Title: “AJAE Appendix for: ‘Does Participation in the Food Stamp Program Increase the Prevalence of Obesity and Health Care Spending?’”

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Discrete Factor Model

Likelihood Function

Define \( w_{0t} = 1 \) if individual is normal weight, \( = 0 \) otherwise; \( w_{1t} = 1 \) if individual is overweight, \( = 0 \) otherwise; \( w_{2t} = 1 \) if individual obese, \( = 0 \) otherwise. In addition, let \( p_{it} = 1 \) indicate participation in FSP, \( = 0 \) otherwise, and \( \mu_i \) and \( \mu_2 \) denote the cut-off points of the ordered probit model. The Discrete Factor Model (DFM) likelihood function is then:

\[
L = \prod_{i=1}^{T} \prod_{t=1}^{N} \sum_{k=1}^{K} \pi_k \cdot w_{0t} \left[ 1 - \Phi_i (X_{it}' \beta_1 + \rho_i \eta_k - \mu_i) \right] \cdot w_{1t} \left[ \Phi_i (X_{it}' \beta_1 + \rho_i \eta_k - \mu_i) - \Phi_i (X_{it}' \beta_1 + \rho_i \eta_k - \mu_2) \right] \\
\cdot w_{2t} \left[ \Phi_i (X_{it}' \beta_1 + \rho_i \eta_k - \mu_2) \cdot \Phi_2 (X_{it}' \beta_2 + Z_{it}' \delta + \rho_i \eta_k)^{p_{it}} [1 - \Phi_2 (X_{it}' \beta_2 + Z_{it}' \delta + \rho_i \eta_k)]^{1-p_{it}} \right]
\]

Properties

The first application of the discrete factor nonparametric estimation technique was by Heckman and Singer (1984) in the case of duration modeling. They established the consistency of this estimator analytically for a general class of duration models and conducted Monte Carlo experiments to evaluate the estimator’s performance. While there is not yet a general asymptotic theory for all applications of the DFM, a number of studies have evaluated the estimator using Monte Carlo experiments. Mroz and Guilkey (1992) provide Monte Carlo results for a model with a discrete outcome variable (probit) and a continuous endogenous variable, a continuous outcome variable and a discrete endogenous variable, and a sample selection model. Likewise, Mroz (1999) provides extensive Monte Carlo simulations for a model with a continuous outcome and discrete
endogenous variable. Cameron and Taber (1998) report simulations for discrete outcome (logit) with no endogenous variable and suggest that the slope parameters of the model are appear to be distributed asymptotically normal and converge at a rate of $\sqrt{n}$. In general the performance of the DFM is superior to conventional maximum likelihood estimators that assume normality when the distribution of the error term is not normal, and are no worse when this distributional assumption is valid.

**Food Stamp Eligibility Tests**

*Gross Income Test*

To be eligible for the FSP, a household’s before tax gross income must be lower than 130 percent of the federal poverty line adjusted for household size and composition. We obtained the FSP monthly gross income limits for 2000 – 2003 for each category of household size and composition (# adults vs. # children) and applied these to total reported annual household income in the MEPS divided by twelve to determine gross income-based eligibility. In accordance with program rules, we exempted households from this test if they contained someone over age sixty or a disabled household member.

*Net Income Test*

To pass the net income test, a household’s monthly net income must be at or below 100 percent of the federal poverty line adjusted for household size and composition. Monthly net income is calculated by applying a number of exemptions to monthly gross income, beginning with a standard deduction of $134 for households of 4 or fewer persons, $157 for households with 5 persons, or $179 for households greater than 5 persons. Twenty
percent of labor market earnings and any child support payments were deducted from gross income, and medical expenses greater than $35 were deducted for disabled adults.

Households are also able to deduct dependent care expenses under the net income test. MEPS respondents are asked whether their children go to daycare facilities or receive childcare services in the home of a third-party caretaker or the child’s own home. They are not, however, asked to report the amount paid for child care to third-party caretakers. Therefore, we subtract the average reported dependent care deduction of $119 in 2001 for children of 2 or more years old that receive care by a third-party, and $134 for children less than 2 years old. These average deductions were obtained from the USDA Food and Nutrition Service (2003).

The final deduction under the net income test allows households to deduct shelter costs that are greater than half of income after other deductions. Unfortunately, the MEPS does not contain information on rental payments or housing costs, so we obtained data from the Center for Budgetary and Policy Priorities (Rosenbaum, Tenny and Elkin 2002) on the average monthly shelter expenses for each state and the share of households in each state that received the shelter deduction in 2000. We multiplied the share of households in the state benefiting from the deduction by the average shelter cost (adjusted for inflation in 2001 – 2003) and applied this predicted deduction to gross income for every household.

Asset Test

Households are permitted to have $2,000 in countable assets or $3,000 if they contain an elderly (age > 60) or disabled household member. The MEPS collects information on a person’s interest and dividend income, which we used to impute total countable
household assets. In particular we estimated the invested principle corresponding to reported interest income using the 6 month CD rate for all persons in the household. Note that this calculation excludes asset income in non-interest bearing accounts.

Eligibility Criteria Accuracy

When we apply all three eligibility tests 58 percent of the individuals who report receiving food stamps during any of the twelve months are classified as eligible, while 68 percent are classified as eligible if we apply just the gross income test. Because our reconstruction of eligibility is based on yearly data and not all households remain eligible for an entire year, some of the people we deem as ineligible were only eligible for certain months during the year. If we re-calculate these percentages after excluding those who participated in the FSP for less than 12 months, 64 percent of individuals reporting food stamp pass all three tests, and 72 percent pass the gross income test. Many of the additional excluded participants from our eligibility criteria were probably subject to certain state-level exemptions that we do not consider. It is important to note that when we apply just the gross income test as opposed to all three tests the number of FSP participants increases by 17 percent, but the number non-participating eligibles increases by 62 percent. This suggests moving from the three test to gross income eligibility criteria expands the sample to a potentially large number of individuals who were in fact not eligible for the program. Therefore, we prefer the three test eligibility criteria, despite the fact that it excludes a larger number of reported participants.
References


