional upon participation. Using the reported subsidy variable we find that men will work 2.4 and 2.0 fewer days per month in urban and rural areas, respectively, while the comparable figures for women is 3.0 and 0.8. When we employ the predicted subsidy value, the disincentive effect is even greater. This is consistent with a difference between the net transfer and net increment in expenditures of around 50 percent of its gross value. However, it would premature to assume that the reduction of net benefits is a deadweight loss; the reduced time in the labor market contributes to home production activities as well as leisure which enhances overall household welfare.

1. INTRODUCTION

The literature on targeted subsidies focuses primarily on the degree to which transfers actually reach the intended beneficiaries. In particular, considerable attention has been given to the need and mechanisms for discriminating between individuals that the program is designed to serve, and those that the program would ideally exclude (Alderman 1991; Pinstrup-Andersen 1988; Ravallion 1989). This issue of the sensitivity and selectivity of subsidies is relevant to attempts both to design interventions from anew, or in the context of the universal rationing schemes, to reform existing programs. The literature, however, also recognizes that in addition to administrative costs, targeting has welfare costs, for example in terms of social stigmas or in terms of behavioral changes induced by the presence of means testing (Besley and Kanbur 1991).

There is, however, another aspect of the efficiency of the subsidy system that has been given comparatively less attention: the effect of the transfer on labor supply. Under the standard theory of household utility maximization over leisure as well as goods, a change in exogenous income or in the price of commodities will affect labor allocation as well as commodity choice. Thus, the incentive effects of the food ration on labor supply will have potentially important implications on the level of net benefits of targeted programs.

Kanbur, Keen, and Tuomala (1992) show that the implications of labor supply is particularly important from a "non-welfarist" perspective in which the consumption of certain goods — often food — rather than total household utility is the objective of the program. The importance of the criteria for measuring impact comes from the fact that in a welfarist perspective the consumption of leisure is valued at the marginal wage rate and treated as other commodities. Welfarist and non-welfarist perspectives not only diverge in regards to marginal taxation (and subsidies) but in targeting criteria. For example, Kanbur, Keen, and Tuomala show that under a non-welfarist criteria the effectiveness of an income transfer targeted on the basis of indicators correlated with poverty depends on labor supply behavior; every thing else equal, groups with more elastic labor supply mitigate the effectiveness of a transfer in reducing poverty.

Thus, Moffitt (1992) states the following in a recent review: "The lack of research on the effects of in-kind transfer programs on labor supply is a serious problem in light of the critical role such transfers have played [in the U.S.]...." This conclusion is reached with full knowledge that there have been some relevant studies examining the labor supply effects of programs in the U.S., such as the research on the disincentive effects of Aid for Dependent Children (Danziger, Haveman, and Plotnick 1981; Fraker and Moffitt 1988; Winkler 1991).

The paucity of studies on intervention programs in developing countries is yet more acute. In fact, we know of no studies of how food-related income transfers have affected labor supply from developing countries. Thus, the

remainder of this study will use household-level data from a country with a significant transfer program, Sri Lanka, to investigate the extent to which the labor supply decision of males and females in rural and urban areas is affected by access to a subsidized rice ration. In addressing that issue, we also distinguish between the effects on the probability of labor market participation, and the response in terms of the number of days worked conditional upon participation. The advantage of this two-step approach is that it allows different variables to enter into the participation and response functions, as well as for the possibility of a discontinuous response.

2. THE RICE SUBSIDY AND ITS BENEFICIARIES

The Sri Lanka food ration system persisted for more than 25 years as a general subsidy, with no real effort made at targeting. Over time, however, the Sri Lankan food distribution system evolved from a means of rationing scarce food commodities into a targeted intervention designed to provide income support for the poor (Sahn and Edirisinghe 1993; Edirisinghe 1987; Gavan and Chandrasekera 1979). The most fundamental change followed the 1977 election of a government committed to moving toward a more market oriented economy with a diminished role for the state. Among the major economic reforms instituted was the initiation of means testing as a feature of the subsidy. This was motivated, in large part, by the fact that the subsidy comprised 17 percent of government expenditures and 6 percent of GNP.

The targeting of the food subsidy began in January 1978. The objective was to restrict the access to subsidized rice to households with income less than Rs. 300. To achieve this objective, a means test was performed by local government administrative officials. The social service administration made available and distributed an income declaration form to all households interested in remaining eligible for the newly targeted subsidy. Recall that in the Sri Lanka case, prior to the targeting, access to the subsidy was universal; failure to fill out the form, or indicate an income level less than Rs. 300 per capita were grounds for exclusion.[1]

The form was designed to account for income in the form of wage and non-wage earnings, in-kind payments and consumption of goods produced at home or on one's own farm.[2] Furthermore, basic socio-demographic information, such as household size and structure, occupation, and durable goods and assets were reported, the latter serving as a cross-check on the reported incomes. Once filled in by the potential recipients, these forms were in returned to, and reviewed by local level government social service workers. As remarked by Edirisinghe (1987, p. 14), "the procedure of the means test, which was conducted on self-reported incomes, may have been conducive to underreporting." In fact, while assets themselves were not included in the formula to determine eligibility, those that were conspicuous, and prominent, such as ownership of an automobile, or television, served as important signals to those charged with reviewing the self-reported income forms.

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[1] At the time that the income declaration forms were filled out, the Rs. 300 cut-off point had not been announced.

[2] Edirisinghe (1987) indicates that one of the reasons for the rural bias, and the regional differences in the incidence of receiving the transfer was the difficulty in valuing agricultural-related and seasonal income in monetary terms.

Once a household was deemed eligible to continue receiving the rice ration, the quantity of the subsidy provided to households was determined by the size of the household.[3] Conditional upon income being below the cut-off point, the quantity of the subsidy was invariant to the degree to which incomes fell below the cut-off point.

Despite the weaknesses inherent in relying on self-reported income in a society where consumption of home produced food was important, and where there was no systematic mechanism to double-check these forms against, for example, tax records, the effort to target the program did succeed in reducing the coverage from being universal, to where only around 50 percent of the households received the rice ration. Furthermore, the change in the distribution of the benefits delivered through the rice subsidy were substantial, and reasonably progressive, especially in light of the relatively low administrative costs of the transition. Only 11.9 and 24.1 percent of the households in the upper expenditure quintiles in the urban and rural areas, respectively, received rations. The corresponding numbers for the lowest expenditure quintile were 77.6 and 83.3 percent (Table 1). Thus, while not perfectly targeted, the rice ration was a significant departure from the previous universal ration.

As intimated above, the Sri Lankan food ration system differs from similar in-kind welfare programs in the U.S. in that it does not impose a "tax rate," often referred to as a "benefit-reduction rate" on the level of work performed. While welfare programs in the U.S. and other developed countries involve a reduction in benefits if the recipient earns wages in the labor market, the system in Sri Lanka did not vary the level of transfer as income rose. Furthermore, households were not constantly monitored and removed from the program if their incomes crossed a threshold. In fact, it was not until the period after that covered by the survey data used in this study, when the government instituted a change in the subsidy from a quantity rationing scheme to a food stamp program, that there was any re-evaluation of eligibility (Edirisinghe 1987; Sahn and Edirisinghe 1993). From an analytical point of view, the most important implication of these characteristics of the rationing scheme, and this data set, are therefore that the budget constraint is not kinked as it is in some welfare programs. One need not model the effects of an increasing marginal tax on income and can focus directly on the substitution effect of leisure for labor as income is augmented. This would suggest smaller labor supply effects than when the benefit-reduction rate operates.

The analysis is also assisted by the fact that the rice ration is inframarginal for virtually the entire population. Thus, one can treat the subsidy as an income transfer and avoid having to model the corner solution often implied by a dual price regime.

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[3] Variation in the amount, received was also a result of actual degree of utilization of the ration shops, given that a portion of the rationed needed to be purchased, albeit at a subsidized value.

Table 1 — Share of Households Receiving Rice Ration by Sector and Expenditure Quintile, 1978/79

Per Capita Expenditure Quintile	Share Receiving Rice Ration	
	Urban	Rural
	Percentage	
1	77.6	83.3
2	60.7	72.0
3	45.5	58.2
4	36.8	44.1
5	11.9	24.1
All	41.0	58.6

Source: Edirisinghe (1987)

For the purpose of the analysis, however, an important question is to what extent can participation in the subsidy scheme be considered endogenous. That is, are there any unobserved factors that may account both for participation in the program and in the level of labor supply. One reason often cited for the endogeneity of participation in a variety of programs is awareness of program. This was clearly not relevant in this case, as universal coverage for a generation prior to program changes ensured universal awareness. A second reason is the stigma effect that could induce households to self-select out of the program (Moffitt 1983; Ranney and Cushman 1985). Once again, this is not likely an issue in the Sri Lanka case due to the long period of universal entitlement.

A third factor that could affect participation was the transaction costs of dealing with the ration shops. The ration shop system in Sri Lanka, however, was highly efficient and convenient. Moreover, even though the rice subsidy at the shops was targeted after 1979, other nonrationed universal subsidies, such as sugar, wheat flour, and bread, continued to be available to all households.

The main source of endogeneity of participation in the subsidy is that households that were more determined and capable of deception may have proven better able to remain on the program, despite not conforming to the income criteria. Although identification of these households is difficult, one may anticipate the direction of bias. In particular, it is likely that those who are more aggressive in dealing with the ration system may also be more assertive in the labor market. If this is the case, the failure to model this attitude will lead to a positive bias in the relationship between subsidies and labor.[4] We control for the individual heterogeneity, by substituting a predicted subsidy for the observed subsidy in one set of estimates. We compare these results with similar estimates which use the reported, rather than predicted subsidy to test our priors that the expected negative impact of transfers on labor supply would be dampened when using the uninstrumented (reported) subsidy.

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[4] A negative bias is also possible if there is reverse causality from disability to eligibility. The instrumenting procedure used controls for this; as is shown below, the possibility is only theoretical as disability does not have a significant coefficient in the instrumenting equation.

3. DATA

This empirical analysis relies on two surveys. The first is the 1978/79 Consumer Finances and Socioeconomic Survey conducted by the Central Bank of Ceylon which is used to derive information on the level of benefits from the food subsidy, as well as to estimate the labor market participation and response functions. The nationally representative sample survey was conducted during four rounds, from October 1978 to September 1979. While the entire survey covered nearly 8,000 households, we limit our analysis to urban and rural areas. By excluding estates the sample is reduced by nearly 2,000 households. The quality of the data is attested to by the fact that the estimated values of the rice subsidy and food expenditures derived from the survey were 97 percent and 95 percent, respectively, of the figures reported in the national accounts. There is evidence from comparisons with national accounts, however, that nonfood expenditures may have been underestimated by as much as 22 percent (Edirisinghe op. cit.). In addition to a complete compilation of information on the structure of the households, food and nonfood expenditures, and incomes, the survey collected data on labor market participation. However, the survey did not include information that allowed us to compute hourly wages. This is an obvious drawback for the chosen topic.

In order to estimate the requisite market wage, we therefore relied on a Labor Force Survey conducted in 1980/81 by the Department of Census and Statistics. The 5,000 household sample was also nationally representative, and based on the same sampling frame. It collected detailed information on hourly earnings for all household members. Wage functions were estimated using this latter survey (Sahn and Alderman 1988). The coefficients from these equations were then applied to the 1978/79 data to arrive at a predicted wage that was subsequently entered in the participation and labor supply functions.

The obvious question is: why not use the 1980/81 survey for the entirety of the analysis rather than alternate between two data sets? Unfortunately, the later survey does not provide detailed enough information to determine the value of the food subsidy which was received.

4. EMPIRICAL APPROACH

The two key equations in this study are specified as follows:

$$\text{Probability of labor force participation} = 1 - F(-\beta x_{1i}) \quad (1)$$

$$D_i^s = d(x_{2i}, \hat{S}_i, \lambda_i) \text{ conditional on } d_i > 0 \quad (2)$$

where x_{1i} and x_{2i} are vectors of regressors, $\hat{S}_i$ is the value of the rice subsidy, λi is the inverse of the Mill's ratio[5] calculated from the probit estimation (1), and D_i^s is labor supply measured in days worked during the last month. Among the regressors in vector x_{2i} is the predicted log of wage, lnW_i. This was derived by applying the parameters on various human capital and household structure variables to the 1978/79 data, although the parameters themselves were estimated from the 1980/81 Labor Force Survey using a standard two-step approach to estimate a market wage.[6] The superscript, s, for sector, denotes that we estimate separate wage and participation equations for rural and urban areas, as well as for males and females.

With one exception, the equations conform to what is now standard in the literature. The exception being that the equation for participation behavior, using the 1978/79 Consumer Finance Survey (Equation 1), includes not only the derived wage variable, but more importantly, the value of the subsidy. It is expected that the subsidy will have a negative effect of the probability of participating. However, the decision to participate may be lagged, that is, made earlier on the basis of having access to the subsidy prior to it being targeted. To the extent that is the case, then, the participation decision will not be as sensitive to the receipt (or loss) of the subsidy as is the conditional labor supply. That is, the amount worked by an individual is likely to adjust to changes in the household's receipt of subsidy income more rapidly and readily than the participation decision.

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[5] The Mill's ratio is the sample selection correcting valuable derived from the participation equation. The selection approach is based on Heckman (1974). More recent work such as Heckman (1990) and Newey, Powell, and Walker (1990) suggests that often identification cannot be achieved. These studies also claim that often the assumptions about error structure that makes selection important do not prevail. Under the latter, it is still worthwhile to decompose total labor force participation into probability and conditional response as often the magnitude of the parameters differ.

[6] The human capital variables which determine wages include education and job experience (proxied by age minus years of schooling). In addition, landholding variables as well as series of seasonal dummy variables are included. See Sahn and Alderman (1988) for a more detailed discussion of the wage equation.

Thus, in Equation 2, we examine the effect of the subsidy on labor supply conditional on labor force participation. This includes work in own account activities such as agriculture and nonfarm enterprises as well as wage labor.[7] The labor supply equations include own-wages as well as the wage of the spouse, or in the absence of the spouse, the person of the opposite gender with the highest predicted wage.[8] In addition, the rural labor supply equations include landholding size, as well as an interaction between area and wages. This latter interaction term captures any difference in the response of landholders to changes in wages (Rosenzweig 1984). We also include a series of seasonal dummy variables to capture temporal differences in labor market conditions. Separate equations are run for rural and urban areas, as well as by gender in order to capture any differential effect of the rice subsidy on participation and labor supply among these four groups.

In order to deal with the potential bias introduced by individual heterogeneity (reflecting the simultaneity of labor and subsidy choices), we redo the above estimations using a predicted value for the subsidy coefficient. Identifying instruments include conspicuous housing characteristics as well as possession/ownership of certain conspicuous durables that would both be recorded on the disclosure forms used to apply for the subsidy and be difficult to conceal. These include the size of the house, whether there is indoor plumbing, ownership of automobiles and motor scooters, electric stove and refrigerator. We should point out that we see no strong conceptual argument to include such durable goods in the labor supply equation, and find no compelling reason to depart from the practice in the literature whereby such parameters are not included in labor supply models.

A second group of instruments used to identify the predicted subsidy are the 22 District dummy variables. As discussed earlier, these capture the effect of regional differences in how the process of income declaration was administered, including the accuracy with which the income declaration forms were filled in, and the care taken in their review. Information on the race of the household head that will capture any discrimination against non-Singhalese, and a dummy variable whether the family had migrated during the past year which may explain potential problems in getting enrolled in the targeted scheme are also potential, albeit less compelling instruments. So too are the covariates that include information on the occupation of the household head.[9] This information on occupation, also collected in the form for self-declaration of need, could be

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[7] As is often the case, a variety of home production activities such as cooking and fetching fuel are not included in the data.

[8] There is a potential sample truncation issue that enters the analysis insofar as the small share of households without two persons between the ages of 15-65 are left out of the analysis.

[9] The inclusion of occupation in the instrumenting equation was felt to be justified since it is largely a lagged endogenous variable that pre-dates the implementation of the targeted subsidy.

used by program administrators to help in efforts, albeit limited, to identify those reporting inaccurate income information. It is thus possible to simulate the impact of the instrumented and non-instrumented value of the rice subsidy on labor market participation and labor supply.

RESULTS

We begin with a presentation of the results of the participation models, with the probit functions shown in Table 2. The most important feature of the urban models is that the rice subsidy leads to a reduction of female labor force participation. This is not readily apparent from the rice subsidy variable itself; in both the men's and women's equation the coefficient is positive, although in the case of the women's equation, it is only marginally significant. However, the total derivative on the subsidy equation, taking into account the interaction of the transfer with the wage variable, is negative for the entire relevant range of wages for women. For men, however, there is an inflection point for low wage workers. This may be a result of not being able to employ a sufficiently flexible functional form in the model without introducing a high degree of multicollinearity; a quadratic term for the subsidy variable was negative, although not significant.

In rural areas, the sign on the subsidy coefficient in the men's equation is negative. However, it is only marginally significant. For women the subsidy variable is positive and significant, although the size of the coefficient is extremely small. The fact that the subsidy does not show a major impact on the participation decision or, in the case of rural women, that it has an effect opposite of that expected on the basis of theory, may in part be a consequence of the fact that the decision of whether to work or not was made long before the targeting of the ration. Moreover, the decision whether or not to work is likely less responsive to transfers than a decision to adjust hours worked.

Another result that is worth commenting on is the fact that in urban areas persons with higher expected wages, both male and female, have a lower probability of working. To determine whether there was an age dimension to this unexpected finding, we include an interaction term with a dummy for persons under 30 years of age. This variable is positive, although not significant. This same finding of a negative effect of wages on the probability of working applies to men in rural areas, although this is not the case for rural women. We assume that this finding on the wage coefficient is a result of structural unemployment in the labor market, especially among higher wage workers. However, these unexpected signs are a source of some concern.

The other variables included in the probit models generally behave as expected. For example, all age variables are positive, with a negative quadratic indicating declining participation with age. The disability variable captures the fact that those with physical and mental handicaps are less likely to be labor force participants. Demographic effects are also as expected. For example, urban women with children below the age of 6 have a reduced probability of labor force participation. Conversely, the more females between the ages of

Table 2 — Probit Analysis of Market Force Participation Using Reported Subsidy Value

Independent Variables	Urban		Rural	
	Women	Men	Women	Men
INTERCEPT	-51.73 (-15.07)	-44.25 (-13.02)	-68.00 (-18.97)	-21.52 (-5.86)
AGE	2.83 (13.90)	3.54 (18.21)	1.36 (16.73)	2.23 (24.96)
AGE 2	-0.03 (-13.72)	-0.04 (18.95)	-0.02 (-14.84)	-0.03 (-24.56)
RACE 2	-3.35 (-3.80)	1.40 (1.43)	-7.56 (-10.73)	-0.03 (-0.44)
RACE 3	-3.70 (-2.20)	0.45 (0.22)	9.52 (7.61)	-0.32 (-0.19)
RACE 4	3.91 (3.08)	2.10 (1.51)	-14.52 (-15.36)	-0.05 (-0.61)
CHILDREN < 6	-0.57 (-1.79)	0.83 (1.99)	-0.56 (-2.78)	0.75 (3.15)
CHILDREN 6-14	-0.27 (-1.23)	-0.48 (-1.83)	0.49 (3.85)	0.17 (1.22)
MALES 15-65	-1.60 (-5.93)	-0.90 (-3.34)	-0.84 (-5.00)	-0.69 (-4.49)
FEMALES 15-65	1.25 (5.21)	-0.43 (-1.41)	-0.54 (-3.49)	-0.31 (-1.71)
ADULTS > 65	1.03 (1.84)	-1.21 (-1.53)	-2.07 (-5.56)	-1.41 (-3.37)
SUBSIDY (OBSERVED)	0.01 (1.73)	0.10 (3.53)	0.03 (9.05)	-6.12×10^{2} (-1.82)
MARRIED	-3.95 (-5.59)	8.66 (7.36)	-7.88 (-17.42)	6.26 (10.13)
COLOMBO	2.14 (3.77)	-0.04 (-0.07)	–	–
ROUND ONE	-3.41 (-5.08)	-0.60 (-0.78)	3.03 (7.71)	-1.02 (-2.37)
FEMALE WAGE	-7.38 (-6.24)	–	45.53 (9.34)	–
FEMALE WAGE^2	–	–	-6.70 (-3.68)	–
MALE WAGE	–	-9.56 (-4.61)	–	-13.08 (-2.01)
MALE WAGE^2	–	–	–	6.62 (2.18)
SPOUSE WAGE	1.28 (1.78)	-1.17 (-1.00)	-2.66 (-5.44)	2.75 (-4.02)
DISABLED	-7.86 (-3.14)	-18.34 (-8.55)	–	–
AGE*WAGE < 30	0.04 (0.44)	0.78 (0.61)	–	–
WAGE*SUBSIDY	-0.06 (-4.49)	-0.09 (-3.30)	–	–
AREA OWNED	–	–	-2.20 (-2.31)	1.51 (1.34)
WAGE*AREA	–	–	-0.06 (-0.11)	-0.69 (-0.70)
NON ZERO OBS	634	1,839	2,407	5,901
ZERO OBS	2,465	792	6,230	2,042
CHI-SQUARED (19)	386.16	1,270.19	–	–
CHI-SQUARED (18)	–	–	2,085.32	2,456.49

Notes: t-statistics are in parentheses; all coefficients x 10.

15-65 in the household, the greater the labor market participation of any one of them. It is assumed that this is partly due to other women substituting in home production and child care activities. Women are also more likely to be working in Colombo than in other urban areas.

It is also noteworthy that in both rural and urban areas, the marriage dummy is positive for men, and negative for women, in all cases being highly significant. In the case of men, there are two possible explanations. One is that the responsibilities of the family induce them to find a job, or alternatively, women are less willing to marry men who are not working, leading to a correlation of job status and marriage over time. As for women, marriage affords them the possibility, or gives them the responsibility, of engaging in home production, rather than market activities.

Turning to the labor supply equations, the value of the subsidy coefficient is negative and significant across the board for women and men in rural and urban areas (Table 3). The absolute values are greater in urban than rural areas, and for men compared to women. Most other variables also have the expected sign. Most important is the wage variable which is positive and highly significant in all cases. It is noteworthy that the magnitude of the wage coefficient is 70 percent greater for men than for women in urban areas. Likewise, the wage coefficient is nearly three times higher for men than women in rural areas. However, in the rural equation we add an interaction between wage and land, which in the case of men is negative and significant. The negative coefficient indicates that the greater the landowning, the less the net market response of the individual to a change in wages. This result is unexpected, and not easily explained. Also in both the urban and rural models, the cross-wage effects for both women and men are positive and significant. This positive cross response is observed in a number of other studies of labor force participation (Killingsworth 1983). A number of possible explanations can be posited. Among them is that there is an underlying criteria in selecting a spouse that involves persons which place a lower value on leisure marrying each other.

Next we turn to same models employing the predicted, rather than the reported subsidy variable. The instrumenting equations for the subsidy values are found in Appendix Table 2. Many of the identifying instruments are plausible and significant. For example, most of the coefficients for durable goods are negative, although only that for radio is significant in both rural and urban areas. The high standard errors on the other durable goods variables indicate considerable multicollinearity, and indeed, these parameters are jointly significant. The significance of most of the district dummy variables also suggest considerable regional differences in access to the subsidy, likely due to differences in the accuracy of self-declared income, and the scrutiny with which the forms were reviewed. Furthermore, the dummy for race, taking the value of 1 for Singhalese, and zero otherwise, assumes a positive and significant sign in both rural and urban areas, being higher in the latter. Also, the negative and significant coefficients on persons engaged in high wage, formal sector occupations, such as professionals, and clerical workers, conform to our prior expectations, although clearly occupation is not as strong of an instrument as the others discussed above.

Table 3 —Labor Supply Equations (in Days Worked Last Month) Using Reported Subsidy Value

Independent Variables	Urban		Rural	
	Women	Men	Women	Men
INTERCEPT	25.41 (5.66)	15.64 (5.74)	-1.34 (-0.20)	3.88 (1.33)
AGE	-0.20 (-0.89)	0.24 (1.65)	0.54 (3.46)	0.55 (4.13)
AGE^2	0.00 (0.92)	0.00 (-1.88)	-0.01 (-3.53)	-0.01 (-4.10)
RACE 2	0.11 (0.12)	-0.28 (-0.69)	3.27 (3.00)	2.98 (9.15)
RACE 3	1.82 (1.18)	2.10 (2.80)	3.57 (2.56)	-0.07 (-0.08)
RACE 4	-1.47 (-1.37)	-0.37 (-0.64)	-2.91 (-1.65)	0.27 (0.61)
CHILDREN < 6	0.23 (0.81)	-0.14 (-0.89)	-0.39 (-1.91)	0.16 (1.43)
CHILDREN 6-14	0.31 (1.55)	0.11 (0.96)	-0.16 (-1.22)	0.13 (1.87)
MALES 15-65	-0.10 (-0.38)	0.05 (0.41)	-0.14 (-0.73)	-0.08 (-0.94)
FEMALES 15-65	0.23 (0.98)	-0.02 (-0.11)	0.25 (1.51)	0.30 (3.07)
ADULTS > 65	0.14 (0.29)	0.62 (1.84)	1.26 (3.03)	0.64 (2.84)
SUBSIDY (OBSERVED)	-0.03 (-5.64)	-0.03 (-8.71)	-0.01 (-2.06)	-0.02 (-12.21)
MILLS RATIO	1.02 (1.07)	0.96 (0.97)	1.35 (0.88)	2.89 (2.10)
FEMALE WAGE	2.47 (2.64)	—	8.94 (3.45)	—
MALE WAGE	—	4.82 (5.60)	—	6.23 (11.15)
SPOUSE WAGE	1.54 (2.73)	1.14 (2.37)	1.49 (2.75)	0.66 (1.87)
MARRIED	-0.25 (-0.38)	0.08 (0.15)	-2.35 (-2.83)	0.95 (2.31)
AREA OWNED	—	—	-2.34 (-2.21)	2.26 (3.72)
WAGE*AREA	—	—	0.92 (1.65)	-1.56 (-3.04)
N	632	1,833	2,406	5,900
R^2	0.1343	0.1183	0.1002	0.1020

Notes: t-statistics are in parentheses; all coefficients x 10.

The endogenized subsidy coefficients in the urban probits for participation, when evaluated at the mean wage, indicate negative derivatives with a higher absolute value than the models which use the reported subsidy (Table 4). In contrast, the rural probits for both men and women have an unexpected positive sign when the predicted subsidy replaces the reported value. In the case of the former, the parameter estimate is extremely small and not significant at the 5-percent level. In the case of women, however, the coefficient is significant. This was also observed when reported ration system benefits were used in the model, although the magnitude of the coefficient is greater with the predicted variable.

In contrast with these somewhat difficult to explain results for the probits in rural areas, the labor supply equations in rural areas follow the patterns in urban areas: on both sectors the coefficients on the rice subsidy are negative and significant (Table 5). In the rural labor supply equations, as with the urban probits and urban labor supply models, the absolute value of the coefficients in the predicted subsidy model was greater than the subsidy coefficients when the reported values were used. The increase in the magnitude of the subsidy variable was particularly dramatic in the labor supply equation for women in urban areas. At the same time, the value and significance of the wage variable falls. This suggests a large bias in the wage and subsidy variables due to the endogeneity of participation in the ration system. Unobserved factors which increase the probability of subsidy participation appear to correlate with labor supply leading to a smaller subsidy impact in the earlier model which included the reported level of benefits.

The models serve as the basis for simulating the effects of the subsidy on labor supply. The total effect can be broken down between the probability of working and the number of hours worked conditional upon participation. Focusing on the models using the predicted subsidy variable, the results indicate that the effect on the probability of working is considerably less than the issue of conditional labor supply. This is attested to by, first, the fact that simulations using the coefficients from the probit indicate that the subsidy alters the probability of working by relatively small amounts. Second, many of the coefficients in the probit equations are not statistically significant nor are they as robust to specifications as we would like. And third, the predicted probabilities are largely driven by the interaction effects with wages in the urban areas, and it is difficult to sort out whether the total derivative is reflecting that subsidies affect participation differently at different wage levels, or conversely, that the effect of wages on participation changes with the level of subsidy received.

In terms of the labor supply effect, conditional upon participation in the labor market, we limit the simulations to persons from households that benefit from the targeted subsidy. The results using the reported subsidy variable indicate that men will work 2.4 and 2.0 fewer days per month in urban and rural areas, respectively (Table 6). For women, comparable figures are 3.0 and 0.8. When we employ the predicted subsidy value, the effect on labor participation is even greater. For men in urban areas, they work 3.5 fewer days, and in rural areas, 3.4 fewer days. For women, the comparable numbers are 4.7 and 3.6.

Table 4 — Probit Analysis of Labor Market Participation Using Predicted Subsidy Value

Independent Variables	Urban		Rural	
	Women	Men	Women	Men
INTERCEPT	-64.51 (-14.51)	-47.84 (-12.64)	-75.33 (-18.70)	-20.67 (-5.58)
AGE	3.44 (14.30)	3.60 (18.06)	1.28 (13.93)	2.24 (24.87)
AGE^2	-0.04 (-13.93)	-0.04 (-18.83)	-0.01 (-12.10)	-0.03 (-24.49)
RACE 2	-4.33 (-4.40)	1.35 (1.37)	-8.34 (-9.96)	-0.04 (-0.07)
RACE 3	-3.75 (-2.13)	-0.03 (-0.01)	9.27 (6.85)	0.67 (0.38)
RACE 4	8.30 (5.54)	2.13 (1.51)	-14.93 (-14.74)	0.14 (0.16)
CHILDREN < 6	-0.13 (-0.35)	0.88 (2.02)	-1.01 (-4.63)	0.53 (2.16)
CHILDREN 6-14	0.15 (0.56)	-0.44 (-1.56)	0.20 (1.38)	0.04 (0.25)
MALES 15-65	-0.90 (-3.15)	-0.95 (3.49)	-1.38 (-7.60)	-0.80 (-4.98)
FEMALES 15-65	1.39 (5.12)	-0.37 (-1.17)	-0.63 (-3.73)	-0.44 (-2.38)
ADULTS > 65	0.95 (1.44)	-0.96 (-1.19)	-1.88 (-4.53)	-1.47 (-3.50)
PREDICTED SUBSIDY	1.4×10^{-3} (0.07)	0.20 (3.84)	0.09 (11.45)	0.02 (1.89)
MARRIED	-4.49 (-5.66)	8.90 (7.44)	-7.84 (-15.62)	6.20 (9.92)
COLOMBO	1.28 (2.07)	-0.21 (-0.30)	–	–
ROUND ONE	-2.61 (-3.59)	-0.67 (-0.88)	3.57 (8.26)	-0.98 (-2.28)
FEMALE WAGE	-9.35 (-6.67)	–	56.57 (10.76)	–
FEMALE WAGE^2	–	–	-9.42 (-4.85)	–
MALE WAGE	–	-7.98 (-3.48)	–	-16.71 (-2.51)
MALE WAGE^2	–	–	–	8.36 (2.69)
SPOUSE WAGE	2.66 (1.82)	-1.56 (-1.25)	-4.14 (-4.41)	-2.26 (-3.19)
DISABLED	-9.02 (-2.92)	-18.41 (-8.57)	–	–
AGE*WAGE < 30	1.32 (1.30)	1.49 (1.13)	–	–
WAGE*PSUBSIDY	-1.70 (-7.56)	-0.20 (-3.80)	–	–
AREA OWNED	–	–	-1.74 (-1.56)	1.25 (1.06)
WAGE*AREA	–	–	-0.42 (-0.66)	-0.41 (-0.39)
NON ZERO OBS	525	1,807	2,056	5,843
ZERO OBS	2,245	785	5,653	2,025
CHI-SQUARED (19)	369.91	1,258.22	–	–
CHI-SQUARED (18)	–	–	1,933.03	2,432.82

Notes: t-statistics are in parentheses; all coefficients x 10.

Table 5 —Labor Supply Equations Using Predicted Subsidy Value

Independent Variables	Urban		Rural	
	Women	Men	Women	Men
INTERCEPT	20.90 (3.12)	14.68 (4.79)	1.62 (0.26)	6.65 (2.24)
AGE	0.05 (0.17)	0.43 (2.64)	0.46 (3.19)	0.51 (3.81)
AGE 2	0.00 (-0.08)	-0.01 (-2.81)	-0.01 (-3.17)	-0.01 (-3.82)
RACE 2	1.22 (1.22)	0.02 (0.06)	2.01 (1.63)	2.91 (8.93)
RACE 3	1.08 (0.68)	1.40 (1.83)	4.05 (2.91)	0.52 (0.66)
RACE 4	-0.17 (-0.13)	-0.16 (-0.27)	-2.69 (-1.54)	-0.05 (-0.11)
CHILDREN < 6	0.94 (2.84)	0.20 (1.18)	-0.17 (-0.76)	0.49 (4.26)
CHILDREN 6-14	0.55 (2.32)	0.34 (2.79)	0.24 (1.68)	0.42 (5.02)
MALES 15-65	0.20 (0.72)	0.24 (1.83)	0.33 (1.52)	0.21 (2.27)
FEMALES 15-65	0.18 (0.69)	0.19 (1.31)	0.66 (3.73)	0.56 (5.52)
ADULTS > 65	0.46 (0.82)	0.68 (1.95)	1.09 (2.55)	0.80 (3.56)
PREDICTED SUBSIDY	-0.09 (-6.01)	-0.07 (-9.60)	-0.07 (-5.90)	-0.06 (-15.25)
MILLS RATIO	1.55 (1.24)	1.81 (1.68)	2.29 (1.67)	2.68 (1.93)
FEMALE WAGE	0.87 (0.68)	—	7.40 (2.76)	—
MALE WAGE	—	2.60 (2.76)	—	5.41 (9.60)
SPOUSE WAGE	1.26 (1.09)	0.42 (0.83)	0.98 (0.98)	-0.04 (-0.12)
MARRIED	-0.38 (-0.51)	0.53 (0.97)	-1.41 (-1.78)	1.09 (2.63)
AREA OWNED	—	—	-3.66 (-2.64)	2.25 (3.72)
WAGE*AREA	—	—	1.65 (2.07)	-1.54 (3.02)
R^2	0.1773	0.1385	0.1299	0.1182
N	524	1,806	2,055	5,842

Notes: t-statistics are in parentheses; all coefficients x 10.

Table 6 — Actual Days Worked and Reduction in the Days Per Month Worked as a Consequence of Receiving the Subsidy

	Actual Days Worked	Reduction in Days Worked	
		Reported Subsidy	Predicted Subsidy
Urban			
Men	25.6	2.4	3.5
Women	26.0	3.0	4.7
Rural			
Men	23.4	2.0	3.4
Women	21.1	0.8	3.6

Note: Days are defined at 8 hours.

Putting this decline in labor market participation in another perspective, consider that the average daily wage of males in households that receive the rice ration is around Rs. 14. The average monthly value of the transfer to these households is Rs. 86 in urban areas, and Rs. 91 in rural areas. Combining these figures with the simulated labor response, suggests that if men reduce their labor supply by 3.5 days, as implied by the models with the fitted subsidy variable, the difference between the net transfer and net increment in expenditures is around 50 percent of its gross value. Using the reported subsidy variable, the disincentive effect is on the order of 33 percent. The wage for women engaged in comparable types of agricultural activities such as harvesting is generally about 20 percent less than men, and the predicted decline in days worked is approximately the same as men. The lower wage leads to a smaller income effect; the difference between the net transfer and the income decline owing to the disincentive effect is about 20 percent lower for women. If the male household head and the spouse were working, and both their labor supplies decline, the disincentive effect will be additive. In any event, the range of the disincentive effect is high, although it does not depart greatly from that reported for AFDC recipients in the U.S. (Moffitt op. cit.).

Reviewers and editors often request that authors do not express surprise at results reported, as if researchers do not have strong prior expectations. Nevertheless, the magnitude of the disincentive effect must be termed surprising, especially as the system in Sri Lanka did not impose an increasing marginal tax on earnings. The results indicate a high marginal propensity to demand leisure. These results, however, conform to those measured using an alternative method for estimating the demand for leisure and using a different national data set from Sri Lanka.[10] Therefore, these results are unlikely to be artifacts of either a variable definition or modeling technique.

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[10] Alderman and Sahn (1993) estimated a complete demand system, including leisure as a food. As with the current study the marginal propensity to consume leisure was found to be high.

5. CONCLUSIONS

This study examines the effect of receiving a rice ration on labor supply. It was found that in rural areas the average value of the reduction in earnings owing to the reduction in the level of work effort in response to receiving the rice ration corresponded to around 50 percent of the value of the subsidy for males, and around 40 percent for females. The large magnitude of the disincentive to work has major implications for transfer programs in developing countries. In fact, the results of this study suggest that while researchers and policy makers have devoted considerable time and attention to errors of inclusion, and to a lesser extent of exclusion of transfer programs, the labor response represents a potentially more important departure from stated (non-welfarist) policy goals. The fact that this has gone unrecognized or unheeded is not surprising, given the data and analytic requirements for modeling the disincentives to work.

The direction, if not the magnitude, of the main result is fully consistent with standard labor theory. Going a bit further in order to derive implications for targeted programs, the results also indicate that the difference between net transfers and net increment in expenditures, measured in money metric terms, will be greater, the higher the wage of the persons in the household. This is simply a consequence of the income loss associated with a comparable reduction in days worked being greater for someone with higher earnings per unit time. This implies that the errors of including high wage, and thus high income, households in targeted programs are compounded by the greater labor supply mediated income losses of these individuals. This underscores one conclusion in the study by Kanbur, Keen and Tuomala discussed above.

However, it would be premature to assume that the reduction of net benefits due to the change of work incentives is a deadweight loss. The model ignores whatever productivity effects may follow from the food subsidy increasing intake. It has been shown that higher calorie intakes do raise wages and — by inference — productivity in Sri Lanka (Sahn and Alderman 1988, op. cit.). Thus, it is reasonable to expect that whatever increase in food intake occurs from the subsidy, will have some positive productivity effect. It is also possible, although unknown, that there may be positive effects on labor supply from the subsidy which are indirectly due to the higher wages, that in part counter the disincentive effects.

Moreover, some of the reduced time in the labor market is likely going into home production activities. But even to the extent that there is a large labor supply response that results in increased leisure, the fact remains that in a strict welfare sense, the utility of the household is increased. The increase in utility, however, may in practice not result in an increase in the consumption bundle that corresponds to the objective function of the designer or evaluator of the subsidy scheme. Only under a subset on non-welfarist objectives is the consumption of leisure viewed as wasteful, or indulgent. That this view is

common reflects a lack of appreciation for the disutility of labor, especially for low-income households engaged in heavy manual work,[11] and would result in an intervention appearing ineffectual, despite its utility raising benefits. Thus, there is a need for caution in ascribing a negative connotation to the large difference between net transfers and net increment in expenditures (for example, as implied by the word leakage).

Finally, in interpreting the results of the Sri Lanka case, considerable care is required before generalizing the findings to a range of developing countries. For example, the response of workers in a country without the extensive and subsidized social infrastructure may be different. There may be a different labor supply response in cases where a subsidy is introduced, and viewed as a transitory income shock in contrast to Sri Lanka where the subsidy system has an institutional history going back almost 40 years.

Even within a single country, the labor supply effects may also differ according to the form of the subsidy, the nature of the delivery system and labor market conditions. For example, Sri Lanka converted its subsidy program to one which delivered food stamps and is now in the process of replacing that program with one which stresses credit and asset formation (through the Janasaviya Trust). The relative impacts of these programs on leisure and commodity demand is not fully studied. This, in combination with the absence of comparable studies from other countries, makes the need for more research in this area compelling.

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[11] Recall that most of the measured effect is in changes of days worked, not in participation in the labor force.

Appendix Table 1 —Definitions of Variables

Variable	Definition
RACE 1	Equals 1 if the individual's race is Sinhalese, and 0 otherwise, and is omitted
RACE 2	Equals 1 if the individual's race is Ceylon Tamil, and 0 otherwise
RACE 3	Equals 1 if the individual's race is Indian Tamil, and 0 otherwise
RACE 4	Equals 1 if the individual's race is Moslem, Burghur, white and others, and 9 otherwise
CHILDREN < 6	The number of children less than 6 years of age
CHILDREN 6-14	The number of children greater than or equal to 6 and less than or equal to 14 years of age
MALES 15-65	The number of other males greater than or equal to 15 years old and less than or equal to 65 years of age
FEMALES 15-65	The number of other females greater than or equal to 15 years old and less than or equal to 65 years of age
ADULTS > 65	The number of household members over 65 years of age
SUBSIDY (OBSERVED)	Value of rice subsidy
PREDICTED SUBSIDY	Predicted value of rice subsidy
MARRIED	Equals 1 if the individual is married, and 0 otherwise
FEMALE WAGE	Predicted wage of the women
FEMALE WAGE^2	Predicted wage of the women
MALE WAGE	Predicted wage of the men
MALE WAGE^2	Predicted wage of the men
SPOUSE WAGE	Predicted wage of the woman/man who has highest potential earnings
DISABLED	Equals 1 if the individual is disabled, and 0 otherwise
AGE*WAGE<30	AGE * PREDICTED WAGE if the individual is less than 30 years old
WAGE*SUBSIDY	PREDICTED WAGE * RICE SUBSIDY
WAGE*PSUBSIDY	PREDICTED WAGE * PREDICTED SUBSIDY
AREA OWNED	Total land area owned
WAGE*AREA	PREDICTED WAGE * TOTAL LAND OWNED
COOKDUM	Equals 1 if the household has a gas or electric cooker, and 0 otherwise
REFRDUM	Equals 1 if the household has a refrigerator, and 0 otherwise
SCOOTDUM	Equals 1 if the household has a scooter or motorcycle, and 0 otherwise
CARDUM	Equals 1 if the household has a car, and 0 otherwise
RADIODUM	Equals 1 if the household has a radio, and 0 otherwise
WATERDUM	Equals 1 if the household has piped water, and 0 otherwise
NEDUC1	Number of persons in the household who have not attended primary school

Appendix Table 1 (continued)

Variable	Definition
NEDUC2	Number of persons in the household who have attended primary school only
NEDUC3	Number of persons in the household who have completed between grades 6-10 and have not passed the General Certificate Exam
NEDUC4	Number of persons in the household who have passed the General Certificate Exam, but have not gone to university
NEDUC5	Number of persons in the household who have gone to university or done post-graduate training
DIST1-22	Dummy variables for districts
AGEMX	The oldest person in the household
$AGEMX^2$	AGEMX * AGEMX
MIGRANT	Equals 1 if the household head is a migrant, and 0 otherwise
HHSIZE	Household size
RACEDUM	Equals 1 of the household head is ther than a Sinhalese, and 0 otherwise
OCCUPATIONAL DUMMIES	(PROFESSIONAL, CLERICAL, SALES, SERVICE, FARMERS, AG. LABOR I, AG. LABOR II, PRODUCTION, MISC.)
ROUND ONE	Seasonal dummy variable

Appendix Table 2 — Rice Subsidy Equations

Independent Variables	Urban	Rural
INTERCEPT	23.62 (2.02)	-8.35 (-1.11)
COOKDUM	-3.21 (-0.57)	-7.20 (-0.79)
REFRDUM	4.13 (0.78)	-7.21 (-0.78)
SCOOTDUM	-3.57 (-0.45)	-3.77 (-0.47)
CARDUM	-4.53 (-0.73)	-1.14 (-0.19)
RADIODUM	-17.13 (-7.05)	-13.57 (-9.58)
WATERDUM	-13.72 (-4.07)	3.75 (0.83)
NEDUC1	3.56 (1.97)	3.28 (3.31)
NEDUC2	3.33 (2.41)	2.51 (3.29)
NEDUC3	-0.91 (-0.89)	0.04 (0.05)
NEDUC4	-6.48 (-4.97)	-6.00 (-6.91)
NEDUC5	1.21 (0.25)	-9.23 (-2.49)
DIST2	-4.19 (-0.82)	13.21 (4.27)
DIST3	11.84 (2.53)	23.06 (7.48)
DIST4	17.42 (2.65)	24.15 (7.46)
DIST5	8.33 (1.06)	18.33 (4.42)
DIST6	—	26.80 (5.21)
DIST7	-56.27 (-3.96)	-35.21 (-4.38)
DIST8	—	-28.30 (-4.56)
DIST9	-8.35 (-1.01)	-21.98 (-5.69)
DIST10	13.05 (1.96)	4.48 (1.19)
DIST11	18.92 (3.73)	27.17 (6.26)
DIST12	10.96 (0.82)	19.62 (2.39)
DIST13	-8.53 (-0.89)	-6.39 (-0.86)
DIST14	-15.40 (-1.97)	-10.84 (-1.88)
DIST15	-34.55 (-2.40)	-33.64 (-3.64)
DIST16	-5.77 (-1.14)	2.42 (0.85)
DIST17	-5.20 (-0.62)	10.10 (2.21)

Appendix Table 2 (continued)

Independent Variables	Urban	Rural
DIST18	4.14 (0.52)	-9.33 (-2.06)
DIST19	-3.83 (-0.36)	-9.83 (-2.74)
DIST20	13.40 (1.72)	38.50 (11.75)
DIST21	6.35 (0.75)	6.50 (2.10)
DIST22	-15.47 (-1.67)	-6.69 (-2.46)
AGEMX	-0.69 (-1.13)	0.53 (1.47)
AGEMXSQ	0.01 (1.46)	-0.01 (-1.73)
MIGRANT	-2.55 (-0.28)	-6.68 (-0.80)
HHSIZE	5.17 (7.96)	6.09 (15.98)
AREAACR	-0.96 (-1.04)	-0.33 (-0.43)
RACEDUM	5.07 (1.81)	8.41 (2.90)
DISABLED	2.52 (0.31)	5.44 (1.17)
PROFESSIONAL	-12.07 (-2.17)	-14.45 (-3.98)
CLERICAL	-13.95 (-2.49)	-20.59 (-4.98)
SALES	2.31 (0.46)	-7.80 (-2.58)
SERVICE	-12.42 (-2.24)	-6.68 (-1.72)
FARMERS	-3.33 (-0.44)	-2.32 (-0.90)
AG LABOR I	4.36 (0.53)	3.32 (1.05)
AG LABOR II	3.00 (0.41)	3.28 (0.81)
PRODUCTION	-1.22 (-0.26)	-2.89 (-1.10)
MISC	-5.98 (-1.00)	0.60 (0.16)
R^2	0.2970	0.2629
N	1,475	4,556

Note: t-statistics in parentheses.

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27

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